

AFRICAN WIRELESS COMMUNICATIONS YEARBOOK 2022



From the publisher of
**NORTHERN AFRICAN
WIRELESS**
COMMUNICATIONS
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AFRICAN WIRELESS COMMUNICATIONS YEARBOOK 2022

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A state of change



Amy Saunders,
editor, *African Wireless
Communications Yearbook*

The African wireless communications landscape is vast and complex, particularly to someone new to the sector! Coming from a satellite and military communications background, it's not all novel, however, the African market is a whole different ballgame with unique challenges.

Reflecting on year at large, I'm struck by a theme: change.

This is the year the global population has finally breached 8 billion people. A new-born baby called Damian was registered in the Dominican Republic on 15 November, chosen to symbolise the 8 billion milestone. While we're now aware that our climbing population has more to do with people living longer than booming birth rates, it remains alarming to know that global population levels are expected to peak at more than 10 billion in 2086 before finally starting to fall.

We're now in 2022 living in an almost post-COVID-19 landscape – while the virus lives on, mortality rates seem to have fallen, and social

distancing and other safety measures have all but ended, allowing most countries and organisations a return to normal.

Looking back, the advent of the COVID-19 pandemic in 2020 saw communities across the globe struggle to contain the spread of the virus. Governments implemented a wide range of crisis response policies, resulting in economic contraction in around 90% of countries, as per the World Development Report 2022. This is greater even than the number of countries in contraction following both world wars, the Great Depression, and the Global Financial Crisis. In 2020, the global economy shrank by 3% and global poverty increased for the first time in a generation.

The impact of the pandemic was unequal. Larger businesses were better able to withstand fiscal pressures than SMEs and informal businesses, the latter of which comprises a large proportion of total economic activity in emerging market economies like much of Africa. In sub-Saharan Africa, for instance, the informal economy accounts for 34% of GDP.

The African Development Bank reports that the Russia-Ukraine conflict threatens to set back the continent's economic recovery from COVID-19, with supply chain disruptions of the energy, agriculture, and fertiliser sectors severely disrupted. As a result, GDP is expected to grow by 4.1% this year, taking

a significant tumble from the almost 7% of 2021. Should the Russia-Ukraine conflict persist, Africa's GDP growth is expected to remain at 4% in 2023.

Despite an uncertain economic environment, Africa's mobile economy has come on in leaps and bounds. Mobile was, naturally, at the forefront of the COVID-19 pandemic response across sub-Saharan Africa, acting as a lifeline for consumers, and remains crucial in the move to a post-pandemic world.

The GSMA reports that some 515 million people subscribed to mobile services in sub-Saharan Africa by the end of 2021, amounting to 46% of the population. 100 million new subscribers are expected by 2025, bringing the region's total mobile penetration to 50%. Home to a youthful population, subscriber growth will remain strong for the foreseeable future.

Mobile internet, too, is spreading. Today, some 40% of the sub-Saharan African population is making use of mobile internet services, helping enhance productivity and drive inclusive development. However, a further 44% of the population, while covered by mobile network, has yet to come online, states the Mobile Economy sub-Saharan Africa 2022 report: "addressing the main barriers to mobile internet adoption for these people, including affordability and digital skills, should be a priority for stakeholders in order to realise the potential of mobile connectivity to drive economic growth and development in a post-pandemic world."

While improved infrastructure and the rise of mobile adoption has boosted access to mobile internet, penetration remains well below the global average of 66%. As per Statista in January, Morocco had an internet penetration of 84.1%, the highest in all Africa, followed by the Seychelles at 79% and Egypt at 72%. In contrast, the Central African Republic had just 7.1% penetration, the lowest across the continent, followed by Eritrea at 8% and Comoros at 8.5%. Gender gaps remain in place in many countries, most notably in Benin,

Tanzania, and Liberia.

Affordability of both handsets and data remains a key challenge in many areas. As of January, São Tomé and Príncipe had the most expensive mobile internet on the continent (and indeed, one of the most expensive globally), with 1Gb coming in at a hefty US\$29.5. In contrast, 1Gb of data cost just US\$0.48 in Algeria, Africa's lowest price this year. The average price for 1Gb in 2022 in Africa, according to Statista, was US\$4.47, although in North Africa the average was a much more reasonable US\$1.05.

Value added services have continued to expand across the continent, with mobile money remaining popular with consumers. Social media penetration expanded to 380 million African users, with nearly 60% of those in North Africa now interacting via the platforms, with Facebook and WhatsApp preferred. E-commerce has also proven popular, expanding from 140 million online shoppers in 2017 to 390 million in 2022.

Mobile gaming is emerging as a key trend helping drive smartphone adoption and data consumption. 58% of the adult population across 10 major African countries analysed play digital games at least once a week according to the GSMA. In sub-Saharan Africa, the number of gamers has more than doubled in the last five years to 186 million people, according to Newzoo and Carry1st. This is largely being driven by mobile gaming – 95% of gamers across the region play on a smartphone or tablet, as opposed to consoles and computers. The expansion in mobile gaming has been attributed to improvements in mobile and fixed networks in terms of speed, latency, reliability, and coverage; advances in streaming technology; and the proliferation of cloud/edge infrastructure.

On a continental scale, telecommunications infrastructure remains scarce and underdeveloped, however, rapid progress is being made. As of June, Africa's fibre optic network reached 1,184,028km, with an additional 34,474km entering service in the

previous twelve months. An additional 119,062km is under construction, 125,541km planned, and 69,352km proposed.

Despite the significant advancements in fibre rollout, fixed connectivity remains elusive to most Africans. Fixed wireless access (FWA) technologies are being lauded as a cost-effective solution for the continent, where population density in even suburban areas remains too low for the affordable deployment of fibre. While mobile is the primary connectivity method for African consumers, the speeds and latency are lower than required by many; 5G FWA, on the other hand, delivers higher speeds, lower latency, and comes complete with fast, cost-effective easy installation and deployment.

Although 3G continues to dominate the African continent, new subscriptions fell for the first time in 2022 as consumers migrate from legacy networks to 4G. GSMA reports that, by 2025, 4G will account for a third of mobile connections in the region, compared to under a fifth of connections in 2021. 5G, meanwhile, continues to rollout across the continent. 5G spectrum auctions, pilots, and commercial trials, and locally relevant use cases are all underway.

Broadband speeds, both fixed and mobile, are on the rise across Africa, although lagged behind the global median of 33.17Mbps down, as per Ookla. South Africa leads the pack on mobile download speeds, recording 34.75Mbps in September, while Ghana came bottom of the ladder at 3.73Mbps.

Historically having very low involvement in the satellite sector, African nations have been ramping up activities in this area in recent years. November saw Zimbabwe launch its first satellite, a nanosatellite designed for Earth observation. Shortly after, the country announced plans on the launch of its first communications satellite. Botswana, too, plans to enter the sector with the launch of an Earth observation satellite in 2023.

In other news, the direct satellite-to-device

movement, which will see satellites able to communicate directly with consumer devices, is gaining pace. This technology is expected to reduce the barrier to entry for customers, and, with wholesale agreements with MNOs, expand coverage to billions of new subscribers across the globe. MNOs stand to gain increased customer satisfaction (and thus reduced churn), reduce deployment costs, and unlock new revenue generation opportunities. As well as consumer uptake, direct satellite-to-device is expected to be game-changing for the critical communications field, enabling secure, reliable connectivity in even the harshest and most remote locations.

While Starlink and T-Mobile, and Globalstar and Apple have partnered on the delivery of satellite-to-device services in various world regions, AST SpaceMobile has agreed deals with Vodafone Group, Rakuten Mobile, AT&T, Orange and more to deliver these services in low latitude regions, including Africa. Something to look out for in the not-so-distant future...

For the first time ever, the African Wireless Communications Yearbook comes complete with a data centre chapter. With edge computing, data sovereignty, the cloud, 5G and IoT taking Africa by storm, data centres are becoming increasingly big business across the continent, and increasingly key for MNOs and service providers alike. Challenges remain, however, particularly surrounding reliable power supplies, cooling technologies and sustainability, which must be addressed holistically across the value chain.

The African wireless communications sector is in a state of great change, with new technologies and challenges appearing at great pace. As time goes by, the digital divide narrows, and connectivity gaps are bridged; however, there is still a long way to go, and many hurdles to leap, for the continent to fully realise its potential. ■

CHAPTER 1:	STATE OF THE MARKET	
	Comment & analysis	09
CHAPTER 2:	CELLULAR NETWORKS	
	Introduction	35
	Interviews	48
	Supplier Profiles	64
CHAPTER 3:	DATA CENTRES	
	Introduction	68
	Interviews	80
	Supplier Profiles	88
CHAPTER 4:	CRITICAL COMMUNICATIONS	
	Introduction	91
	Interviews	98
	Supplier Profiles	105
CHAPTER 5:	SATCOMS	
	Introduction	107
	Interviews	122
	Supplier Profiles	136
CHAPTER 6:	BROADBAND	
	Introduction	141
	Interviews	156
	Supplier Profiles	162
CHAPTER 7:	FIBRE	
	Introduction	167
	Interviews	171
	Supplier Profiles	177
CHAPTER 8:	FIXED WIRELESS ACCESS	
	Introduction	180
	Interviews	188
	Supplier Profiles	192
CHAPTER 9:	VALUE ADDED SERVICES	
	Introduction	195
	Interviews	206
	Supplier Profiles	219
ACKNOWLEDGEMENTS		221



Transforming digital Africa



chapter 1

State of the Market



Keoikantse Marungwana,
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sub-Saharan Africa, IDC

From pure telco to platform player: how the telco needs to evolve

The shape of the telecommunications company (telco) is changing. Today, it should be defined by digital – by the network and organisational DNA and how it leverages digital to interact with external stakeholders and customers.

This digital telco is powered by connectivity and capability that extends beyond the limitations of the past toward more inclusive and dynamic service provision across multiple touchpoints. The network infrastructure of the digital telco is focused on a service-based architecture that caters to the increasingly sophisticated requirements of customer, technology and use case alike.

The modern telco

The modern telco must be capable of catering to simple voice and data delivery while equally

meeting the demands of bandwidth-hungry services such as 4K streaming, augmented reality and virtual reality. It must also provide customers with a network that can handle the demands of automation, the Internet of Things (IoT), and artificial intelligence (AI).

In addition to seamless delivery of evolving services, telcos need to fully digitise network operations with AI-enabled functionality. This ensures that they can deliver real-time network visibility, predictive maintenance, self-optimisation, and zero-touch provisioning alongside the rapid and dynamic allocation of resources. With this level of granular control, telcos can gather insights from customers and fundamentally transform

“The modern telco must be capable of catering to simple voice and data delivery while equally meeting the demands of bandwidth-hungry services such as 4K streaming, augmented reality and virtual reality.”

their experiences across the network while using the insights to launch new and innovative services that are both relevant and timeless.

The innovation lifecycle isn't the typical one to two years anymore. Digital telcos can launch products and innovations in a matter of months, if not weeks. Billing models in a digital telco are not rigid so pricing can be adapted to suit consumption patterns, usage behaviour, or, for complex enterprise deals, business use cases and end-user value.

Shifting to digital

This shift from traditional to digital within the telco environment is directly linked to the rapid digital transformation revolution taking place across the globe.

IDC predicts that 65% of the global gross domestic product (GDP) will be digitised by the end of 2022 which is a fundamental and transformative shift in terms of how business is done, how digital services are consumed, and how those services are procured. Customers across the enterprise, consumer and government segments want service providers that not only deliver digital services, but that can curate end-to-end digital service experiences that are relevant and customisable.

Companies that lag on digital maturity will see a continuous and marked decline in their core service revenues and will start losing market share to competitors with networks that resemble digital service delivery platforms. Companies that have digitised, automated and AI-enabled operations will gain ground on the global stage as they can actively engage with, and connect, customers to the services they want to consume. Digital transformation within this sector is closer to organisational transformation – enabling agility and dynamic responsiveness to market forces.

Preparing for business disruptions

The latest 2022 IDC CIO Digital Transformation survey found that 62% of CIOs identified digital capabilities as their key investment objective when it comes to preparing for future business disruptions, and this has never been more relevant than it is to the telco today. The digital telco is in a unique position to become a trusted partner that's relied on by CIOs across all industries and that can provide collaborative input and services for projects, PoCs and innovations that drive digital initiatives and solutions.

Ecosystem players also want to deal with the digital telco when it comes to forging strategic partnerships that allow for the development of new products and services that are unique and that leverage deep industry and vertical insights.

As the global economy becomes increasingly digitised alongside the accelerated digital transformation introduced by the pandemic, customers around the world have adopted a digital-first strategy. If the telco is prepared and ready to initialise its digital-first operations and approaches, then it gains a competitive advantage. The ability to scale globally while meeting changing needs on the local stage.

The future of enterprise

This is the future of the enterprise, the future of work and the future of ecosystems.

This is where the cloud-native business model that enables access to digital services, skills, and revenue from anywhere in the world comes into its own. And this is where the telcos stuck in traditional ruts will come to a slow end as the digital native and digital explorer takes the lead and transforms the sector and its capabilities. ■

Spectrum policies for rural connectivity in Africa

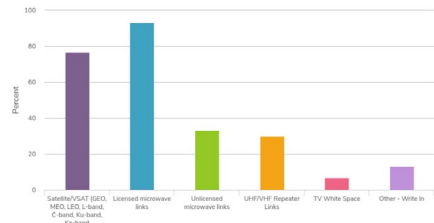
Survey on Spectrum Policies for Rural Connectivity in Africa - ATU

Rural connectivity in Africa

In October 2020, the African Telecommunications Union (ATU) established a task group to develop spectrum recommendations to improve rural ICT connectivity. This project aims to develop proposals based on best practises in Africa and worldwide on how spectrum policy, regulations and methods can promote rural ICT connectivity in Africa.

The task group sent questionnaires to the ATU member countries to assess spectrum challenges of rural connectivity on the continent. By the response deadline in January 2021, 30 out of 48 member countries submitted their responses. This report - Survey on Spectrum Policies for Rural Connectivity in Africa - presents the results on spectrum policies and other regulatory tools for rural connectivity in the member states.

microwave links and UHF/VHF repeater links, respectively. Elsewhere, 7% of the respondents used TV White Space (TVWS).



Value	Percent	Responses
Satellite/VSAT (GEO, MEO, LEO, L-band, C-band, Ku-band, Ka-band)	76.7%	23
Licensed microwave links	93.3%	28
Unlicensed microwave links	33.3%	10
UHF/VHF Repeater Links	30.0%	9
TV White Space	6.7%	2
Other - Write in (click to view)	13.3%	4

Wireless backhaul technologies used to connect rural areas

Coverage of telecommunication/ICT services

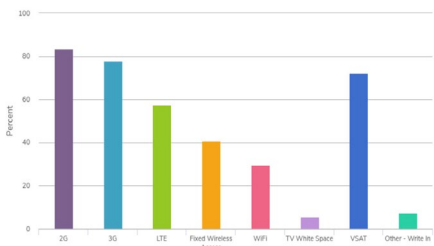
The study found a median of three mobile network operators (MNOs) and ten internet service providers (ISPs) exist in each respondent country. 83% of the MNOs and 70% of the ISPs provide services in remote/rural areas in their countries. Only one country indicated that it had a dedicated rural service provider.

Wireless backhaul technologies

The respondent countries use wireless backhaul technologies to provide services in rural areas; many of the countries use multiple technologies. 93% use licensed microwave links as the backhaul technology, while 77% confirmed using satellite. In addition, 33% and 30% of the respondents indicated using unlicensed

Access network technologies

The survey evaluated the wireless access technologies used to connect rural and remote areas. 2G mobile (82%), 3G mobile (74%), and VSAT (71%) were dominant, while LTE has grown to almost 60%, and TVWS stood at about 6%.

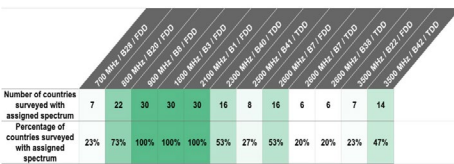


Access network technologies used to connect rural areas

Assignment of frequency bands identified for IMT

The survey considered frequency assignments in the IMT bands within Africa. All the respondent countries have assigned 900MHz (Band 8/FDD), 1800MHz (Band 3/FDD), and 2100MHz (Band 1/FDD).

73% of the respondents have frequency assignments in the 800MHz (Band 20/FDD), while 53% have assignments in the 2300MHz (Band 40/FDD) and 2600MHz (Band 7/FDD). Less than 30% stated that they had assignments in the other IMT bands except for the 3500MHz (Band 42/TDD), where 47% of the countries indicated that they had assigned the frequency bands.



Details of the frequency plans

Spectrum recommendations

Spectrum licensing is a strong statutory instrument that aligns the use of radio frequency spectrum with the national information and communications technology (ICT) policy objectives to the benefit of all citizens.

Frameworks are a critical component to maximize spectrum resources to ensure that they enhance the capacity and coverage of mobile and broadband networks for end users, helping bridge the digital divide. Besides ensuring that spectrum is made available in low, mid, and high frequency bands, how spectrum is made available is equally important.

High quality mobile services are vital for consumers and businesses and deliver major

socioeconomic benefits. They rely on increasing amounts of spectrum to support faster broadband speeds and rapidly growing data demand. Given that there is a limited supply of mobile spectrum, it is vital that governments and regulators ensure it is awarded to operators who will use it most efficiently, as technology improvements alone cannot deliver the required capacity.

To this end, the development of guidelines that address maximizing spectrum availability, implement long-term spectrum licenses to maximize regulatory certainty, take a technology-neutral approach to licensing, and make innovative licensing options available while ensuring the protection of existing services is recommended.

Spectrum licencing

An examination of previous spectrum auctions/ assignments in several countries suggests that many could be viewed as problematic. In many cases, auctions have failed because reserve prices were set too high and because the amount of spectrum on offer was limited.

However, Nigeria has been able to find a middle ground. The Nigerian Communications Commission (NCC) has organized and executed several spectrum auctions which include the digital mobile auction of the 900MHz and 800MHz band in 2001, the 2GHz 3G auction in 2006, the 2.3GHz wholesale wireless access in 2014 and the 2.6GHz spectrum auction in 2016. It also auctioned two slots of 27MHz in Lagos state in 2016 just before the 2.6GHz auction.

Moreover, Nigeria's Spectrum Trading Guidelines, published in 2018, allow for NCC licensees to share and trade spectrum, whilst putting in place measures to guard against exploitation of the principles of the guidelines. For instance, the guidelines allowed spectrum to be traded by eligible licensees that had held spectrum for up to two years and achieved at least

25% of rollout obligations specified in the licence.

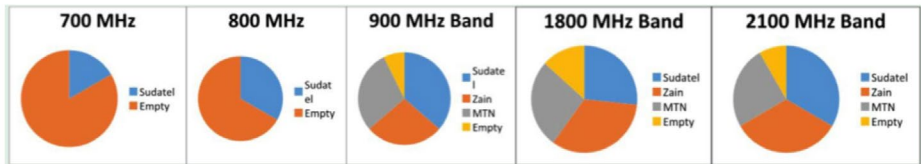
Historically, Tunisia's spectrum was assigned on a technology specific basis, however as a measure to improve mobile broadband connectivity during the COVID-19 pandemic, Tunisia granted technology neutrality, on a temporary basis initially, so operators could use their spectrum for LTE. Soon after, the decision was made permanent by the ICT minister, as it concluded it is more appropriate to aim for technological neutrality for these licenses and leave the field for operators to choose the appropriate technology and the most appropriate timing for the adoption of future generations of technology.

Meanwhile, in Sudan the license each operator was issued depended on market requirements, with agreements signed between the TPRA and the licensee. Spectrum was awarded taking into consideration the economic status at that time, and the upfront fees were a portion of the total license fees. An annual usage fee is applicable for all operators for the use of access and transmission frequencies. The main mobile and broadband

operators in Sudan are mobile operators Zain and MTN; fixed broadband operator Canar; licensee with unified licensing, Sudatel.

In licensing for telecom operators, the term of agreements should always include the reframing of spectrum when needed. This was very useful for Sudan when reframing was used to gain access to the valuable 850MHz band by granting the operator a replacement in the 700MHz and 800MHz bands instead.

For fixed broadband, four ISPs have been licensed to provide services in dedicated areas to increase the penetration of fixed broadband services in Sudan using the 3.5GHz, 28GHz and 5.8GHz bands. For delivering connectivity in rural areas, the main operators have agreed to include a universal service obligation, which provides a specific amount to be funded to the universal services treaty to cover the cost of connecting the unconnected. Moreover, the license and annual fees take into consideration (and encourage) the coverage of rural areas. ■



Spectrum assignment for Sudan's operators

Mobile economy developments in MENA

The Mobile Economy Middle East & North Africa 2022 - GSMA

Market overview

Since the emergence of COVID-19, mobile networks have been instrumental in delivering reliable connectivity to sustain social and economic activities. As countries bring the pandemic under control, a priority for governments in MENA and elsewhere is to drive economic recovery

and promote sustainable development. Digital services and technologies will be crucial to realising this objective, by stimulating economic growth, mobilising the workforce, and enabling industrial efficiencies.

The number of mobile internet users in MENA

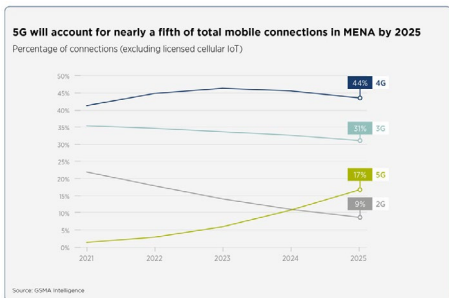
exceeded 300 million in 2021, with penetration due to reach 50% of the population by the end of 2022. Smartphone adoption is growing well and is set to increase most strongly in MENA's less advanced mobile markets over the period to 2025, underpinned by continued network investment from operators. Increasing user engagement with bandwidth-hungry applications such as video will lead to a surge in data consumption across the region, growing by 430% between 2021 and 2027.

4G is MENA's leading mobile technology, with

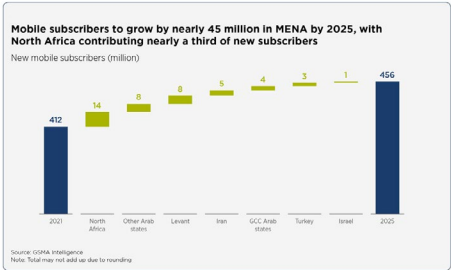


almost 270 million connections at the end of 2021. Take up has more than doubled over the past five years, driven by network expansion and efforts by MNOs to transition users from legacy networks. However, 4G adoption is projected to peak in 2023 as consumers increasingly migrate to 5G plans. At the regional level, 5G remains at a nascent stage. The current adoption rate of just 1% is expected to grow to 17% by 2025.

While the consumer market has been the focus



of early 5G deployments, B2B is the largest incremental opportunity in the 5G era, with a raft of digital transformation projects underway.



To fully exploit these opportunities, 5G leaders in MENA are investing in new capabilities, with edge computing a priority. This ties in with operators' efforts to grow revenues beyond core telecoms services. 5G fixed wireless access (FWA) has also garnered significant early interest from operators in MENA.

In a post-pandemic world, digital connectivity is expected to become even more vital to citizens, firms, and institutions alike. Regulatory frameworks that are conducive to investment will be crucial to incentivising the deployment of telecoms infrastructure. Such infrastructure will be key to economic recovery and future crisis resilience.

Operators step up their network transformation plans

The commercialisation of 5G has coincided with the introduction of network innovations such as open RAN, virtual RAN, and network automation. Combined with new market demand for energy efficiency and network security, operator decisions on network transformation strategies have never been so important.

In the Middle East and Africa, sustainability, network security and end-user security are the main priorities of operators' network transformation strategies, according to GSMA Intelligence's latest survey. This is unsurprising given the backdrop of rising security threats and demand for a greater focus on energy efficiency

from shareholders and customers.

There exists widespread interest in the use of cloud and IT technologies in the network, as well as automation of business functions and network operations. Combined, such technologies can help operators scale networks to match demand more easily, reduce costs and accelerate service innovation.

Operators in MENA have been working closely with leaders in cloud networks to deploy new capabilities and accelerate progress. In 2021, only around a quarter of operators in MENA claimed that the use of open networking technologies (including open RAN) was a very or extremely important priority. This points to the many competing priorities that need to be juggled and the fact that open RAN announcements until recently have hailed from other regions.

However, this is starting to change; open RAN momentum is building in MENA. In July 2021, e&, STC, Zain Group, Mobily and Du signed a MoU to progress the implementation of open RAN solutions in their respective markets. Batelco and Omantel were later added in March 2022. In the same month, the Open RAN MoU operators launched the first regional community lab in collaboration with Telecom Infrastructure Project (TIP) and Intel. This will help foster the open RAN ecosystem in MENA, enabling operators to accelerate the deployment of open networking technologies.

Operators look to diversify revenues

There is often scepticism about operator success beyond core telecoms services, but operators in MENA are providing a growing number of examples of revenue diversification. Revenue beyond core as a percentage of total revenues varies significantly among MENA operators, and there is no 'one size fits all' in terms of strategy

or timeline for diversification, reflecting different regulatory environments and consumer habits.

Some operators offer a wide range of consumer services beyond core: Orange is one notable example. Consumer services still represent the largest contributor to revenues in MENA, but enterprise is the main growth driver as operators increasingly target the digital transformation of vertical industries.

Financial services and security represent key components of revenue diversification strategies for operators in MENA. Orange Money provides an example in financial services. As of June 2021, it had reached 23 million active customers across Africa and the Middle East.

The pandemic resulted in growing demand for security-related services provided by operators as enterprises pushed ahead with their digital transformation. Most operators consider investing in security very or extremely important to help achieve long-term enterprise revenue goals. According to the GSMA Intelligence Operators in Focus: Enterprise Opportunity Survey 2021, security was highlighted as the primary growth area by more by more than 50% of operators surveyed in MENA.

Enhancing digital inclusion

At the end of 2021, 307 million people in MENA were connected to the mobile internet—an increase of 14 million on 2020. However, 322 million people remain offline. Operators' investments mean only 6% of the population are not covered by a mobile broadband network, but a far greater proportion (45%) do not use mobile internet services due to various non-infrastructure limitations. These include affordability, knowledge and digital skills, relevance, safety and security, and access to enablers (such as electricity and formal ID).

Affordability remains a barrier to mobile

STATE OF THE MARKET

internet use for many in the region. Affordability of internet enabled handsets and mobile data worsened in MENA (and many other regions) due to the impact of COVID-19 on employment and income levels. Operators have been supporting customers through social tariffs and handset-financing models, such as payment instalment plans, subsidies, loans, leases, and rentals.

Efforts also continue to reduce the number of people not covered by a mobile broadband network. In November 2021, the Algerian telecoms

5G networks has created upward pressure on operators' energy usage to power the new equipment. Being energy-efficient and using renewables economically is a necessity to avoid a competitive disadvantage; energy is a top three area of opex for operators, after labour and site rentals. Private sector commitments across the region on net zero are likely to accelerate during 2022–2024, while renewable electricity demand is expected to grow, driven by rising energy prices and the region's ample access to solar as a natural resource.

Diesel generators have traditionally been the most economical way to generate electricity in off-grid or bad-grid scenarios across MENA. However, solar has become a competitive option over the past few years, due to three main factors:

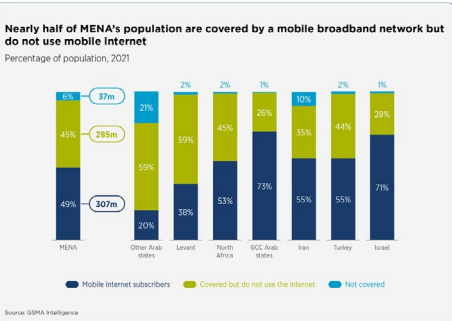
- Strong support for renewable electricity from local governments
- Operator aims to control energy costs
- Reduced prices of photovoltaic panels

regulator awarded extra spectrum in the 900MHz band to the country's three network operators to help improve services and widen coverage.

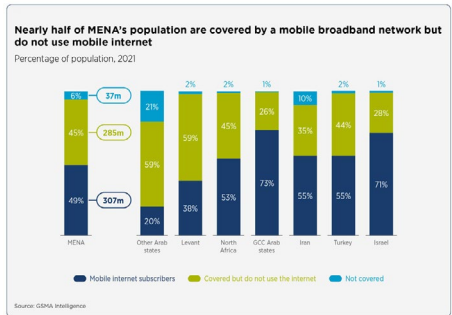
Sustainability commitments and ambitions grow

Sustainable transformation is gathering pace across MENA. Operators like MTN are implementing programmes to deploy base stations powered by renewable energy, hybrid solutions and advanced cooling solutions, while reducing dependence on diesel for base-station backup power. Countries with few or no natural energy resources are more exposed to global fluctuations in energy prices, so local operators have every reason to be ambitious with renewables.

MENA is home to some of the leading 5G markets globally. However, the rollout of new



MENA has an exceptional sunshine duration ratio, which makes solar a particularly promising option for network operators. They can deploy solar panels at their sites and store the unused electricity in batteries, and they can build larger, centralised solar farms. ■





Amy Saunders,
editor, *African Wireless
Communications Yearbook*

Addressing fixed wireless access on the continent

The GSMA has reported that in 2021, mobile internet users reached 307 million in MENA, with some 50% of the population expected to come online via mobile by the end of 2022. Meanwhile, in sub-Saharan Africa some 303 million people, 28% of the population, connected to mobile internet in 2021; this is expected to expand steeply by 2025 to 40% of the populace.

With new applications and use cases spreading fast throughout the African continent for government, enterprise, and consumers alike, faster connectivity speeds are required than ever before. 4G is MENA's leading mobile standard, accounting for 41% of connections in 2021, but again, sub-Sahara Africa is lagging with 4G accounting for just 17% of connections in the same year. With typical mobile 4G download speeds equalling 8-10Mbps, customers are seeking improvement to truly join the digital revolution.

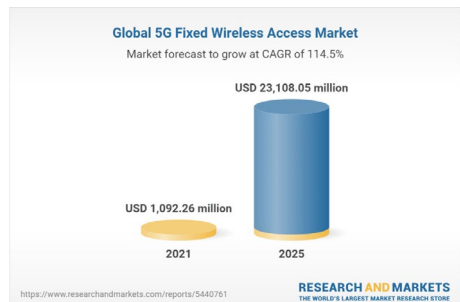
Fixed wireless access (FWA) is considered a key enabling technology for the delivery of high speed, low latency, cost-effective connectivity for government, enterprise, and home use cases. 5G and FWA technologies go hand in hand, with the 5G FWA segment expected to expand at a compound annual growth rate (CAGR) of 114.5% to US\$23,108 million over 2020-2025, as per Research And Markets. Indeed, 5G FWA is widely anticipated to deliver fibre-like services, affordably, helping to rapidly

bridge Africa's digital divide.

Unlike the lengthy deployment times related to fibre installation, FWA installations are both extremely fast and simple to deploy; pre-existing telecommunications towers can be adapted to support FWA rollout, requiring low initial investment and fast return on investment for operators and service providers.

According to Ericsson, more than 70% of global service providers offered FWA in 2021, and connections are expected to exceed 180 million by the end of 2026. 5G FWA connections are expected to surpass 70 million by 2026, with installations focused on regions with low fixed broadband penetration like Africa.

The wider rollout of 5G FWA isn't without its challenges, though. High infrastructure costs, compatibility challenges, spectrum allocation standardisation, power dissipation in MIMO, and inter-cell interference are all potential roadblocks. Although 5G FWA will be unable to compete with fibre in those regions where extensive digging and laying makes sense, it is expected to play a valuable role in delivering connectivity in fibre-free areas. OMDIA has speculated that households in sub-Saharan Africa alone account for an addressable market of 142 million for FWA; a bright future indeed for those in the value chain. ■



Connecting Africa

Global Connectivity Report 2022 - ITU

The impact of connectivity

The impact of internet connectivity on businesses, governments and individuals is far-reaching, delivering significant economic benefits. Generating productivity gains and innovation, the internet contributes to job creation and economic development. Governments use the internet to deliver essential public services such as education and healthcare, some at reduced cost and with greater reach. The internet can also enable other government services such as business registration and tax collection, and to deliver benefits.

An ITU study shows that a 1% increase in fixed broadband penetration increases gross domestic product (GDP) in a country by 0.08%, while a 1% increase in mobile broadband penetration increases GDP by 0.15%. While the economic impact of fixed broadband is greater in more developed countries, mobile broadband benefits are maximized in developing countries, where mobile tends to be the way most people access the internet. In Africa, a 1% increase in mobile penetration is estimated to increase GDP by 0.25%. Mobile broadband penetration in Africa increased from just under 30% in 2018 to just over 40% in 2021; this 10% increase corresponds to an increase of 2.5% in GDP.

The benefits of connectivity are considerable for society. There exists a very close relationship between connectivity and human development, although the relationship works both ways: connectivity drives development and more development leads to more connectivity. The benefits of connectivity are considerable for the marginalized and vulnerable, typically the least connected populations. Connectivity can

reconnect refugees with their communities and provide online services including education, employment, and financial support.

Fixed broadband access

Today, there exists high-speed fixed and mobile broadband networks that deliver always-on internet access in most countries.

Although more people use mobile networks than fixed networks for internet connectivity, the latter remains important. Fixed broadband networks generally have a higher data capacity than mobile networks, and download limits are higher than similarly priced mobile broadband plans. They are faster and are more reliable than 3G or 4G networks, making them more suited for high-bandwidth activities such as games and video calls.

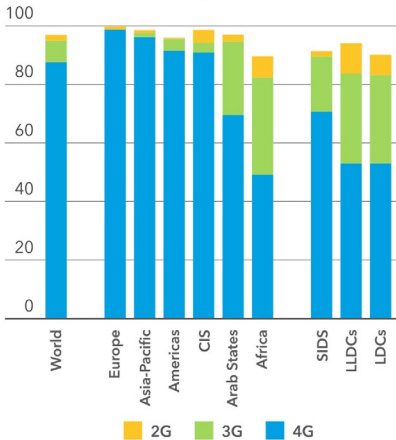
Fixed broadband networks are expensive to roll out, maintain and upgrade, depending on the geography and extension of the territory. The topology of many fixed broadband networks consists of fibre-optic rings with access points from which homes and businesses are connected. For efficient and profitable network deployment, there must be a high geographic concentration of households and businesses.

However, most people do not have access to fibre optic networks because of their location. Globally, only 2.3 billion people (29%) lived within 10km of a fibre-optic network in 2021 and living within 10km of a fibre-optic network is no guarantee of a connection for many reasons, including the absence of a point of presence (PoP), optical-line terminal or fibre-optic drop to connect the network to the home or office. In Africa, just 25% of the population lives within

10km of a fibre-optic network.

For a household to access a fixed network, a 'last mile' connection is needed. In Africa only 7% of households can potentially subscribe to a fixed network (for LDCs this figure is just over 1%). No access to a fixed network impacts the number of fixed broadband subscriptions. In Africa and in LDCs and LLDCs, few subscribe to fixed broadband services.

Percentage of the population covered by a mobile-cellular network, 2021



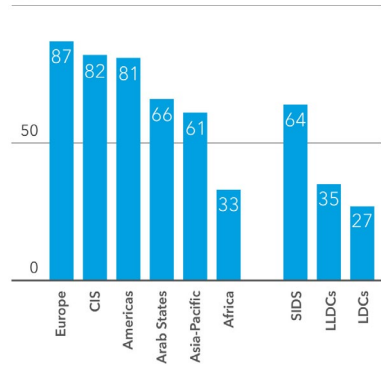
Connectivity divides

The COVID-19 pandemic has highlighted the importance of fast and affordable internet. In the first year of the pandemic, percentage growth of internet users was the highest in a decade.

In 2021, an estimated 2.9 billion people were still offline. Most of the global offline population, 1.7 billion people, reside in Asia Pacific, followed by Africa with 738 million people offline. In percentage terms, Africa was the least connected region in 2020, with 67% of the population offline.

The share of internet users is estimated to be twice as high in urban areas as in rural areas in 2020. In Africa, internet use in urban areas was

Percentage of the population using the Internet, 2021

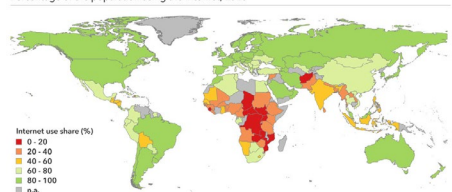


Note: CIS = Commonwealth of Independent States.
Source: ITU.

almost 3.5 times as high as use in rural areas. Lower rural usage is partly a result of a lack of infrastructure, but there are additional factors at play. Rural areas usually have lower income levels, and the population often has lower levels of education and lower levels of ICT skills, all of which are negatively correlated with internet use.

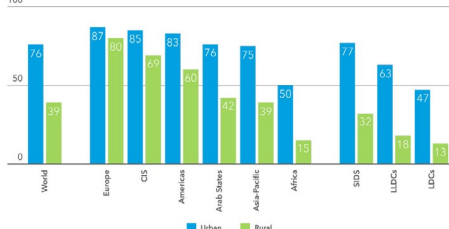
Combining data on coverage and internet usage makes it possible to distinguish between those not using the internet because of a lack of infrastructure, and those not using the internet for other reasons. In Africa, almost 30% of the rural population cannot access the internet, 18% of the rural population has no mobile network coverage, and another 11% only has access to 2G. In rural Africa, just 15% of the population

Percentage of the population using the Internet, 2020



Note: The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of ITU and of the secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. The base map is the UNmap database of the United Nations Cartographic Section.
Source: ITU.

Percentage of the population using the Internet in urban and rural areas, 2021
100



Note: CIS = Commonwealth of Independent States.
Source: ITU.

uses the internet and the coverage and usage gaps are almost the same size, whereas in Africa's urban areas, mobile broadband coverage is almost universal and only a usage gap exists.

Users judge their broadband quality on their experience of connection speeds. Speed is another dimension of the digital divide, reflected by median download and upload speeds. In low- and lower-middle-income economies, mobile broadband offers the faster alternative (this is the case across African countries), while in high-income economies, fixed-broadband speeds are 30-50% faster.

While mobile networks provide a comparable alternative to fixed networks in most parts of the world concerning download speeds, there is a clear gap between the upload speeds. Mobile upload speeds measured in the different regions are surprisingly similar, remaining around the global median of 10-12Mbps, with Africa scoring the lowest in 2020 at 8Mbps. Users on fixed networks, on the other hand, could benefit from 2-3 times faster upload speeds than those in the same region using mobile networks.

Affordability challenges

Device pricing is a significant barrier hindering digital adoption. Price reduction has its challenges, however. Very few countries manufacture and control pricing, and importing countries have no say in how the pricing is arrived at.

Governments affect device price by imposing import duties and sales taxes. The World Trade Organization (WTO) Information Technology Agreement (ITA) calls for countries to eliminate duties on IT products. Despite the initiative having 82 signatories, many of the world's poorest countries, particularly in Africa, have not signed.

A4AI reports that the average global smartphone price in 2021 was around 25% of monthly income, rising to 53% in LDCs. A4AI calls for using USF funding to subsidize the cost. Some operators are playing their part to lower handset costs. Working with Chinese manufacturers, MTN has introduced a handset that costs less than US\$40 across its markets. In Zambia it is subsidizing handsets, and in Uganda it offers customers an instalment plan amounting to US\$0.17/day. China's mobile phone manufacturer TECNO has the highest mobile phone sales in Africa because it sells affordable handsets.

There are concrete measures that can make data more affordable in low- and middle-income countries. Governments can:

- Ensure provision of unlimited broadband access to community centres and schools, with access to those in the surrounding community who cannot afford it at home
- Ensure that temporary COVID-19 concessions that were established by operators in many countries (higher data allowances or providing free WiFi) are maintained for the poorest segment of the population, those needing medical support, and students
- Subsidize data use for the poorest segment of the population through social tariffs
- Apply zero ratings for critical services such as e-government, education, and health services
- Create charitable data donation schemes

Achieving meaningful connectivity in Africa

Great strides have been made in the maturity of ICT regulation in recent years to achieve universal and meaningful connectivity. However, the weakness of institutions in many countries remains an impediment to the development of a robust and well-balanced market to connect the unconnected.

More effective regulation is needed to combat market dominance of incumbents in both fixed and mobile markets. It remains challenging for new players to enter the market, with barriers to entry including tariff-mediated network effects, anti-competitive measures taken by incumbents, and the high cost of building a network. Effective regulation would allow countries to apply necessary competitive levers such as interconnection, wholesale access regulation, infrastructure sharing, and pricing transparency.

Universal service funds have been largely unsuccessful on the continent, often sitting unused or misused, instead of connecting the unconnected. The effect has often been counterproductive. Extractive rents in mobile company taxation in some instances and secondary taxes through universal service funds have often increased prices of services and devices, constraining the take-up and use of broadband services.

There are several ways governments could address these challenges:

- Enabling environment for the entry of service providers with low-cost access business models
- Removing customs or excise tax on entry-level devices
- Scrapping regressive end-user taxes on social networking platforms, which are often the most cost-effective communication

means for those in the subsistence economy

- Providing free public WiFi at all public buildings
- Exploring new forms of demand aggregation that will allow people to connect through public WiFi and mesh networks from their homes
- Exploring long-term public sector anchor tenancies to get adequate infrastructure to underserved areas

ITU has initiated several multistakeholder partnerships and is contributing to several initiatives.

Mobile- and fixed-network infrastructure.

Fixed connectivity was initially provided by state-owned operators. Sector reform then liberalized telecommunication markets and allowed for competition; private operators have since expanded the availability of mobile services and competition in broadband services, built on spectrum allocated by ITU. However, gaps remain which stakeholders are working to fill and that governments are targeting through broadband plans, universal access and service funds. These plans are promoted by the Broadband Commission for Sustainable Development. The World Bank Group is supporting the Eastern Africa Submarine Cable system (EASSy), a regional first, with a novel open access model. The Internet Society is helping develop community networks. Meta is now investing in submarine cables and WiFi platforms.

Affordability of connection and device.

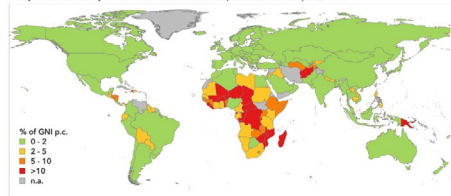
The Alliance for Affordable Internet works to reduce connectivity and device costs, setting an affordability target where 1GB of mobile broadband data costs a maximum 2% of average monthly income, also supported by the Broadband Commission. GSMA has a focus on meaningful connectivity, highlighting tax impact

on consumers and operators.

Access to mobile and fixed devices. Some companies seek increased availability of smart devices, lowering manufacturing costs and addressing taxation. Safaricom and Google are helping make devices more affordable by spreading the cost, while KaiOS offers an operating system that makes less expensive phones ‘smart’ for as little as US\$10.

Digital skills. The International Labour Organization has a focus on digital skills for

Entry-level data-only mobile-broadband basket prices (% of GNI p.c.), 2021

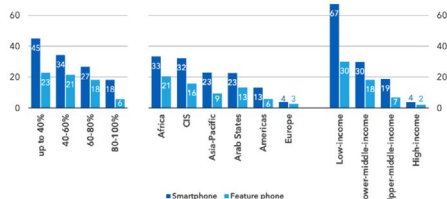


Notes: Refer to the methodology document, available at: https://www.itu.int/en/ITU-D/Statistics/Documents/publications/price2021/ITU_ICT_Prices_Methodology.pdf, for a description of the basket. The designations employed and the presentation of material on the map do not imply the expression of any opinion whatsoever on the part of ITU and of the secretariat of ITU concerning the legal status of the country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. The base map is the UNmap database of the United Nations Cartographic Section.

Sources: ITU and A4AI for price data, World Bank World Development Indicators for GNI per capita data (retrieved November 2021)

Affordability of smartphones and feature phones

Median price (percentage of monthly GNI per capita), 2021



decent jobs, including the Digital Ambassador Program developed by the Digital Opportunity Trust, a Canadian non-profit organization that provides digital skills to people across Rwanda.

Connection security and navigation safety. ITU has several initiatives to help build cybersecurity confidence including its Global Cybersecurity Index to help foster the capabilities of nations. The World Economic Forum helps improve digital trust, while the Internet Society has initiatives strengthening the Internet. Microsoft helped to set up the CyberPeace Institute and brokered the Cybersecurity Tech Accord. ■

Developments in the African telecommunications sector

Africa Telecommunications Sector 2021-2022 - EMIS

With the spread of COVID-19 in early 2020, the telecom sector became an anchor for economic activities to continue.

However, switching to working from home and online classes has been a challenge for Africa, where one third of the world's population lives without internet. In 2020, of the 3.2 billion people who don't have access to the internet, 871 million live in Africa, according to Visual Capitalist and DataReportal. It is important to account for the various challenges in the African industry such as access to electricity, lack of well-developed digital infrastructure and regulations, as well as the ability of the population to use digital solutions, where they are available.

Internet usage

According to the World Bank Report, African countries spend about 1.1% of their annual GDP on digital investment, while that share for advanced economies averages 3.2%. In terms of internet usage, Africa is at the bottom of the global ranking with only 28.2% of its population using the internet, below the world's average of 53.6% and well below the 82.5% in Europe, according to the ITU.

Africans log into the web mainly via their mobile phones with the number of mobile internet users at 335 million at end-2019. Just 10% of these subscribers use 4G technology. In the wake of COVID-19, meaningful participation in the

digital economy requires high-speed broadband connection to the internet. Cable.co.uk reports that 32 of the 50 slowest-performing countries in terms of broadband download speed are located in Africa. Northern Africa performed worse than sub-Saharan Africa with Algeria (1.83Mbps) and Libya (2.60Mbps) offering the slowest speeds, while the best performers are Madagascar (18.00Mbps), Réunion (16.35Mbps) and South Africa (14.04Mbps).

Mobile services

While most African countries have made rapid advances in mobile phone and mobile internet penetration, ICT infrastructure is not fully developed. The leading economies – Kenya, Nigeria, and South Africa – have developed next-generation mobile and digital networks, but smaller economies still rely on legacy network technologies like 2G. Infrastructure deployment in sub-Saharan Africa increased 3G coverage from 63% in 2017 to 70% in 2018, extending access to more than 80 million people.

Africa's telecommunication sector has been growing rapidly in recent years, driven primarily by the mobile services segment. Mobile telephone subscriptions grew at a CAGR of 8.3% over 2009–2019, the fastest in the world and above the global CAGR of 6%, according to ITU data. That helped Africa claim a share of 11.9% of all mobile users worldwide in 2019, second only to the Asia Pacific region, which accounted for a share of 57%. ITU estimates subscriptions in Africa, excluding the Arab countries, grew by 5.5% year-on-year (y/y) to 882 million in 2020. The growth was supported by the increased impact of the mobile economy during the pandemic. Post-pandemic growth drivers will include an increase in private consumption once the African economies recover, strong and growing developer and digital talent, coupled

with investments in digital infrastructure.

The number of active users, however, stands significantly below the number of subscriptions (at 335 million as of end-2019), due to widespread multiple SIM card ownership. This practice is driven by the still insufficient quality of mobile services. Moreover, prepaid subscriptions still have the lion's share across the continent. In terms of users and revenues, the mobile segment is currently driven mainly by mobile data and mobile money services.

While 60% of Africa's population accesses the internet via mobile, most mobile connections are through 2G networks, with the affordability of 4G devices the main barrier to smartphone adoption. Though the average selling price of smartphones has reduced significantly recently, many Africans remain unable to afford the one-off upfront cost. Still, there has been an increasing demand for high-speed internet and GSMA Intelligence forecasts sub-Saharan Africa's 3G and 4G broadband connections will account for 54% and 31%, respectively, of all connections by 2025. The share of 5G connections is seen reaching a mere 3% in 2025.

Broadband strategy

Though internet access has improved significantly in recent years, Africa lags far behind global development. ITU reports that 299 million Africans were using the internet at the end of 2019, nearly five times more than 2009, but accounting for just 8% of the world's total users. The strong penetration of mobile services has contributed significantly to improved internet access. The number of active mobile broadband users in Africa expanded at a CAGR of 45.1% over 2009–2019, nearly double the 25% pace at which global subscriptions grew over the same period.

As part of efforts to support investments in

telecom infrastructure by the end of 2019, 50 African countries adopted a national broadband strategy. A significant milestone was also achieved in February 2020 when the Digital Transformation Strategy for Africa was adopted by the African Union Commission. Under these strategies, investments are directed towards terrestrial backbone fibre and undersea fibre-optic cable projects, among other things. In 2020, 25 backbone fibre projects were announced. Among these, the 'One Africa' fibre-optic network project stands out, as it is planned to connect Cape Town in South Africa with Cairo in Egypt. Undersea fibre-optic cable projects also saw development, the most notable being the launch of the South Atlantic Cable System, which provides a direct connection between Africa and South America (Angola and Brazil), offering alternative lower-latency routes to the Americas.

The digital economy

More pivotal for the growth of the telecommunications sector is the growing digital economy in Africa. The digital market has attracted more venture capital and has championed growth in many sectors, including maturing ones such as the mobile money market in Kenya. The digital economy has also bred new talent within the continent's youthful population. There are now over 618 tech development hubs across Africa.

The internet economy is also offering leapfrog opportunities to address challenges faced by informal businesses and workers. Informal businesses represent 92% of firms in Nigeria and 99% in Ethiopia. Businesses in Africa's informal sector have less access to finance and limited use of modern business practices, especially in accounting. They also face higher costs in dealing with suppliers or clients due

to poor logistics, multiplicity of middlemen, and the prevalence of cash transactions. In the informal sector, access to electricity is less certain, especially in rural areas, and the overall business environment is unstable. However, most workers in the informal sector own a mobile phone, with ownership broadly correlating with access to digital connectivity at the national level. There are 1.2 million informal retailers in sub-Saharan Africa already engaged in the distribution of mobile services.

COVID-19 has highlighted how digital platforms addressing the informal sector can support societal resilience. In several markets, digital platforms were critical in supporting government responses to the outbreak, particularly in reaching the underserved, as they were able to quickly re-engineer their platforms. For instance, Twiga Foods has partnered with Jumia to deliver agricultural produce to consumers. The government of Nigeria is relying on payment service providers to provide cash transfers to 3.6 million impoverished households. Digital platforms have enabled the rapid deployment of social protection programmes and enabled some essential government services to remain operational.

In 2019 the number of registered mobile money accounts in sub-Saharan Africa increased by 12% y/y to reach 469 million, of which active accounts made up 181 million, according to GSMA Intelligence. A total of 23.8 billion digital transactions were made in the region in 2019 and their value stood at US\$456.3 billion, up 27.5% y/y. For the Middle East and North Africa, the figures show that there were 51 million registered mobile money accounts (91 million active) in 2019, when 663 million digital transactions were made at the value of US\$9.1 billion, up 37.4% y/y. ■

Satellite in Africa

African Space Industry Annual Report 2022 – Space in Africa

The African space economy continues to grow at a higher rate than Africa's GDP and is fast becoming a strategic tool to boost the national economy and contribute toward achieving the Sustainable Development Goals (SDGs). The African space industry was valued at US\$19.49 billion in 2021 and is projected to grow by 16.16% to US\$22.64 billion by 2026.

Increasing financial investment from governments

African nations allocated US\$534.9 million to national space programmes in 2022, a 2.24% increase from the revised US\$523.3 million in 2021. National budgets consistently contribute to the industry valuation annually, and governments' contributions increased by 80.83% in 2021 from the revised US\$289.33 million in 2019 to US\$523.2 million. Many African countries are also improving their space application goals as different national priorities span space democratisation, propulsion and launch technology development, human capacity development, and local and international space partnerships, amongst others.

Growing satellite communication market

The satellite communication market, which includes fixed satellite services (FSS), mobile satellite services (MSS), and satellite TV services, accounted for a major share of the African space and satellite industry valuation in 2021.

There has been a paradigm shift from large to small satellites, primarily due to the high cost of manufacturing large satellites and the long development time. The possibilities for small satellites are endless, with several

applications being explored to have a tangible impact and directly translate to socioeconomic and environmental development in Africa. These innovative small satellite applications include the Internet of Things (IoT), weather forecasting and early warning systems, crop and livestock monitoring for agricultural purposes, etc.

The ground segment market has massive potential in Africa. Many African countries want to develop and launch satellites in the next five years and since nearly all missions, including commercial, military, or scientific payloads, use space ground systems for launch and on-orbit operations, the ground segment is expected to boost the African space market.

However, there exists a downward trend within the satellite component manufacturing segment, attributed to the reduction in revenues of some companies, several companies closing down, while some are still working on marketing their first products and, as such, have not been generating revenues. With more companies growing their market base and others generating income from the sale of the new products, satellite manufacturing is expected to grow in the coming years.

Flourishing NewSpace industry

In 2022, Space in Africa estimates that 272 NewSpace companies are charting the course of space democratisation on the continent. These companies, domiciled across 31 African states, are innovating novel methods of leveraging space technologies and its derived data to develop cutting-edge technologies and solutions across several fields, including manufacturing, medicine, transportation and logistics, and much more.

These companies provide goods or services primarily to other private sector entities (B2B) and/or consumers (B2C), and sometimes, the government. Furthermore, in most African regions, private companies leverage space systems and infrastructures built by the government and/or foreign organisations to provide niched solutions/services, including decision-ready datasets, satellite and component manufacturing, and satellite communication services (e.g. internet services, DTH TV, satellite radio, etc.).

Increased investment in human capital development

Human capacity development is the bedrock of Africa's space ecosystem development and has prompted considerable investment from several African public and private actors. The long-term goal of any capacity development programme is to bring about a more robust national space

ecosystem in African countries. However, the current landscape of the African space industry shows a lack of skilled human resources across all space industry sectors, making it difficult to take advantage of several technological advancements. Also, the lack of infrastructure at different levels of the education sector to support human resource development has slowed the progress across the continent.

Despite this, the continent is beginning to witness slow but consistent growth, especially with improved investment from all space actors to enhance the education and training of experts, creating the required testing and building infrastructure, enabling the environment to foster international cooperation and the necessary legal and regulatory frameworks. To this end, several capacity development initiatives have been organised to proffer solutions to the industry's human capital gap and establish a sustainable talent pipeline to meet future skills needs. ■



Amy Saunders,
editor, *African Wireless
Communications Yearbook*

Critical communications go digital

The necessity of critical communications capabilities has never been more keenly felt than in recent years. With soaring environmental instability, geopolitical tensions and the first global pandemic in modern history, access to ensured, reliable and secure communications is an absolute must.

In times of crisis, critical communications, whether they be satellite, radio, TETRA etc. make all

the difference in safeguarding personnel, wildlife, and property. Meanwhile, critical communications are also game-changing for a wide variety of everyday operations that happen to be located in remote, rural and often dangerous locations; mining, oil & gas, utilities, fishing, agriculture, etc., helping maintain employee safety and wellbeing, as well as smooth running of business activities.

The global critical communications market is booming, with Research And Markets' outlining a global market value of US\$17.04 billion in 2022, which is expected to expand at a compound annual growth rate (CAGR) of 9.02% to US\$26.24 billion by 2027. In the Middle East and Africa, meanwhile, the mission critical communications market is expected to expand from US\$1,175.96 million in 2022 to US\$1,876.11 million by 2028, a CAGR of 8.1%.

Wireless communications have become mission critical for a whole host of new applications in recent years, with remote monitoring of facilities, factories, networks, crops, and herds, all now essential to enterprise operations. This swing towards Industry 4.0 and the adoption of IoT technologies has played a major role in driving the critical communications market both globally and in Africa. The COVID-19 pandemic, too, further boosted critical communications demand among first responders, utilities, healthcare, government, and other essential services.

As with so many other spaces, critical communications are undergoing a digital transformation of their own, with the industry moving

forwards on the conversion from analogue to digital. While analogue has historically proven extremely effective over the decades, the limits of innovation have been reached. OMDIA has forecast that by 2025, more than 80% of global critical communication radio installed base will be digital. Moreover, the Middle East and Africa region is expected to lead the pack with more than 95% of its land mobile radio (LMR) users converted to digital by 2024.

In the face of continually evolving threats and an ever-changing environmental and political landscape, critical communications systems exist in a state of constant evolution by necessity, to stay ahead of emerging developments and threats. This is likely to remain the state of play for the foreseeable future. ■

Developments in connectivity

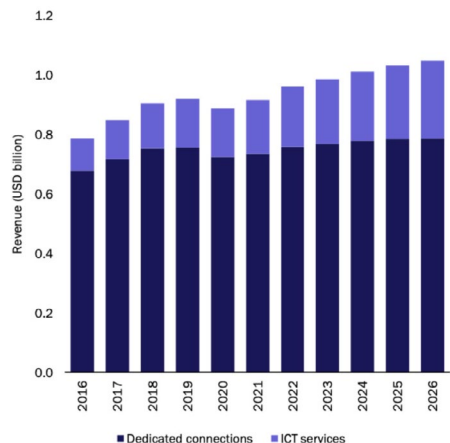
sub-Saharan Africa telecoms market: trends and forecasts 2021-2026; 5G deployment tracker - Analysys Mason

Analysys Mason has forecast in its 'sub-Saharan Africa telecoms market: trends and forecasts 2021-2026' report that operator revenue for dedicated connection services will grow from US\$734 million in 2021 to US\$786 million in 2026. These services include uncontended data connectivity for businesses, such as dedicated internet access and point-to-point connections based on MPLS and Ethernet. Demand for dedicated connections is increasing to support the growing migration of business applications to the cloud.

Meanwhile, fibre infrastructure investment by operators is increasing the availability of such connectivity. However, revenue growth will be limited by price competition and the availability of alternative solutions based on high-quality broadband services coupled with SD-WAN, and other software-enabled network services.

Operator revenues from business ICT services will grow at a compound annual growth rate

(CAGR) of 7.6% over 2021-2026 to US\$261 million. ICT services include security, unified communications, co-location and hosting and cloud services such as SaaS and IaaS. The growing presence of hyperscalers across Africa - AWS, Azure, Google and Huawei Cloud - is helping



to stimulate demand. Many operators in the region have invested in partnerships with cloud players and IT vendors as well as developing their own capabilities to deliver ICT services.

Deploying 5G

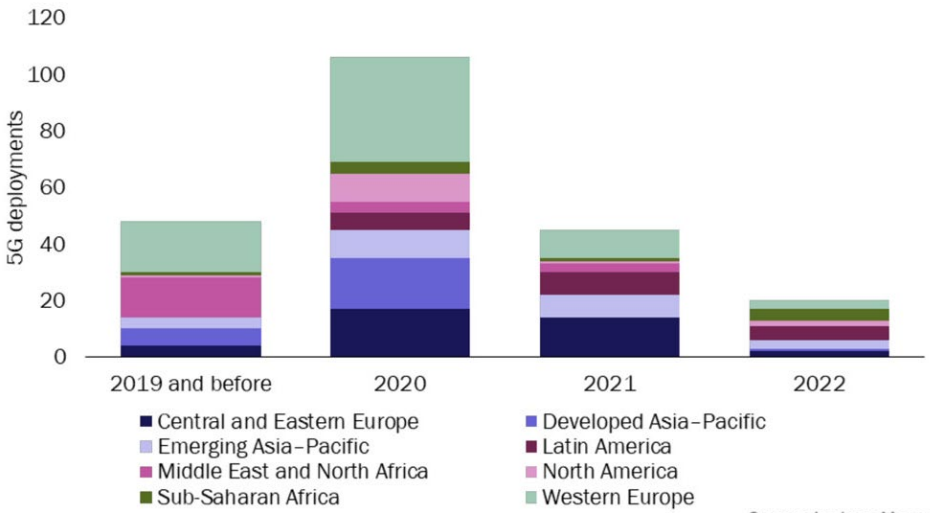
The latest version of Analysys Mason's 5G deployment tracker shows that an additional 62 operators are either planning their networks or are expecting to launch by the end of 2022 or at the start of 2023. Most 5G network launches between 2019 and 2020 took place in Europe and developed Asia Pacific.

However, from 2021, operators in sub-Saharan Africa (SSA), Latin America and emerging Asia Pacific (EMAP) have become increasingly active, despite regulatory barriers that have hindered deployment. To date, a lack of regulatory clarity regarding the price and availability of

additional spectrum for 5G services has forced delays and the withholding of investment decisions in these regions.

Most operators in SSA have prioritised 4G network investment and the region had just six commercial 5G networks in 2021. Large parts of SSA are affected by a lack of clarity regarding long-term licensing of 5G spectrum bands and spectrum prices, which has hindered 5G development within the region. However, countries such as Réunion, South Africa and Zimbabwe have since made progress with deploying 5G.

Compared with other operators in SSA, South Africa has reasonable amounts of legacy 2G and 3G spectrum that can be re-farmed to 5G technology, and this has influenced the speed of deployment. The number of 5G connections in SSA is expected to increase at a CAGR of 160% between 2021 to 2024. ■



Source: Analysys Mason

Operational 5G network launches by region, 2019–2022

Digitising agriculture – the slow spread of 4IR



Louise Fox,
non-resident senior fellow in the Africa
Growth Initiative (AGI), part of the Global
Economy and Development Program at
the Brookings Institution



Landry Signé,
senior fellow in the Global Economy
and Development Program and
the Africa Growth Initiative at the
Brookings Institution

Overcoming the barriers to technology adoption on African farms

sub-Saharan Africa's agricultural sector is widely recognised to have vast, under-utilised potential. Land and labour productivity are low compared to other regions and have barely increased over the last 20 years. Low productivity has created widespread rural poverty and food insecurity.

Scholars, development organizations, and some entrepreneurs have identified digital technologies associated with the Fourth Industrial Revolution (4IR) as one potential path toward overcoming these productivity challenges.

Anecdotal evidence from well publicized start-ups - such as Hello Tractor, a tractor-sharing platform in Kenya; and Zenvus, a Nigerian soil mapping company - have fuelled a narrative that digital agriculture represents the key to delivering productivity gains to African start-ups. Yet as a recent FAO report admitted, hard evidence that digital agriculture is delivering on this promise is difficult to come by, as long-standing challenges persist in preventing to fully unlock the potential of these technologies.

The optimistic narratives around African farmers' adoption of technology often overlook the more long-standing challenges they face that are preventing the adoption of much older productivity-increasing technology, such as fertilizers and conventionally produced hybrid seeds. For digital agriculture to be effective and transformational in Africa, a concerted effort to address Africa's long-standing agricultural

productivity challenges is needed.

What is the digital agriculture narrative about?

4IR technologies offer significant productivity and income-enhancing potential on the farm and post-harvest. Possible applications include:

- Farmer-tailored digital information platforms could help farmers quickly obtain knowledge, such as how to acquire and use new technologies (extension information), weather advisories, prices and buy offers from traders, and how to rent agricultural equipment.
- IoT technology could help farmers track soil composition, crop growth progress, weather effects, and the presence of disease, allowing farmers to react swiftly to problems such as a lack of water or nutrient deficiencies. IoT technology can also monitor post-harvest storage conditions to ensure that spoilage does not occur.
- High-productivity, disease-resistant seed varieties developing using CRISPR gene-editing technology could reduce risk to farmers while increasing yields.

These applications are currently in wide use in developed and emerging market countries in other regions, but aside from some technologies like mobile phones used to connect suppliers

and traders, most African farmers are not using contemporary technologies. Where they have been used, evidence has emerged that, although access to mobile phones has improved market performance in agriculture at the macro level, the impact at the micro-level is heterogeneous. At the micro level, mobile applications have not systematically improved farmgate prices or on-farm earnings for the average farmer, although they have in some cases reduced price dispersion, especially for perishable crops such as bananas, suggesting that some farmers, possibly in more remote areas, have benefited.

Why have 4IR technologies spread so slowly on African farms?

One reason for the slow pace of technology diffusion among the African agricultural sector is limited internet access. In rural areas, less than 30% of adults report having access, mostly to mobile broadband at 2G and 3G speeds, which is inadequate for many applications. Without access to information about technologies that might improve yields and without the internet speeds to run relevant applications, technological developments aren't reaching those who need them most.

Other perhaps more important obstacles to technology diffusion are agricultural policies and contexts that make technological adoption unappealing for farmers. Producers adopt new technologies when they solve a current, urgent production problem at an affordable cost. However, context-specific constraints lead many producers to conclude that the risks inherent in the new technology outweigh the benefits. These constraints include the cost of the technology, a lack of information on how to use the technology, poor access to markets, or expensive or lacking complementary inputs (such as energy, water,

or transportation). According to recent surveys of the state of agricultural technology adoption in Africa, context-specific constraints have hindered the adoption of existing technology (such as fertiliser and hybrid seeds) and will probably limit the adoption of 4IR technology on the farm in the near future.

These challenges include:

- Limited supplies, high prices, and uncertain quality of modern inputs, increasing the risk associated with technology adoption.
- Uncertain and limited rainfall and lack of irrigation and other systems of water management.
- Lack of secure land tenure, which deters on-farm investment and is leading to declining soil fertility.
- Poor roads and minimal information and telecommunications infrastructure, resulting in high transportation costs and greater information frictions and marketing transaction costs, causing farmers to receive a smaller share of the final product price.
- Low public investment in agriculture, especially in R&D, so that there are few science-based options that can be tailored to sub-Saharan Africa's many microclimates.

The African agricultural productivity challenge is hard, and there are no easy solutions. Rural areas in Africa are less densely populated than in Asia, which contributes to the high cost of inputs and infrastructure expansion. Agro-ecological conditions show tremendous variation in Africa, increasing the need for local and context-specific agricultural research and

development, which is one reason why this has not yet been a 'Green Revolution' in Africa. Land tenure issues are tricky to resolve when so many rural households working on small plots of land depend on farm production for food security and income.

Green shoots of progress

The past 20 years have brought important changes to African agriculture. Africa recorded the highest average annual production growth rate of all regions in the world - nearly 4%. Although much of this increase was based on land expansion, several African countries recorded positive total factor productivity growth (that is, more output per unit of inputs), including Cameroon, Ethiopia, Ghana, Mozambique, Senegal, and Sierra Leone.

Meanwhile, where ICT infrastructure is available and service cost is affordable for rural households, research suggests that use of mobile phones and the internet have raised household incomes. However, this has occurred by raising incomes off the farm in small-scale nonfarm household enterprises, not by raising agricultural incomes.

What can be done?

Agriculture remains an important sector in African development strategies. Growth in agricultural production supports both sustained economic growth through structural change, as well as poverty reduction.

A recent survey of research on African agricultural technology use and productivity gains concluded that much more remains to be learned about how to increase technology adoption and productivity on African farms. The authors suggest that given the multiple constraints farmers face, multi-faceted interventions at the local and national level

may be required. In thinking about how to encourage technology adoption on African farms, we suggest that:

Governments need to continue to support agricultural R&D. Donors and supporters should work with research institutes to help deploy technology advances such as CRISPR to speed up the process and allow the effective development of high-yielding and disease resistant seeds.

Energy and transportation infrastructure investments in rural areas should remain a high priority. Whole supply chains are disrupted when power is unavailable, or perishable items are not able to reach their destination in a timely manner.

Given the heterogeneity of farmer conditions and needs, NGO- and private sector-led farmer-tailored programs may be required, whether related to land and farm management, access to markets, access to finance, value chains, among others. Local governments can help support this approach. Stakeholder attention should be directed at fostering, evaluating, and, if successful, scaling up these programs.

Innovators and entrepreneurs need to develop and scale appropriate technologies that address the most urgent challenges faced by farmers and are affordable enough to be systematically used in a productive manner.

Expanding access to ICT services in rural areas should be a priority even if the benefits for farm incomes are elusive for now. Helping households to shift their working hours into more lucrative activities off the farm has widespread, long-term benefits. If more intensive, context-specific, local agricultural research is able to achieve new breakthroughs, ICT platforms can help spread the message. Eventually, when other farm productivity constraints are reduced, and the cost of new technologies is reduced as well, the digital revolution could eventually benefit African farmers. ■



Maagatha Kalavadakken,
research analyst, Africa, EMIS

Telcos under pressure

The past ten years have been both transformational and disruptive to the telecom companies' business model. This trend has been driven by gains in broadband penetration and growing internet adoption. As the COVID-19 pandemic began to spread, demand for traditional phone calls and SMS had already been declining and was being radically substituted and displaced by instant messaging and internet-enabled voice and video calls.

The African telecommunication sector has

“The pandemic has put telcos under immense pressure to accommodate increased network traffic, which required additional spending on critical infrastructure and digitalisation. This, coupled with reduced consumer spending has exerted added cashflow pressure and depleted margins for telcos.”

matured and has positively and significantly impacted the growth of the economies on the continent in many ways. From enabling access to banking via mobile phones to connecting the formal and informal economies that exist in the region. However, the COVID-19 pandemic highlighted the need for a more robust and inclusive telecommunication sector in the face of national lockdowns.

COVID-19 has had a significant impact on the global economy as whole. Many countries instigated a form of lockdown, with the strictest level allowing only essential services to operate while the rest were encouraged to work from home. Consequently, many business including telcos have been disrupted amidst the economic slowdown. For African countries, while both the public and private sector rose to the challenge by increasing the bandwidth as demanded by the increased data traffic due to people working from home, existing challenges saw the majority excluded.

The pandemic has put telcos under immense pressure to accommodate increased network traffic, which required additional spending on critical infrastructure and digitalisation. This, coupled with reduced consumer spending has exerted added cashflow pressure and depleted margins for telcos.

Looking forward, as the economies recover so will demand for mobile internet services, as the use of WhatsApp, Facebook, and video call services will continue to dominate the market, providing telcos with opportunity to grow revenues. The three main telecoms in Africa – MTN, Orange and Airtel – have all revealed their strategies to expand their 3G and 4G coverage across the continent. This move is expected to diversify and grow their revenues in future. ■



Amy Saunders,
editor, *African Wireless
Communications Yearbook*

Modernising data management

Africa's data centre market is small but growing rapidly, with revenues expected to expand at a compound annual growth rate (CAGR) of 12% between 2019 and 2025 to reach US\$3 billion. Demand is booming for cloud services and modular data centre solutions from government and enterprise, with more than 70% of African organisations forecast to move to the cloud by 2025. In 2021, Africa accounted for less than 1% of global colocation supply, but Xalam Analytics expects this to reach 25% by 2023.

MNOs on the continent are experiencing exponentially growing voice and data volumes across their networks as a result of wider mobile adoption, increased geographical coverage, 5G and IoT. The market is also expected to be boosted further by data sovereignty regulations, which require localised data storage. Accordingly, Africa's MNOs are rapidly turning to data centres to keep pace with data storage, processing and dissemination demands. Indeed, the third quarter of 2021 saw almost 78 exabytes of data traffic pass through global telecommunications networks, up from 55 exabytes in the same quarter of 2020, as per Statista.

Africa's data centre capacity – currently standing at 140,000 square metres in more

“Africa's MNOs are rapidly turning to data centres to keep pace with data storage, processing and dissemination demands.”

than 100 facilities – is unevenly distributed, with South Africa boasting more than 66% this year. A mixture of factors has led to this situation, including the large economy, the location of subsea fibre optic cables, the proximity to NAPAfrica – the country's largest internet exchange – and of course a well-established telecoms market. Kenya, too, hosts a large volume of the continent's data centre capacity. The country is conveniently cited on four major subsea cables and boasts several strong cross-border fibre connections.

The State of the African Data Centre Market report from Oxford Business Group and the African Data Centre Association states that some 15 African nations have populations and economies large enough for the development of data centres and cloud service ecosystems.

The International Data Corporation has forecast cloud computing subscriptions to expand from US\$370 million in 2019 to US\$1.7 billion in 2024 – for South Africa alone. Government and banks are particularly interested in migrating operations to data centres as they expand their digital offerings.

The future for African data centres looks bright; however, with global data centre facilities consuming up to 3% of power produced, and consuming massive quantities of water for server cooling, more focus on creating climate neutral data centres is required. ■



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chapter Cellular Networks 2



Dario Betti,
CEO,
Mobile Ecosystem Forum (MEF)

With 24% of Africans in the 18–24-year-old demographic, Africa is a young continent. It has been the fastest-growing continent by population since 1967, with this trajectory set to continue for years to come. Projections from the UN see sub-Saharan Africa alone contributing more than half of the global population increase through 2050. Whatever goods or services an organisation offers, there'll clearly be a market for them in Africa: both the potential and headroom for growth are huge. It's up to stakeholders across the mobile ecosystem to interact effectively at every turn, develop and share insights, ensuring this potential can be realised. It's all about creating impact in a responsible way that both benefits and protects people, and the environment.

Strong foundations

Advancement in the mobile fintech arena (think Kenya and Nigeria) rivals the rest of the globe

and such initiatives are shining light on a path all of Africa must surely tread. Connectivity is central to getting any potential there is just to the launchpad – never mind off the ground.

Kim Buller, co-founder and CFO of Alchemy Telco Ltd. in Gambia notes that “more people in our neck of the woods have a mobile phone than access to water. We believe mobile and the simple SMS/IVR have the acceleration potential for the region and Africa as a whole to leapfrog ahead in its economic development.”

Charles Stretch, founder and CEO of SMSPortal, adds that “mobile has long been the go-to for communication within Africa because of its reach and reliability, but with the advancements within SMS and personalised two-way messaging, mobile is at a time and place where it truly has the ability to transform the way businesses operate.” But it's not just about being connected, it's about how it is leveraged and having a real understanding of the wider environment.

There is plenty of work yet to be done though. Buller agrees: “we are a very long way from government and business utilising mobile to solve digitisation barriers in the value chain and addressing the informal economy challenges rural communities face.”

Waheed Adam, executive chairperson of iTouch, brings to light something that could easily be overlooked by those not on the ground in Africa: “an unspoken reality of the African environment is the fact that there are so many ‘informal’ businesses that are excluded from the data we see reported. Hence most reports on potential opportunities on the continent do not reflect what is the true reality on the ground. These informal businesses are the future economy and solving real-life problems at grass root level.”

Inclusion

It's human nature to hold up shining examples of people or countries as inspiration for others. Aspiration and the desire to transform for the better are important, and along with necessity are what drives so much invention and innovation. We must regularly take a step back to gain some perspective though. Progress (in the widest sense) can only be affected if the majority are shown the benefits and are able to ride the wave of innovation.

Inclusion is critical as Tracey Maluleka Molete, managing director of The Apprentice Valley, comments: “the bridging of the digital divide is at the core of this topic for Africa. Some of us have enjoyed the transformative benefits through accessing services such as digital health services, entertainment, wellness applications, digital learning and teaching, digital financial services - as well as the convenience of navigating to a meeting

venue, online meetings and accessing news by the minute. The list is endless and these experiences through mobile phones have truly transformed lives in Africa.” Now surely it must be about turning the “some of us” Tracey refers to into “all of us.”

That is not an easy ask and no stone should be left unturned in the quest to achieve this. Offering fantastic connectivity everywhere might appear to be THE way to make this a reality but the fact is, there is far more to it than that. One of the many other factors is the commercial model. So much comes down to consumer pricing.

In 2020 only 28% of the population in sub-Saharan Africa was connected to the mobile internet. Digital services being at the heart of so much, as already noted, there needs to be a real urgency to bring unconnected communities online, particularly vulnerable groups.

Taha Jiwaji, founder and CEO of Beem in Tanzania, has seen himself that “mobile commerce and social commerce on WhatsApp, Facebook and Instagram are driving data and digital consumption across Africa. In most African markets, social commerce has bypassed traditional online ecommerce as consumers are more comfortable with and trust the interactive format.” But the spanner in the works today is that sub-Saharan Africa has the world's most expensive mobile data prices.

Policy

Research shows time and again that increasingly, young Africans in particular see internet access as a basic right. This means that the high price of data is fast becoming a ‘hot button’ issue. Factors driving high pricing are many but in order to ensure that the power mobile has to truly transform people's

“It's human nature to hold up shining examples of people or countries as inspiration for others.”

daily lives can be leveraged to the max, policymakers have to make it worthwhile for telecoms companies to cut prices. This can be achieved, for example, by reducing licence fees and allowing them to lower costs by using government-funded infrastructure. African economies would see massive benefits if the internet became more affordable.

Policymakers need to be enablers in many ways and Teniola Stuffman, business development director with VAS2Nets Group, believes that “Africa needs to get it right with export supply chain management in order to be among the top exporting countries and not

just import dependent. Creating an enabling environment with digital transformation and Artificial intelligence will help in security, environmental sustainability governance (ESG) and reduce the pressure on FX exchange. A good opportunity for Africa to produce its own and reduce the import bill.”

Transformation does not have to take place in huge leaps and bounds either. We must be pragmatic and realistic. Surely, it's more about taking constant incremental steps towards improving the daily lives of billions? And to do that, all stakeholders across mobile must pull together in the same direction. ■



Jordan Cox,
research executive, GSA

Africa's lack of infrastructure and communication coverage, and its issues with older network infrastructure, are well-documented. But there is real potential for new-generation technologies to connect the continent to the rest of the world. Indeed, many operators and countries are now investing in and launching 5G networks across Africa.

Globally, there are more than 970 operators investing in LTE networks, with 813 now having launched public LTE networks in 241 countries and territories. In North Africa, 18 operators have rolled out LTE mobile services, of which nine have launched LTE-Advanced in Algeria, Libya, Morocco, Sudan, and Tunisia, with one other operator currently in a testing phase.

Of these 18 telecom providers in North Africa, 15 have also launched LTE fixed wireless access (FWA) services. In the larger sub-Saharan Africa

region, 181 operators are investing in LTE, with 142 networks launched and a further 11 operators actively deploying LTE. Furthermore, 37 operators in this region have deployed LTE-Advanced, and a further five are deploying, plan to deploy or are testing the technology. There are also 84 operators in this area that have deployed or launched LTE FWA networks, with four more currently in the process or planning to deploy.

As a result, Africa now makes up 20.4% of the total number of operators investing in LTE and 19.6% of all commercially deployed networks. Although the continent still accounts for many places without LTE access, it has seen a dramatic drop in the number of not-spots. The only African countries and territories with no LTE network known to GSA are Central African Republic, Djibouti and Eritrea.

In terms of LTE and 5G subscribers,

however, the continent is further behind. Mobile subscriptions in Africa stood at 1.2 billion by the end of December 2021, according to data supplied by OMDIA. In absolute terms, LTE was the fastest-growing mobile technology in Africa in the 12 months to the end of 2021, gaining 57.3 million subscribers to reach a total of 247.9 million, although this pales in comparison with WCDMA networks, which reached 646.6 million subscribers by December 2021. GSM continued to decline, falling from 393.6 million to 337.9 million subscribers.

LTE is now gaining a foothold in Africa. It was the fastest-growing technology in percentage terms and just above WCDMA in absolute terms. LTE subscriptions hit 247.9 million by the end of 2021, up more than 30% over 12 months, accounting for slightly more than 20% of all mobile subscribers on the continent. In comparison, globally, LTE represents over 67%. As LTE gains ground, eventually delivering gigabit speeds, GSA expects a migration from 3G to 4G or LTE and later 5G. But for now, Africa represents only 3.6% of the world's LTE subscribers. It is important to note that LTE population penetration in Africa was still only about 18% in March 2021.

New generation technologies

Along with the rise of LTE, we are starting to see more and more LTE-based solutions for voice and Internet of Things (IoT) services in Africa. VoLTE is now commercially available in at least 17 African networks, with three other operators known to be actively deploying the technology and two planning to do so. Narrowband IoT, meanwhile, has been launched in Kenya, South Africa, and Tunisia, with further investments in Liberia and Nigeria. Network operator MTN has been involved in trials of LTE-M in South Africa.

5G is on the horizon. Network suppliers and operators worldwide are currently testing and deploying 5G networks — in fact, 225 commercial 5G networks have now been launched worldwide. The pace of evaluation and deployment has been accelerating in Africa too. GSA is aware of 44 African operators from 29 countries that have been investing in 5G networks, including pre-commitment evaluation, testing, and trialling, all the way to service launch.

Southern African operators are at the vanguard of the region's 5G development efforts, with 5G network launches by MTN, Rain and Vodacom. GSA has also recorded 5G launches in Angola, Botswana, Madagascar, Mauritius, Reunion, Seychelles, South Africa, Togo and Zimbabwe. There has been a soft launch in Lesotho, pre-commercial deployments in Ethiopia, Kenya, Libya and Mozambique and further active deployments underway in Angola and South Africa. Furthermore, GSA has identified other operators with plans to deploy in Cape Verde, Cameroon, Ghana, Kenya, Mauritius, Namibia, Nigeria, Republic of the Congo, Seychelles, South Africa, and Tunisia.

The year ahead

GSA expects LTE to continue its rise in Africa during 2023. With at least 11 operators known to be deploying new LTE networks as of September 2022, we might expect to reach nearly 175 LTE networks providing either FWA or full mobile services in Africa by the end of the year.

It will be a few years before the technology is as widely used as 3G. But given the recent rise in commercially launched networks, the expected launch of more LTE services in 2023 and the fact that it will be available to many more people as network coverage widens, LTE

will attract more and more users.

In addition to the growth in use of LTE, GSA expects the quality of the LTE infrastructure to improve. We forecast that the number of networks being upgraded from LTE to LTE-Advanced and LTE Advanced Pro will increase — predominantly through the introduction of carrier aggregation to improve speeds, and the launch of 3GPP IoT technologies. Currently, few networks in Africa can boast maximum (peak theoretical) download speeds of much more than LTE Category 4. GSA has identified 20 operators offering Category 6 or better.

Beyond LTE-Advanced and LTE Advanced

Pro services, the launch of 5G networks will help to deliver higher speeds for end-users and will additionally open new opportunities for industry. With more than 10 operators having launched or currently deploying 5G networks, roll-out of 5G will continue to gather pace across the African continent over the next few years, supported by more governments and regulators making spectrum available — a critical enabler for 5G deployment. At the same time, new technologies designed to improve rural coverage, coupled with wider availability of lower-cost mobile devices, will bring LTE and 5G within reach of more households. ■

Mobility in Africa

Ericsson Mobility Report (June 2022 edition) - Ericsson

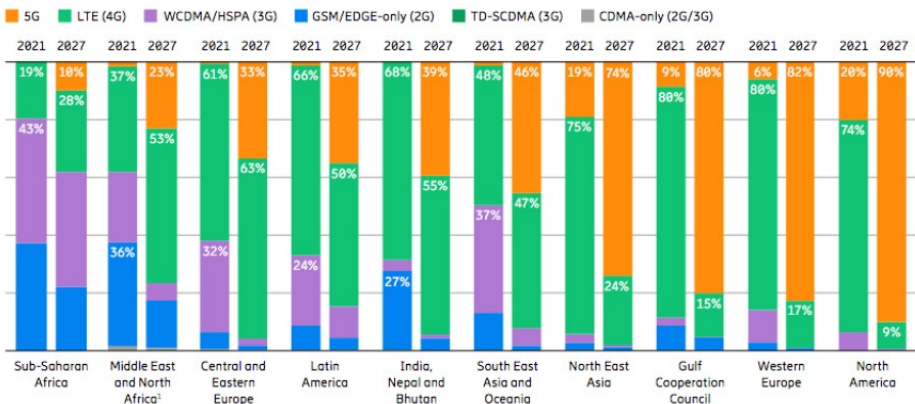
Mobile and data

Demand for mobile voice and data services continues to grow in the region. Investment in telecom infrastructure accelerated during 2020–2021 in the wake of COVID-19, including mobile coverage and fixed wireless access

(FWA) build-out, enabling service providers to address additional subscriber segments with mobile broadband.

In 2021, the number of 4G subscriptions grew by 26%, and strong growth is expected to continue during 2022. Migration towards 4G devices continues to be an important driver for

Mobile subscriptions by region and technology (percent)



4G subscription uptake, which in turn drives the growth of mobile data traffic. 3G mobile data traffic is still increasing, but most of the traffic growth is expected to be in 4G. Over the forecast period, total mobile broadband subscriptions are predicted to increase, reaching 78% of mobile subscriptions.

Regulatory initiatives are being taken to make more spectrum available in key markets across Africa. This will enable access to mobile services for a larger part of the population, especially in rural areas that have traditionally been underserved. Middle East and North Africa mobile subscription growth in the region is predominantly driven by the uptake of 4G services in less mature markets. In 2021, 4G subscriptions increased by about 54 million, while 2G and 3G declined.

Digitalization is a high priority in some countries as a means for transforming economies and societies. Service providers are motivated to undertake extensive network modernization and expansion to improve network performance, which stimulates further subscription growth. 5G subscriptions grew to around 10 million in 2021, and the region is forecast to reach nearly 200 million 5G subscriptions in 2027.

In the Middle East and North Africa (MENA) region, data traffic is expected to continue rising as the transition to 4G networks continues, coupled with the availability of more affordable 4G devices and data packages. The average data traffic per smartphone is expected to be around 45Gb per month in 2027.

Data traffic in sub-Saharan Africa will maintain an upward trajectory, as mobile broadband-capable devices become more accessible. This is due to increasingly affordable price plans and service provider subsidies in some parts of the region. In markets such as South Africa and Kenya, recent spectrum allocations will enable service providers to extend their coverage

and capacity of 3G/4G networks, leading to rising data traffic. 3G mobile data traffic is still increasing, but most of the traffic growth is expected to be in the 4G networks. The average data traffic per smartphone is expected to reach 11Gb per month over the forecast period.

The evolution of MTN's connectivity platform

Continued investment in 4G – and the expansion of 5G – technologies are expected to play a crucial role in realizing MTN's ambitions and will enable it to meet evolving market demands and monetise new use cases across markets in the sub-Saharan Africa region.

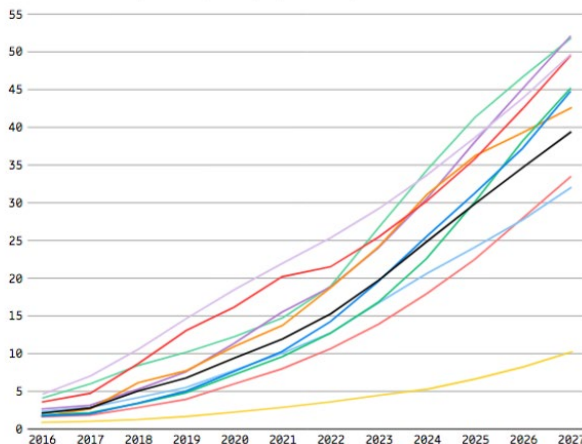
MTN Group, South Africa, has defined its strategic 'Ambition 2025' plan, built on its current market position where connectivity is the foundation, while platforms are gradually expanded to capture new growth opportunities and deliver value. In this context, 5G network deployment and evolution across markets plays an important role in enabling new services for consumers, enterprises, industries, and society. For MTN, 5G is an innovation platform with the ability to transform various aspects of business and livelihoods beyond pure connectivity.

Data connectivity and usage – drivers for revenue growth

In the sub-Saharan Africa region, connectivity is still dominated by 3G and 2G technologies, with 4G only making up around 20% of mobile subscriptions by the end of 2021. However, demand for data connectivity and digital services is increasing across markets. Operating in 18 markets across the Middle East and Africa, MTN is pursuing these new growth opportunities.

Continuous network modernization and

Mobile data traffic per smartphone (GB per month)



Regions	2021	2027	CAGR 2021–2027
North America	15	52	24%
Western Europe	15	52	23%
GCC	22	50	15%
India, Nepal, Bhutan	28	50	16%
South East Asia and Oceania	9.4	45	30%
Middle East and North Africa ¹	18	45	28%
North East Asia	14	43	21%
Global average	12	40	22%
Latin America	7.9	34	28%
Central and Eastern Europe	10	32	22%
Sub-Saharan Africa	2.9	11	25%

coverage build-out, supported by MTN's Rapid Rural Rollout (R3) program, has enabled it to capture strong new subscriber growth and stimulate increased data usage. This has resulted in increased data service revenues, despite price pressure in the markets. In South Africa, MTN networks experienced strong data growth as the number of customers actively using the internet grew by 12.5%, leading to a mobile data traffic growth of almost 60% in 2021. The average mobile data traffic per pre-paid subscriber was 2.3Gb and 10.3Gb for post-paid subscribers.

MTN considers data as a main driver of revenue growth over the medium term. Initiatives to stimulate further data adoption include data service bundling, segmented value propositions and the development and launch of freemium data propositions, supported by strategic over-the-top partnerships.

MTN's strategic priorities up to 2025

MTN continues to invest in 4G technologies and has expansive plans for 5G to realize the opportunities it has identified to evolve and

expand its service offerings for the consumer, enterprise, and industry segments.

MTN's strategic priorities are articulated in its Ambition 2025 strategic framework, which is underpinned by 10 key technology strategic pillars intended to enable growth in connectivity and platforms businesses. Some of the most important pillars are ensuring best-in-class, ubiquitous access across mobile and fixed networks, maintaining network leadership and efficiencies, and the monetization of infrastructure. Other priorities include investment in sustainable technologies and zero-touch, service-aware networks.

5G networks will play an essential role in delivering on the technology pillars to realize the Ambition 2025 plan. Monetization of network infrastructure includes a network-as-a-service (NaaS) strategy, where network sharing (national roaming, MOCN and MORAN) is the starting point, followed by 5G network slicing which enables exposure of network functionality via APIs to build new enterprise services. An additional step will be the monetization of data exposed via online third parties. ■

Mobile economy developments

The Mobile Economy Middle East & North Africa 2022; The Mobile Economy sub-Saharan Africa 2021 - GSMA

The GSMA reported earlier this year that mobile networks have proven key in delivering reliable connectivity to sustain social and economic activities throughout the COVID-19 pandemic. A top priority for governments in the Middle East & North Africa (MENA) is to drive economic recovery and promote sustainable development. Digital services and technologies will be crucial to realising this objective, by stimulating economic growth, mobilising the workforce, and enabling industrial efficiencies.

subscribers coming from North Africa.

Smartphone adoption is growing well, accounting for 77% of connections in 2021, and is set to increase most strongly in MENA's less advanced mobile markets over the period to 2025, underpinned by continued network investment from operators. Smartphone adoption is expected to grow to 84% by 2025.

Increasing user engagement with bandwidth-hungry applications such as video will lead to a surge in data consumption across the region, growing by 430% over 2021-2027.

MENA's mobile internet users surpass 300 million

The number of mobile internet users in MENA reached 307 million in 2021, with penetration due to reach 50% of the population by the end of 2022. The number of unique mobile internet users is expected to grow at a compound annual growth rate (CAGR) of 4.2% over 2021-2025 to reach 362 million, a market penetration of 54%, with almost a third of new

4G dominates but 5G's footprint expands

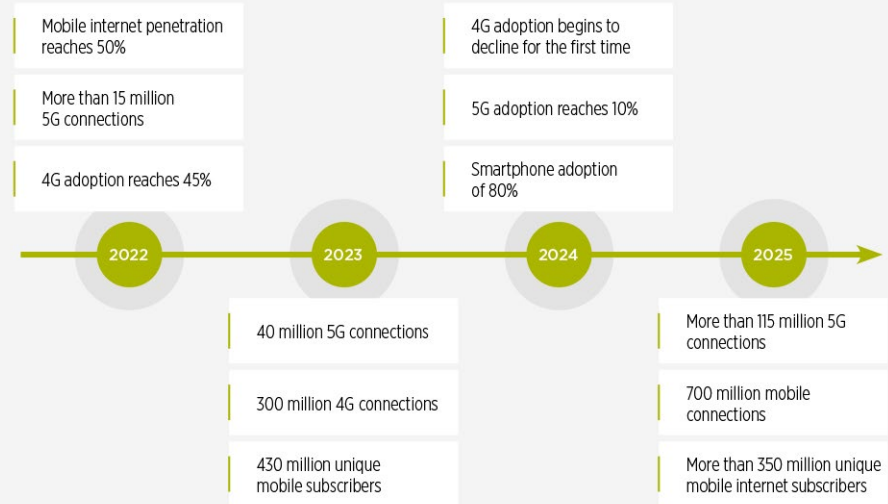
The GSMA reported that MENA had 412 million unique mobile subscribers in 2021, a penetration rate of 66%, which is expected to grow at a CAGR of 2.5% over 2021-2025 to 456 million unique subscribers, a 68% penetration rate.

4G is MENA's leading mobile technology, with almost 270 million connections at the end of 2021, accounting for 41% of connections, and expected to account for 44% by 2025. Take-up has more than doubled over the past five years, driven by network expansion (particularly in frontier markets) and efforts by mobile operators to transition users from legacy networks.

However, 4G adoption is projected to peak in 2023 as consumers move to 5G plans, which remain at a nascent stage regionally speaking. The current adoption rate of just 1% is expected

“4G is MENA's leading mobile technology, with almost 270 million connections at the end of 2021, accounting for 41% of connections, and expected to account for 44% by 2025.”

Key milestones for the mobile industry in MENA to 2025



Source: GSMA Intelligence

to grow to 17%, some 116 million connections, by 2025. While the consumer market has been the focus of early 5G deployments, B2B is the largest incremental opportunity in the 5G era, with a raft of digital transformation projects underway across industries.

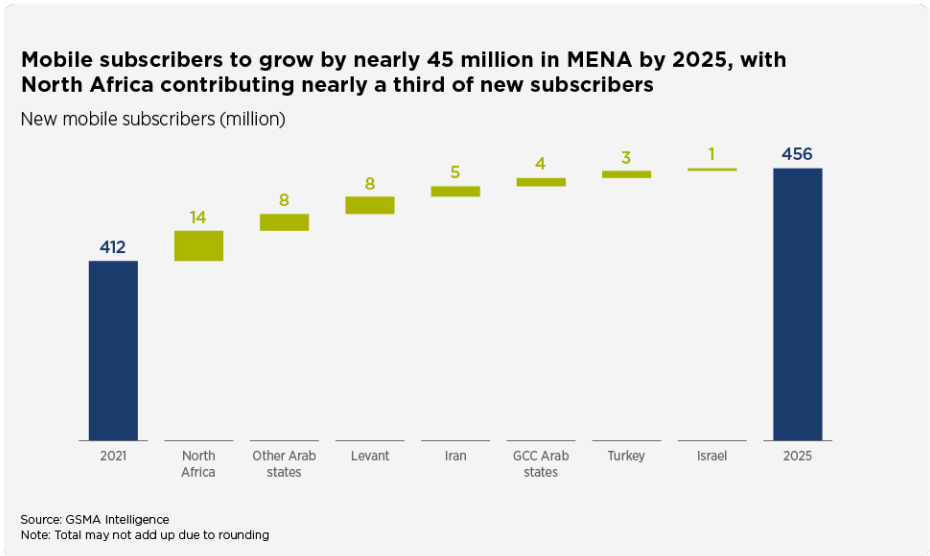
To fully exploit these opportunities, 5G leaders in MENA are investing in new capabilities, with edge computing a priority. This ties in with operators' efforts to grow revenues beyond core telecoms services.

5G continues to make inroads in MENA, driven by developments in the GCC Arab states. With network coverage expanding, 5G adoption is steadily rising. However, as is the case in most countries around the world, 5G has yet to move beyond early-adopter status. Operators in MENA are therefore increasing their efforts to promote the incremental

benefits that 5G brings and the services that benefit consumers the most. This includes cloud-based gaming, e-sports and extended reality (XR) applications.

Examples include:

- e& and Microsoft have formed an agreement to enable e& customers to bundle an Xbox Game Pass with their mobile subscription, providing access to Microsoft's library of games (including cloud gaming) across devices.
- Zain's e-sports subsidiary hosts a range of competitive gaming tournaments in the Middle East.
- Ooredoo has announced a three-year strategic collaboration with Snap to build augmented reality (AR) experiences at a range of sites across MENA, including



the National Museum of Qatar and FIFA World Cup 2022 stadia.

5G fixed wireless access (FWA) has also garnered significant early interest from operators in MENA and there have been some promising early signs in terms of user adoption.

Operators pursue 5G enterprise opportunities

While the consumer market has been the focus of early 5G deployments, B2B is the largest incremental opportunity in the 5G era, with a raft of digital transformation projects underway across different industries. To fully exploit these opportunities, 5G leaders in MENA are investing in new capabilities.

Edge computing is a priority for operators in the region, with multiple routes to market available. In a GSMA survey, 50% of respondents reported that edge computing would be a key investment area over the 2021-2025 period.

Those that can deliver complete solutions can position themselves as a 'one-stop shop' for enterprises. Alternatively, partnering with vendors, such as cloud service providers and telecoms vendors, can provide operators with a faster time-to-market with compelling solutions that take advantage of operators' unique 5G edge capabilities.

For example, e& launched its 5G Enterprise MEC solution in collaboration with Microsoft in October 2021. Oil & gas, transportation, smart manufacturing and logistics were touted as key industry sectors for the proposition. e& UAE announced a similar partnership with AWS in March 2022; the two companies will create a catalogue of pre-packaged 5G edge computing solutions for enterprises.

The GSMA has forecast mobile operator revenues to grow from US\$63.3 billion in 2021 to US\$66.5 billion in 2025, culminating in US\$37.3 billion capex in 2025, of which 73% will be on 5G. The contribution made to MENA GDP from the mobile sector is expected to grow

from US\$255 billion (5.4% of GDP) in 2021 to US\$276 billion in 2025.

Sub-Saharan Africa – the landscape

Meanwhile, in the latest version of the GSMA'S The Mobile Economy sub-Saharan Africa report (2021), analysts reported that revenue growth is benefitting from the recovery of economic activities, following disruptions caused by the pandemic in 2020. Data and mobile money remain the prime revenue growth drivers, with adoption and use of both services continuing to rise rapidly. Beyond this, operators are seeing strong demand for a wider range of digital services, reflecting a shift in consumer behaviour triggered by the pandemic.

COVID-19 has underscored the value of mobile networks, which remain the only form of internet access for many in sub-Saharan Africa. Mobile networks have remained resilient as operators implemented various measures, including investments in network capacity, to cope with the surge in data traffic. With the use of digital services likely to continue rising, operators' investments will only become more important. 5G will be a major part of this investment as commercial services are deployed in new parts of the region.

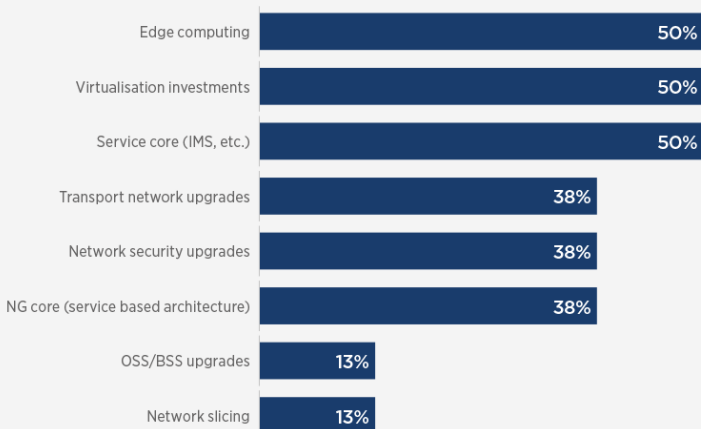
5G: sub-Saharan Africa takes a measured approach

5G continues to make progress globally; commercial 5G services are now available

Edge computing is a top priority for operators in the Middle East and Africa

Considering your 5G core and service network, which areas of investment are most important for delivering successful 5G services?

Percentage of respondents, Middle East and Africa



Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2021

in every region of the world, making it a truly global technology.

Network rollout is a first step to realising 5G's potential, with the availability of applications an important next stage. Operators and other stakeholders in pioneer 5G markets are increasingly focussing on the development of 5G labs dedicated to co-creating solutions with partners, including start-ups, academia, cloud providers and enterprises, to address specific needs.

In sub-Saharan Africa, the journey to 5G has begun but it is still early stages for network deployment and commercialisation. By the end of June 2021, there were seven commercial 5G networks in five markets across the region. In these markets, 5G coverage remains limited to major cities. Enhanced mobile broadband (eMBB) and fixed wireless access (FWA) services are the main use cases.

Youthful generation sustains subscriber growth

By the end of 2020, 495 million people subscribed to mobile services in sub-Saharan Africa, representing 46% of the region's population – an increase of almost 20 million on 2019. With more than 40% of the region's population under the age of 15, young consumers owning a mobile phone for the first

“In sub-Saharan Africa, the journey to 5G has begun but it is still early stages for network deployment and commercialisation.”

“With digital services set to be at the heart of a post-pandemic world, the urgency to bring unconnected communities online, particularly vulnerable groups such as women, has never been greater.”

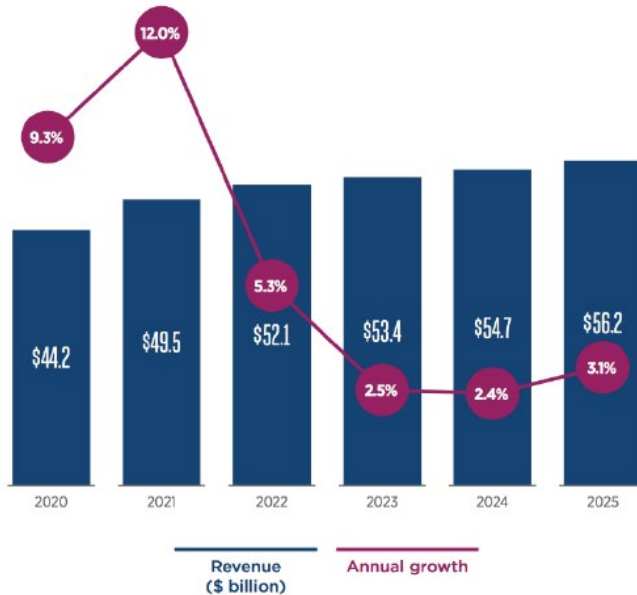
time will remain the primary source of growth for the foreseeable future. There will be around 120 million new subscribers by 2025, taking the total number of subscribers to 615 million (50% of the region's population).

At the end of 2020, 303 million people across sub-Saharan Africa were connected via mobile internet, equivalent to 28% of the population. With digital services set to be at the heart of a post-pandemic world, the urgency to bring unconnected communities online, particularly vulnerable groups such as women, has never been greater. Several operators in sub-Saharan Africa have implemented initiatives to improve digital inclusion for women. By 2025, more than 170 million people across the region will have started using mobile internet for the first time, taking the penetration rate to just under 40% of the population.

Lessons from Safaricom's Maisha Ni Digital campaign

In Kenya, mobile users who are aware of mobile internet but do not use it face three main barriers: affordability of handsets; knowledge and digital skills; and relevance of mobile internet to their lives. To address these barriers,

Revenue growth remained in positive territory during the pandemic, underpinned by strong demand for mobile services



Safaricom launched the Maisha Ni Digital (Life Is Digital) campaign in partnership with Google in 2018, which takes a holistic approach to increasing mobile internet use among priority groups, including women, by offering a 4G smartphone at an attractive price.

In 2019, the 4G-enabled Neon Ray smartphone, sold for KSH3,999, was the flagship device for the campaign. More than 500,000 Neon Ray smartphones have been purchased, 54% by women. A GSMA study found that after a smartphone was acquired through the Maisha Ni Digital campaign, internet use tended to increase substantially.

The Maisha Ni Digital campaign has helped Safaricom and Google increase the number of women using mobile internet in Kenya. To implement initiatives that can help close

the gender gap in other markets, mobile operators and other stakeholders should look to the following:

- Provide customers in underserved groups, especially women, with more affordable internet-enabled handsets
- Address barriers beyond affordability in parallel, such as digital skills and relevance
- Improve understanding of how data packages work to help address data affordability
- Make digital skills training material more accessible by using local languages, audio and video, and images. This is particularly relevant when targeting women in LMICs, given lower literacy levels relative to men ■



Nicholas Van Slyck,
senior director, Africa and Asia,
SBA Communications

Africa is a large and diverse continent with over 50 countries. Our experience so far has been limited to just two of them, and one, Tanzania, is a very recent new foothold. In South Africa, we have approximately 1,700 high quality multi-tenant towers, and as of January this year, we have acquired 1,445 sites in Tanzania from Airtel as part of a joint venture with Paradigm Infrastructure Partners.

With entry into our new market in Tanzania, we have begun to think about a more regional management structure making the most of synergies between our teams. For example, theft and vandalism have been a real challenge in South Africa and developing creative solutions to combat this is an ongoing effort. These solutions can be shared with our operations team in Tanzania to address similar challenges.

Meanwhile, in the Tanzanian market, towercos are responsible for power; our local team there is quite skilled at managing this part of the business. In South Africa, in contrast, power is just beginning to shift from

“With entry into our new market in Tanzania, we have begun to think about a more regional management structure making the most of synergies between our teams.”

“This year, the two biggest challenges that we’ve faced in our African markets are grid reliability, and theft and vandalism.”

the MNOs to the towercos, meaning that there is a lot for our local team to learn from their counterparts in Tanzania.

Across the African continent, green solutions are growing in demand. There have been several technological advancements with solar power over the last decade resulting in greater dependability at reduced costs. Solar power is now offering a compelling alternative energy solution for carriers.

In fact, we have an ongoing solar business in Jamaica where we are using solar power and batteries to provide backup power to one of our customers. This has lowered the customer's energy costs by reducing dependency and power consumption from the grid. This is a model that could possibly be used in other markets.

We have a few sites in Tanzania in areas that have either bad grid or no grid at all. Solar solutions are used at some of those sites, but not all. With fuel prices going up so sharply over the last 12 months coupled with the fact that carriers and infrastructure companies both want to reduce their carbon footprint, it seems that there's a strong case for more solar powered solutions in this market.

This year, the two biggest challenges that we've faced in our African markets are grid reliability, and theft and vandalism. In South

Africa, grid reliability has deteriorated over the last few years resulting in daily load shedding. In a country with 40%

unemployment, theft and vandalism are also big problems resulting in substantial losses of batteries, fuel, and even entire generators. MNOs want to pass this responsibility over to the towercos for obvious reasons.

The challenge for our industry is to develop a cost-effective solution that is both reliable and has an effective anti-theft system built in to withstand the constant threat.

Looking at the market as a whole, colocation has been a real theme recently among wireless service providers. Demand for colocation has been strong in South Africa, where we average 2.3 tenants per tower. In Tanzania, we are beginning to see real interest in colocation from all MNOs, so that's another area to watch.

From the carrier perspective, the African market seems to prefer to lease infrastructure rather than ownership, and the number of sale lease back transactions across the continent over the last decade supports this view as well. Over time, MNOs have come to accept that building redundant infrastructure is inefficient

and not the best use of their capital; they've decided it's better to use their resources to invest in network improvements and expansion so they can attract more subscribers.

From their perspective, why tie up capital via ownership and take on the challenges of ongoing operations when that can be easily outsourced instead? ■

“Colocation has been a real theme recently among wireless service providers. Demand for colocation has been strong in South Africa, where we average 2.3 tenants per tower. In Tanzania, we are beginning to see real interest in colocation from all MNOs.”

Looking ahead: We see sustained growth coming from our existing markets in South Africa and Tanzania in terms of new builds and lease-up.

In South Africa, growth has been steady with a lot of repeat business. In Tanzania, we are just getting started, but we like what we see so far. MNOs clearly embrace the shared infrastructure model, so we see very good potential for lease-up on our existing portfolio. Additionally, we expect to have some new build opportunities.

We always have our eyes open for new market opportunities, but they must meet our disciplined investment criteria. Our approach over the years has been to look for high quality growth in stable markets, so we are extremely selective in terms of

the countries and assets we invest in.

Having said that, we are a growth company, so we do have a vision that includes extending our activities into other countries. How we do that varies from market to market. For example, expansion could come in the form of a sizable build-to-suit opportunity in a stable market with three or more healthy MNOs. This was our approach in South Africa seven years ago and that strategy has been executed very well. Another approach is from a sale lease back transaction much like what we did in Tanzania. The third option would be a hybrid of the first two, where we would look to do a sale lease back with a commitment for decent volume of BTS over a defined period.



Chuninda Mittal,
sr marketing manager,
Tecnotree Corporation

The African telecommunication sector has grown and made a crucial impact to Africa's economic growth. From unique mobile subscribers to mobile internet users, and 4G to 5G, the African telecom market has shown tremendous growth in recent years.

The market has undergone rapid development due to the increasing demand for services like 5G, fintech, AI, virtual reality, etc., which is leading to increased adoption of digital services in Africa. With telecom companies now moving from being telco to techco, the African telecom industry has opened up to many new business opportunities.

Vodacom South Africa was the first company in the world to launch the prepaid system in November 1996, under the name Vodago package. Using an intelligent network platform made it possible to debit customers' accounts in real time. Vodacom also received an award for the Best GSM Service from GSMA. The concept was further copied by a lot of companies under different brands globally before CSPs viewed themselves as DSPs or experience providers.

The African entertainment and telecommunication market is expected to list a compound annual growth rate (CAGR) of 11.2% from 2021 to 2026, rendering Africa's digital consumption growth among the highest in the world, as per Mordor Intelligence's report.

According to Statista's report on the share of internet users in Africa published in January 2022, Morocco has the highest share with around 84%, followed by Seychelles and Egypt with 79% and 71.9%.

As per the report from the Broadband Commission, the World Bank Group introduced

a promising initiative to connect African countries with high broadband speed by the year 2030, to drive economic transformation across the region. These kinds of initiatives will mark a significant impact on the telecom industry.

Meanwhile, as per the GSMA, by 2025, 4G adoption in sub-Saharan Africa will double to 28%, compared to a global average of 57%. Although 5G is still in its early ages in sub-Saharan Africa, by 2025 end 5G will account for 3% of total mobile connections in the region. The GSMA has also reported that there will also be a profound shift in consumer mobile engagement across the young customer base in West Africa. This will show an increase in voice-centric engagement and non-core communications services like online gaming, video streaming, VR, etc...which is expected to grow sevenfold across the wider sub-Saharan Africa and West-Africa region by 2024.

According to the Fintech Times as of 2021, 57% of the African population do not have traditional bank accounts. However, mobile penetration is high and sub-Saharan Africa is the world's fastest growing mobile phone market. As per the report by QuartzAfrica, the region has shown increasing demand in the fintech market which now accounts for 70% of the US\$1 trillion global mobile market. Africa's top telecom companies are getting bank licenses to deliver the increasing fintech demand. The Central bank of Nigeria is also issuing banking licenses to the big MNOs.

An example of the increasing fintech demand can be the success of M-pesa, a fintech wallet of Safaricom and Vodafone. This wallet is operating in many African countries and has become one of the most successful fintech wallets in developing countries, within just three years of its launch.

MTN Uganda has also implemented DLM (Digital Loyalty Management) Platform with Tecnotree and branded it as 'MTN Senkyu' which means thank you in Uganda. The number of

subscribers enrolled in the program increased by 45% to more than 13 million, which is nearly 90% of MTN's entire customer base. TM Forum has recognized the success of Senkyu as a TM Forum excellence awards category winner under Customer Trust.

MTN Group is one of the largest telecommunications providers in the region, operating across different countries in Africa and the Middle East. MTN is one of Tecnotree's key accounts as we have transformed their legacy BSS system into digital BSS. We have also recently launched our digital multi-experience platform, Tecnotree Moments in collaboration with MTN Nigeria, which will create lifestyle bundles of content, applications, and connectivity through a pre-integrated digital partner ecosystem for global and local high-demand and hyper-growth sectors in PAN Africa.

The platform will attract leading partners across different sectors such as education, entertainment, gaming, sports, health, and wellness, to enter PAN Africa and use direct customer billing to convert ecosystem partners into instant revenue generators.

We have also announced a successful go-live of

DSPS (Digital Service Provisioning System) with Zain South Sudan and marked another global footprint in African telecom market. This deal will allow Zain to leverage the 5G Cloud Native platform to meet its current and future market requirements. It is quite evident that the 5G footprint is expanding with services now available in a lot of countries in Africa, which is showing great progress in digital transformation in this region.

We have also deployed our digital BSS solution for MTN Nigeria. The operator aims to provide leading digital services to drive this transformation journey. The deal will incorporate the first phase of digital transformation with catalogue-driven order fulfilment using Tecnotree's Digital Catalogue Manager (DCM) and Digital Order Management (DOM) in Africa. Tecnotree will also deploy its next set of market-proven BSS solutions - Digital Customer Lifecycle Manager (DCLM), Digital Resource Management (DRM), and Digital Business & Operations Dashboard (DBOD). The solutions will enable omni-channel customer engagement and journey management using a data-driven approach which will enable faster customer onboarding, 360-degree customer view, and a simplified payment process. ■

Looking ahead: The telecom industry across the globe is competing fiercely to survive in the digital environment where private networks are operating. It requires a very strong omnichannel strategy and extensive technology investments especially in 5G, to succeed in a world where customer demands are changing rapidly.

The future of Africa's telecom industry is quite bright as opportunities are increasing. Africa has become a hot spot for foreign investors which are investing in Africa's telecom infrastructure by expanding fibre coverage, cloud computing, and new mobile networks. This will even attract more

foreign direct investments.

Investment in expanding revenue streams by leveraging digital services, communication solutions, VR, AI, and fintech is resulting in huge business opportunities. This industry is overcoming under-connectivity to bridge the gaps with other countries by increasing and creating new industry standards, investing in digital transformation, and understanding the high need and demand for digital services across the African population. With over 650 million mobile users across Africa, a lot of big digital transformations and opportunities are yet to come.



David Lotfi,
CEO, Evina

After raising the most money globally in the area of cybersecurity for telecom payments in 2021, Evina has expanded its activities in the MEA region, signing with major telco groups such as Orange, Ooredoo and Vodacom. This expansion has allowed Evina to witness and take part in the major transformation that telecoms are undertaking.

The most forward-thinking telecoms are beginning to realize that they could be the biggest fintech companies to come and MEA operators are particularly ahead of the curve in this realization.

In sub-Saharan Africa, telecom operators continue to successfully capitalize on their strategic assets to further develop mobile money. Their huge customer base, network of agents and the rapid spread of cell phones and smartphones allow them to offer a range of financial services that banks are unable to provide.

For Safaricom, the fintech business now represents nearly 40% of its annual revenue. 346 million mobile money accounts are currently active in Africa and the region accounts for 70%

“This positive momentum is good news for mobile operators which have faced a deterioration of their profitability on data and voice supply activities during and after the pandemic.”

of mobile money users worldwide.

This positive momentum is good news for mobile operators which have faced a deterioration of their profitability on data and voice supply activities during and after the pandemic.

With mobile payments operated by telecoms steadily growing, 2022 can be defined as the year of the rise in attacks on mobile payments by cybercriminals. Cybercriminals have acknowledged the revolutionary efficiency of carrier billing and its rapid growth is an incredible windfall. These attacks specifically target unprotected transactions on carrier billing.

These are serious attacks, not only because they result in stolen money, but because they jeopardize the telecom's capacity to grow a healthier payment business. For the DCB, many operators have reacted in a hurry by setting up complex payment flows, introducing One Time Passwords (OTPs), and reducing their partner networks.

Yet these measures aren't always the right answer, as cybercriminals have found ways to bypass these. When it comes to mobile money, many operators targeted by cybercriminals have simply decided to cut back, reduce their commercial actions and focus efforts on cyber-hygiene. This did not work either.

That's why in 2022, Evina's solutions have proven more necessary than ever.

On DCB, Evina has allowed operators to deploy one-click payments and expand their partnerships without worrying about increasing customer complaints. Apart from resulting satisfied customers, these actions make way for a strengthened brand image and new contracts with premium merchants.

On mobile money, Evina has enabled operators to grow fast, expand their network and conduct targeted marketing operations in a secure way without cybercriminals being able to

interfere. With the fraud risk eliminated, partner operators can grow quickly and effectively - which is key in an expansion phase - and offer a range of new services such as micro-credit.

Evina can deliver unique results thanks to the continuous improvement of its algorithms, the synergistic collaboration between machine learning and human analysis, and its continuous monitoring of threats, and the analysis of deep web forums or feedback from experts in the field.

Our €20 million funding in November 2021 has also allowed us to increase our research and development, recruit new industry experts and hire the best malware analysts. This has paid off. Our teams identified, before anyone, a new family of sophisticated malware: the Autolykos malware. This malware can make mobile users sign up for subscriptions without their consent and is hidden among apps downloaded on Android app stores.

We now protect more than 20 million transactions a day, operate in over 80 countries,

“The partners who put their trust in us this year have seen their business grow by up to tenfold while complaints have been cut in half. They could develop their business beyond what they thought possible once they got rid of fraud”

and have surpassed the value of transactions Apple announced it was protecting against fraud last June (US\$1.5 billion).

The partners who put their trust in us this year have seen their business grow by up to tenfold while complaints have been cut in half. They could develop their business beyond what they thought possible once they got rid of fraud. ■

Looking ahead: Telecoms that will accelerate the protection of their payments will play a major part not only in the fintech economy but also in the digital economy.

Two factors will come into full play.

Rising rates and a deteriorating global growth outlook will put a lot of bad and weak fintech players out of business. The latter are highly dependent on financial leverage to grow their customer base, and as money dries up, the game is going to get harder for them. The telecom giants don't have this problem and already have huge customer bases that they just need to tap into. Now is the time for operators to create sustainable consumer habits and to create a sustainable alliance between telecom operators and payments.

On the OTT side, streaming subscription services are under pressure. Consumers who are suffering from inflation are reluctant to subscribe and others simply cancel their subscriptions. This is an opportunity for operators to offer large platforms the DCB technology that is able to boost their conversion rates (10 times higher than credit cards).

It is possible to take advantage of these opportunities as long as the payment is secure.

As previous crises have shown, hackers are very resilient in the face of crises, and worse, they thrive when investments in cybersecurity decline. Investments in payment protection will therefore be key in the coming year, both as a necessary condition for the growth of the sector and as a key to its longevity.



George Kalyvas,
chief commercial officer, Upstream

As in much of the world, in Africa, it's not just that businesses should be mobile too, but mobile first. From engaging customers and expanding revenue streams to streamlining operations and enabling more agile processes, mobile sits at the centre of business innovation.

Boosted by the COVID-19 pandemic, connectivity is now the most important thread holding the economy together. At the same time, the ability to target users via third-party cookies is soon to be completely phased out. This means direct mobile channels are now even more important. At Upstream, we focus on enabling businesses to put this to their advantage and use mobile marketing technology to push their campaigns to new heights.

With over 495 million people currently subscribed to mobile services in sub-Saharan Africa, the GSMA predicts that by 2025 mobile technologies and services will generate US\$155 billion of economic value.

Upstream, having started its operations in Africa in 2008, has an established presence across the continent, with a particularly strong focus on South Africa, Nigeria and Kenya, addressing millions of mobile users across the continent. Firmly committed to the African market and having worked with the most important MNOs on the continent, we see huge opportunities for even more businesses in all sectors to engage with consumers via mobile.

Mobile networks are the gateway to reaching consumers directly and accurately and our strong know-how on the MNO multiple channels and how to maximize their potential, has been the perfect recipe for our campaigns' success.

When the largest mobile operator in Africa asked our help for its recently rolled out music streaming service, we managed to deliver a staggering fourfold increase in the service's active user base within the first three months of the campaign. Over the course of the eight-month campaign, almost 1.8 million new subscribers were delivered to the service. The cost-per-acquisition was also minimal, as the operator owned most touchpoints leveraged in the campaign.

Upstream also supported another major African MNO in pushing their messaging super-app to subscribers with minimum costs. In South Africa, the app was installed 72,000 times in two months at a 25% conversion rate with 20% decrease in cost per installation.

Our unique and long-lasting experience as a go-to partner for African mobile operators has allowed us to take our offering further and today we work across verticals from FMCGs to financial institutions, insurance and more.

In South Africa, Upstream worked with a popular food retailer to maximize digital traffic for its online store. Before working with Upstream, the retailer's campaigns had struggled to reach a mass audience via digital touchpoints. However, once Upstream introduced rich communication services (RCS) to encourage customers to visit the retailer's home page and view current deals, the brand was able to achieve 12,000 clicks in just two weeks with a CTR of 22.2%. It was clear that deploying mobile marketing technology as part of a multichannel strategy was the boost needed to level up the performance of the campaign.

Similarly, when approached by a multinational consumer goods company to relaunch its popular rewards and loyalty platform under a new name, again in South Africa, Upstream was able to boost digital traffic to the sign-ups branded page by leveraging RCS communications to engage customers with rich video and animated ads.

Just as the COVID-19 pandemic made digital engagement a necessity for most businesses, we unveiled Grow – our innovative multi-channel technology-enabled mobile marketing automation platform.

Grow enables mobile operators, advertisers, and brands to easily deliver multi-channel customer engagement, predominantly through mobile devices, using channels such as mobile websites, SMS, RCS, device notifications and social networks. With Grow, it's now possible within a single platform, to have a clear view of users' flow, at any level of the funnel, apply different tactics for each level, optimise results, and feel assured about the validity of the acquisitions reported.

Grow also offers advanced capabilities that enable faster and more informed decision making, with deep insights, analysis, and audience management. These capabilities also allow the implementation of high conversion strategies, incorporating user identification, targeting, and retargeting across different channels.

Despite the dramatic increase in demand expected for digital services, our in-house research has revealed that the majority of operators in Africa rely on physical revenues

“Now is the time when brands, mobile network operators and advertisers across Africa should consider the mobile first mindset of consumers.”

with their sales coming mostly from physical stores and call centres. The opportunity is there, waiting to be tapped.

Digital customer engagement with the consumer on the mobile, will not only help open lucrative new revenue streams for operators, but it would also provide new opportunities for other businesses wanting to use their services to engage more closely with consumers.

Now is the time when brands, mobile network operators and advertisers across Africa should consider the mobile first mindset of consumers. Putting mobile front-and-centre of their multichannel marketing campaigns and using a platform such as Grow to manage performance and decision-making with ease is an essential part of the picture. ■

Looking ahead: With Africa's population set to double and reach 2.5 billion by 2050, Upstream is dedicated to helping MNOs and increasingly brands and advertisers reach and engage with this growing consumer base in the most effective and efficient ways possible.

However, with privacy trends across the world also leading to the phasing out of third-party cookies, the growing importance of 'first-party data', conversational communications channels on the rise and a revival of SMS as a highly effective marketing channel, the old ways of reaching consumers will no longer be enough. Consumer appetite for mobile

engagement across Africa is growing and this must be where brands place most of their energy.

Using our mobile marketing technology, our partners across Africa have the chance to communicate more effectively with their customers, increase overall digital sales, upsell tariff plans and push their product portfolio, as well as tap into new revenue streams via harnessing the power of first-party data and the mobile identity. We expect significant growth across multiple promising domains as our innovative Grow platform is being adopted by enterprises to meet and fulfil these needs.



Mark Joseph,
CEO for Africa, Amdocs

It has been a fantastic 12 months for Amdocs in Africa, securing several strategically important deals with the continent's leading telco providers and executing multiple projects as we continue to unlock our customers' innovative potential, empowering them to provide next-generation communication and media experiences for consumers and enterprises. Our success in Africa contributed to a landmark year for Amdocs, leading to us reporting record global revenue of US\$4.58 billion in fiscal year 2022.

For many of our customers in Africa, the priority is making the transition from telco to tech-co. This means moving beyond the traditional focus of providing connectivity to building an ecosystem of partners in the open, platform-based digital economy that we see today. This is a journey we're supporting customers on around the globe. A key focus is digital transformation of systems and processes to ensure they are robust and future-proof.

Africa plays an increasingly important role in the global economy and is well placed to benefit from its fourth industrial revolution. Africa is awash with untapped talent and ideas, and it

offers exciting new growth opportunities for Amdocs and our customers.

Communications service providers (CSPs) are here to provide connectivity, but today the role goes beyond that: it's about benefiting society. Whether it's tackling the digital divide by ensuring that even remote communities are connected, and all children can enjoy the benefits of online learning or ensuring that more citizens can secure online appointments with a doctor, the telecoms sector is a driver of positive social change. Indeed, for me, there are three key areas in which telecoms can spearhead improvements in African society: education, healthcare, and governance. There is a golden opportunity for the telecoms sector to lead the change in all these areas and more, building its reputation as a force for good.

We have operated in South Africa for two decades and have an office in the Johannesburg region, but now we're focusing on expansion. We're here to provide innovative new ways for telcos to be more creative and efficient, so that they can launch exciting new products and services quickly. This means that they can provide next-generation experiences for their customers while offering better solutions to broader social and economic challenges. That's where our 'Make it Amazing' brand message comes from: we help those who build the future to make it amazing. ■

Looking ahead: The telecoms sector has a critical role in enabling Africa to fulfil its potential and achieve improved social and economic outcomes for its citizens. CSPs have an opportunity and a responsibility to be the catalyst for greater fairness, equality, and attainment across Africa.

Looking ahead to 2023 and beyond, 5G will gain momentum. South Africa was the first country in Africa to launch 5G and has since been joined by

a handful of other countries. 5G is mission critical to the future of enhanced connectivity and all the innovations and transformative technology that come along with that, so delaying investment or waiting for a 'killer' use case will only make companies vulnerable to having to play catch up in the future. Those telcos who capitalized on 5G's early commercialization will be the first to reap the rewards from the new revenue streams it creates.



Jukka Heiska,
CMO, Qvantel

In North Africa we are seeing many operators progressing with digital transformation. As ARPU's slide, many are looking to become digital operators and open new revenue streams beyond connectivity.

This is being driven by the increased roll out of 4G and the increase in smartphone adoption. This move to digital is helping with digital inclusion in society and some operators are looking at working with partners to provide digital healthcare and education services.

Another trend we're seeing in North Africa is that the digitalisation of channels and services is first provided for B2C customers, and then operators look to digitalise their B2B operations too.

Qvantel implemented a digital BSS for a leading North African operator to enable digital transformation. This required a replacement of legacy business support systems (BSS) to enable customers to engage via digital channels and for the operator to sell a wide range of additional digital services, such as gaming and entertainment offers. By investing in a digital

BSS, this operator has been able to make more focused offers and personalised services. The result is that net promoter score (NPS) shot up and this operator now has the highest NPS in their country.

In sub-Saharan Africa many operators are starting digital transformation projects. More than half of mobile customers use a smartphone, and this rate is only going to increase as we see an increase, opening the door for digital transformation. Operators are starting to look at upgrading their business support systems, not just to support apps and websites, but also to speed up time to market and enable new business processes to be developed quickly and cost effectively.

While digital transformation is the main activity now, many operators are kicking off transformation projects with an eye on the 5G future. The GSMA is forecasting that 5G usage in sub-Saharan Africa will account for 1-6% of mobile usage by 2025.

Even at these levels, operators in sub-Saharan Africa are checking that the BSS they are upgrading to support their digital transformation journeys will also support 5G and provide the agility required to develop new business models and enter new vertical markets. This future proofing of BSS makes sense and will help drive transformation and ensure that operators are ready for 5G. ■

Looking ahead: I'm expecting to see more innovative ideas come to fruition with more 'beyond connectivity' services being offered as 4G rolls out and smartphone penetration increases. This will also increase the usage of operators' mobile banking services and deliver more digital inclusion.

Countries with relatively low mobile ARPUs often have very innovative operators as they develop ideas to provide new services to existing customers. There is also a drive to deliver the best customer experience possible so that their customers will want

to use services provided by their mobile operator - be it a banking, TV, music, telehealth, or an education service. This comes back to the example of the North African operator who underwent a digital transformation process and as a result has the highest NPS in the market.

Customers prefer to buy services from companies they trust and like. This focus on customer experience will be key as operators look to develop, launch, and monetise a range of new digital services that go beyond connectivity.



Waheed Adam,
executive chairperson, iTouch

■ Touch, a South African based Mobile Solutions provider and one of South Africa's oldest messaging providers, has since 1995 focused on enterprise, retail, and more heavily on the banking sector, internationally.

We serve banks in 10 African countries wherein we are integrated into the banking platforms and to deliver transactional and one-time passwords (OTP). This is a time-critical service to the banks and requires 'bank-grade' security, capacity, and reliability, ensuring iTouch is compliant in all aspects.

When a transactional message or an OTP is sent, it needs to deliver instantaneously, necessitating secure, stable, and reliable routing via the MNOs. SMS remains ubiquitous and cost effective and has for many decades been the chosen channel for delivering such communication, until now...

In recent years MNOs have decided to create 'international hubs' whereby any company sending messages from an international destination in-country - or are internationally owned, meaning they may have a presence in-country but are owned by international shareholders - are obliged to route their messages via an international hub. The reason given is for the MNOs to be able to view what comes into the country and to ensure security measures to block

international fraudulent opportunists.

While I support this initiative - as I regard mobile fraud a global pandemic of its own - the MNOs have conveniently invented a different pricing model.

This initiative may carry some additional costs and one can expect to pay a higher price per message, however the MNOs have decided to use this opportunity to support their declining revenue model to exploit international businesses wanting to deliver their services in-country. And by 'exploit' I mean commercial models that are somewhere between 300-800% higher than their usual price per message.

The higher costs in most cases, if not all, are - down the value chain - regrettably passed onto the client. The bank's client is a local, using a bank in their location, for a local service, but they must pay an exorbitant fee because of profiteering?! It's another case of win the battle but lose the war. The service will have to move away from A2P messaging because of unnecessarily high costs.

I once sat on a panel with an MNO lead at the ITU conference and when asked why the hefty commercial model, her answer was precisely what I suggest above.

There is no justifiable reason other than a great opportunity to increase the MNOs bottom line, she said.

MNOs reserve the right to choose how they want to price the service, but when it becomes a risk to its utilization then that not only impacts the MNO itself but the entire A2P messaging sector. Companies like iTouch that provide messaging services fall victim to this loss too, hence my intervention in creating a global committee that serves to educate the market - including the MNOs - of the impact their decision is likely to cause.

"There is no justifiable reason other than a great opportunity to increase the MNOs bottom line."

One of the banking institutions we serve has branches across several African countries.

Each entity is locally registered, employs local people from each country, including upper management and executives, and serves the local banking community. However, their cost per message rose month by month in a short space of time to the numbers above, 300-800% higher! This is a pain point for the bank and one they regard preposterous.

Each MNO has a different policy of what qualifies as an international business. There is no clear definition to whether this bank is deemed international or not. As a bank that has a local legal entity, employs local people, and serves the local communities, should they be deemed international?

Lastly, is banking not a critical service to the local market? Should it be labelled as an international company in this instance and be forced to pay the high prices set by the MNOs?

In a world where there are many channels of communication, and a time where new channels have made major ground, such as WhatsApp business, iMessenger, etc., the bank has new options to consider.

Africa's smartphone penetration is growing exponentially which also gives rise to in-app messaging as an option.

The banks are considering alternatives and spending their R&D budget on exploring these options. Some have already made the move to alternatives, and some are using a hybrid of different channels, keeping A2P SMS as the fall back while testing the reliability of other channels. According to a Mobile Squared presentation at a MEF conference in June 2022, the financial sector is still the largest user of A2P messaging, and the 'international hub' commercial model is directly impacting the future of this channel.

This commercial model is likely to negatively impact the use of A2P messaging, which will only result in the further decline of MNO revenue in the long run, though they may enjoy short term growth.

The irony is that these MNOs are themselves internationally owned and don't qualify for lower pricing under their own criteria if they were a consumer of the service. It has sadly become an accepted commercial model amongst many MNOs now but one I hope to change by highlighting the risks associated. ■

Looking ahead: As the pandemic gave rise to the convenience of home shopping, e-commerce has catapulted to new heights while technology enhancements and the streamlining of logistics is securing it as the way of the future. More businesses, particularly small and medium size businesses (SMBs) are entering the e-commerce environment to benefit from the wider pool of customers.

This move is increasing the need for digital communication channels to serve the transaction process. Just when we thought we may be reaching a

peak in A2P SMS messaging, this new SMB market is fast changing that.

According to Mobile Squared, there are over 304 million registered businesses in the world of which most don't use SMS as a communications tool. However, as they enter the e-commerce environment, they will need SMS. Some markets are already experiencing over 25% growth in SMS usage. If only 30% of the SMBs use SMS it will grow this sector to over \$140 billion. This resurgence is testament to the long life we can expect from the SMS channel of communication.



Willem Wentzel,
head of wireless, NEC XON

5 G and Open RAN are changing connectivity in Africa and other emerging markets in different ways than developed markets such as Japan, the US, and Europe.

Developed markets have focused on embracing 5G's high speeds, bandwidth, and low latency. However, emerging market service providers are primarily focusing on a connectivity play. They are leaning harder into 5G's capabilities to provide dense connectivity in urban settings.

Coupled with the opportunity to integrate new Open RAN 5G equipment with legacy infrastructure, they can leverage new Opex and Capex benefits, further driving the connectivity business case across Africa.

This shakes up how mobile network operators have traditionally operated in Africa. That many network operators want 5G's speed, bandwidth and latency benefits is not news. However, that they want it using Open RAN is because it is a marked departure from how they have traditionally operated.

5G offers better mobile broadband connectivity and massive machine-type communication.

"50% of the world's children younger than five who die of pneumonia, diarrhoea, measles, HIV, tuberculosis and malaria are African, according to the United Nations World Health Organization (WHO)."

Smart farming, smart cities, digital mining, smart logistics, advanced healthcare, industry 4.0, energy, retail and more have caught the imagination of many through the media.

But, while all of that and more are possible, not a lot of it is highly probable in Africa. For example, 5G can be enormously beneficial to smart farming. However, The Borgen Project is a non-profit addressing hunger and poverty in Africa that estimates as much as 65% of farming in Africa is subsistence farming.

Additionally, as much as 92% of platinum, 73% of diamonds, and 89% of the world's gold come from Africa. But there has not yet been any significant smart and digitised mining in Africa. Not least among the challenges are the economic realities of cheaper labour and commodity pricing volatility.

Africa could benefit from advanced healthcare. But on a continent where more immediate concerns are providing primary healthcare, we are unlikely to see wide scale remote surgical procedures. 50% of the world's children younger than five who die of pneumonia, diarrhoea, measles, HIV, tuberculosis and malaria are African, according to the United Nations World Health Organization (WHO).

Many of the more than 1.2 billion Africans use some form of cellular communication. 2G's main benefits are cheaper handsets, long range, low power needs and long battery life. 3G offers more scope for a higher level of user services, likewise 4G, and so too will 5G. However, each step up also requires more energy, operates reliably over shorter distances, and is increasingly affected by adverse terrain.

The ideal would be to combine all the technologies into one network, something that can be next to impossible without the integration capabilities that Open RAN offers.

Mobile network operators used to buy their

proprietary network kit from a single vendor. It wasn't economically feasible for large-scale commercial networks to develop the high level of skills necessary to use previous generation open technologies for the core and radio networks. It was, nonetheless, expensive to buy exclusively from a single provider.

That is how the Open RAN movement gained momentum and support from global vendors, including NEC.

Open RAN makes it possible for mobile operators and other communications service providers (CSPs) to integrate with the legacy equipment, eliminating the need to forklift the old network whenever a new generation of technology is introduced. It significantly reduces Capex and Opex requirements, as much as 40% Capex and 30% Opex, according to analysts and early commercial results from our partner Rakuten's deployment in Japan.

Africa's tiered markets require different

services from markets overseas. More than 650 million Africans lived in rural areas in 2020. However, more than 40% of Africans were also urbanised, according to The World Bank and Statista.

Rural Africans use different services from urban Africans. Rural Africans prefer plain text messages and services such as mobile money. In fact, 548 million mobile money accounts were registered in Africa in 2020.

Those services typically do not need 5G's benefits that include low latency, high speed, and high throughput. That is why mobile operators can deploy 5G in Open RAN architectures to the dense urban centres. Since it can be integrated with their existing equipment, they can shift the current infrastructure one step further out to gain many advantages. They increase coverage on a much smaller investment, gain the ability to offer new services, and they can expand their subscriber and user base. ■

Looking ahead: The future of 5G in Africa relies heavily on Open RAN, the success of which is heavily determined by the partnership ecosystem to support it.

While mobile operators and CSPs previously relied on a single Capex- and Opex-intensive supplier for their proprietary networks, Open RAN enables more cost-effective sourcing from multiple suppliers. However, they must either develop the skills to integrate, service and maintain the network themselves or work with partners who can.

This will elevate these partner ecosystems a lot more in future in Africa. It's an extension of a shift many of the mobile operators and CSPs have already been making, which is to either absorb systems integrators through acquisition or joint venture or develop close operational partnerships.

The requisite skills are intense, which is why we partnered with Rakuten Symphony, to extend their global expertise to African organisations. For example, they developed the automation to reduce site deployments from days or weeks to just minutes or hours. They now run a six million subscriber network with just 250 engineers and have developed and deployed their own RAN technology that enabled them to deploy over 270,000 cells and achieve 97% coverage within three years.

The future of telecommunications in Africa will remain mobile and it will advance on 5G Open RAN technologies and cloud-native services. This is the most cost-effective and fastest way to deploy and it offers support for numerous use cases, which are what ultimately drive the adoption of any technology.



Faisal Ghazaleh,
VP Sales for MEA & India, Infovista

From Infovista's point of view, the African countries we traditionally focus on such as Egypt, Morocco, South Africa, and Algeria have been quite active over the past year as we have supported them with 5G network rollouts and optimization. They aim to adopt the latest technologies and are consistently at the forefront of new network technology.

Across the rest of the continent, we have addressed business opportunities coming from growing economies such as Niger, Rwanda, DRC and most recently in Botswana, where we are helping with the modernization of the existing mobile network and optimizing the planning of future 5G-ready network infrastructure.

“Deploying cellular networks across huge areas of ‘rural and remote’ territory is a massive logistical challenge.”

Looking ahead: To date, African regulators are our main customers, followed by CSPs operating across the continent that are expanding their LTE networks and have adopted some unique services such as mobile money and multiple over the top (OTT) applications and services.

In Africa, most of the countries are among the later adopters of technology, and therefore, we expect 5G to continue gaining momentum over the coming 3-5 years and, along with 5G network rollouts, we anticipate technologies such as network automation, analytics, AI/ML, IoT,

Our work allows Botswana's leading CSP to test, benchmark and optimize the performance delivered by its mobile network, helping ensure its subscribers using connected services enjoy the best possible quality of experience. Finally, we have been involved in some of the major projects funded by the IMF and Bank of Africa to help develop the telecommunication sector within Africa.

Some of the biggest challenges that we deal with in our work in Africa arise from geography. Deploying cellular networks across huge areas of what we call ‘rural and remote’ territory is a massive logistical challenge, and we employ the latest hard and software to plot the optimal location of network infrastructure – ensuring the delivery of the best possible network for CSPs and their customers.

Alongside this, we have discovered that monitoring and maintaining some legacy technologies such as 2G and 3G, which less and less meet the needs of the different African markets but remain vital (for now), can raise interesting challenges for our technical teams. Finally, geopolitical stability can impact the development and deployment of telecommunications networks and services – and so we must always be mindful of the situation in the countries where we operate. ■

blockchain, Open RAN, and private networks to be emerging as trending technologies throughout that timeframe.

We also envision the development of 5G specialized offerings towards industries such as mining, oil and gas, retail or healthcare. This would make 5G a key factor in unlocking the potential of African countries to grow further and increase their contribution into the world economy. A good example is the impact of IoT on farming, which directly contributes to improving the production yields and quality.



Andrew Schafer,
CEO, PowerX

2022 was a major turning point for Africa. It's the first time that major towercos utilised artificial intelligence (AI) to increase the efficiency of passive infrastructure and reduce carbon emissions.

It has been a buoyant year with continued growth of mobile coverage across Africa. Traditional technologies have proven insufficient for tower operations; only by overlaying more advanced, artificial intelligence (AI) led analysis and resultant workflow can passive infrastructure truly be digitised, and assets optimally used to deliver financial returns at scale. This is fantastic news for PowerX. Our industry-first AI tools place data intelligence at the heart of tower operations. Recent customer announcements demonstrate that this approach is endorsed by market-leading tower companies and new market entrants.

There is pressure to expand connectivity in Africa, whilst ensuring resilient, cost-effective service delivery. Yet, there are a multitude of inefficiencies occurring every day at every site. With current systems and resource limitations, only a small proportion of those are ever identified.

The industry relies upon manual operations; however, historical investments often leave tower teams with limited data availability, a lack of actionable insights and an inability to act at scale across tower estates. More focus needs to be placed on better use of site data so that data intelligence-led optimizations

and future autonomous AI control can be applied.

PowerX is working with partners and customers to identify these data gaps and establish a robust foundation for machine learning (ML) / AI technologies. Even where data sets are limited, there is significant value in applying AI-led intelligence to optimise operations. AI-driven automation is rapidly becoming a pre-requisite for modern, resilient, cost-effective tower operations. Benefits realised with PowerX's AI-led solutions include:

- Fuel consumption reduction of 20-30%
- Diesel generation run time reductions of 15-20% with resultant savings in maintenance, re-fuelling, and extended asset life
- Solar yield improvement of 10-15%
- Reduced maintenance trips and resultant costs by 15-20%
- Overall asset utilisation improvement of over 10%
- CO2e/GHG reduction of 10-30%
- Improved resilience with reduced risk of SLAs breaches
- Improved revenue assurance and tenant billing accuracy
- Improved grid classification with resultant cost and revenue benefits
- Labour savings on reporting and analysis

The industry can redefine tower performance using AI. PowerX AI sees through 100s of billions of data sets, delivers 100+ millions of automated improvements and scales existing team expertise by a factor of 30-50. ■

Looking ahead: The growing interest we have seen in 2022 re-enforces our vision. There is a better way to manage tower passive infrastructure sustainably so that our customers can deliver on their vision of connecting more customers without compromise, whilst improving operational

efficiency. History has shown that once market leaders embrace a new technology and gain a competitive edge, it rapidly becomes the market norm. Thus, we expect to see more towercos, MNOs, ESCOs and tower passive infrastructure providers roll out PowerX technology.

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Advantage 360 is a leading supplier of Convergent Telecom OSS/BSS solutions world-wide. Leveraging more than 25 years of experience, we provide a completely integrated platform with robust features supporting service provider's billing and operational requirements.

Our products consist of core modules that include Point of Sale, Inventory, Locations, Employees, Service Fulfillment, CRM, Accounting, Collections, Provisioning, Mediation, Online/Offline Rating, Convergent Billing & Invoicing, Self-Care, open APIs, and much more with support for GSM, CDMA, 4G, LTE, 5G, VoLTE, TAP, CIBER, NTRDE, Interconnect, Wholesale, ILEC, CLEC, Long Distance, POTS, Centrex, PRI, BRI, Special Circuits, DSL, CATV, FTTx, Broadband, VolP, IPTV, PPV, VOD, Home Automation, and much more.

Our products support limitless language, currency, and taxing requirements in addition to integration with various 3rd parties for ERP Systems, Workforce Management, Plant Management, Fiber Asset Management, Address Validation, Credit Scoring, Taxing, Toll Destinations, Currency Conversions, Payment Gateway & ACH Bank Debit, Document Presentation, AppleCare Warranty, POS Hardware, and much more.



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Roaming

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As a leading international communications enabler, BICS is at the heart of the communications ecosystem. We enable people, applications and things to connect, wherever they are. We are a global provider of international voice, messaging, mobile data, cloud communications and IoT services. Our solutions, delivered seamlessly and securely, are essential for supporting today's data-hungry consumers and digitally driven enterprises. Headquartered in Brussels, with a strong presence in Africa, Americas, Asia, Europe and Middle East, BICS powers the global communications that connect the world.



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Cerillion is a leading provider of billing, charging and customer management systems with more than 20 years' experience delivering its solutions to mobile, fixed, cable and multi-service communications providers worldwide. These are used to price and bill subscriptions and variable usage for wholesale, retail and white label services; B2B and B2C offerings and multi-country service provider portfolios.

With more than 80 customer installations, Cerillion has a proven track record of delivering cost-effective solutions to the billing, charging and CRM challenges of today and tomorrow. We combine leading edge products with highly skilled and experienced staff, to provide long-term solutions to your business challenges. From fully integrated systems to managed services and SaaS, we offer a range of approaches and business models to suit your needs now and in the future.

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Towers

Rooftops

Indoor DAS

Green Power

Expertise, Resources and a Proven Track Record

At Minara Tanzania, our robust wireless communications infrastructure portfolio, combined with our multi-tenant leasing model, allows us to provide mobile network operators with an array of towers and other assets that help meet their coverage and capacity needs.

We are leading the way in providing wireless communications infrastructure, with wireless service solutions that help carriers meet current and future network demands including:

- Towers – A portfolio of 1,400+ towers with locations and heights to fit your coverage needs
- Rooftops – Our extensive rooftop portfolio at premium sites in major urban areas help you increase network coverage and capacity
- Indoor DAS – Our system enables property owners to install one wireless infrastructure solution supporting all service providers and frequencies
- Green Power – Renewable energy solutions to power telecom towers as an alternative to diesel generators

As a preferred communications infrastructure provider, we are continuously setting the standard for customer satisfaction by "Building Better Wireless."®

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Solutions

Customers

Company

Resources

Parallel Wireless is a leading provider of centralized RAN over cloud-based Open RAN technology for wireless network operators. We design our Centralized RAN solution to introduce new innovations and reduce total cost of ownership (TCO), improve scalability options, and increase power efficiency for global MNOs.

We achieve this through full RAN centralization, RU-DU separation, and power efficiency. We are engaged with over 50 global MNOs and have been recognized with over 74 industry awards. We believe the power of software can unlock amazing opportunities for the telecom industry by helping customers reimagine their networks. At the core of what we do is our team of re-imagers who value innovation, collaboration, openness, and customer success.



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Who we are

Site Leasing

Site Development

Tower Acquisitions

Put Our Capabilities to Work for You

SBA South Africa is a preferred provider for mobile network operators. Our experience, capabilities and resources assist carriers to meet their network coverage, capacity and performance requirements. Working with our experienced team ensures speed to market while helping carriers provide high quality, feature-rich voice and data service.

SBA South Africa is a leader in providing wireless communications infrastructure including towers, buildings and rooftops, with more than 1,000 communications sites throughout the country. We offer wireless service solutions that help carriers meet current and future network demand while remaining flexible with build times and design including:

- Site Leasing – leasing antenna space on our multi-tenant towers under long-term lease contracts.
- Site Development – Constructing towers in strategically chosen locations or at the request of wireless carriers under a build-to-suit arrangement.

As a preferred provider for mobile network operators, we are continuously setting the standard for customer satisfaction by "Building Better Wireless."®





Transforming digital Africa



chapter Data centres 3



Kevin McLoughlin,
chief commercial officer,
Open Access Data Centres

In a year when many of Africa's businesses and much of its urban workforce is adjusting to a 'new normal' of hybrid working and the migration of many functions into the cloud, Africa's data centre (DC) industry is also moving rapidly towards a new normal.

Currently representing only 1% of global DC capacity, Africa's burgeoning DC industry is set for huge change. Recent analysis by Balancing Act reports that over the last two years, the number of carrier neutral DCs on the continent has grown from just 20 in 15 countries at the start of 2021 to more than 50 in 26 countries today (November 2022). Over 70 additional facilities are in planning or deployment, with between \$5-6 billion earmarked for investment in the expansion and/or construction of new facilities over the next 3-5 years.

This huge increase in DC footprint - which includes the existing, well-established regional hubs of South Africa, Nigeria and Kenya, and a wide range of new DC markets such as Botswana, Cote d'Ivoire, the DRC, Ethiopia, and

Uganda - is based on several important drivers:

- Global cloud operators are increasingly extending their network edge into Africa and are encouraging wider use of cloud-based services. 2022 has seen announcements by Google, Oracle, AWS and Huawei of new cloud zones and/or cloud regions in Africa.
- The COVID-19-related imperative for extension of corporate networks to remote/home workers has driven very significant increases in bandwidth demand, and expedited business adoption of outsourced ICT solutions, including storage, services, and applications.
- Data privacy and security concerns, together with data sovereignty legislation that enforces retention of certain business data within national borders, are driving demand for secure, local data storage facilities.

This year has also seen key global DC operators stepping into the African market.

- In January, Digital Realty announced plans to acquire leading South Africa operator Teraco Data Environments.

Combined with its earlier investments in Medallion (in Nigeria) and iColo (in Kenya, as well as Mozambique) the deal, completed in August, gives Digital Realty a footprint covering the three key African regional hub markets.

- Digital Realty's announcement was just preceded by that of Equinix's initial expansion into Africa, through acquisition of leading West African DC and connectivity provider MainOne, which gave it an immediate presence in Nigeria, Ghana, and Côte d'Ivoire.
- In July, Vantage completed construction of the initial (16MW) phase of a \$1 billion, 80MW facility in Johannesburg, its first in Africa.
- This was swiftly followed by NTT's October launch of its 6MW DC a few km across the city.

South Africa has also seen expansion by existing operators such as Africa Data Centres and Teraco, whilst newcomer Open Access Data Centres (OADC) has rapidly established DC facilities in Cape Town (at Rondebosch and Brackenfell), Durban and Johannesburg, as well as constructing a unique edge DC network comprising 30 DCs across the country. Yondr also announced a \$4 billion war chest for Africa, initially investing in construction of an 80MW DC in Johannesburg.

Across the rest of southern Africa, a National Data Centre has been launched in Malawi, TelOne in Zimbabwe and BofiNet in Botswana have both constructed facilities, and in Mozambique both iColo and Raxio have broken ground in Maputo.

West Africa has also experienced significant growth, with MainOne's build-out to new countries, Africa Data Centres' development

"Currently representing only 1% of global DC capacity, Africa's burgeoning DC industry is set for huge change."

of sites in Nigeria and Ghana, and Raxio constructing in DRC and Cote d'Ivoire. In Nigeria, Open Access Data Centres, Kasi, Galaxy Backbone and 21st Century Technologies are all building DCs. PAIX have announced plans for a DC in Senegal. Paratus supplemented its existing portfolio with construction of its Windhoek DC in Namibia, launched in August.

In East Africa, there has been growth in several markets. In Kenya, IXAfrica, PAIX and iColo have all launched new data centres in Nairobi. Two new DCs are in development in Tanzania, with Raxio building in Dar es Salaam and Oman Data Park in Zanzibar. Raxio has also launched the first phase of its 1.5MW Kampala DC in Uganda, which has expansion capacity up to 400 racks. Four separate DC initiatives are underway in Ethiopia, with all operators (including wingu, who are also building in Djibouti) focusing on Addis Ababa.

Open Access Data Centres closed its funding in November 2021 and since then has established itself as an influential and important player in the African data centre ecosystem. The company has so far deployed five core data centres in Nigeria and South Africa and established a network of 30 smaller edge data centres across South Africa to support expansion of mobile and broadband networks and extend the cloud edge closer to the point of content generation and consumption. The company's plan is to extend its core-to-edge proposition to other markets, starting with Nigeria in 2023. ■



Harry Van Schaick,
managing editor, Oxford Business
Group – produced in collaboration
with Africa Data Centre Association

State of the African data centre market

Data centres (DCs) are the lifeblood of the global digital economy. Throughout Africa, DCs are fast becoming an essential for MNOs and service providers in the face of exponentially growing data volumes. Consisting of large groups of networked computer systems and servers, DCs remotely store, process, and distribute vast troves of data, and have been widely referred to as ‘the new gold.’

Supply and demand

Gartner estimates that the global market for DC provision will reach US\$200 billion in 2021, up 6% year on year.

African DC market revenue is expected to expand at a compound annual growth rate (CAGR) of 12% over 2019-2025 to US\$3 billion. Increasing demand for cloud-based services and modular DC solutions from SMEs and government agencies will underpin the market, with more than 70% of African organisations estimated to shift to the cloud by 2025.

Demand has only recently justified the rollout of multi-tenant facilities in major markets. Late adoption has produced a massive supply gap – Africa needs up to 1000MW and 700 facilities to meet demand and bring capacity density up to par with that in South Africa.

Data centre capacity

Africa had 140,000 square metres of DC space

from just over 100 DCs at the time of writing. Rapid digitisation and the rollout of 4G and 5G mean that supply is poised to increase by 50% over 2021-2026.

Capacity is unevenly distributed, with more than 66% in South Africa: Johannesburg alone hosts 55MW of capacity. This is due to several factors, including the size of its economy (US\$351.4 billion in 2019), links to subsea fibre-optic cables and a long-standing liberalised telecoms market. It is also the locus of Africa’s largest internet exchange, NAPAfrica, which retains the largest number of peering connections on the continent.

Another leading market in Africa is Nairobi, which hosts 19MW of capacity. Kenya sits on four major subsea cables and boasts strong cross-border fibre connections, making it well placed to become a regional centre. Nigeria and Côte d’Ivoire boast similar advantages, as do Ghana and Senegal.

According to Xalam Analytics, 10% of the existing DC capacity serves nearly half of sub-Saharan Africa’s economic output and broadband connections. Moreover, 33% of Africa’s 80 cities with a population of more than 1 million people have a DC rated Tier-3 or above, demonstrating the scale of the distribution gap.

Analyst estimates for the growth of the African DC market are based on a confluence of driving factors, not least a rapidly growing population. The UN forecasts that more than half of the global population growth between 2020 and 2050 will occur in Africa. The sub-Saharan population is estimated to double over the next 30 years to 2.5 billion. The UN also predicts that more than half of Africa’s population will live in cities by 2040, eight of which will be mega-cities of 10 million-plus inhabitants.

15 African countries currently have economies and populations large enough to develop DC and

cloud service ecosystems. 40% of the African population had access to the internet in 2019, set to increase by 11% over the next decade. The internet economy is projected to be worth US\$180 billion by 2025, growing to US\$712 billion by 2050. Meanwhile, data sovereignty regulations demanding that data is stored in-country, or at least within the five sub-regions that partition the continent, will help drive demand for localised data storage.

International Data Corporation (IDC) estimates that annual cloud computing subscriptions in South Africa alone will grow from US\$370 million in 2019 to US\$1.7 billion in 2024. Governments are increasingly driving demand for DC capacity. Senegal will transfer all government data and digital platforms from foreign servers to a new national DC, maintained












by Huawei, to strengthen its digital sovereignty.

Data consumption drives growth

Economic growth is driving data consumption and production in Africa, with digital inclusion playing a leading role in recovery from the COVID-19 economic contraction. Benin, Côte d'Ivoire, The Gambia, Lesotho, Madagascar, Namibia, Togo, Uganda, Zambia, and Zimbabwe all improved their social protection efforts during the pandemic through mobile money platforms and electronic cash transfers.

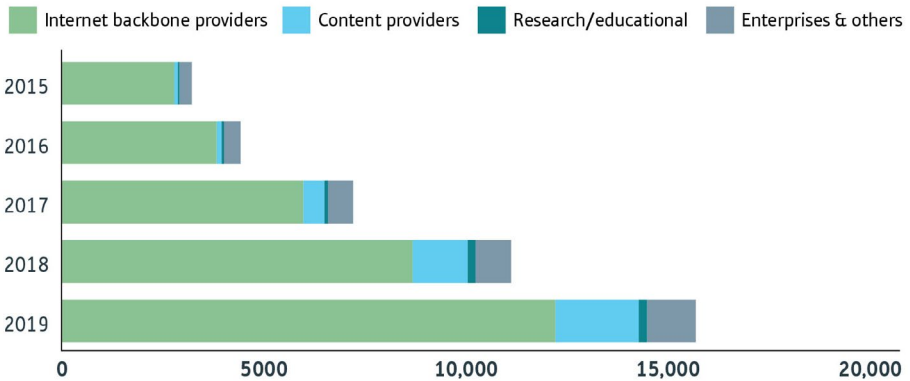
sub-Saharan Africa is forecast to experience the globe's fastest growth in mobile money technology through 2025. Mobile banking is key to driving the digitalisation of the informal

iGDP* for selected African countries

	2020E		2025F		2050F	
	\$ bn	% of GDP	\$ bn	% of GDP	\$ bn	% of GDP
 Kenya	7.4	7.7	12.8	9.2	51.1	15.2
 Morocco	7.8	6.8	12.1	7.8	48.1	12.9
 South Africa	21.6	6.5	31.5	7.9	125.1	12.9
 Senegal	1.5	6.2	2.9	7.1	11.6	11.7
 Nigeria	24.6	5.7	36.5	6.9	145.3	11.3
 Algeria	9	5.6	11.9	6.2	47.4	10.1
 Cameroon	2.1	5.4	3.3	6.2	13	10.2
 Côte d'Ivoire	3.2	5.3	5.5	6	22	9.9
 Egypt	15.4	5	26	6	103.3	9.8
 Rwanda	0.5	5	1	6	3.9	9.8
 Ghana	3	4.4	5	5.3	19.9	8.7

**iGDP measures the contribution of the internet to GDP*

International bandwidth usage by source in Africa, 2015-19 (Gbps)



sector, which the World Bank estimates to account for more than 35% of output and 60% of employment across the region.

Traditional financial institutions are migrating their operations to DCs as they look to expand their digital offerings.

First Bank of Nigeria and KCB Bank, Nigeria both have mobile apps with more than 1 million users, while Kenya's Equity Bank allows free bank-to-mobile wallet transfers. Fintech will be a driver of data consumption, and WeeTracker estimated that US\$679 million was invested in African fintech start-ups in 2019, primarily in Kenya and Nigeria.

Governments will also drive demand, with several pursuing digital transformation

agendas to diversify their economies and streamline processes.

While South Africa accounts for nearly half of all cellular IoT connections in sub-Saharan Africa, use cases are emerging across the region and could help address region-wide challenges in energy, water management, agriculture, transportation and logistics, manufacturing, and healthcare.

African DC principles

Africa's largest DC players are in South Africa, led by Teraco, which has invested in hyperscale carrier- and cloud-neutral co-location DCs, several in Johannesburg (with a capacity of approximately 55MW), which serve as the on-ramp for AWS, Google and Microsoft's Azure cloud services. Teraco's smaller facilities in Cape Town (5MW) and Durban (3MW) allow direct access to NAPAfrica.

Other major players in South Africa include Business Connexion; MTN Business, which operates both enterprise and colocation DCs across the continent; and Dimension Data.

"Incorporating sustainability into DC design is important in Africa because higher temperatures necessitate additional cooling power."

Africa Data Centres (ADC) operates facilities in several South African cities, including a Tier-4 DC in Johannesburg and a 5.5MW DC in Cape Town. ADC also maintains the largest DC in Kenya – a 7.5MW facility in Nairobi – and is building a 10MW DC in Nigeria.

Raxio Group seeks to establish 10 to 12 DCs in underserved areas by 2023. Having already established a DC in Kampala, Uganda, Raxio plans to construct another in Kinshasa, the Democratic Republic of Congo, and a 3MW, Tier-3 facility in Addis Ababa, Ethiopia.

Nigeria is an emerging hotspot. Rack Centre's Tier-3 DC has at least 40 carrier connections, while MainOne's unit MDXi has 26 facilities at its Lagos operation. MDXi also operates DCs in Abidjan, Côte d'Ivoire and Accra, Ghana.

The fragmented picture of DCs on the continent is changing rapidly as new players enter the market. IXAfrica broke ground on a DC in Kenya in April 2021 as part of broader plans for a 42.5MW rollout in East Africa, which is estimated to cost US\$250 million.

Sustainability

Incorporating sustainability into DC design is important in Africa because higher temperatures necessitate additional cooling power. Access to renewable energy sources is therefore essential.

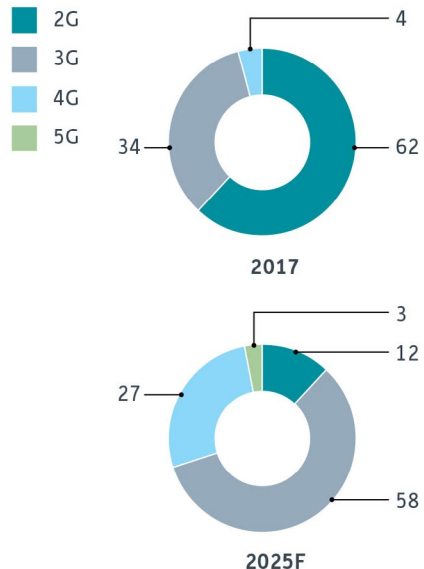
Solar power has great potential for operators on the continent. Nine African countries are enhancing their solar capacities, and Egypt and South Africa are already members of the solar 'gigawatt club' of countries with at least 1GW of installed solar power capacity, according to a 2021 report from the Africa Solar Industry Association. Morocco is working towards the 1GW target, with its 1200ha, 580MW Noor Ouarzazate Solar Complex – the world's largest concentrated solar power facility. In West Africa,

solar capture and storage projects are making progress in resolving the limited storage capacity of the region's grids.

Africa is also an emerging leader in microgrid capacity – grid-connected, on-site energy generation or storage plants that can help DCs lower power bills by saving on peak demand costs. Colocation and enterprise operators are adopting renewable energy sources to power DCs.

ADCA and other organisations are working to establish an energy-efficiency code of conduct, drawing inspiration from the European Commission's best-practice guidelines for DC energy efficiency. The guidelines recommend a modular rather than monolithic DC design to

Mobile technology mix in sub-Saharan Africa, 2017-25F (% of total connections)



limit excess provisioning of space, power and cooling. They also include guidance on energy-efficient equipment and airflow management to reduce the need for cooling. In future, advanced building information modelling will allow for taller building designs and direct-liquid cooling systems that focus air movement on servers alone rather than entire buildings.

Water consumption is another area of concern. Cooling systems in older facilities consume up to 30% of total DC energy demand, but until today the industry has largely focused on reducing power consumption, in part because of the use of PUE ratios as an indicator of DC sustainability. Operators in Africa have an opportunity to spearhead a global drive to include water source and use metrics in their reporting and promote the wider use of water recycling in data facilities.

Artificial intelligence (AI) is emerging as a

key element of DC development. AI is integral to improving energy efficiency, as machine learning can build a picture of likely spikes in IT loads and energy consumption, and help cooling systems adapt to lower PUE. In some systems cooling sensors communicate in real time with cooling management systems to achieve greater efficiency.

For predictive maintenance, AI allows DC operators to foresee system faults and component failures. Sensors can listen for unwanted vibrations or sounds in IT equipment, flagging potential failures. Algorithms can also help balance server workload, which in turn reduces system stress and the risk of data outages. Machine learning can also assist in tightening cybersecurity, as well as analysing regular inflows and outflows of data, detecting aberrations that suggest the presence of malware or attempts at hacking. ■

Impact of AI on DC operations



Improves security

AI-based cybersecurity can screen and analyse incoming and outgoing data, detect malware and implement behavioural analytics to protect data



Optimises servers

AI-powered analysis can help distribute workload across various servers



Monitors equipment

AI uses pattern-based learning to identify equipment defects



Reduces downtime

AI can monitor server performance, network congestion and disk utilisation to detect and predict data outages



Conserves energy

AI can learn and analyse operations to identify and remedy sources of energy inefficiency, reducing overall consumption



Stephen Beard,
partner, global headquarters GB,
Knight Frank

Data centres are a growing investment opportunity in Africa

Africa currently boasts just 140,000 square metres of data centre space, the same as Switzerland. However, rapid digitisation and the rollout of 4G and 5G infrastructure across the continent means this is set to grow by 50% over the next five years.

Traditionally, data centres have been clustered in a select few geographies at existing peering points, or internet exchange points. These locations have been in the US (Virginia), Europe (London, Paris, Amsterdam, Frankfurt, and Dublin) and Asia Pacific (Tokyo, Hong Kong, and Singapore).

However, as technology and content has become more complex, the quantity of data required has increased to a level where the existing model is no longer viable. As a result, cloud-based service providers are now looking to be closer to population centres, which will enable them to deliver more sophisticated services in a timelier manner and reduce transit costs.

Further, as Guy Willner, CEO of data centre operator IXcellerate notes, adoption of data sovereignty in countries such as Nigeria and Morocco mean that new data centres will need to be built in these places.

Supply gap

Africa remains underserved for data centre provision. Live IT power in markets such as Dublin and London stand at 795.8MW

and 728.25MW, but in Africa this figure is significantly lower with leading markets such as Johannesburg and Nairobi recording a total live IT power of 54.9MW and 19.04MW respectively, according to DC Byte.

There are clear opportunities for the development of not just retail and wholesale colocation, but also built-to-suit hyperscale data centres in the tier one markets. This will help to narrow capacity gaps and enable the market to keep up with increasing – and increasingly complex – demand at both individual and state level.

To house these data centres, a range of different types of real estate provision will be required. Depending on the type of demand, this could mean build-to-suit industrial units, repurposed industrial or office units or even build-to-lease data centre real estate.

Demographics

With a population of 1.3 billion people, the continent has over recent years provided an opportunity for the rapid and accelerating deployment of technology into a young and dynamic populace.

Africa currently accounts for less than 1% of total available global data centre capacity, according to Xalam Analytics, despite being home to approximately 17% of the world's population. However, with the continent's urban population set to grow by 60% by 2050, characterised by an increasing technology talent pool and an emerging middle class, the demand for data centres is set to increase.

From a supply standpoint, the southern African region continues to be the most well served, accounting for 54% of data centre space across Africa. But with at least half of Africa's growing population expected to have

internet access by 2030, according to GSMA, and legislation encouraging data localisation, the potential for data centres in Africa is set to continue growing exponentially.

Connectivity

Recent progress in fibre optic connectivity offers Africa the ability to leapfrog other continents in establishing a world-class system of network infrastructure. Geographically, cities such as Mombasa in Kenya are incredibly well located on sub-sea fibre links offering a gateway to Asia and, as such, see a large amount of internet traffic working through them.

Currently much of Africa's data content is driven through Marseille rather than being domiciled on the continent, limiting those operators who need to offer premium latency (data transfer) speeds to their customers. However, the commencement of Google's Equiano project, an underwater cable connecting west Africa to Europe and Facebook's 2Africa, a 37,000km sub-sea cable that will circumnavigate the continent and connect it with Europe and the Middle East, clearly shows how the tide is changing.

Green energy

Data centres consume a vast amount of power. This is especially the case in Africa, due to the added cooling requirements. In Europe for example, the requirement is 99.99% of uptime power at a minimum.

Unreliability in Africa's grid network is therefore considered the main stumbling block to investment by international data centre operators. However, the unfolding revolution in Africa's market for renewable energy is set to create new opportunities. Between 2010

and 2017 the average cost of producing solar energy fell by 73%, and by 22% for onshore wind power, according to the International Renewable Energy Agency. Renewable energy is set to spur growth and ensure accessibility even in the most remote regions across Africa, while achieving the sustainability goals of the cloud computing powerhouses such as Microsoft and Google.

Competitive capital

As the proliferation of smartphones and mass adoption of business software on the continent leads to soaring demand for data centres to power technology, international investors, including private, institutional, and sovereign capital, are increasingly keen to win lucrative investment deals.

By way of example, see the recent US\$250 million investment by private equity firm Actis. Further, in 2019, Berkshire Partners acquired a stake in Teraco Data Environments, which owns Africa's largest data centre and powers much of the cloud computing in South Africa, with the aim of doubling capacity from 30MW to 60MW in the next few years.

Liquid Telecom's Africa Data Centres, which has earmarked US\$1 billion for expansion across Nigeria, Ghana and further into Egypt and Morocco, also recorded an influx in investor interest including US\$300 million from the US government's International Development Finance Corporation.

Growing competition between emerging powers such as China and countries with longer-standing economic ties with Africa, such as the US, UK, and France, is anticipated to open this sector further to more lucrative investments, with Chinese capital expected to debut in the sector in the near future. ■



Amy Saunders,
editor, African Wireless
Communications Yearbook

Data centre sustainability

Data centres have become a vital installation in the MNO playbook in recent years, providing centralised locations for data storage, processing, and dissemination. With data volumes growing exponentially because of the rise in data and voice traffic across the world as mobile adoption increases, combined with the upcoming 5G and IoT deployments, data centres have become essential to keep things ticking over.

In the third quarter of 2021, almost 78 exabytes of data traffic passed through telecommunications networks globally, up from 55 exabytes in the same quarter of 2020. Global mobile voice traffic remained static year on year at 0.23 exabytes in the third quarter of 2021, according to Statista. As a result, African MNOs are investing heavily in data centres to keep up with demand brought about by digital transformation.

Delivering vital services

For MNOs, data centres are expected to help operation teams with simplified and automated data management that improves operational efficiency while cutting costs. Meanwhile, their customers are set to benefit from lower latency and higher quality services – a win-win for everyone.

With the rise of 5G, providers must transform their infrastructure to meet new requirements like high data rates, ultra-low latency, and

massive machine-type communications. Incorporating cloud-native architecture into telecommunications data centre design is the key to enabling new services made possible by 5G that are application driven, agile, and mobile. This provides the best experience for the end user and optimizes and reduces bandwidth occupancy on the network transport side.

This technology presents an opportunity to provide services that maximize revenue opportunities with Opex savings. It helps deliver converged broadband and multi-access edge computing. This will result in an improvement of service velocity, agility, and operational efficiency that service providers can pass on to their consumer and business customers.

Recognising the opportunities offered by data centre technology, Africa's MNOs have adopted their use faster than anticipated; a fantastic development for those in the value chain but one that raises questions about sustainability.

Indeed, it's been estimated that data centres consume as much as 3% of global power consumption, which is just one reason why sustainability has become a key target for all those in the value chain. Many data centre operators and MNOs have committed to becoming climate neutral by 2030, and as of July 2022, 74 data centre operators and 23 associations have signed up to the Climate Neutral Data Centre Pact, which requires increased energy efficiency; clean energy; water efficiency; circular economy; circular energy.

One of the biggest challenges in attaining a climate neutral data centre environment is legacy data centre technology. Data centres built a decade or more ago consume huge amounts of energy and will require heavy investment and retrofit activities in the years to come for decarbonisation. This has been recognised by the Climate Neutral Data Centre

Pact, which holds new and legacy data centres to different timeline requirements.

However, this isn't a huge problem for Africa, where most data centres are modern constructs with environmentally friendly designs. Further, for the many upcoming data centres on the continent, there are several features that can be incorporated from the planning stages to produce a greener installation. Immersion cooling, the application of artificial intelligence for workload management, and sourcing renewable materials for construction are just the tip of the iceberg. As well as proving positive for the environment, these green initiatives lower Opex for the lifetime of the data centre.

Indeed, many new ideas are coming into play, and vendors that can help source renewable energy, lower power usage effectiveness, and provide for greater building efficiency can expect to gain business in the years to come.

Energy efficiency is key

Data centres on the African continent face challenges unique from much of the world, including a hot, humid environment which requires more energy to cool and dry than those in Europe. Meanwhile, energy consumption accounts for around 20-30% of the total cost of ownership, a great deal of which is required for cooling measures. Thus, energy efficiency is key for both sustainability and financial reasons.

The Africa Data Centres Association (ADCA) reports that the average African data centre power usage efficiency ratio (PUE) is just 1.5, significantly lower than the global average of 1.58. One of the reasons for this better-than-expected score is that most of Africa's facilities are modern and more efficient, a positive result from being late joining the digital revolution.

Looking to ensure African data centres continue to improve on their environmental credentials, the ADCA has outlined the following plan for sustainability:

- Continued adoption of latest technology for new data centre construction
- Creation of an African Code of Conduct utilising the process of continuous improvement through, planning, and monitoring
- Promotion of the use of on-site renewable energies like solar, wind, water, hydrogen
- Development of a 'Keep it African' Label to ensure the maximum usage of construction materials and hardware are sourced from the continent
- Avoid the mistakes made in the past by global data centres lacking climate awareness
- Power supply is challenging in parts of Africa and varies widely from country to country. South Africa, for example, has faced heavy power disruptions throughout the year, causing chaos for MNOs and other enterprises relying on continuous connectivity.

The ADCA and the Climate Neutral Data Centre Pact have both highlighted the fact that renewable energy has a huge role to play in the African data centre market. Adoption of renewables varies widely across the continent, although the International Renewable Energy Agency (IRENA) states that solar is now the fastest-growing renewable energy source in Africa, with an increasing number of countries working to increase their solar capacities beyond 1GW. Northern and Southern Africa lead in renewable projects but countries across sub-Saharan Africa also have major renewable projects in the works. In Kenya, some 90% of

electricity is generated from renewable sources, but in South Africa, most power comes from thermal power stations.

Several governments are adding more renewable energy production to meet the increased requirements from data centre operators in Africa. Morocco commissioned the 300MW Boujdour wind farm, part of an 850MW integrated wind energy project in August 2021, while in South Africa, Eskom plans to invest US\$7 billion for renewable energy for the next nine years.

On-site power supply has been highlighted as a key factor in obtaining reliable energy for data centres. Accordingly, diesel generators are frequently found at African data centres for backup during grid outages to ensure continued operations for customers; however, these come with a high cost, both financial and environmental. The delivery of on-site renewable energy is particularly challenging due to the compact form factors of most data centres, which limit the number of solar panels that can be installed. Signing long-term power purchase agreements with renewable power providers could make a huge impact on data centre sustainability, as well as the local grid; however, regulations on this vary across the continent.

Building a greener environment

The African data centre market is in its infancy; however, demand is booming as the digital revolution takes hold, particularly among MNOs as the race to 5G unfolds across the continent. Indeed, the African market is seeing some of the fastest growth in internet use and availability in the world due to a combination

of factors including increased availability and a fast-growing population with a high proportion of young people.

With huge growth in mobile phone ownership driving mobile voice and data volumes, and IoT and smart cities coming to fruition, we can expect to continue to see investments in cable, fibre and data centres boom for the foreseeable future.

This is corroborated by Arizton Advisory and Intelligence, which reports that the African data centre market is expected to expand at a compound annual growth rate of 12.73% to US\$5.4 billion over 2021-2027, significantly above global averages. The market is expected to comprise 1,355,000 square feet of floor area and 267MW of capacity by 2027. Research And Markets reports that Africa has more than nine data centres that have each added 30,000 square feet of white floor area or more in 2021.

South Africa is the leading country in terms of investment at more than 50% in 2021, followed by Kenya, Nigeria, Egypt, and Ethiopia. South Africa can expect to see its market expand at a CAGR of 11.15% over 2022-2027 to US\$3.23 billion. The physical market size is expected to reach 555,000 square feet of floor areas and 103MW of capacity by 2027, while colocation market revenue should hit US\$540 million.

But what does this mean for sustainability? Green initiatives and strategies will play a huge role to ensure that Africa doesn't contribute disproportionately to climate change. Global and local standards can help here, however, good intentions only go so far. Real action is needed across the entire ecosystem - from MNO, to service provider, through to the data centre owner, to consumer - to strive for and demand truly sustainable technologies, for the good of their wallet, and indeed the good of the world. ■



Dr Ayotunde Coker,
chief executive officer, Open Access
Data Centres

It's been an exciting year for me having taken up the role of CEO for Open Access Data Centres (OADC) in June. I was appointed to lead OADC initiatives that will play a major role in accelerating Africa's digital transformation. We are investing up to \$500 million in a pan-African network of Tier III-certified data centre facilities. We are also rolling out a unique core-to-edge open-access data centre ecosystem based on delivering a combination of hyperscale, regional and OADC edge data centres. We have constructed over 30 data centres in the last 12 months, built an expert team, and created a strongly differentiated brand and client proposition.

Looking at trends this year, we rapidly recognised clients' desire for a truly high-quality service and delivery experience. We also identified the gap in the African market for deployment of non-core data centres to outlying locations. To date, Africa has largely either offered core data centres – often distant and implying significant data transmission costs – or left clients to construct and operate their own facilities. There is a need for deployment of a core-to-edge data centre architecture that supports organisations in outsourcing IT infrastructure whilst at the

same time democratising the cloud by moving the network edge closer to the point of content generation and consumption.

We saw a clear opportunity for deployment of converged open digital infrastructure to speed Africa's digital transformation – getting away from islands of connectivity and democratising the cloud by taking it closer to the point of content generation and consumption.

Deploying smaller data centres into a much wider range of locations across a country enables extension of the cloud edge. Not only does this deliver managed, power-secure facilities supporting colocation and disaster recovery services for local businesses, it also means improved latency for new time-sensitive applications and business services, offers transmission cost savings through pre-processing of data at the edge, and supports network extension by 5G operators, regional broadband providers, ISPs, and value-added service providers.

Going forward, we will focus on completing the construction of our first-phase deployments, whilst continuing to evaluate and pursue further opportunities. We will ensure that we deliver operational and service excellence to every client and will continue to develop a healthy pipeline of sales opportunities, enhance our service portfolio with a range of value-added services and extend our core-to-edge proposition to new markets. ■

Looking ahead: Data centre demand in Africa continues to grow rapidly. Our challenge is to attract an increasing proportion of that growth into our facilities. By the end of 2022, we will have successfully established our initial footprint of 35 data centres located across South Africa and Nigeria. As well as launching our core-to-edge

architecture into Nigeria early in 2023, we also plan to extend our coverage into new markets, starting with the DRC in the first half of 2023.

We are excited by the opportunities presented by African markets and are looking forward to delighting clients with our transformational service experience.



Ranjith Cherickel,
CEO, iColo Data Centers

We're still very excited by the long-term growth potential in our market, as a result we continue to invest and build our digital infrastructure.

We have expanded our Nairobi campus to 3,400 square metres to accommodate a large teleport for customers. We have also since commenced construction on our largest carrier-neutral data centre so far in Nairobi which will have an additional 3,500 racks.

We completed the construction of our MBA2 data centre in our Mombasa campus in Nyali which was specifically designed for cable landings.

We have also opened our first new campus in Maputo which is now servicing customers. It is a 10,000 square metre campus with the first phase of 80 racks now open for customers and the second phase in development.

Predicting the long-term demand remains a challenge in these markets and building just-in-

"Predicting the long-term demand remains a challenge in these markets and building just-in-time capacity for that demand."

"Most African markets deserve a carrier neutral DC that is committed to building an open access model. Satellite teleports in addition to the growing DC market is a great addition to help increase internet penetration in Kenya and Africa as a whole due to the remoteness of certain locations."

time capacity for that demand.

Most African markets deserve a carrier neutral DC that is committed to building an open access model. Satellite teleports in addition to the growing DC market is a great addition to help increase internet penetration in Kenya and Africa as a whole due to the remoteness of certain locations.

The last layer of connectivity will be the satellite providers of which we have built a large facility within our data centres to handle the demand. The internet consumption per person in Kenya has significantly increased to an average of about 3Gb per person, per month in the last few years further pushing cloud adoption by the CDNs in the market. ■

Looking ahead: Going forward, we continue to expand in Kenya and other emerging markets in Africa to meet the growing internet demand. We do expect a cooling in the global markets

for digital infrastructure however the long-term trends in Africa remain robust and our intention is to continue building towards those long-term goals.



Jasper Lankhorst,
group CEO, Rack Centre

The shortages of quantitative and qualitative carrier neutral data centre capacity have led to a huge attraction of foreign investors in the African digital infrastructure space. In 2020 and 2021, four major pan-continental data centre deals and investment commitments totalling US\$2 billion were concluded.

We operate a pan-African data centre platform, which we founded in 2020 after taking a majority stake in Rack Centre, the best-connected carrier & cloud neutral facility in West Africa. In the past year our business in Lagos, Nigeria has been thriving with a solid operational foundation laid by the local team in the past 10 years, bolstered by an explosion in demand from connectivity providers, enterprises and international content and cloud service providers.

We've doubled capacity of our existing data centre facility in Lagos, up to 1.5MW and broke ground on our campus expansion plans. We will deliver a second data centre in Lagos, a hyperscale ready facility consisting of 12MW. This new facility will be ready for deployment in late 2023.

In June, our commitment to reducing our carbon footprint was sealed by the International Finance Corporation (IFC) EDGE certification,

making our new Lagos facility the first Green Certified Data Centre in Africa, Europe and the Middle East! Expansion plans into additional African markets are well under way. We have completed our data centre campus design for Nairobi, Kenya and there is more to come.

There are many challenges in the African data centre industry including power, access to talents and cost of business. Consistent power supply remains challenging due to the of access to reliable and renewable sources. The competition for talents remains fierce and our industry is suffering from a brain drain, with mass emigration overseas of talented and skilled individuals looking for a higher standard of living. Operating and investment cost are also under pressure, as we see increases in power and equipment costs due to the Russia-Ukraine war and global supply chain issues.

The African market presents unlimited emerging opportunities; the trick is to pick the right ones and go for it. Optimists like to describe Africa as the 'world's last frontier' of lucrative business opportunities, but you've got to make some key adjustments as lots of things are changing and developing.

The increase in submarine cable investment and fibre connectivity will attract more data centre investments supporting the evolution of cloud ecosystems. This has led to the development of hyperscale data centres, which have existed in South Africa since 2016 and are now being built in North, East and West Africa. ■

Looking ahead: Our strategy is based on Africa's digital transformation which is a long-term play. We are lucky that our shareholders have an aligned view on the industry. Digital transformation is a key driving force for innovation and sustainable growth that can

ensure the 4th industrial revolution transforms Africa into a global powerhouse.

I see a bright future ahead in terms of growth for the whole digital infrastructure industry, especially since we are all investing in bringing Africa online!



Pierre Havenga,
managing director, Vertiv, Africa

The African IT market has grown at pace throughout 2022, driven by increased connectivity, digitalisation, and the entrance of international colocation providers. Heightened demand from enterprise customers (edge solutions) has also contributed to the growth.

According to Arizton, around US\$20 billion will be spent procuring IT infrastructure for data centres in Africa between 2022-2027. Adopting cloud, big data, and IoT will increase the deployment of high-end applications and the need for more efficient systems.

Challenges such as a lack of infrastructure, foreign currency availability and a shortage of skills in Africa has created operational complexities. However, these challenges also bring opportunities.

Vertiv is focused on enhancing customer experience, which includes identifying more of our products that can be locally manufactured or assembled, bringing us closer to our customers. This will help to reduce logistics-related risk and facilitate better supply chain management.

We are also working to bridge the gap between local and global skill sets, from consultant to executive, to identify where we need to help and

how we can increase skill levels to service larger projects whilst ensuring global standards are met. This is critical to the success of our future growth model, which includes supporting the region from our key hubs with our partner network.

Part of this skills development drive is the launch of our internship program. Currently around 98% of African Vertiv employees are from Africa. We want to continue to invest in local resources with a strong focus on diversity. It is important that we transfer our global experience and technology knowhow to Africa to enable best of breed technology deployment in this market.

We are also working on developing the right services model to drive growth of the distribution business in the region. There are a lot of new projects underway, and we want to ensure that we can install, maintain, and provide the right level of aftersales service.

As a part of our services and growth drive, we have introduced several training programs offering certification training for Approved Vertiv Service Providers (ASPs). This provides our ASPs and data centre experts with first-hand experience of our products and gives users a chance to really understand Vertiv's diverse range of critical infrastructure solutions. In addition to the products' physical availability, Vertiv provides training on its large-scale modular data centres, power, and cooling solutions through virtual reality. ■

Looking ahead: According to Turner & Townsend, the Africa data centre market is expected to reach US\$3 billion by 2025, growing at a compound annual rate of over 12%. We expect that the expansion of global players in the African market will continue at a rapid pace for many years, helping to facilitate the increase in data traffic and reduce latency. Digitisation will continue at a high rate and increased connectivity will drive demand for data management.

We are excited about the growth opportunities and Vertiv's positioning in the market to ensure 'fit for purpose' solutions and in country support to assist in driving the digitisation of Africa. We will continue to invest in the region with local presence, partner networks, skills development, and improved services. We have a dedicated management team tasked with increasing our presence in Africa to support all future projects.



Robert Mullins,
CEO, Raxio

2022 has been a busy year for us. Our facility UG1 in Uganda celebrated its first anniversary since being commissioned having provided a much-needed environment to improve continuity and developing a hub that allows businesses to interconnect with each other. We also saw significant progress with construction in our second facility ET1 in Ethiopia, set to be commissioned in the first half of 2023.

We also announced our entrance into Tanzania, the second largest telecoms market in East Africa, with a growing demand for content and data processing which has become an important centerpiece of our growing portfolio. It reinforces our commitment to our strategy to deliver the vital digital infrastructure needed on the African continent and is set to be commissioned in 2024.

We also broke ground on the construction of “Access to stable, mission critical environments in these countries is more important now than ever before and we are looking forward to supporting their digital growth with our internal teams, alongside experienced local and regional technical partners specialised in design, engineering, and construction.”

facilities in Mozambique, the DRC and Ivory Coast, taking our presence in Africa to six countries.

As you can probably tell, we have made notable progress against our strategic goals in 2022, driving growth across our markets and expanding into new territories. To support this rapid expansion, we have hired teams of local professionals to manage our data centre facilities across the business. This currently consists of a team of 47 employees, based across seven countries, representing 13 different nationalities, reflecting our Africa-wide focus.

The overarching challenge we had to address was the ongoing issue of COVID-19. A relatable and shared unprecedented pressure amongst our peers, which saw a knock on effect on well-oiled global supply chains, due to successive lock downs and restrictions.

The pandemic accelerated the technology industry to make a rapid shift to digital solutions, resulting in an overwhelming demand for electrical and mechanical equipment, placing an ever-bigger strain on the supply chain, in order for businesses to get the necessary materials in order to meet deadlines and what could be achieved.

However, we have seen digital connectivity in the region grow and the demand for services increase. The positive take aways from this has been the drive to innovate around environmental and sustainable solutions in our designs. We are in the position to be able to offer industry leading technology solutions that have the ability to accommodate the highest power density racks whilst operating at the lowest power usage effectiveness ratio (PUE) in the region.

The locations of our data centres provide ideal operating environments, prime access to connectivity and power infrastructure, and the opportunity to supply our sites largely from renewable energy sources, allowing us to further our ambitious ESG goals.

Access to stable, mission critical environments in these countries is more important now than ever before and we are looking forward to supporting their digital growth with our internal teams, alongside experienced local and regional technical partners specialised in design, engineering, and construction.

These new data centres will not only provide a critical and missing part of these countries' digital infrastructure, but will also facilitate internet traffic amongst content providers locally and internationally, making the internet experience faster, more resilient, and more affordable for all digital users.

Mobile network operators, ISPs and carriers will be able to interconnect to each other and their customers, reducing the cost of access to content across the country at a time when new submarine cables will also be providing Mozambique with enhanced international connectivity.

We have seen a trend of digital transformation in this region, as consumption of digital content, most likely resulting from COVID-19, and the economy being largely driven by the services

“Mobile network operators, ISPs and carriers will be able to interconnect to each other and their customers, reducing the cost of access to content across the country at a time when new submarine cables will also be providing Mozambique with enhanced international connectivity.”

sector and a thriving middle-class.

With new connectivity solutions arriving and the continued evolution of the digital ecosystem in the region, we will continue to build facilities across a wider geographic footprint to meet the demand from SMEs to hyperscale content delivery networks. ■

Looking ahead: In 2023 we plan to continue to expand digital connectivity across Africa, building more facilities in the markets in which we already have a presence, alongside new markets. We will also be developing and building hubs that develop the digital ecosystem which will bring together connectivity providers, financial services providers, mobile network operators, ISPs and CDNs.

As Africa's digital landscape transforms as customers start to adopt digital services, there will be a need for the establishment and modernization of infrastructure to grow rapidly. The arrival of new submarine and terrestrial networks mean that connectivity is also undergoing a transformation, driving demand, enabling mobile network

operators, ISPs, and carriers to interconnect with each other and their customers.

As consumption of data and local content in both the consumer and enterprise segments will increase significantly, the necessary digital infrastructure is needed to be delivered to support this. These new data centres will not only provide a critical and missing part of these countries' digital infrastructure, but it will also facilitate internet traffic amongst content providers locally and internationally, making the internet experience faster, more resilient, and more affordable for all digital users. Resulting in the creation of new jobs, opportunities to do business and make the world a much smaller place.



Iyer Sivakumar,
sales manager for Africa, Siemon

Our Africa business has been growing steadily and this year has experienced sizable growth, particularly in the finance and banking, enterprise LAN and data centre markets. We are strongly positioned to keep growing as a key structured cabling infrastructure provider in the region. Our distributors have re-energized post-pandemic, and we have signed a new distributor in South Africa which will give us a sizable market share.

Enterprise and colocation data centres gained phenomenal growth. We have achieved top market share mainly because of our technical support, our data centre design services offering, and an innovative product set which can effectively solve the needs of any type of data centre. We also have sound system integration partners across the region and strong distribution channels.

We have seen an increased need for the correct specification of data centre design across Africa. Particularly for new projects, it is important that the data centre infrastructure is designed from the ground up to ensure performance, reliability, uptime, and scalability. At the same time, network speed and long-term costs must be taken into

consideration. Our data centre design expertise and our approach ensure that cabling infrastructure is specified for optimum support of switching, server, and storage technologies. It also guarantees resiliency, allowing a facility to be upscaled if demand increases, supporting both current and future operational needs.

The provision of sufficient amounts of power as well as the efficient use of available power remain critical. We have seen an increase in the production and use of renewable power via solar power plants and increased focus on energy efficiency and the deployment of products and technologies that support a more efficient usage of power.

There have been several challenges over the past 12 months including currency devaluation, availability of foreign exchange, the China lockdown, and political instability. Slow decision-making processes have also been challenging. Because of the reorganization of certain governments where elections were scheduled, government projects slowed.

Our business strategy will focus on sustainable growth. We are looking to expand our customer base in the enterprise, hyperscale and colocation data centre markets as well as in the intelligent building market. Developing the South African market is one of our key goals. It's a mature market and provides us with great potential to grow. ■

Looking ahead: End users adopting new technologies such as 5G or WiFi 7 is encouraging the move to higher data speeds which means that data centre infrastructure must be upgraded to 400 Gigabit Ethernet speeds in the near future.

We are also seeing a rise in modular data centres. Due to the lack of power availability in Africa, deploying modular facilities means that they can be moved to locations where power is available.

With our portfolio of advanced data centre solutions, Siemon is well positioned to support

these developments. Our innovative LightVerse™ high-density fibre optic cabling system for example improves fibre network performance, manageability, scalability, and flexibility in data centre and LAN environments. LightVerse enclosures and panels allow for easier and quick rollouts and moves, adds and changes. LightVerse modules and adapter plates combine with Siemon's plug and play trunks, traditional LC duplex and LC BladePatch® fibre jumpers to deliver a complete end-to-end ecosystem that unlocks the potential of high-density fibre installations.



Wouter van Hulten,
CEO, PAIX Data Centres

In the past 12 months we have continued to interconnect our customers. We see further growth in the markets we operate in: Ghana and Kenya. In both locations, more networks are now connected. In our interconnection datacentres, we help clients generate new sources of revenue, reduce latency, improve performance, and assist to work with their business partners more efficiently.

We've been searching for land in various countries and are looking for new colleagues to join the PAIX team and build the organisation to deliver PAIX services across Africa.

Urban planning is an enormous challenge for Africa's fast-growing cities. Those exceeding 5 million inhabitants without a central planning department end up with all the challenges of cities that have too many cars on the road and lacking public infrastructure. As a result, finding suitable land is an issue for all types of businesses, including data centre development.

Once you find a suitable location, construction is the next challenge. Importing equipment onto the continent isn't always easy, in part because of the taxes that are applied differently in different markets.

You sometimes encounter administrative bodies who are keen to monetize their position, which is of course a big no-no.

On the road ahead, we see further regulation of the sector as a big stumbling block. The more licenses that are required to operate a data centre, the less likely it is that a market will develop a successful industry. Governments can look at the Nordic countries to learn what policies and regulations might work.

Looking at emerging opportunities, with more metro and submarine fibre becoming available, cities are 'unlocked.' Now we need more mobile networks and terrestrial networks, to interconnect the various communication systems.

The tech market continues to go from strength to strength, with more venture capital and private equity becoming available. Now we need to make sure that all this data can circulate on the continent. In the broader market, in markets where fibre is readily available, we see recognition that cloud- and carrier-neutral data centres are central to delivering high speed and high-performance internet services.

Most network operators recognize that it's difficult to be both a network operator and a data centre player, because you cannot own a network and be carrier neutral at the same time. We will continue to see networks and real-estate as separate developments, closely working with investors who are aligned. ■

Looking ahead: A whole new young generation is growing up on the continent, keen to learn and explore and they have the chance to participate in a growing industry, or one of the industries that is powered by the digital economy. There are many exciting new opportunities ahead. We see our interconnection hubs at the heart of the digital economy, enabling communities of interest to develop, and thus creating ecosystems where talent and opportunity meet.

PAIX Data Centres will continue to invest in the African continent, develop our existing markets and expand into new territories. With our investor base from across the continent – Africa50 has as shareholders 29 countries, 2 central banks, and the African Development Bank, a few committed private investors, along with debt funding from the Dutch Good Growth Fund – our ambition is to be present across the African continent, and beyond. PAIX is the heart of Africa's digital economy.

Open Access Data Centres (OADC)

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www.openaccessdc.net

Our sites

Colocation

Connectivity

News & Insights

Open Access Data Centres (OADC) has been established to transform the provision of data centre services in Africa. As a WIOCC Group company, it leverages strong existing relationships with clients in Africa and well-established delivery capabilities across the continent, together with the proven and long-standing data centre expertise of the OADC Executive team.

The company is implementing a world-class, pan-African, carrier-neutral data centre footprint that will deliver an unparalleled client experience offering expert assistance and support, partnership in tailoring bespoke solutions and leading-edge information systems to support client business decision-making.

OADC is deploying its open-access, Tier III core data centres at major cable landing locations and in key business hubs throughout Africa.

OADC EDGE data centres are being deployed into smaller locations, serving the ongoing need to support service providers in extending network reach and the growing requirement for content storage, processing and delivery at the network edge.

OADC is an environmentally responsible company and as such is pursuing a wide range of environmental and management accreditations.



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About Rack Centre

Colocation service

Connectivity ecosystem

Whitepapers

Rack Centre is the best-connected Carrier and Cloud neutral Tier III constructed facility certified data centre in Africa. Established in 2012, the company focuses solely on providing best-in-class data centre colocation services and free interconnection between carriers and customers. Knowing this gives customers a technically superior, physically more secure, and lower-cost environment for their information systems.

The Carrier and Cloud neutrality advantage allows customers to manage traffic to get better value, lower latency, and higher resilience and creates an open market for partnerships between customers, networks, cloud and content providers, the Internet Exchange Point of Nigeria, and managed service providers.

Rack Centre's clientele includes 57+ telecommunication carriers, Internet Service Providers (ISPs), global Tier 1 networks, and pan Africa international carriers, including direct connections to all five undersea cables serving the South Atlantic Coast of Africa including Equiano, 2Africa and every country on the Atlantic coast of Africa.



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WIOCC is the leading player in the deployment of carrier-scale, future-proofed network infrastructure into Africa. We have the flexibility and scale to meet the ever-growing demand for reliable, high-speed capacity throughout Africa, driven by end consumers, enterprise users and the ecosystem that supports them.

Our policy of continual investment in our network to create Africa's first, truly hyperscale network infrastructure means ongoing investment for growth, ensuring our readiness to meet the future data volume demands of end users throughout Africa.

Operating exclusively as a wholesaler, we have revolutionised the delivery of high-capacity connectivity between Africa and the rest of the world. Widely recognised as Africa's carriers' carrier, we offer carriers, content providers, cloud operators, ISPs and mobile operators reliable, seamless, high-capacity connectivity between more than 30 African countries and key global financial and commercial centres.

Our focus on building and maintaining strong, long-term relationships with each client enables us to develop bespoke solutions that meet their current requirements and have the capability to match future demands for growth, extra resilience and geographical expansion.



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Mining

Fleet management

Public Safety

Agriculture

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

- Emergency services
- Commercial fleet management
- Public transport & bus management
- Smart cities & smart highways
- Remote monitoring & surveillance
- Mining & exploration
- Asset tracking & RFID



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chapter Critical Communications 4



Ken Rehbehn,
principal analyst, CritComm Insights

A new era for African critical communications

Across Africa, the ever-evolving critical communications technology sector plays a vital role in helping keep citizens safe and industry efficient. In our challenging late-pandemic times, the need for these narrowband and broadband wireless systems has never been greater. Unfortunately, the barriers to deployment have also never been higher. Evolving standards, nascent 5G deployments, supply chain disruption, and a turbulent global economic picture create a complicated landscape to navigate.

But signs of progress are visible as Africa's nations embrace 5G for advanced communications. New 5G networks are taking shape in major metropolitan areas of Botswana, Tanzania, Nigeria, South Africa, Kenya, and others. These networks complement existing

LTE networks and offer high-speed internet that can enhance the delivery of emergency services. An excellent example of 5G benefits comes from Orange Botswana's partnership with MRI Botswana. The joint Connected Ambulance project leverages 5G to deliver pre-hospital medical guidance to field paramedics.

For rural areas, high-power analog VHF radio systems remain unchallenged for reliable and ubiquitous coverage over the landscape. Limitations on LTE and 5G device transmission power make these areas very difficult to cover profitably. Though 5G holds tremendous promise for public safety enhancements and industrial growth, more straightforward narrowband push-to-talk technology remains Africa's mainstay of operational communications.

Professional Mobile Radio (PMR) solutions delivering DMR or TETRA radio technology in urban areas around Africa will remain a foundation for push-to-talk coverage for years to come. Network operators can select an approach matching the organization's requirements and budget with various DMR options, including simple unlicensed digital, licensed conventional, and sophisticated licensed trunked systems.

Some nations embrace standardized radio technology for sensitive government network operations emphasizing security and confidentiality. The global TETRA standard holds particular appeal thanks to a rich interoperable network and device ecosystem. Even Project 25, a radio technology found mainly in North America, has gained traction in Africa with the recent deployment of Senegal's emergency services communications.

Governments, however, look forward to a future when they can retire dedicated public safety networks by moving to commercial LTE or 5G services that offer Quality of Service, Priority, and Pre-emption (QPP). For Africa's regions that enjoy robust LTE coverage, a move towards standardized push-to-talk over cellular with 3GPP Mission-critical Voice, Video, and Data (MCX) could serve as a path forward for enhanced secure communications serving public safety operations. And for the most optimistic believers, MCX is a foundation for an African technology leapfrog that could occur as legacy analog network transitions skip digital trunking technology and jump directly to broadband.

Yet the slow Public Safety Broadband Network (PSBN) progress across Europe suggests Africa will not be able to move quickly. Europe continues to await compelling MCX device form factors beyond the smartphone. Specifically, devices incorporating practical solutions for back-to-back direct mode operations are essential for emergency services when the LTE network is unavailable. The gap remains because LTE devices are subject to strict output power limitations that keep power at far lower levels than analog or digital trunked systems. For an isolated firefighting team in the lower levels of a large building, an LTE device lacks the power to transmit a signal to a nearby vehicle. The

solution rests in hybrid devices that combine LTE MCX and legacy DMR/TETRA DMO radio technology in a single device. Unfortunately, those devices are tough to find on the market.

Beyond device availability, regulatory hurdles and network build-outs make rapid progress in Africa a tall order. Regulators across the region have yet to establish a regulatory framework supportive of higher classes of service for the emergency services. In many nations, mobile network operators cannot create service offers for the government without a legal basis for services incorporating QPP capabilities. In addition, a shift from legacy PMR systems to LTE MCX demands a dense LTE cell site grid that delivers consistent ubiquitous service to devices in all populated areas. Of course, that grid must be supported by high-performance backhaul over microwave and fiber links.

In the future, low Earth orbit (LEO) satellites may provide a workable foundation for an African leapfrog move. Several early LEO platforms already claim success in terminating mobile cellular connections from off-the-shelf LTE terminal equipment. The density of these LTE constellations can provide the rural reach MCX requires before legacy analog PMR technology can be retired. The technology is promising and may prove the optimal path forward. Non-Terrestrial Networks (NTN) Standards developed in 3GPP will extend satellite-based functionality to 5G New Radio (NR) technology, opening up powerful capabilities supporting moving platforms.

Regardless of technology choices, wireless communications remain a vital fabric of society. Advances in LTE, 5G, and satellite technology promise benefits that will make African communities safer and their industrial activities more efficient. In 2023, this future will come into focus. ■



Ildefonso de la Cruz Morales,
principal analyst, government
& manufacturing critical
communications, OMDIA

Critical communications in Africa

In recent years, we have witnessed the soaring number of emergency incidents across the globe. The increasing frequency and magnitude of these disasters not only have devastating effects for the safety of the population but also dire consequences for the nations' economic stability.

The main purpose of a critical communication system is to provide its users with robust, reliable, and secure mechanisms to exchange useful information in case of crisis to help resolve emergency incidents in the most efficient and effective way possible.

When dealing with a crisis, and even with routine troubleshooting, minimizing the response time is of the essence to avoid potentially catastrophic consequences. Critical communications are not strangers to transformation. To guarantee services under any circumstances, critical communication systems need to be constantly evolving and adapting to the threats that could compromise their operations.

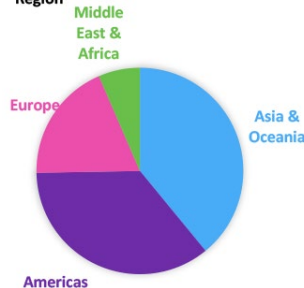
The perfect example of this evolution is the digital transformation of the critical communications industry from analogue systems. Analogue radios provide affordable, long-distance voice services and have proven themselves effective in countless deployments around the world. However, analogue technology reached the limits of innovation and started experiencing slower growth in terms of end-user

adoption from the late 1990s.

OMDIA forecasts that this slow migration to digital will continue, especially as newer cost-optimized digital technologies gain a competitive advantage through cost efficiencies and suitability for business-critical end users. OMDIA predicts that by 2025, more than 80% of the global critical communication radio installed base will be digital. In particular, the Middle East and Africa (MEA) region is expected to continue to adopt digital communications technology, and by 2024 it will be one of the most digitized regions in the world, with more than 95% of its land mobile radio (LMR) users converted to digital.

For decades, critical communications have relied on digital narrowband frequency spectrum and focused on providing reliable, secure services to support essential voice communication needs in case of emergency. Different LMR systems have been developed and implemented globally which has directly addressed the demanding voice communication requirements of mission critical user groups. Among these LMR protocols, different technology standards can be found, from high-end terrestrial trunked radio (TETRA) and APCO Project 25 (P.25) to a group cost optimized digital

Global LMR Installed Base World Market Breakdown by Region



Source: Omdia

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technologies (CODT) that include digital mobile radio (DMR), and police digital trunking (PDT) protocols among others. These have become indispensable tools for emergency responders to enable high quality voice communication even under extreme situations, where other commercial communication systems would fail.

The MEA region consists of a diverse range of countries with economies at different stages of development. This diverse range of very poor to extremely wealthy nations results in a similarly diverse range of LMR requirements and available budgets for such equipment. MEA has particularly favourable conditions for growth in the communications market because sub-regions rich in natural resources are faced with security concerns, making critical communications more important.

The increasing economic diversification of the region and the requirement for public safety and security provide strong market drivers for a robust communications infrastructure; the largest adopter of LMR technology in MEA is the PSS sector, which accounts for more than 60% of all critical communications users.

In particular, the African market has been historically divided between countries which are rich in natural resources and those that are relatively poorer. The wealthier nations have opted for TETRA, which offers public safety authorities a rigorous security feature set along with a competitive and interoperable device ecosystem. On the other hand, the cost efficiency of cost-optimized digital solutions like DMR has appealed to the cost-sensitive parts of Africa looking to replace their legacy analogue systems with a simple but effective digital solution. For example, DMR is well-suited to open geographic regions, making it an ideal communications solution for police forces in Uganda, Ethiopia, and Tanzania and for other

PSS organizations such as port authorities in Kenya and Tanzania.

Worth noting is the increase anticipated for PDT technology. Via foreign direct investment, PDT is being used sporadically across the region and is expected to continue in low volume but high growth across the forecast period. The African market for LMR terminals was particularly buoyant last year, with double-digit growth rates seen in the technology deployments of cost optimized digital solutions and TETRA terminals, surpassing deployments in the Middle East.

With the increasing complexity of the world today, critical communication systems are forced to continuously adapt, evolve, and optimize their services to remain ahead of all potential threats. In addition to voice applications, which remain essential to critical communication users, there are growing requirements to enhance the current capabilities with data-centric features and multimedia services. Critical communication technology is looking to pivot on data and video to enhance the vital situational awareness of users with multimedia applications like location-based services, real-time video group communications, and critical data sharing.

As a result of the unprecedented advances of cellular connectivity unlocked in the last decade, critical communications systems are moving towards the adoption of mission critical broadband solutions. The evolution toward critical communication broadband systems has caught the attention of many governments for their national critical communication networks. Countries around the world find themselves at different stages of the LTE adoption process for their PPDR networks led by South Korea's SafeNet, the United States' FirstNet and other European initiatives in the UK, Finland, and France. It should be noted that MEA has also

been an early adopter of LTE technologies with early deployments in Saudi Arabia, Qatar, UAE, Ghana, Kenya, and Nigeria.

However, the concept of broadband national critical communication networks has been met with caution and some reluctance by government decision-makers, who aim to reconcile the need for advanced critical communications with their challenging geographies, unique economic situations, spectrum, and regulatory limitations. In Africa, there is an uptake of private LTE networks beginning to gain pace, with network initiatives that started in Ghana, Kenya, and

Nigeria, and recently expanded in Egypt, Cote D'Ivoire, and Cameroon among others.

It is becoming clearer that the future of African critical communication systems is taking a hybrid shape. Critical communications will maintain LMR technology that offers reliability mechanisms and a wide variety of failsafe options for critical voice communications enhanced by the adoption of broadband bubbles will foster situation awareness, multimedia communication, interoperability, and collaboration within a hybrid critical ecosystem. ■



Amy Saunders,
editor, African Wireless
Communications Yearbook

Satellite: enabling critical communications

Reliable, assured, always-on connectivity is essential for the provision of critical communications the world over. Many sectors – oil and gas, mining, transport, utilities, government, defence, emergency services, disaster recovery etc. – rely on wireless communications for their smooth operation every day.

The remote and rural locations that can typify these sectors mean that terrestrial solutions like cellular and fibre may well not deliver adequate speeds or any coverage at all at operation sites. Offshore wind farms, shipping, oil and gas production facilities and mining operations, to highlight just a few, perfectly exemplify remote and rural working environments where reliable communications are an absolute must for business continuity and staff safety. Meanwhile, first responders for natural disasters,

emergency healthcare and criminal activity also rely absolutely on wireless communications for exchanging real-time information.

Research And Markets reports that the Middle East and Africa (MEA) mission critical communications market is expected to expand from US\$1,175.96 million in 2022 to US\$1,876.11 million by 2028, a compound annual growth rate of 8.1%.

A wide range of enterprises have come on board with the progressive shift towards Industry 4.0 and IoT technologies for essential operations. Remote monitoring and maintenance of facilities, factories, networks, crops, and herds, for example, has brought about greater efficiencies and profit the world over, and has now become mission critical. This wave of digitisation has been a major driver for the critical communications market globally and especially in Africa, where the growth in wireless technology penetration – internet, smartphones, tablets, etc. – is advancing enormously.

The critical communications market has also received a boost from the COVID-19 pandemic. With non-essential businesses closing down

intermittently for lockdowns across the globe, the only organisations operating were those delivering essential services i.e. utilities, food production, essential retail, goods shipping, healthcare, emergency services, public sector, and so on. To limit the spread of the virus, workforces were cut to the bare bones and social distancing instilled. The application of wireless connectivity for critical communications was hugely beneficial, helping drive demand and boosting the market. Moreover, with non-essential services halted and supply chains severely hindered, manufacturers within the critical communications sector saw R&D and new product lines stopped in their tracks. While congested trade routes and chip shortages remain a challenge, the market is bouncing back following the previous years of instability.

Turning to space

Satellite has long been considered a leading technology for delivering mission critical communications. With fully global coverage on land, in the air, and at sea, and full resiliency to disruptions that negatively impact on terrestrial services (fibre and cell towers being affected by infrastructure damage from natural disaster, war, etc.), it's hard to argue against satellite for critical communications use cases.

The last two decades have been a golden era for satellite technology advancements, particularly in the communications segment. VSAT technology has become widely utilised for remote, rural, and mobile communications terrestrially, on ships, and on airplanes. Small satellites and CubeSats have lowered the cost of entry to space, opening up new applications, and enabling the testing of new technologies like space based IoT, at reduced expense. Conversely, high throughput satellites (HTS) are

now able to offer massive onboard capacities some 100 times larger than conventional geostationary satellites by utilising beam forming and frequency re-use. Access to lower orbits – medium Earth orbit (MEO) and low Earth orbit (LEO) have enabled the advent of small satellite constellations, which promise to help bridge the digital divide and connect the unconnected, with the added bonus of lower latency than satellites in geostationary orbit.

As satellite numbers and capacity have increased and technology matured, cost per bit has fallen, allowing new industries that were previously priced out, notably agriculture, to start using satellite communications.

African critical communications - via satellite

According to the Union of Concerned Scientists (UCS), as of December 2020, there were 3,372 active satellites in orbit, with 1,283 new satellites launched that year. Most of those satellites, some 1,832, were for communications; 906 were for Earth observation; 350 were for technology development and demonstration; 150 for navigation and positioning; 104 for space science and observation; 20 for Earth science; and 10 for 'other purposes.'

Meanwhile, the latest Space in Africa report values the African space economy at US\$19.49 billion in 2021, expected to expand at a CAGR of 16.16% to US\$22.64 billion by 2026. The African space economy continues to grow at a faster rate than its GDP and is actively contributing towards the Sustainable Development Goals. African nations allocated \$534.9 million to national space programs in 2022, a 2.24% increase year on year. Government contributions increased by 80.83% year on year in 2021 to \$523.2

million. The satellite communication market – comprising fixed satellite services, mobile satellite services and satellite TV – accounts for a major share of the market. However, remote sensing, particularly for agriculture applications, are booming.

Africa has historically had low involvement in the satellite industry as a developing continent. The country gained its first satellite, SunSat-1, back in 1999 via South Africa. Today, Egypt tops the African satellite sector with nine satellites in orbit, followed by South Africa with eight, Algeria with seven, Nigeria with six, Morocco with three, Angola with two; Ghana, Sudan, Ethiopia, Kenya, Rwanda and Mauritius each have one satellite. At the time of writing, Uganda and Zimbabwe were preparing to launch their first satellites PearlAfricaSat-1 and Zimbabwe's ZimSat-1. South Africa is also preparing to launch a new satellite to expand national broadband connectivity, connecting government sites, communities, and consumers. There are an additional three satellite multilateral projects, two launched under agreement with the Regional African Satellite Communication Organisation, which are the first African satellites covering the entire continent; the third multilateral project is NewDawn, built for Intelsat and Convergence Partners.

Of the 40+ African satellites currently in orbit, very few were designed, manufactured, and assembled in Africa and led by African states. However, Nigeria, South Africa, and Egypt are all developing infrastructure for assembly, integration, and testing of satellites, and Algeria has established its own Center for Satellite Design (CDS).

Looking to further advance the continent's longer term modernisation goals, the African Union's Agenda 2063 framework includes 15 flagship projects. Project 11 – Africa Outer

Space Strategy – details the use of satellite technology for critical communications applications like banking and finance, defence and security, remote sensing, disaster management, agriculture, etc.

However, other projects among the 15 will also rely on Africa having a strong grounding in space: the Integrated High Speed Train Network, which will connect all African capitals and commercial centres, will require satellite for communications, weather forecasting, navigation and location services; as will the Single African Air Transport Market, which will connect major cities in Africa. The Pan-African e-Network, which aims to achieve transformative e-applications and services; the African Virtual and e-University; the African Commodities Strategy; and Cybersecurity projects will also be positively impacted by an expanded space presence on the continent.

Agenda 2063 and other digitisation initiatives promise to deliver home-grown advancements across the economy and satellite has a huge role to play. Moreover, advancing national satellite capabilities will help ensure independent, secure access to continent-wide critical communications services, as well as promoting digital advancement and economic growth.

The world is at an unstable point right now, amidst rising geopolitical tensions, climate change, increased natural disasters, the ongoing COVID-19 pandemic, antibiotic resistance, rising cost of living, global shortages of food and manufacturing materials, and so on. It's essential that all countries future proof themselves technologically to safeguard their citizens, economies, and businesses from potential turmoil. Critical communications are vital for a huge range of government, business and consumer applications, and satellite remains at the forefront of enabling them. ■



Bryan Raath,
sales & business development -
Southern and East Africa, secure land
communications, Airbus

Airbus Secure Land Communications teams have been preparing our development strategy for emerging markets throughout the Middle East and Africa markets for over 12 months now.

The initial step is in place with the placement of a local representative who understands the complexity of the market as well as the potential it holds. I am pleased to say that we are now positioned to better understand customers' needs and react in a more efficient manner.

Several key issues can be identified within both the private and public sectors. Budget availability within the public safety sector slows the progression and adoption of technology within mission critical environments and maintenance on legacy systems which are fast becoming outdated can no longer be supported.

Another caution we have raised within the market is the requirement for training and/or workshops, enabling end-users with the knowledge base and expertise to select the fit-for-purpose technology suited to their operational policies and user requirements.

"Budget availability within the public safety sector slows the progression and adoption of technology within mission critical environments and maintenance on legacy systems which are fast becoming outdated can no longer be supported."

End-users within both public and private sectors are looking to enhance their operational environments through the adoption of data driven applications. These applications are designed to drive operational efficiency, improve security and enhance real-time situational awareness in promoting multi-agency collaboration between networks, third party applications and users in first responder situations. Our Tactilon Agnet collaboration platform answers these needs perfectly.

Our core focus has always been on the development and deployment of critical communication infrastructure and solutions to our end-users. We will continue this trend in developing user specific applications and services as broadband networks become more available and spectrum availability in the region for private or public entities is segregated. ■

Looking ahead: My view of the previous two years is that the market was given time to identify the challenges, which has afforded sufficient time to research newer technologies to address current challenges as well as future requirements. Key discussions are progressing from research to

planning to budget allocation and we may well see an influx of opportunities being released by the public sector within the next year. It's an exciting time - the mission-critical communications industry is evolving, and the user requirements are becoming more complex and interesting!



Mandla Boo,
sales, Africa Radio Distributors

Over the last twelve months, we have seen an increase in the spending by businesses throughout Africa. It seems that there has been a lot of pent-up demand due to the COVID-19 pandemic and businesses have released some funds to meet that demand. This has been especially true for private sector customers.

The biggest challenge faced in meeting the increased demand has been the lack of stock. The components required for manufacturing electronic products have been very scarce and therefore have created a situation where we can't meet the existing demand for equipment.

In some areas, government spending has decreased significantly due to budgets being reallocated to other pressing public health needs brought on by the pandemic. Some projects have been delayed and others cancelled due to the reallocation of funds, and we now must wait for new budget allocations for the delayed or cancelled projects.

With the world exiting the pandemic and more budgets being allocated, there are good opportunities in the public sector, which is the biggest spender in most countries, and increases economic activity with spending on

big infrastructure projects. The public sector will allocate and spend funds in big infrastructure projects and there are opportunities that will come with that spending.

The most common trend over the last year has unfortunately been the shortage of semiconductors used for electronics equipment. This shortage is mainly due to the big demand of electric vehicles around the world. Typically, an electronic piece of equipment uses between 300-500 semiconductor-based chipsets. A typical electric vehicle uses around 3,000 of the same or similar chipsets. Most electronic goods manufacturers are now competing with vehicle manufacturers for these chipsets in the open market in bidding wars. The vehicle manufacturers are in most instances the winner in such bidding wars due to their larger wallets.

This shortage has forced manufacturers to redesign existing products and remove the problematic components. The manufacturers that have been quick to redesign their products are the ones who are gaining market share in the electronics space.

Our focus going forward is to keep close to customers to make sure that we are still relevant when the situation normalises. The fact that most original equipment manufacturers are facing the same challenge means that alternatives are difficult to come by. Strong customer relationships will stand us in good stead for when the industry returns to normal. ■

Looking ahead: The belief in the electronics industry is that the supply constraints will persist until the demand for electric vehicles tapers down or there is an increase in semiconductor production capacity.

The current forecasts are that the semiconductor

shortages will persist until the end of 2023 and hopefully start to normalise beginning of 2024. The business environment will be impacted by this and as things stand supply will continue to be a challenge.



Mark O'Connell,
general manager for EMEA & APAC,
Globalstar

The last 12 months have seen continued growth in Africa.

We've seen satcoms adoption from groups in wildlife preservation, as well as lone worker and site safety. There is now a major requirement for satcoms and asset protection in a range of contexts. Globalstar technology (SPOT Trace) is being deployed in African National Parks to monitor operational vehicles, while SPOT devices are safeguarding conservation workers.

Alongside our value-added reseller in Africa, Wintec Solutions, we've seen our technology deployed for animal tracking. Super lightweight Globalstar solar-powered tracking tags are being used to monitor wildebeests, cheetahs, elephants, and vultures to monitor their migration. Meanwhile, Globalstar satellites are enabling reliable safety and vehicle tracking during wildlife-tagging operations.

Awareness of satcoms to support critical communications continues to see strong growth. Globalstar is helping governments track and protect people, equipment, and vehicles, even across

remote areas with little or no alternative telecoms infrastructure. Humanitarian organisations providing relief in Africa continue to trust SPOT to ensure the safety of personnel. Governments also trust Globalstar to help optimise their military vehicle fleets. SOS functionality and satellite push-button operation are increasingly becoming staff welfare policy within both governmental and NGOs.

Satellite IoT has become a buzzword. Companies across Africa have recognised how satellite-IoT data, delivered via satellites and advanced ground stations, can improve business operations, and manage costs. New low-cost highly capable satellite enabled tracking solutions are helping African businesses with a range of applications from fleet management, asset optimisation to worker protection.

Globalstar is involved in a deployment in the mining industry in which SPOT devices are providing safety to workers as they carry out hazardous roles. Meanwhile, ambulances fitted with SPOT Trace are helping ensure that on-site medics can rapidly provide emergency help to where it is needed. In oil and gas, in addition to vehicle management, Globalstar satellite IoT technology is helping providers and partners to monitor pipelines across vast, barren areas, delivering critical data on oil or gas flow, pressure, etc. ■

Looking ahead: Satellite IoT will continue to drive development forward everywhere, including in Africa.

With fuel prices increasing, air costs remaining unstable post-pandemic, amid general economic challenges, companies are keen to employ technology to help improve operations and reduce costs. There will continue to be greater understanding that reliable, always-on satellite connectivity is required for data networks to operate without interruption.

Across sectors, data enabled by satellite-powered

communications will increasingly aid business decision-making and projects leveraging satellite IoT will proliferate. We believe that more OEM manufacturers will recognise the value of reliable satcoms and integrate it into their platforms.

Importantly, with the creativity and abiding customer focus of Globalstar's specialist technology partners, we'll see continued innovation as they invent new solutions that meet the needs of organisations and people in Africa.



Mark Zheng,
director, Hytera Southern Africa

Hytera's ever-growing team across Africa has continued to work hard to help our customers and partners to achieve their goals.

As a key player in the professional communications market, Hytera offers one of the most comprehensive product portfolios consisting of digital mobile radio (DMR), push-to-talk over cellular (PoC), and terrestrial trunked radio (TETRA) series radios, body cameras, and accessories.

However, we have moved on from our roots as a device provider and are now providing complete network solutions.

We have customers in Africa across multiple vertical markets including public safety, utilities,

“More and more African organisations concerned with public safety are either building and renovating their networks or migrating to new technologies. Instead of simple networks, they want their network to be integrated and converged consisting of multiple technologies, which is exactly where Hytera excels.”

mining, oil and gas, emergency response, hospitality, private security, facility management and transportation, among others.

We have a proactive programme of exhibitions and conferences, seminars, and forums to demonstrate our capabilities to current and potential new customers and partners across the African continent.

This year the region experienced a lot of challenges including pandemic recovery, national load shedding in South Africa, high oil prices and inflation, currency depreciation, as well as supply chain issues. This resulted in a shortage of funds, delayed projects, longer delivery times and slower technology adoption. All these challenges add up for most companies regardless of their sector in Africa. For Hytera, our biggest challenge is exceeding the expectations and requirements of our customers.

More and more African organisations concerned with public safety are either building and renovating their networks or migrating to new technologies. Instead of simple networks, they want their network to be integrated and converged consisting of multiple technologies, which is exactly where Hytera excels. They are looking to improve efficiency, boost productivity and reduce costs by digitizing their operations, especially communications systems.

Hytera can do this. For example, we implemented a state-of-the-art command and control center for one municipality to help them fight crime and improve efficiency. There are similar projects across Africa where we are working with public safety officials to improve the way they do things.

A few years ago, broadband seemed to be the buzz word for critical communications and many people believed that broadband technologies like LTE would ultimately replace narrowband. However, we can see that this is not happening in Africa on a large scale. Commercial customers in

the urban areas where MNOs have good coverage are attracted more and more to PoC (push to talk over cellular).

Meanwhile, mission-critical customers like public safety and utilities are continuing their investments on narrowband like TETRA or DMR, but also have a growing need for video capturing and transmission, data applications and other value-added features.

Considering this, we at Hytera are seeing more and more customers embracing a converged solution that includes TETRA or DMR radio, converging MCS, body worn camera, computer aided dispatch (Hytera Integrated Command and Control Solutions), CCTV, analytics, etc.

MCS stands for mission critical service, a 3GPP standard application based on an MNO's broadband network. This offers quality of service (QoS) for customers, similar to what the UK and US has been doing with Firstnet, an emergency service network which is the first nationwide public safety broadband network, services and solutions dedicated to first responders and those who support them.

This converged ability is what customers in Africa have been dreaming of - and will be in high demand.

Our focus in the region will be on how to help more and more customers benefit from the technologies that Hytera has been promoting and their integration, which makes our life and security in Africa even better. We will listen more carefully to our customers' requirements and develop the

"A few years ago, broadband seemed to be the buzz word for critical communications and many people believed that broadband technologies like LTE would ultimately replace narrowband. However, we can see that this is not happening in Africa on a large scale."

products and solutions that they need in this region, which sometimes is quite challenging.

We have launched a new partner programme to recruit more distributors, resellers, and system integrators across the African region, and empower them to scale up profitability in existing markets as well as expand into new ones.

The program includes benefits in sales incentives, financing terms, joint marketing, after-sales services, and manufacturer-assigned leads. In addition, the Hytera Partner Enabling Plan aims to give businesses an additional competitive edge by ensuring each partner meets a global quality standard. High standards matter for professional communication users, as they must be able to rely on their communication equipment to help them conduct their daily operations more efficiently, productively, and safely. ■

Looking ahead: In my eyes, Africa has always been full of opportunities and challenges.

I see more hope and opportunities than difficulties here regardless of the circumstances.

We live in a world of competition. My belief is that we should keep providing the most competitive

products to benefit the African continent. Continuous innovation, cost-effectiveness, faster delivery, intelligent convergence, etc. is what Hytera will continue to offer.

We are confident Hytera will continue to grow, and invest, across Africa.



Uwe Niske,
sales director, SSA, Motorola Solutions

We have seen growing demand for our highly secure and robust mission critical communications systems and technology across many parts of SSA over the past 12 months. Public safety agencies and government organisations are responding to safety and security challenges by modernising these critical networks.

Beyond providing secure and resilient communications, these upgrades are also supporting the growing need for emergency services to communicate and interoperate together in response to major emergencies. Whether responding to natural disasters, cross-border crime and other major events, agencies including police, fire, ambulance services all benefit from communicating together to deliver a safer and better

“It’s clear that public safety and emergency service organisations are grappling with some big challenges. From doing more with constrained budgets and resources, responding to complex and unpredictable events and the continuing need to modernise technology.”

coordinated response.

The past 12 months has shown that cybersecurity continues to be a major challenge all over the world and SSA is no exception. Public safety and government organisations have always needed access to highly secure and trusted mission critical communications and that demand will continue. Now, the complex nature of public safety is driving the adoption of a broader mix of broadband and software technologies.

Agencies need to be able to extend the reach of their mission critical communications across jurisdictions and to other agencies and individuals, they need video security, analytics, and AI technologies to help identify potential threats and they need advanced software to work more safely and efficiently in the field and the control room.

To work more effectively, public safety agencies not only need all of these technologies to integrate and work together seamlessly, but they also need their entire technology ecosystem to provide the same level of safety and security as their dependable mission critical communications solutions have always delivered.

I think video security and analytics technologies will play a major role in helping SSA reach its future ambitions for public safety. We are already seeing some local agencies invest in body worn video cameras to protect their frontline personnel while helping to increase transparency in all their interactions with the public.

Mobile video cameras in police cars and other operational vehicles are also helping to keep officers and citizens safe while helping control room workers to maintain eyes on the scene by broadcasting live footage.

Fixed video security systems powered by

AI are also helping the public safety and security sectors to do things that we humans just aren't suited to doing on our own. For example, finding a missing child among a sea of people in a bustling city. For a human to identify a lost child in a crowded scene can be like finding a needle in a haystack, but AI makes that task much simpler and frees up more time for people to engage in more meaningful work.

The case for video security solutions has never been stronger and the experience of the global pandemic has also helped to make people more aware of the benefits of video to reduce the risk of viruses spreading in public places and to protect remote frontline workers.

That said, video security is still an emerging technology, and we acknowledge that privacy, data protection and compliance are important issues. We help our customers to navigate those challenges and we advise and help them to deploy solutions that comply with public policy while still delivering the best possible outcomes.

It's clear that public safety and emergency

service organisations are grappling with some big challenges. From doing more with constrained budgets and resources, responding to complex and unpredictable events and the continuing need to modernise technology. To remain focused on their mission, these organisations increasingly need strong technology partners to help them to manage their mission critical solutions, networks, and services. This includes providing 24/7 technical support, maintenance and keeping their technology up-to-date and fully supported.

Motorola Solutions has made a number of strategic acquisitions in recent years, especially in the video security and analytics space. This year, that has included Ava Security and Calipsa, two leading global providers of cloud-native video security and analytics solutions. As we continue to build our portfolio of mission critical solutions, we will be introducing more cloud-based capabilities to our customers and supporting them with the integration and deployment of these technologies. ■

Looking ahead: The past two years have certainly delivered unprecedented challenges for the public safety sector. From the global pandemic to civil unrest and the emergence of new physical and virtual threats.

In this environment, our public safety and emergency service organisations need to be ready to respond to anything. Increasingly, they need reliable and highly secure tools that enable them to protect sensitive information while keeping citizens' data private. They also need access to more data sources and predictive analytics to get ahead of what's next and place

their finite resources where they can have the greatest effect.

The experience of the global pandemic has also caused many public safety and enterprise organisations to re-evaluate their risks, their security posture and in many cases, accelerate the deployment of technologies they had been planning to introduce for some years.

With this in mind, I think we'll see even greater technology adoption over the next 12 months, including new use cases for those technologies that were deployed specifically for public safety and protection during the pandemic.

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Hytera is committed to innovation and provides user-orientated critical communication products. Fully understanding the communication challenges the industrial users are facing in Public Safety, Energy, Transportation, Utilities, Commercial and other industry verticals, Hytera continuously invests in technology development and application innovation, and is committed to promoting most open communication standards from narrowband to broadband, including TETRA, DMR, PDT and LTE.



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chapter 5

Satcoms



David Oni,
research analyst, Nigeria, NSR, an
Analysys Mason company

A growth period for satellite communications

Over the next ten years, NSR forecasts US\$1.2 trillion in revenues, 34,000+ satellites to be launched, and 530 exabytes of information. Space and the satellite communications sector is on a growth path – generating more revenues and connecting more places than ever before.

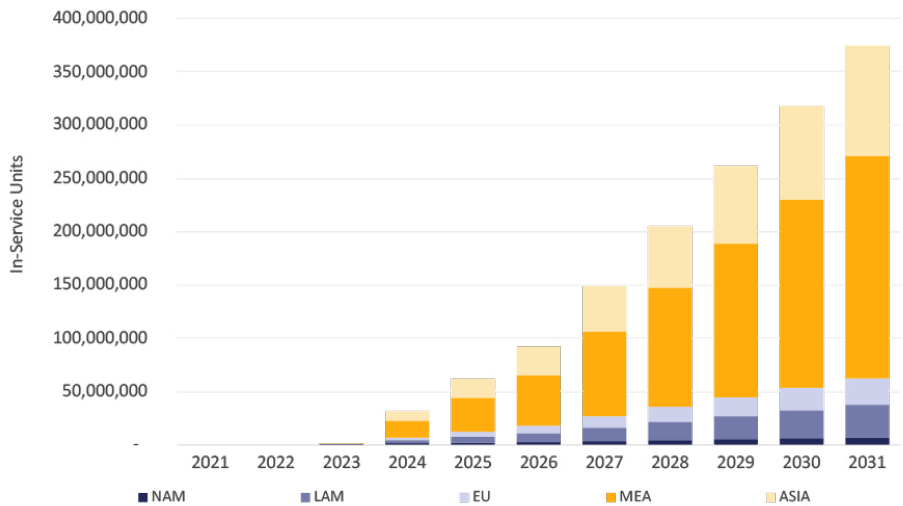
Amongst the global landscape of satellite connectivity, Africa will be a key market fuelling that growth. As digitalization initiatives expand, partnerships will be key, and new satellite connectivity solutions such as the direct-to-device satellite connectivity markets will be greenfield opportunities for global operators and local providers alike. Overall, new business models and new technology is helping to drive satellite connectivity to a stronger position in connecting Africa.

Now, more than ever, Africa is looking to digital solutions to improve productivity and drive development among member nations. Post pandemic, authorities see an opportunity to leverage digital technology and services to build economies that are more resilient to future shocks, enhance productivity and efficiency in service delivery, and ensure more inclusive socioeconomic development. Many of the industry-relevant regulatory policy changes made by most African governments during the pandemic emphasized digital accessibility.

The AU's Digital Transformation Strategy 2020–2030 aspires to achieve universal digital access and a single pan-African digital market by 2030. According to the International Telecommunications Union (ITU), Africa achieved 13% year-on-year growth of internet penetration. Today, 40% of the African population are online. The Global Systems for Mobile Association (GSMA) projects that there will be nearly 100 million new subscribers by 2025, taking the total number of subscribers to 613 million (50% of the region's population).

Satellite communications in Africa have come a long way. Although a burgeoning segment in the continent's rapidly developing digital industry, several stakeholders and industry players have

Direct Satellite-to-Device Subscribers by Region



Source: NSR

come to realize the importance of providing connectivity to remote locations on the continent. Satellites are a particularly cost-effective way to reach large numbers of viewers, particularly in regions with widely dispersed populations and challenging environments. Satellite covers all households within the footprint, including those unable to access over the top (OTT) services due to insufficient internet bitrates. This enables the service provider to supply all customers with a similar instantaneous service across regions. Direct satellite-to-device has the potential to become the largest satcom market.

While satcom operators will initially focus on developed economies, NSR's 2022 5G via Satellite report forecasts a sizable portion of the demand to be generated from emerging markets in the Middle East and Africa (MEA), where coverage is underdeveloped, and satellite connectivity will have more room to capture market share. In the long-term, Africa presents a significant growth opportunity.

Satellite connectivity has long been touted as a possible solution to the challenge of providing connectivity in hard-to-reach locations. The dominance of mobile network operators (MNOs) such as Vodacom, MTN, Airtel, and Orange in Africa is undisputed, and has led to innovations and service delivery through MNOs becoming the de facto option for most non-fibre connectivity requirements.

Some countries have launched operational GEO satellites to provide internet services to underserved and remote locations. Indeed, most of Africa still relies on satellite operators to provide connectivity. As such, some countries have come to realize the importance of partnerships with these legacy companies; Vodacom DRC has selected Intelsat to provide its Ku-band satellite services, Free Senegal has signed a deal with Avanti Communications to build a satellite gateway for the latter's Hylas 4 Ka-band satellite, and Orange Mali has also partnered with Intelsat to extend mobile broadband services to rural

areas. All this though, is occurring amongst a sea-change of connectivity from space - the migration from GEO to non-GEO.

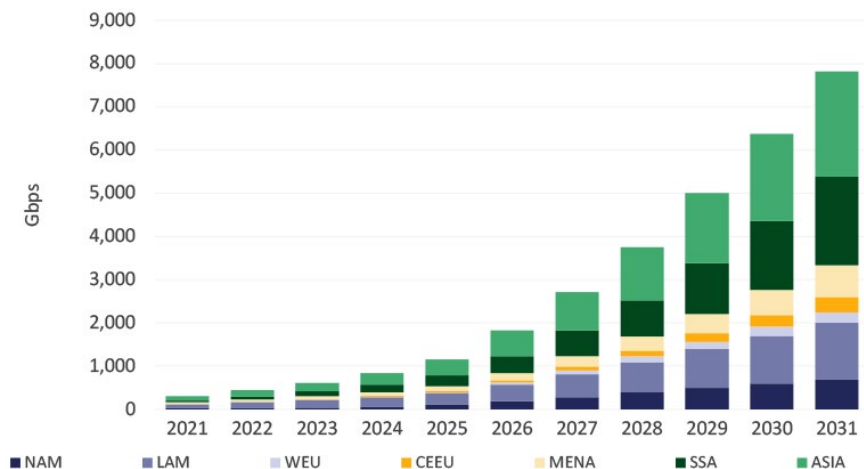
Non-GEO satellite operators have gained access to the African market. The low Earth orbit (LEO) constellation model promises a reduced cost structure and higher-performance capability relative to legacy geostationary satellites that operate at much higher altitudes. Pockets of great deal activities exist in some west African countries (Ghana, Nigeria, Senegal, Cote d'Ivoire), East Africa (Kenya, Ethiopia) while Angola and South Africa see decent growth. Demand in DRC continues to grow with recent deals (Intelsat, Eutelsat etc.). Multi-nation deals continue to grow with large telcos operating in multiple countries.

Starlink has been approved in Nigeria and Mozambique and is set to begin operations before the end of the year. Globalstar has obtained spectrum rights to operate in Kenya, Gabon, South Africa, Mozambique, and Rwanda. Telesat also has an existing partnership with the UK's Sat Space Africa to provide broadband connection

in selected southern African countries. Liquid Telecom has similar arrangements with Telesat to improve the quality of service in broadband delivery to 10 African countries. In 2019, the Rwandan government together with Qualcomm Technologies and Softbank Group Corp raised a total of US\$3.4 billion to finance OneWeb's LEO constellation. Also, SES is providing similar services in Senegal and the Democratic Republic of Congo (DRC) through its medium Earth orbit (MEO) O3b system.

Satellite combined with other technologies like fibre to form hybrid solutions is seen as critical to efforts by industry stakeholders to increase broadband connectivity in Africa. Combining linear TV via satellite and on-demand services via OTT offers content in optimum quality at the convenience of the viewers. Wireless backhaul is also witnessing the entrance of new actors traditionally not involved with satcom. This is the case for towercos or cellular integrators that now see the opportunity of offering new services to MNOs. This trend initiated in Africa, but it is

Total Backhaul Capacity Demand in Gbps



Source: NSR

starting to expand towards other regions.

NSR's 2022 Wireless Backhaul via Satellite report highlights while that most of Africa is performing strongly, there are several critical challenges to solve before unleashing its true potential. Accessing the funding to kick-off deployments has been a major challenge and some satellite operators have decided to take part of the risk themselves through investments, loans or equipment purchases to accelerate network rollouts. Similarly, execution of the deployments is certainly a massive challenge. Reaching rural Africa (unpaved roads, non-existent energy grid, etc.) while keeping cost under control is a hard balance. Extreme pressure on pricing continues, with some operators now owning aging satellites with low utilization rates, they moved to be extremely aggressive on pricing to try to activate elasticities and foster 4G deployments (2G networks can still monetize voice traffic with better margins).

Nigeria hosts the largest addressable market, but it is also a highly contested market. Multiple satellite operators have gateways and landing rights in the country, and various integrators (start-ups and traditional towercos) are going after the same business. DRC continues to be

an extraordinary market for satcom with new deployments taking shape. The Ethiopian market is finally opening. The mix of new entrants, poor coverage and difficult geographies set the perfect scene for satellite to capture opportunities. South Africa and Kenya might have been slower lately, but these markets are ready to embrace LTE, and newly competitively priced capacity will surely unlock growth in the future.

The bottom line

As satellite becomes a cost-effective solution for rural connectivity, a massive addressable market in Africa will offer huge growth opportunities, given the number of unconnected populations.

However, low purchasing power weakens any potential scale. Government and social inclusion programs by development institutions are critical to unlock the opportunity to scale. Operators continue to pursue strategic investments in local distribution and network as a service (NaaS) providers to capture market share: AMN and Intelsat, NuRAN Wireless and Spacecom. Partnerships for managed services continue to rise, helping both operators and service providers de-risk unstable demand (ABS and iSAT). ■



Robert Bell,
executive director,
World Teleport Association

Growth opportunities in satellite-cellular integration

Satellite and cellular networking technologies have evolved in parallel over decades to create conditions for significant growth in satellite backhaul. Once confined primarily to fulfilling regulatory requirements to serve remote areas

and supporting government disaster relief efforts, satellite backhaul is now widely viewed as a commercially viable business that can help the data-centric cellular industry continue its worldwide expansion.

The World Teleport Association (WTA) surveyed 10 subject-matter experts representing

satellite service and technology providers to discover how satellite and cellular have converged to create conditions for significant growth in the satellite backhaul business, and to characterize the noteworthy trends, markets, and challenges ahead.

Serving MNOs

Prominent satellite backhaul markets today include rural and ultra-rural communities in developing countries, disaster response and peak-hour offload, as well as island territories and remote vacation spots. Technological advances are expected to spur growth in each of these markets.

The primary near-term satellite backhaul markets are in developing parts of the world where terrestrial infrastructure is limited, particularly in rural and ultra-rural areas in Africa, Central and South America, Asia, and the Middle East.

In sub-Saharan Africa, many rural villages are being connected with cellular for the first time. These ‘greenfield’ deployments are often for 2G services limited to voice and text. The ability to serve these markets rests in part on the availability of low-cost 2G handsets.

For areas with low population density, data services are not profitable, so only voice and texting are available. However, for towns of 2,000-3,000 people, 4G can be installed since there are enough potential subscribers to support a large deployment. For smaller communities, as time goes by and mobile and internet adoption increases, hopefully alongside prosperity, 3G and 4G technologies may become viable.

Technical requirements

4G/LTE standards lend themselves to satellite

backhaul solutions, and 5G networks are expected to be even more closely intertwined with satellite. The technical requirements for satellite backhaul tend to be driven by MNOs, who want three things: easy compatibility with their own network architecture; high reliability; and low costs.

Individual MNOs might use multiple network configurations, and satellite service providers must accommodate that. For example, an MNO might use both Layer 2 and Layer 3 IP communications protocols and satellite networks need the flexibility to handle either.

While TDMA remains prevalent in satellite backhaul due to the ‘bursty’ nature of data services, MNOs are increasingly employing technologies and applications that are not well suited to a bandwidth sharing environment. Thus, satellite service providers need the ability to dynamically shift between TDMA and other solutions such as Single Channel per Carrier (SCPC), in which capacity is fixed and dedicated to a single site.

Satellite service providers must also be able to identify and prioritize network traffic. Voice and signalling traffic are the top priorities, whereas data services are effectively ‘best effort.’ MNOs tend to be more demanding than consumer broadband customers owing to the basic business model: if a website fails to download, the customer tries again, whereas dropped voice calls are a bigger problem. If an outage affects a small number of residential internet customers, it’s not the end of the world - but if a base station with 500 users goes down, you’re in deep trouble.

That said, there is variability between MNOs on reliability requirements. For low-cost cellular service providers, reliability rates of 99.5% might be sufficient, whereas the major carriers demand 99.9%+. MNOs typically require

availability rates of 99.999%, and service providers need to ensure they design antennas and networks to meet that. For satellite service providers, meeting MNO stringent reliability requirements means going the extra mile to protect against things like rain fade and jitter.

Competitive pricing

In recent years satellite has shifted from an option of last resort to a more integral part of MNO offerings, but service providers still have room for improvement on pricing. This will likely change as more non-geostationary satellite constellations enter service.

Currently, satellite backhaul prices are driven by the usual market factors, such as volume and minimum quality of service requirements. Variables include service reliability, network efficiency and volume.

Managed services may be the big opportunity for satellite and teleport operators to add value to basic bandwidth provision. MNOs often lack the knowledge to manage 4G and 5G networks over satellite, and many are looking to get out of the business of managing infrastructure altogether. Satellite service providers can work closely with local terrestrial infrastructure operators to create end-to-end solutions for MNOs.

Satellite and teleport operators could help MNOs monitor their networks and troubleshoot problems, bringing different advantages to the table. Most national telecom regulators require that satellite signals land at a domestic teleport, putting local teleport operators on the critical path to backhaul delivery. Teleport operators are often better connected with local infrastructure owners, giving them an advantage in the provision of managed services to MNOs.

Innovations driving growth

Rapid technical innovation and the growing push for interoperability will help teleport and satellite operators capitalize on the continued cellular build-out, from greenfield deployments to upgrades to 4G/LTE and 5G. HTS and VHTS satellites have already dramatically reduced bandwidth costs to expand opportunities in backhaul. Medium and low Earth orbit constellations are expected to further reduce bandwidth costs while significantly reducing, if not eliminating, the latency that has long been an issue with geostationary satellites.

On the ground side, several technical innovations are enhancing satellite network speed and efficiency, improving its attractiveness as a backhaul option. Adaptive coding and modulation (ACM) can help network operators lower the price they must pay, in terms of bandwidth, to protect against antenna pointing errors, interference and, in the case of Ka-band systems, rain fade.

Software-defined wide-area networks (SD-WANs) are another emerging capability that will increase transmission speeds and bandwidth efficiency while reducing expenditure. SD-WAN technology recognizes the type of traffic being carried by a network and dynamically routes it over the most logical pathway, be it terrestrial infrastructure or satellite. Many experts view SD-WAN as the key to true integration of satellite and cellular networks.

The satellite ground segment has fallen behind the space segment when it comes to flexibility. Between rapidly reconfigurable, software-defined satellites and the utilization of different orbits, there is a massive new space layer. The answer is digitization and virtualization of the ground segment.

5G is viewed as a major opportunity to integrate satellite and terrestrial networks. The 3GPP is

helping to create 5G non-terrestrial standards, which, if successful, will facilitate more seamless integration of traditionally distinct satellite and cellular networks.

The changing business case

Several innovations are making the business case for satellite backhaul more attractive. Key among these is virtualization of base stations, which has dramatically reduced the cost of core networks and base stations in remote areas. These virtualized base stations are a fraction of the size of traditional base stations, and in many cases, can operate exclusively on solar power.

Combined with LTE small cell technology, virtualized base stations are helping to close the business case for backhaul solutions in remote areas, independent of universal service obligations. They can be used for roaming services in cooperation with MNOs or to create private LTE networks that leverage over-the-top calling applications like WhatsApp or Skype.

Private cellular networks for enterprise are another major growth opportunity in cellular backhaul. Remote sites are increasingly leveraging edge computing, by which signals are processed locally rather than being transported via satellite to distant servers, freeing up additional bandwidth and easing latency issues. Edge computing applications in satellite backhaul environments include tele-health, IoT, precision farming, and content caching.

Cellular infrastructure sharing is another way to serve remote areas for less cost, providing additional opportunities for satellite backhaul.

Intelligent routing, which recognizes the types of signals being transmitted and directs them accordingly, can create new opportunities for satellite even in urban and suburban areas well served by terrestrial infrastructure. During

peak demand, satellites can be an important safety valve, offloading traffic from stressed terrestrial infrastructure.

The mobile future

For mobile connectivity and backhaul, the future is widely expected to bring continued growth. There will be more people getting connected with more devices in different parts of the world, with video and emerging applications like IoT and connected cars driving demand.

The GSMA's 'The State of Mobile Internet Connectivity 2021' report projects industry capital expenditures will reach \$900 billion over the next five years, while governments will continue to invest large sums in narrowing the digital divide. Over half of the world's population, or more than 4 billion people, are using mobile internet today, an increase of 225 million compared to 2019. Growth has been steady in low- to middle-income countries, which still account for 93% of the unconnected population. The number of people with no mobile coverage currently stands at 450 million, with the largest portion residing in sub-Saharan Africa.

The backhaul market is expected to grow along with the broader cellular market. According to Kenneth Research, the global wireless backhaul market is expected to grow to \$63.69 billion by 2025, a compound annual growth rate (CAGR) of more than 13.5% from 2016. The IMARC Group consultancy predicts a 12% CAGR for backhaul from 2021-2026, while Mordor Intelligence put the figure at 14% over the same period.

The extent to which satellite backhaul will grow along with the overall cellular market depends heavily on its ability to integrate with the terrestrial grid, especially 5G. While substantial progress has been made, compatibility gaps remain. Teleport infrastructure in many cases remains analogue

based, and thus less responsive to the dynamic reconfigurability requirements of modern mobile communications. Moreover, satellite networks are not well suited to transmitting oversized data packets, known as jumbo frames. Another looming gap is the ability to monitor traffic and network health across all three segments of the overall architecture: satellite; satellite ground; and cellular.

Challenges notwithstanding, most of the experts we spoke with view closer satellite-cellular integration as inevitable. With software-defined networks and intelligent routing, data will follow the path that makes the most sense based on factors including cost, bandwidth efficiency and latency tolerance. That means closer integration, not only between satellite and cellular networks, but also between satellites in different orbits. ■



Martin Jarrold,
vice president international
programme development, GVF

What does space mean to you?

This question has never been more important than it is now. Recognition of the importance of asking, and getting answers to, this question is growing significantly; prompted by various factors. One of those factors is that “Space is – demonstrably, objectively and without doubt – vital in our lives here on Earth.”

To understand what space means to humanity we don't need to look back in time to the extremes of the Universe's beginning. We can look much closer to home; between the Karmen line (altitude 100km) and the geostationary orbital arc (altitude 36,000km). This is what I refer to as Earth's useful orbital space; but levels of general awareness of its significance in our everyday lives is very limited, and people have little understanding of the breadth of the work being done in space today.

What on Earth is the value of space?

This is the title of a recent report on global perceptions of space. Research commissioned

by Inmarsat provides a snapshot of global attitudes to space and illustrates that people do not appear to understand the role space is already playing in their everyday lives, nor its potential to deliver a brighter future.

The research findings show that 21% of people associate space with aliens, 14% with science fiction and 10% with ‘Star Wars’ – compared with just 8% for communications & connectivity and 3% for broadcasting & television. The fact that perceptions are being shaped by such popular cultural influences is a wake-up call for the satellite communications industry – our technologies and services are invisible to the majority.

Across a global demographic there are wide variations in perceptions of space; differences arising out of different cultures, different countries, different age cohorts, and differences between business leaders and the public. People over 55 remember the Cold War Space Race, human footprints on the Moon, and NASA's Space Shuttle programme. Meanwhile, young people aged 18-24 are more likely to link billionaires like Bezos, Branson, and Musk, as well as millionaire space-tourists, with space; conflating the technological innovation of the internet age (perceived as good) with billionaires and customer millionaires in private rockets (perceived as bad, and exclusive to a

tiny minority), resulting in mixed attitudes to the Space 2.0. Without realising it, this digital generation is benefitting from technologies that are by-products of the first Space Age, but the innovations are so embedded in everyday life that they're taken for granted.

Space 2.0

We are now witnessing Space 2.0/NewSpace, with expectation of important returns from scientific and engineering advances and direct and indirect economic benefits. The public are not totally unaware of this, but what awareness there is does not come with a sense of wonder and curiosity.

Inmarsat's research highlights that a small core globally are aware of the potential for space to answer many of the world's challenges. 7% said that space can alleviate poverty; another 7% thought space can support the goal of producing enough food to feed our growing population; 11% imagined space will have a role in researching and finding cures for diseases like cancer.

Overall, space-and-satellite is almost invisible, or confusing. People fail to appreciate that without satellites they would not enjoy the levels of connectivity they have come to expect as a daily given.

The imperatives of space and satellite business for Africa

In this second space age, I see a three-fold imperative of space business for Africa: the centrality of satellite communications and Earth observation to the continent; African nations' direct engagement in space business; the contribution of space to wider sustainability issues impacting the continent, as well as

affecting the rest of the world.

Across Africa businesses such as telcos and MNOs, themselves serving enterprises with their own data management applications requirements, have in common exponential growth in their need for access to, analysis and management of, vast volumes of data. This growth is dependent on constant and ubiquitous high-performance connectivity. Moving massive volumes of data within Africa and to regions outside of Africa can be costly, difficult, and unsustainable. Given that fibre and microwave infrastructures have limitations in deployment feasibility, amounting to a significant barrier to advancing network growth and connectivity, the solution is flexible, high-bandwidth, low-latency, cloud-optimised seamless global networking based on satellite connectivity.

Coverage ubiquity is an established facet of GSO (geostationary) satellites. NGSO satellites – existing medium Earth orbit (MEO) and more advanced MEO systems coming on stream, and the growth of various low Earth Orbit (LEO) mega-constellations – add much reduced latency, more ubiquitous capacity, and slashed costs of bandwidth. This constitutes what it takes to accelerate the deployment of universal, reliable, and affordable broadband networks in Africa, and to build innovative solutions to provide always-on connectivity. In even the most remote and challenging locations for connectivity – mining, rail, oil and gas, civil defence, and first responder humanitarian aid – where other networks simply don't exist, satellite is allowing people to access the internet, private data networks and cloud services from anywhere, including while on-the-move.

Joining the club of space faring nations has always been a very expensive business. However, the advent of NewSpace has set in train a countervailing trend, diluting the

barriers to entry. Africa, 20% of the Earth's land mass, is endowed with a true wealth of natural resources that is not well reflected by its widespread problems of poverty, inequality, and unemployment, and associated political instabilities.

Of course, some African countries have been active in the space economy for years, and those with established space agencies have moved ahead of the countries where governments have not instituted funding for such activities. Such prioritising of funds has usually come from a recognition that space activity brings socioeconomic benefits through, for example, satellite telecommunications infrastructure or monitoring natural resources from space, and a political will to grow domestic capacities in satcoms, Earth observation (EO), and navigation.

The second sub-Saharan African country into space, after South Africa, was Nigeria. Its space agency, NASRDA, was the continent's leading light in satellite remote sensing with the launch of NigeriaSat-2 and NigeriaSat-X, each carrying payloads of imagers for EO applications such as resource management, mapping and agricultural and disaster management.

For Africa, satellites play a vital and increasingly important role in enabling broadband communications, expanding access to the internet, and monitoring and measuring innumerable facets of everyday life, gathering, managing, and analysing data generated by the bustling urban mega-conurbations, from industry, from agriculture, and from the remoteness of the rain forests and coastal waters.

Now, more African nations have engaged in space business, with around 20 having space programmes at various levels of development. With NewSpace manufacturing it has already become increasingly viable for lower-income nations to design and

manufacture their own small satellites to serve broadband communications, navigation, and Earth observation.

One of the more recent sub-Saharan countries to reach orbit was Ethiopia, and more recently still came the beginning of the space ambitions of Mauritius in the form of a nanosatellite built to collect climate change data, and for weather forecasting, road traffic management, and maritime surveillance of Mauritius' Exclusive Economic Zone.

As elsewhere in the world, each African country enters space business to meet its own policy objectives and national requirements (in terms of enhanced communications capabilities, access to nationally relevant Earth observation/remote sensing data, etc.), and there can be a myriad of facets to this. Equally, becoming a member of the club of space faring nations can be a matter of national prestige, or a matter of competing with neighbouring states.

In terms of national policy objectives, countries have always desired to leverage their national rights to ITU coordinated orbital slots, historically, and most commonly, related to increasing resources to additionally contribute to bridging the national digital divide.

The satellite design, build, and launch environment is now very different to the commissioning, building and launch of bespoke design, multi-metric tonne, geostationary spacecraft the size of a double-decker bus. The major change has been to an affordable, entrepreneurially oriented, domain populated by many small-scale start-ups and spin-offs from academia. Aplethora of 'smallsat' manufacturers employing short development cycles, small development teams, off-the-shelf components, miniaturisation technologies, mass-production, and standardised form-factors, approaches akin to factory production lines.

Countries may desire their own satellites not only for their functional purpose, but to develop the advanced technology base of their higher education institutions (or even, these days, their technical schools) and promote improvement of the population skills-base in STEM (science, technology, engineering, and mathematics).

Climate change and sustainability

At the start of the United Nation's Cop27 climate summit in Egypt, a World Meteorological Organisation report set out how record high greenhouse gases in the atmosphere are supercharging extreme weather with the past eight years being the eight hottest ever recorded. Africa is more vulnerable than any other continent to the climate crisis. Seemingly all the negative effects of global warming are amplified. Africa loses up to 15% of GDP growth a year to the destructive forces of climate change; extreme weather threatens life, food, and water security.

African nations engaging in space business for communications and remote sensing have been alerted to the role of satellites in combatting climate change. Inmarsat, partnered with Globant, has quantified the per annum CO2 tonnage that three major sectors could save by using satellite communications technologies. Satellites are helping agriculture, transport, and energy to identify efficiencies and decarbonise to the tune of 1.5 gigatonnes of carbon per annum – the equivalent carbon output of the UK, France and Germany combined. There is still more that could be achieved, and the expansion of the African continent's satellite resources devoted to agricultural monitoring,

fisheries and forestry, urban planning, etc., can only add to the capacity for effective environmental monitoring.

Space needs better PR

Industry concern about perceptions of space and satellite is increasing, so much so that there are now conference events exploring the issue. Included in the Secure World Foundation '4th Summit for Space Sustainability' programme was a panel with communication and public relations experts looking at how people and the media perceive space, and asking such questions as: "how does the world outside the space bubble perceive our domain?" and "what can we do to promote our own sector in a productive, modern and fruitful way?"

The space and satellite industry has this public relations problem at the time when we need to be encouraging more young talent into STEM, and to enter the space industries, bringing with them their aspirations for what space could enable us to achieve.

Space needs more talent

GVF – and its partners, SatProf and the SSPI – has developed a series of Space Business Qualified (SBQ) Fundamentals courses as the first part of a comprehensive solution to the staff recruitment, onboarding, and retention needs of the space and satellite industry.

SBQ is a set of online courses and certification ideal for people new to the space and satellite industry or those looking to deepen their knowledge, providing a comprehensive understanding of the business of space today and tomorrow. SBQ offers a series of online courses, taught through a mix of self-paced, interactive tutorials, videos, illustrations, and

testing to validate understanding and reinforce learning on topics including launch, orbits, LEO, MEO, and GEO, antennas, signals, and links – all with a business perspective.

Recently made available for immediate enrolment is course SBQ405: Space Business – Finance, Legal & Regulatory, the fifth and final course in the Fundamentals series following SBQ401: Fundamentals of Orbits and Getting

into Space; SBQ402: Spacecraft Fundamentals; SBQ403: Space Communications Fundamentals; and SBQ404: Space Business – Markets. Following on from the Fundamentals courses will be more specialised courses in satellite communications, Earth observation and spacecraft and launch. A free of charge introductory course, SBQ400: Welcome to the Business of Space is available. ■



Martin Coleman,
partner, COLEM Engineering

Can we connect a continent?

I am reminded by the numerous articles and debate on the digitalisation inroads made in Africa. Yet, Africa remains the most disconnected continent - a communications 'black-hole' in many areas. Why? The solutions are available, yet division and proprietary systems within the communications industry still rule. No wonder progress is slow...

The real innovation for today's communication systems was the internet, the creation of networks and IP, the routing and addressing of packets of data. The problem is that communication is seen to have two sides: terrestrial and satellite.

The arguments about spectrum remain

between terrestrial and satellite, each at loggerheads with each other over how to share or reorganise spectrum. Additionally, disagreements over standards and proprietary versus open, remain. The satellite industry still talks in terms of proprietary or bespoke products and services.

Most conversation between the mobile and satellite industries is still entrenched in backhaul. That is good business and should be continued, as satellite is a terrific way to service this need. It should, however, be noted that the mobile industry only uses backhaul via satellite when it must - it is not the preferred method of operation due to cost and complexity. About 1.5% of total mobile network connectivity utilises satellite backhaul. There is, of course, a significant difference in revenue generation between the two industries which is why, when looking at the satellite industry's business, backhaul accounts for around 20% of revenue.

But the conversation needs to move on. We know about backhaul and the continued role for satellite. This just brings home that each industry needs each other to operate. Satellite needs to push the conversation forwards and be the technology and role innovator. Through the auspices of 3GPP and the technology innovations of some satellite operators, that

"The problem is that communication is seen to have two sides: terrestrial and satellite."

conversation is starting to move forward. We know that 5G broadcast is available, but we rarely talk about it. Yet, that is really something the satellite network can deliver, and now.

It should be remembered that users are application based, not service based - and the devices we use are not the problem either. Around 2015/2016 the term 'hybrid' was "the new way forward" for communication. Odd: for the past 50+ years of my career, communication has always been a single entity. There are no boundaries between methods and technology, terrestrial or satellite, just routes to connect people and systems.

To be part of the world's increasingly digital economy, individuals and businesses need reliable, high-speed internet and cloud access. World organisations and national governments across the globe know this, and work with the private sector to improve access to gigabit broadband. Indeed, UNESCO and the ITU Broadband Commission for Sustainable Development have set a target of connecting 75% of the world's population to high-speed internet by 2025. To reach this ambitious, but possible, target, developing countries will need to be the area of focus and no other is more important right now than the continent of Africa!

Sub-Saharan Africa has the lowest access to high-speed internet - less than 30% of the population use the internet at all and, in most cases, it's not high speed. This is compared to some 55% of the world's population and 85% of those in Europe and Central Asia who have minimum download speeds of 60+Mbps and upload speeds of 15+Mbps.

The difference in these figures is striking and has a negative economic impact for just this one area of Africa - a region which contains many of the least developed countries in the world. Widespread, reliable, high-speed

connectivity is vital to support economic growth and development. Without it, a region such as this simply will not have access to the same opportunities that others take for granted.

Where are we today?

The arguments around spectrum remain critical to the way we build out both terrestrial and satellite infrastructure. Each region of the world has different priorities and so spectrum decisions must be made by balancing the practical use against the services needed. Sharing needs to be avoided until smarter technology is truly available.

Specific areas of spectrum must be available to satellite. That equally applies to terrestrial. But there is plenty to go around. It is crazy that we manually allocate spectrum through laborious procedures and the four-year rolling process of WRC! We must be more dynamic than this, four years is way too long. Our industries must do better than this.

Some good news is that the communications industry has successfully managed the transition of C-band use to 5G. Commercial objectives have been met for both terrestrial and satellite, and management of 5G interference incidents are being resolved by satellite operators and affected clients. This has worked so well that we can apply this to all bands and manage the spectrum way forward in a practical and proper manner.

We now have terrestrial versus LEO versus MEO versus GEO. Again, these are often seen as competitive, yet this is a real opportunity. Adding more useable layers to the communication structure is a key ingredient. Cloud infrastructure is also available; that must be another vital ingredient to solving connectivity and quickly using software defined

systems can be implemented to meet the demands of user growth.

5G - the catalyst

The onus is squarely on the satellite industry to deliver their role in 5G.

Satellite can easily deliver to the cell tower. Simpler ground infrastructure can be utilised until we have truly functional and cost-effective flat panel antennas. Satellite can enhance cell tower connections both nationally and globally. Remember my reference to 5G broadcast earlier - this is where satellite can deliver.

Satellite should embrace the cell structure of mobile. Consider an aircraft. Scrap the idea of using a particular airline's service; all that logging on, paying by card and with different rates for each airline operator. Simply consider it a 5G mobile cell or several integrated cells, depending on size. Note, this simple concept can apply to anything from a building to a cruise ship.

As soon as you make everything a continuation of the mobile cell structure, you have immediately met the new requirement of true service provision. That is it. The user simply turns on their mobile phone or device in the usual way, including integrated billing.

The real step change here is simple. The service should start and stay with the mobile operator, who can set the packages up for the user. Packages can range from pay-as-you-go through to fully inclusive and can be integrated as part of a fully inclusive deal or be taken up as extras, as and when the user wishes. The point is, the mobile operator sets the ball in motion; it has the processes already, it does the billing and thus makes it simpler for the user. All services that use satellite become part of the common way we use our mobile devices. The mobile operator pays the fees to satellite

operators, airlines or entities used, which feeds back into the equipment supply chain for the aircraft or other vertical...

The result? Terrestrial and satellite truly working together to supply an integrated connection for users. Seamless, simple, and managed!

How do we connect Africa?

A decent plan and some basic rules are needed if we are to connect the planet, all 8 billion of us. Africa must be the priority.

We have fibre, wireless, cell (4G & 5G), satellite (LEO, MEO & GEO) and new possibilities with HAPS (High Altitude Pseudo Satellites). All these methods will be needed to achieve the goal of connecting Africa. Satellite cannot supply individual terminals everywhere, what with the need to connect with all three orbits – this is just too expensive to consider.

The concept to achieving this goal of global connectivity is to mix the technology. Fibre, wireless, cell and satellite will all be required in all capital and major cities throughout the continent. Gateway satellite ground stations equipped with common agile terminals that can be used for all satellite orbits – LEO, MEO, GEO, etc. - is key.

To enable this connectivity to spread to suburban areas, a combination of fibre, wireless and cell would be optimum, with all cell towers fitted with satellite agile terminals. Smaller outlying towns and villages could be best served by cellular with satellite, and local distribution via wireless.

For main transport routes and remote areas, rail and road can be connected by cell, with satellite and wireless for local distribution where necessary. All remote areas can be served by individual satellite terminal or vehicles fitted with comms-on-the-move (COTM) equipment.

“Everything is still in terms of mobile and satellite being separate industries. An industry is something that has standards, processes and is automated in its operation. Something the communications industry is, or certainly, should, be. Thus, both mobile and satellite are really branches of the communications industry.”

We can provide reliable mobile and broadband networks, and if we standardise the infrastructure, the system can easily grow. With so many layers of communication available, all can be put into immediate use. Together.

Cell towers can be connected from space, high altitude, and the ground. Wireless networks can cover wide areas or just a single building. We can manage spectrum. Not share, but truly manage and set sensible working boundaries so that all the technology can be used simultaneously. We can utilise cloud-based software defined infrastructure and transmitted and received signals from space over IP.

Smart networks exist and they are getting smarter with better automation, machine learning and artificial intelligence. Therefore, what is stopping us from achieving the goal when we have a plethora of technologies to plan with? We need some basic rules or structure on how we bring these methods together.

Firstly, we manage spectrum. 5G and C-band

management has worked well and paves the way for all spectrum use. Both mobile and satellite industries must rationalise their thinking and make spectrum management work. We must be clever with the resources we have and allow our spectrum to be better used, dynamically managed and enable the re-use of portions for numerous purposes, not simply dedicate it to either satellite or terrestrial. That must stop.

Final thoughts

Satellite provides a vital layer of communications providing us all with safety, disaster recovery, medical/healthcare, tracking (aero, maritime, agriculture, freight/fleet, trucks/cars) and, of course, navigation through the various GPS services available. Satellite delivers this totally and is a high reliability network for such cases. That must stay in place, at all costs!

However, none of the above applications grow the satellite business; from a harsh business point of view, there is a real need to strengthen that business model. The satellite industry needs to up their game to allow this vital piece of the humanities puzzle to exist.

5G is the opportunity. Satellite missed out once at the 3G inception and backhaul is still the headline. Innovation is not yet fast enough to make 4G/5G better, or to help connect and make mobile and broadband stronger, more affordable and for everyone.

Everything is still in terms of mobile and satellite being separate industries. An industry is something that has standards, processes and is automated in its operation. Something the communications industry is, or certainly, should, be. Thus, both mobile and satellite are really branches of the communications industry.

We have the technology now.

We need to connect Africa, now! ■



Alastair Williamson,
CEO, Wyld Networks

The shortage of water is becoming a critical issue around the world, but across Africa in particular. And with the population growing, the Economic Commission for Africa predicts that by 2025 close to 230 million Africans will be facing water scarcity, and up to 460 million will be living in water-stressed areas.

Agriculture is a main source of income for almost half of the continent's citizens and it is also the largest user of freshwater. African countries are also reliant on agriculture to maintain and increase gross domestic product and to preserve food security for citizens. With droughts increasingly becoming the norm in recent years, the focus is on helping to solve water scarcity with responsible water use for farming. One approach is to introduce technologies that support sustainable irrigation, to help prevent water sources from being depleted in a way that will negatively affect water availability for both current and future generations. This means reducing water wastage, consumption and pollution, while irrigating only to the demands of the planted crop.

Water is often wasted due to unnecessary irrigation (over irrigation) and poor drainage causing runoff. Accurate irrigation scheduling requires continuous soil moisture monitoring to make the informed real time decisions.

Until recently, remote regions with no access to reliable wireless connectivity relied on physical site visits to collect soil moisture data. But now, with terrestrial and satellite connectivity, it is possible to bring continuous data monitoring to remote locations. This allows soil sensors to send their latest data so that users can make

informed irrigation decisions based on near real-time, reliable moisture readings. When combined with environmental data including temperature, humidity and rainfall, the information can also be used to predict crop water demand and even monitor metrics such as chill units to help predict flowering in many crops.

Over the past few years, Wyld Networks has been working with South African company DFM Technologies to connect soil moisture and weather station sensors to low Earth orbit (LEO) satellites. The soil probes measure moisture content and temperature readings at six depths in a soil profile as well as measuring surface temperature.

Data collected from DFM sensors are transmitted to terrestrial networks if available or to the LEO satellite network via the Wyld Connect range of low-power, sensor-to-satellite LoRaWAN® terminals and modules. With 100% global coverage, it means that this data can be collected from even the remotest of locations. Through continuous soil moisture and environmental logging, farmers can prevent over and under watering, reduce unnecessary crop stress, promote root development and improve fertilizer uptake.

DFM is currently working on a number of exciting projects to improve irrigation and reduce water scarcity. For example, it has helped farmers to reduce pasture water requirements and cut carbon emissions associated with irrigation, to meet carbon neutrality goals.

In another project, DFM has implemented precision irrigation to avoid water and fertilizer wastage as well as reduce plant stress on a strawberry farm by only watering when needed. By using continuous data and taking the guesswork out of irrigation scheduling, the farm has achieved a 50% saving on water for irrigation. Another big benefit is that soil health is so much better and fewer plants are lost to soil pests.

Date palms have expansive and complex root systems with four zones, which require accurate irrigation management. The first zone is a respiratory root system, while the second zone is used predominantly for nutrient uptake by the palm. The third root zone is focused on water uptake and reaches from 1.5-1.9m in depth. Deeper than 2m is a fourth zone, which is highly adapted to the depth of the water table. DFM has produced solar powered soil moisture probes made up of 18 individual sensors to detect soil moisture at every 10cm. By collecting this data via terrestrial and satellite links, irrigation can be monitored and controlled with pinpoint accuracy and tailored to the requirements of each specific root zone.

Satellites are the only way to provide 100% global coverage, but there is a range

of connectivity options across licensed and unlicensed spectrum.

Wyld, uses LoRaWAN, the Low Power, Wide Area Network (LPWAN) protocol in the unlicensed spectrum. LPWAN communicates at significantly longer ranges and with a much lower power consumption than cellular or WiFi options, and LoRaWAN enables affordable, seamless connectivity to private terrestrial networks as well as satellite networks.

The LoRa Alliance® - an open, non-profit association with the mission to support and promote the global adoption of the LoRaWAN® standard – recently upgraded its guidelines to include Long Range Frequency Hopping Spread Spectrum (LR-FHSS) data rates for the LoRaWAN® standard. LR-FHSS enables reliable low power data links directly from sensors to satellites. ■

Looking ahead: The sensor-to-satellite ‘revolution’ is still in its infancy, and we have only just scratched the surface of its potential. Importantly, it overcomes the two key barriers – global coverage and affordability – to help address some of the more demanding environmental and agricultural challenges lying ahead. Away from farming and irrigation, Wyld is also working with Swiss-based Miromico that is involved in other satellite IoT projects in Africa. These include:

- Tracking of raw material supply chains from the mine to the electric car factory using multiple wireless technologies
- Engineering and component supply for high-tech safety equipment used in mining
- Wildlife tracking across different countries, regions and national parks, to track animal species from tiny birds up to rhinos and elephants.
- Tracking and Trace for cars and goods
- Custom large-scale smart-farming and predictive maintenance system.

Sensor-to-satellite is also starting to have a major impact on energy and utilities. For example, oil and gas pipelines cover millions of kilometres across the world and are vulnerable to leaks and corrosion caused by weather erosion, natural disasters and usual wear and tear.

Collecting data from these remote locations and over huge distances often requires energy companies to take in-person measurements if there is no wireless connectivity. But with LEO satellites that can collect data from IoT sensors, issues can be identified in near real-time to avoid operational problems and unplanned downtime. By enhancing network visibility, through collecting data, monitoring and conducting predictive data analytics it is possible to detect faults and manage utility assets and networks more effectively.

With global reach, satellite connectivity is transforming the future of the IoT and opening up exciting opportunities across Africa and the rest of the world.



Dawie de Wet,
CEO of Q-KON Africa,
chief Engineer of Ttwoobii

We need to note that 2022 was the year that marked the beginning of a new paradigm. During 2022, the opportunity was created for satellite technology to transition from being a connectivity option of ‘last-resort’ off-grid rural applications to taking a front row seat as a primary connectivity option for multiple applications.

With the NewSpace developments in LEO, MEO and GEO, satellite services have exorcised the myths that satellite connectivity is slow, expensive and has a latency problem. Services being introduced by OneWeb, LightSpeed, mPower and others have firmly established an updated expectation of what satellite connectivity can provide.

Research done by Statista and published in February 2021, shows that nearly 56% of the population in sub-Saharan Africa has been reached by fibre networks. In absolute numbers, 620 million people now live within 25km of an operational fibre optic network node. That still leaves some 44% of the population of sub-

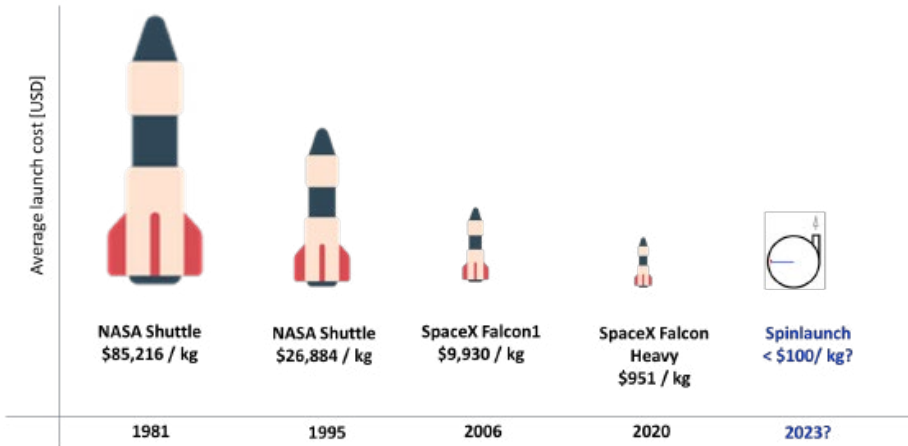
Saharan Africa having to rely on mobile networks or local wireless ISP services instead.

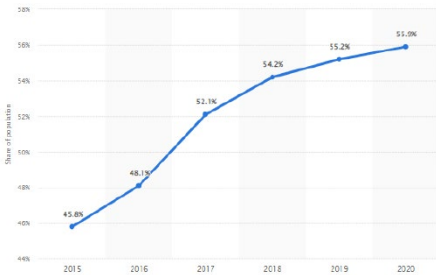
Africa’s connectivity needs are still largely un-serviced, especially if we exclude niche and specialised services for the aero and mobility sectors. It is this un-serviced market that has the potential for industry innovation and for implementing the new space services that have taken root during 2022.

Spinlaunch have continued with their innovative centrifugal launch technology to further reduce the \$/kg launch costs. They have now successfully broken through the symbolic \$100/kg barrier. This represents a massive drop from the NASA Space Shuttle cost of \$85,216/kg back in 1981 and is just 10% of the current \$981/kg cost of SpaceX Falcon Heavy launches.

During 2022 the discussion moved on from “if” to “when.” It is no longer a question of “if” LEO and MEO services will be feasible and enter the market; rather, it is now simply a question of “when” these services will enter the market.

The traditional GEO satellite space industry has moved from a ‘spectator’ role to being an active participant. Eutelsat, SES and Intelsat have all announced partnerships, collaborations or development projects with various LEO





technology providers.

Notably, Starlink maintains its established position as an autonomous NewSpace satellite operator with a direct-to-market channel approach. During 2022, licenses were granted to Starlink for operations in Nigeria and Mozambique with services expected to be active from quarter four in 2022 or early 2023.

Developments have also continued in the GEO constellation field, with Viasat and Intelsat both developing next generation, software-defined satellite constellations. Viasat initially planned to launch their first Viasat-3 satellite in quarter four of 2022 over the Americas. This would have been the first phase in the implementation of a global signal coverage network provided by three satellites, each with an estimated capacity of 1Tbps. The launch of the first Viasat-3 satellite is now scheduled for early 2023.

These are just some of the key NewSpace

waypoints that have already been reached in 2022, all of which mark turning points in the New Space industry discussion. 2022 has proven to be the pivot point.

For Q-KON Africa, 2022 was the year we successfully reached capacity on phase 1 of the Twoobii Smart Satellite Service. Our Smart Satellite Services product strategy has proven to be very successful with an excellent response from both the financial sector and enterprise users with SD-WAN applications. As a Smart Satellite Service, the Twoobii platform can support real-time applications such as video surveillance, and also offers customer-friendly, content-aware smart billing models – and that’s a great cost-win for end users.

Twoobii is now the preferred service provider for four of the largest commercial banks in South Africa for point-of-sale (POS), ATM and bank branch connectivity. The Twoobii team has demonstrated our understanding in this market sector, and we look forward to start introducing NewSpace services into the Twoobii Smart Satellite Services portfolio.

2022 has also contributed to our experience and updated understanding of the business case metrics that will be required to successfully deliver NewSpace, Smart Satellite Services to the African market. ■

Looking ahead: While being aware that we can’t simply predict or forecast the future, we can share.

Firstly, the continued development and introduction of NewSpace services leading to inaugural commercial activations and a possible first customer network deployment. In particular, OneWeb, SES mPower and Starlink will commence service deployments during 2023 - initially at market demonstration levels, then rapidly progressing to full commercial rollouts.

Secondly, the industry will start adapting to the new

technology landscape through universal changes to business at all levels. The drive to successfully deliver NewSpace services in Africa will oblige mainstream satellite operators such as SES, Intelsat and Eutelsat to review and reconsider their positioning as wholesale providers, to licensed regional service providers. The availability of space capacity at Tbps-levels will enable different industry structures and start addressing the current dilemma; namely, that satellite services are too small for the large telcos and too big for the regional service providers.



Doreet Oren,
senior director product and solution
marketing, Gilat Satellite Networks

Gilat Satellite Networks globally executes its vision of calling for the right of all people to be connected. Sub-Saharan Africa is an important continent where Gilat is proud to enable broadband connectivity to the most remote regions.

The COVID-19 pandemic taught us and emphasized the dramatic difference between those who are connected and those who are not. The inequality and digital divide became more pronounced as areas lacking connectivity suffered more in all walks of life.

Online health services were not available to those who are not connected, and the lockdowns which attempted to control the spread of the virus affected business, education, and social interactions. The ability to maintain such basic activities was severely hampered or lost completely due to the lack of broadband connectivity. We now understand even more clearly and hear additional voices declaring internet connectivity as a basic human right.

During 2022 Gilat saw a surge of post-COVID-19 activity in establishing reliable, affordable communication in rural areas. Gilat is the global leader in cellular backhaul over satellite with about 75% market share in 4G networks.

Gilat works closely with telcos and mobile network operators (MNOs) to extend terrestrial networks beyond the reach of fibre to areas where it is not feasible or prohibitively expensive to lay out terrestrial infrastructure. Satellite backhaul provides a cost-effective solution to rapidly grow the network to reach the unserved or underserved.

In serving sub-Saharan Africa, Gilat is a longtime partner of Africa Mobile Networks (AMN). AMN operates the largest satellite cellular backhaul

network with Gilat's SkyEdge II-c platform enabling coverage extension to a dozen countries in sub-Saharan Africa. The network serves Tier-1 global MNOs allowing reach to new subscribers and better service in the most rural regions.

This year, with the growing demand in Africa, Gilat collaborated with a cellular/wireless network provider, who already operates in several countries in Africa. Powered by Gilat's cellular backhaul over satellite solution, additional coverage will be provided to the rural regions in Africa.

Furthermore, we have been working closely with our partner, Intelsat, and closed a multimillion-dollar deal to answer the connectivity needs in the DRC. Congo is the second-largest nation

"Online health services were not available to those who are not connected, and the lockdowns which attempted to control the spread of the virus affected business, education, and social interactions. The ability to maintain such basic activities was severely hampered or lost completely due to the lack of broadband connectivity. We now understand even more clearly and hear additional voices declaring internet connectivity as a basic human right."

in Africa with over 90 million residents, with a tremendous need for connectivity, and where a terrestrial solution is not an option. Here, Gilat's SkyEdge II-c platform will provide cellular backhaul over satellite starting with about 1,000 remote sites of a Tier-1 MNO.

Gilat's cellular backhaul technology is widely chosen due to the following factors:

- Fast and reliable for cellular coverage extension, emergency response and business continuity
- End-to-end encryption with patented layer 2/3 embedded acceleration achieving 1Gbps to the handset
- Enabling advanced edge computing for IoT

- aggregation and caching in remote 5G networks
- Satellite network integration with cloud infrastructure and SDN/NFV core for simplified operations
- SkyEdge IV Aquarius VSATs with > 2Gbps throughput for demanding 5G applications
- Extending 5G private networks to any location

Gilat has been leading the satellite communication market for over 35 years, with innovative technology operating in all regions of the world. The cross section of global expertise, local presence, vast experience working with MNOs and outstanding support and delivery capabilities makes Gilat an ideal match for its partners in Africa. ■

Looking ahead: The satellite industry is undergoing tremendous innovation and change. The launch of non-geostationary (NGSO) constellations, very high throughput satellites (VHTS) and highly configurable software defined satellites are offering the industry unprecedented increases in bandwidth and flexibility. But while these new satellites and digital payloads offer a profound step up in capability, they are also introducing far more complexity, and growing the need for ground-breaking deep technology and tight integration between ground and space.

Disruptive innovation is required to provide the needed higher throughput and flexibility. A major enabler of this revolution is the ability to provide orchestration and harmonization between the ground equipment and the whole new software defined space. This was the driving force in the development of SkyEdge IV, Gilat's latest ground segment technology. SkyEdge IV is a multi-orbit, multi-service platform that enables, together with software-defined satellites (SDS), the creation of programmable software-defined networks (SDN) that support on-the-fly changes

to optimally address dynamic network changes.

SkyEdge IV is a multi-service platform providing solutions for multiple applications required in sub-Saharan Africa and the MENA (Middle East North Africa) region. Gilat sees an increase in the need for cellular backhaul over satellite to reach the rural and ultra-rural regions and expects to continue to provide this required need for connectivity. Gilat also sees a renewed interest in education projects, sponsored by governments and others, to increase school connectivity and promote e-learning opportunities for a growing need of the population.

Gilat has already teamed up with the satellite operators such as SES and Intelsat to deliver on the promise of the next generation of satcom. Gilat's SkyEdge IV platform was selected by SES as the ground segment for the O3b mPOWER constellation and is working together with SES to bring upon the successful launch next year. Gilat is excited to be working next year with its partners to fulfill its vision of the right of all people to be connected.



Libby Barr,
COO, Avanti Communications

A quarter of the world's population is predicted to live in Africa by 2050, and Avanti is perfectly placed to unlock this growth. However, connecting those in ultra-rural areas presents its challenges. These locations tend to be off the grid and miles away from infrastructure.

When it comes to rural connectivity, one of the biggest barriers MNOs face is a lack of infrastructure and terrestrial networks. Traditionally, large telecommunications towers are used to connect dispersed populations, but this takes time, it's expensive, and requires a level of infrastructure ultra-rural areas cannot support. Avanti has introduced connectivity to hard-to-reach areas by partnering with companies to install small, more efficient towers on the outskirts of remote villages which are designed to cover a couple of kilometers, in contrast to the large towers that can cover 50km.

Our partnership with Clear Blue Technologies has significantly accelerated the rollout of low-cost connectivity solutions in some of the hardest-to-reach areas across sub-Saharan Africa. In the past year we have connected 550 sites and we plan to connect a further 2,000 in 2023 covering Nigeria,

West Africa, South Sudan, Ghana and South Africa. We are also the only Ka-band satellite provider with gateways in Nigeria, Johannesburg and Senegal.

In 2023 we will see the continuance of many of the trends that have existed over the last few years. It is likely we will see consolidation, particularly between the larger GEO operators with significant mature broadcast and C-band services. We also anticipate further consolidation as operators start to move down into channel to get closer to customers and develop solution and distribution capabilities. There is a large amount of existing and planned satellite capacity which may be hard to monetize. This is an area where we believe Avanti holds a critical capability lead for our key market sectors in carrier, education, and government services and, in particular, in Africa.

In addition to our growth in African infrastructure, capacity, and coverage, 2023 will see significant increase in deployments of our EXTEND offering, a managed service for rural connectivity. Avanti has huge internal focus on continuing the development of this service throughout 2022, ensuring we have the right systems, processes, people and partnerships in place in country to support our customers. Managed services for rural Africa are a challenging solution to crack, but we have a proven service which is scaling and poised for huge growth. ■

Looking ahead: The first part of 2023 sees the expansion of our network with our own HYLAS fleet, through the commissioning of our Senegal gateway, as well as serving new capacity across West Africa to Senegal.

This will be Avanti's third HTS gateway in Africa. Our approach as a Ka-band HTS operator with African gateways for African capacity on our fleet is unique, bringing huge benefits to our partners and end users in terms of technical integration, security, and geopolitical

aspects.

Our new partnership with Turksat will expand our coverage even further into Northern Africa and the Horn of Africa, as well as adding depth of capacity to our existing African footprint.

What sets us apart, in addition to our technology, is the presence we have on the ground. We have offices and expanding teams in Kenya, Nigeria and South Africa which means we can react quickly to local opportunities.



Paolo Pusterla,
managing director EMEA, ABS

At ABS, we are seeing some growth opportunities in Africa. We have actively set up managed platforms in close association with our partners in the region to provide quality and effective services to MNOs and service providers across the continent.

We have also managed wherever possible to offer solutions both over Ku and C band

“We see more collaborations and synergies as a way forward. We work closely with partners and vendors across the value chain, notably hub vendors and system integrators. We are ready to invest to deploy hub platforms in various African countries to create domestic networks that could be used for government and mobile operator applications.”

payloads, thus maintaining legacy installed base and at once keeping high quality and availability of service.

The COVID-19 pandemic has brought almost a paralysis to many countries; the lead time to deliver equipment and access to remote facilities has reached untenable levels. More recently business has restarted but there is still some inertia in the supply chain and in the logistics.

Some key markets seem to be emerging with important opportunities particularly, Ethiopia and Mali. We also see school/education programs gaining momentum across Africa. Backhauling continues to be a growing market.

We see more collaborations and synergies as a way forward. We work closely with partners and vendors across the value chain, notably hub vendors and system integrators. We are ready to invest to deploy hub platforms in various African countries to create domestic networks that could be used for government and mobile operator applications.

At ABS, we are keen to deploy our resources in emerging markets like Africa, India, Indonesia and the Philippines.

For Africa, we have enough capacities on Ku and C frequencies to meet increased demand for wide beam coverage. We shall continue with our strategic partnerships to build local and international gateways to connect schools, hospitals, government entities, NGOs and MNOs. ■

Looking ahead: Over the last few years, we have seen an oversupply of capacities in Africa thereby putting pressure on prices. The big operators have been running short on wide beam capacities recently which is forcing a rise of prices in the industry for such services.

Carrier-grade type of services will remain key

for MNOs and high-end service providers, whereas some lower segments of the market will be captured by the NGSOs' services.

ABS still believes in the quality that GEO satellites can provide to service providers to serve the needs of corporate and governmental networks in the continent.



Alexandre de Luca,
president enterprise, energy and
government, Marlink

Our experiences and observations of the satellite market in Africa over the last 12 months can be summed up as a continued development of the trend observed since the pandemic.

Enterprise users, whether they are NGOs, IGOs or energy and mining companies are combining increased demand for higher throughput with a move from physical, local assets to cloud-based network solutions.

Companies and their employees operating in remote areas are seeking to maintain a high degree of connectivity but reduce their exposure to large, complex installations. Access to the internet is key to the efficiency of their operations and the ability to use heavyweight applications via the network brings them a 'lean advantage.'

Installing IT environments in remote locations comes with layers of risk; for oil and gas or mining customers, downtime is dollars and for NGOs and governments, uptime is everything. For remote users who rely on contact for safety and operational reasons, a watershed has been passed in terms of what satellite users expect from connectivity providers and how the providers respond to the challenge.

Looking ahead: Our expectations for next year are for continued interest in what 'new LEO' or 'non-Geo' satellite constellations will bring in terms of throughput enhancements and further reductions in latency. Earlier this year we introduced agreements with SES on MEO capacity, and recently we signed up to deliver both OneWeb and Starlink new LEO capacity, so there will soon be more data on what users can expect once these services are available.

Cloud computing and higher levels of mobility have redefined how users see mobile networks. By understanding what these changes mean and responding with new solutions, connectivity and network providers can deliver higher throughput with lower latency over a stabilised and optimised link. Replacing local physical networks with a virtual network, designed from the ground up around user needs has come to be seen as the natural choice. We are increasingly being asked to manage the network, infrastructure, software, and hardware on the customer's behalf.

For solution providers demand is increasing for optimized hybrid network solutions combining satellite (primarily VSAT), fibre and cellular connectivity to remote and local offices or to interconnect specific sites. This extends the range of available digitally managed services such as VoIP and video conferencing, enterprise resource planning and other office applications to ensure secure access to corporate data centres, cloud services platforms and headquarters to further streamline mission-critical operations for help organisations.

Marlink supports this digital enablement by providing value added services, including extended demarcation points to enable software-defined network operations (SD-WAN) and cloud services. By enabling more data handling and processing at remote locations, traffic can be prioritised, and bandwidth can be more optimally utilised for faster application performance. ■

In the meantime, we expect to see an increasing application of hybrid connectivity services comprising GEO, MEO and existing LEO signals together with 4G to deliver the increasingly complex demands of NGOs, governments and energy/mining customers. This demand requires skills of orchestration and curation; our customers require partners that can deliver regardless of location or application requirement, and we expect that demand to continue.



Ralf Schmitz,
chief commercial officer,
AXESS Networks

When many companies were pulling back their sales operations due to COVID-19, we increased our presence in Africa, particularly, in Central, West and Southern Africa. Our activities are now picking up momentum. We have seen solid business growth within the government and enterprise market spaces.

Unpredictable payments due to government restrictions and international money control issues have been some of the biggest challenges this year. We have also seen delays in payments due to volatile rate of exchange between local currencies and the US dollar. COVID-19 has added strain on shipping and delivery schedules resulting in delays of equipment which ultimately led to delays of customer project implementations.

In terms of emerging opportunities, we see mobile network operators (MNOs), oil & gas, and mining companies that require network reliability. MNOs require coverage expansion at minimal network hops to rural communities. For both the oil & gas and mining industries, we see

increased digital transformation, specifically the merging of information technology with operations technology, being able to view and manage critical applications remotely. Connectivity remains the backbone of digital strategies, and it must be robust and hardened.

We are seeing more schools coming online. International NGOs are actively bridging any gap (digital, physical even health). On the business strategy front, we have noticed increased strategic partner alliances, thus leveraging on each partner's strengths.

Our customers remain at the centre of everything we do. We have created a platform to hear more from our customers and will shortly be launching our next annual customer satisfaction survey. The results allow us to make step changes in our operations with the aim of continuously delighting our customers - the way we build and managed our products and services, the way we serve them and the way we contract with them.

We will build on our revenue growth in mining, oil & gas, and NGO/government space, and we will continue to increase our presence and position regionally and in our various vertical markets. We will also leverage more strategic partnerships to increase the value proposition to our customers. ■

Looking ahead: During the past 12 months, we have seen a gradual increase in businesses returning to normal. Customer and prospect budgets are currently being finalised and we anticipate increased business opportunities.

Some of our objectives are to: increase customer value and growth; increase shareholder value; and protect current business. We will continue to increase the quality and quantities of project contracts.

We are moving closer to international NGOs

and governments, as they are moving forward on deploying the broadband strategies and plans in Africa. With our current success rates, rolling out connected schools in rural communities, we are confident more international agencies and government organizations will entrust AXESS with their projects.

Through our innovation centre, we are building expertise in MNO, mining operations, education, and telemedicine beyond just connectivity.



Pieter Paul Mooijman,
regional vice president, Africa, ST
Engineering iDirect

Africa is a key region for ST Engineering iDirect and we continue to work, as we always have, to connect the unconnected.

People and businesses increasingly use the internet for a multitude of different reasons – from providing mission-critical links in the event of a disaster to enabling news broadcasts and public service information to remote communities.

Our technology is helping service providers across the continent to provide all of this. For example, this year one of our longstanding customers, InterSAT Africa underwent a significant technology upgrade to its existing Evolution platform, enabling it to leverage new technologies and efficiencies to remain competitive in an increasingly challenging market.

“Cost-effectiveness is of paramount importance in the market and there is no one-size-fits-all technology to meet this diverse continent’s connectivity requirements. A blend of technologies (satellite, terrestrial, cellular, and wireless) will enable the most cost-effective and scalable communications solutions.”

Cellular has been one of the main drivers of Africa’s tech growth. We have seen a significant increase in that area as well as a steady migration from 2G to 3G and 4G. Obviously, 4G provides more flexibility and efficiency. And with respect to IP, there’s an increase in data utilization.

More and more people in rural areas are embracing and utilizing connectivity. That’s why we’ve been developing tools such as Mx-DMA MRC (multi-resolution coding) which brings the full scalability of TDMA return technologies to SCPC-like efficiency levels and enables service providers to cover a myriad of use cases without making tradeoffs between speed, efficiency, scale, and cost.

The region continues to face challenges, from legislation to the high cost of adoption of new technologies. Governments and commercial companies in the ecosystem are trying to improve this. We need to strengthen all these aspects as one ecosystem so we can focus on reducing the end customer cost which would allow for wider and faster adoption of connectivity for the unconnected. There is still a lot of work to do in the region.

As we are moving into a new era of satellite connectivity, the networks are becoming much more complex which means that more investment is needed and more technical skills are required in the workforce; these are difficult to find in Africa as there is a major shortage of qualified engineers.

Africa represents a huge opportunity for satellite technology. Over half of the population still remains unconnected and there is massive pent-up demand. The majority of people access the internet on a mobile device so the ability to enable MNOs to deliver cellular services to both urban and remote regions is only going to increase.

Cost-effectiveness is, of course, of paramount

importance in the market and there is no one-size-fits-all technology to meet this diverse continent's connectivity requirements. A blend of technologies (satellite, terrestrial, cellular, and wireless) will enable the most cost-effective and scalable communications solutions.

Another important trend we have noted is OTT which is growing in demand. It can be challenging to deliver a high QoS, even in urban areas due to an increase in demand at peak times. This is because even with developed infrastructure in place, there is inadequate bandwidth capacity to meet this population's broadband needs.

The inexorable rise of the smartphone has also been key this year – acting as not just a phone but a TV, a bank, and a source of important information to people. Because of this, demand for data continues to rise exponentially.

HTS satellites are also driving down the cost-per-bit of satellite connectivity. And although more affordable connectivity via satellite does already exist in Africa, it is constantly evolving, and the industry is innovating to improve affordability to reach more customers.

The price point of satellite antennas has been falling as has the size of antennas, reducing shipping costs and import duties. That said, further technological innovation will

“The price point of satellite antennas has been falling as has the size of antennas, reducing shipping costs and import duties. Further technological innovation is required to bring the cost of terminals down to acceptable levels.”

be required to bring the cost of terminals down to acceptable levels.

Cellular backhaul will continue to be a primary focus for us in the region. We are currently working to meet the requirements of regional MNOs that are moving away from managing and maintaining their own infrastructure. This is to reduce cost as managing your own infrastructure is complex and expensive and it is not the core experience of an MNO.

We will also continue to enable more African businesses, organizations, and core services such as healthcare and education to operate more effectively and reach communities that they need to through our technology. ■

Looking ahead: Satellite cellular backhaul is going to continue to be a critical part of Africa's connectivity portfolio.

There is a focus on enabling the continent to move from 2G to 3G and even 4G services. 5G is still in the future for Africa, but there are signs of its adoption in countries such as South Africa where the government has issued a temporary 5G frequency license.

New 5G applications are emerging that fit very well with the African market, such as IoT for agriculture, telemedicine, and industrial augmented reality. As

demand grows for these applications MNOs will need to rely on satellite to increase the reach and reliability of their services, and they'll need to leverage newer LEO, MEO, and GEO constellations for increased coverage and performance.

It is thought that 5G will become the new standard. It will revolutionize how things are processed and how people stay connected. One thing we should seek to do on the adoption of 5G is to work on coverage and affordability. People should be able to gain affordable access to technology.



Rhys Morgan,
VP - general manager, EMEA media
and networks sales, Intelsat

At Intelsat, our mission is to help extend coverage to more people across the continent. Our team of highly qualified sales and technical professionals in Johannesburg, Nairobi, and Dakar as well as people on the ground in the Democratic Republic of Congo (DRC), respond to the continent's connectivity needs by working closely with our customers and partners to develop innovative solutions, new business models, and creative partnerships. This has been the basis of our success since we were first founded in 1965.

After opening three new customer operations centres, launching new satellites, and growing our commercial aviation business, the past year proved a transformational for us. Intelsat leveraged these next-generation capabilities to widen our network and service strategy, serving customers every day with the excellence for which we are known.

As the foundational architects of satellite technology, we never stop pushing the boundaries of innovation. Our ultimate goal is a world with ubiquitous connectivity and no communications boundaries. To make that a reality, we're investing over US\$2 billion to build the world's first truly global and unified 5G network. Intelsat's unified network will set the standard in 5G connectivity and uninterrupted global broadband service with unrivalled coverage, economics, and performance.

Our commitment to empowering Africa never stops. We are encouraged by the initial results of our partnership with MaxIQ Space in Africa in delivering space-focused STEM learning tools to teenagers across the African continent. Sparking that tech interest at such a young age inspires future leaders who will soon lead the way with advancements we never dreamed possible.

Mobile networks remain the only form of internet access for many people, underlining the urgency to identify solutions to accelerate mobile internet adoption and use. Though the coverage has significantly improved in the region in recent years, sub-Saharan Africa still has the largest mobile broadband coverage gap, according to a recent report from GSMA. In 2021, one in five people in sub-Saharan Africa lived in an area without mobile broadband coverage, representing an estimated 210 million people.

As the world emerges from the pandemic and social and economic activities begin to recover, connectivity will continue to play a vital role in how people live, and businesses operate. This is particularly true for Africa, where the impact of internet connectivity on economic development is significant, and the pandemic emphasised the inequalities in access to digital coverage prevailing across the continent. The World Bank estimated that a 10% increase in mobile internet penetration in Africa could translate to a 2.5% increase in the gross domestic product (GDP); thus, Intelsat's connectivity solutions play a significant role in ensuring inclusive and sustainable development.

Closing the digital divide requires multi-stakeholder partnerships. Our hybrid solutions that combine satellite solutions, subsea, and terrestrial infrastructure prove to connect more businesses, people, and communities across the continent. Although subsea internet cable access plays a role in that development, they are not a viable option for land-locked interior countries. Satellites have always supported service providers in Africa, expanding their network coverage and improving the profitability of their networks considerably.

Intelsat is a leader in innovative solutions. We always believed that a fresh approach, fully integrated hybrid networks, new business models, and creative partnerships would be essential to accelerate the build-up of a robust network

infrastructure that would provide an excellent foundation for endless opportunities in Africa.

Intelsat CellBackhaul, our end-to-end managed service, enables MNOs to quickly and cost-effectively deploy their 2G/3G/4G network infrastructure into unreachable areas. They can overcome the cost, complexity, and ROI barriers historically hindering reliable, quality coverage everywhere, even in hard-to-reach rural and remote areas. For example, Intelsat and Ragasat's partnership has made it possible for service providers and mobile operators in DRC to expand their network coverage countrywide, swiftly connecting more subscribers, land areas, roadways, and IoT devices with minimal investment.

Intelsat specializes in building mobile network base stations serving rural communities in sub-Saharan Africa, where there is no existing service, providing existing licensed mobile network operators with a CAPEX-free route to roll out. Today, AMN operates 2,000 mobile network base stations in rural towns and villages spanning ten countries, serving about 7 million previously unconnected people and processing an average of 1.2 billion

phone calls yearly. We are a trusted source among Africa's leading mobile network providers, working to extend their networks, connecting remote, urban, semi-urban, and ultra-rural populations. We serve over 100 MNOs globally with satellite-based backhaul services, including Africa's top 10 mobile groups.

Banking, mining, oil, and gas industries, government organizations, and private and aid-oriented agencies depend critically on their ability to distribute information to and gather information from remote places. They rely on Intelsat's simple and accessible solutions.

Intelsat is the first choice for video distribution in Africa through seven prime video neighbourhoods and is well-versed in viewer preferences and habits in this market.

African and international broadcasters can grow their audience and reach nearly 45 million TV households with IS-20, the most watched media location in Africa, and connect with viewers in emerging markets such as Nigeria, Ghana, Tanzania, Ethiopia, and Kenya. ■

Looking ahead: At Intelsat, we're continuously working on developing and implementing new ways to address the need for broadband and mobile connectivity.

We continue to lead the industry in innovation with the world's first fully global and unified 5G network. Combining our extensive terrestrial infrastructure with the power and agility of Intelsat's multi-layer, multi-orbit, space-based network enables seamless connectivity to keep innovation moving forward for our customers.

Our unified network will set the standard in 5G connectivity and uninterrupted global broadband service with unrivalled coverage, economics, and performance, with 12 satellites already in production, including four software defined satellites.

For customers, that will mean getting the exact

bandwidth they need, when and where they need it - with the ability to quickly scale their existing services to meet traffic spikes. Mobile operators will also quickly and efficiently extend to even more subscribers and provide an optimal roaming experience.

Robust connectivity available across the entire continent is essential to address the significant development challenges of the continent and will help enhance productivity, competitiveness, and economic diversification.

Together with our partners, we are committed to driving digital inclusion in Africa.

We believe in a connected Africa where rural communities will get access to healthcare, education, and financial services, for an improved quality of life, and that's why we are working on the infrastructure of the future.

ABS

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ABS creates and delivers innovative services that meet current and future customer demands. It delivers satellite communications connectivity for video, data, and telecommunication services globally through a fleet of five satellites: ABS-2, ABS-2A, ABS-3A, ABS-4/Mobisat-1 and ABS-6 serving over 180 countries. From broadcast, data, government, mobility and ABSPlus value-added services, ABS ensures essential delivery for a broad spectrum of satellite communications requirements.

For more information, please visit www.absatellite.com

**Delivering
reliable satellite
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**Your mobility/
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**Broadcast solutions
- Grow your
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**ABS satellite-
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We are a highly customer focused satellite organisation. We have the ability to connect more than one billion people across Africa, Europe and the Middle East, whether you are on land, at sea or in the air. We have managed services which deliver seamless integration with your networks and our hybrid network gives you and your customers the world's most reliable satellite connectivity.

**Managed
service for rural
connectivity**

Carriers expertise

Satellite backhaul

**Avanti
Communications**



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Energy

Telcos

NGO/Government

Business

AXESS Networks is a global leader in satellite telecommunications solutions. The company manages the entire satellite communications value chain with engineering solutions tailored to its customers' requirements from a broad range of industries: Oil & Gas, Mining, Telecommunications, Maritime, Corporate, Media, Government and Humanitarian Services.

Founded in 2019 via the merger of Axesat and CETel, two well-established companies in Europe and Latin America, it operates and owns teleports in Germany, Colombia, Mexico, Peru, Saudi Arabia and the United Arab Emirates (UAE).

AXESS Networks offers an exceptional quality of service to its customers wherever and whenever they need it: on 8,000 sites, in more than 50 countries, on four continents. A dedicated team of over 200 employees serves more than 800 customers with deep market understanding.

To learn more, visit www.axessnet.com and follow AXESS on LinkedIn: www.linkedin.com/company/axessnetworks/



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About Us

Services

Channels

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Es'hailSat, the Qatar Satellite Company, was established in 2010 to deliver satellite services to broadcasters, telcos, enterprises and governments in the MENA region and beyond.

With a goal to be a truly global satellite operator and service provider, Es'hailSat commenced operations with Es'hail-1 in 2013, supporting key broadcasters, beIN Sports and Al Jazeera Media Network. Es'hail-2, the company's second satellite was launched in 2018 and is co-located with Es'hail-1 at the MENA hotspot of 25.5°E/26°E orbital location. Es'hailSat's high-powered satellites with Ku-band and Ka-band capabilities, provides the region with advanced and sophisticated services.

Es'hailSat's Teleport in Doha provides satellite Telemetry, Tracking and Command (TT&C) operations and capacity management, along with teleport services such as uplink, downlink, contribution, multiplexing, encoding, payout, VSAT services, hosting services, data centre and other services.

Es'hailSat plans to expand with newer satellites in other prime orbital locations around the globe, offering customers the most flexible and reliable services.

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**Leading the Elastix
Space Era**

SkyEdge IV

Cellular Backhaul

Enterprise

Gilat Satellite Networks Ltd. (NASDAQ: GILT, TASE: GILT) is a leading global provider of satellite-based broadband communications.

With over 30 years of experience, we create and deliver deep technology solutions for satellite, ground and new space connectivity and provide comprehensive end-to-end solutions and services, powered by our innovative technology. We believe in the right of all people to be connected and are united in our resolution to provide communication solutions to all reaches of the world.

Delivering high value solutions, our portfolio is comprised of a cloud-based platform and high performance satellite terminals designed to work in harmony with satellite constellations, including Very High Throughput Satellites (VHTS) and Software-Defined Satellites (SDS) in multiple orbits; high performance Satellite On-the-Move (SOTM) antennas; and highly efficient, high-power Solid State Power Amplifiers (SSPA) and Block Upconverters (BUC).

Gilat's comprehensive solutions support multiple applications with a full portfolio of products to address key applications including broadband access, mobility, cellular backhaul, military, government, and enterprise, all while meeting the most stringent service level requirements. For more information, please visit: www.gilat.com or follow Gilat on [LinkedIn](#), [Facebook](#) and [Twitter](#). Contact us [here](#)



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Broadband

Cellular Backhaul

Community Wi-Fi

**Multinational
Networks**

Hughes Network Systems, LLC (HUGHES), an innovator in satellite and multi-transport technologies and networks for more than 50 years, provides broadband equipment and services; managed services featuring smart, software-defined networking; and end-to-end network operation for millions of consumers, businesses, governments and communities worldwide.

The Hughes flagship internet service, HughesNet®, connects millions of people across the Americas, and the Hughes JUPITER™ System powers internet access for tens of millions more worldwide. Hughes supplies more than half the global satellite terminal market to leading satellite operators, in-flight service providers, mobile network operators and military customers.

A managed network services provider, Hughes supports more than half a million enterprise sites worldwide for customers ranging from petroleum retailers to financial institutions to mobile network operators. Headquartered in Germantown, Maryland, USA, Hughes is owned by EchoStar. To learn more, visit www.hughes.com or follow HughesConnects on [Twitter](#) and [LinkedIn](#).

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Stratosat Datacom

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**High-Speed Satellite
Managed Broadband
Connectivity**

Managed Services

**Tailor-made
Communication
Network Solution Design**

**Satellite Equipment
Supply & Distribution**

Stratosat Datacom forms part of the German based SCHAUBENBURG 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 cost effective tailor-made turnkey satellite and microwave communication solutions in Sub-Sahara Africa. We have rendered products and services to the majority of Telco and Satellite Operators in Africa.

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chapter Broadband 6



Pete Bell,
research analyst, TeleGeography's
GlobalComms Database

Africa's mobile communications market continues to grow at a steady pace and take up shows no signs of slowing. Subscription numbers were up 5% in 2021, following growth of 7% the year before and 6% in 2019.

According to figures from TeleGeography's GlobalComms Database, at the end of 2021, the continent was home to 1.22 billion mobile subscriptions, up from 1.16 billion 12 months earlier. Nigeria is by far the biggest single market, with 190.6 million subscriptions at the end of 2021, followed by South Africa with 110.9 million and Egypt with 101.3 million.

Hot markets

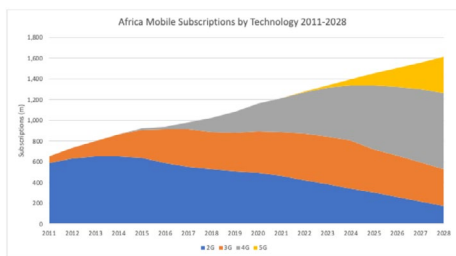
In country terms, Africa was home to almost half of the top 40 fastest growing mobile markets worldwide in 2021. Some of the strongest performers included Niger, where mobile subscription numbers rose 23% to 14.2 million, Ethiopia (up 20% to 58.7 million), Malawi (up 19% to 11.3 million), and Mozambique (up 16% to 17.3 million).

The West African nation of Niger offers good prospects for future growth, with only around 56% of the population subscribing to a cellular service at end-2021, well below the regional average.

Demand for mobile voice and data is now booming, having previously been restricted by a lack of competition, high prices, and low network coverage. Orange Group cited the country's "unfavourable market environment" as the reason behind its exit in November 2019. It is now served by four players: Airtel, Zamani Telecom (formerly Orange Niger),

Country	2021 Growth	Mobile Subs at End-2021
Niger	23%	14.2 million
Ethiopia	20%	58.7 million
Malawi	19%	11.3 million
South Sudan	17%	3.3 million
Burundi	17%	7.7 million
Mozambique	16%	17.3 million
Congo, Dem. Rep.	15%	46.9 million
Benin	14%	12.7 million
Guinea-Bissau	13%	1.9 million
Central African Republic	13%	1.9 million
Burkina Faso	12%	24.7 million
Chad	12%	9.7 million
Mauritania	11%	5.5 million
Eswatini	11%	1.3 million
Liberia	10%	3.7 million

Africa's 15 fastest growing mobile markets in 2021



Africa mobile subscriptions by technology 2011-2028

Moov, and Niger Telecoms. Airtel controls over 47% of all subscriptions.

Meanwhile, Ethiopia's mobile sector has exhibited strong growth, despite still being one of the world's few remaining monopolies, with state-owned Ethio Telecom the only player, at the end of 2021. This has changed, however, with the recent commercial launch of Safaricom Ethiopia which has brought competition to the market. The new operator is hoping to be covering 25 cities by April 2023.

The Malawi mobile market has remained a duopoly since Airtel Malawi started operations as Celtel in October 1999, when it joined Telekom Networks Malawi, which had launched four years earlier. Since 2002, the Malawi Communications Regulatory Authority has sought to introduce new competition to the sector, but none of the licensed companies proceeded with a commercial launch.

In Mozambique, Vodacom is the dominant player, with almost 52% of all subscriptions at the end of 2021, followed by Movitel with 29% and TMCEL with just over 19%.

Future expansion

There is still more room for growth regionally, with population penetration of mobile services in Africa standing at 89% at end-2021, increasing from 87% some 12 months earlier. To put this in a global context, that was more than 15% points behind regions such as Asia, the Middle East, and Latin America.

Looking ahead, mobile subscriptions in Africa are set to rise to 1.61 billion by the end of 2028, a compound annual growth rate (CAGR) of 4% for 2021-2028.

One country set to drive the future take up is the Democratic Republic of Congo (DRC), where population penetration was around 45% at the end of 2021, roughly half the regional average.

The Congolese market has vast untapped potential for future growth, but development remains hindered by many of the challenges facing similar sub-Saharan states, such as poor transport/energy infrastructure, widespread poverty, limited access to investment, weak institutions, and corruption. These barriers are exacerbated by the DRC's size, challenging terrain and dispersed and diverse population.

Technology split

4G subscriptions will soon surpass both 2G and 3G as the most popular platform in Africa. By the end of 2023, 4G is expected to be being used by almost 470 million people on the continent, just ahead of 3G.

4G and 5G growth

As 3G usage goes into decline, 4G will continue to grow in popularity, with a predicted 730 million 4G subscriptions by end-2028.

5G services have already been introduced in several African markets, in countries such as South Africa, Botswana, Togo, and Zimbabwe, plus island nations including Reunion and Seychelles.

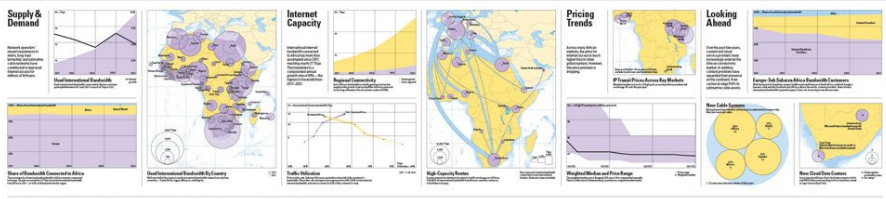
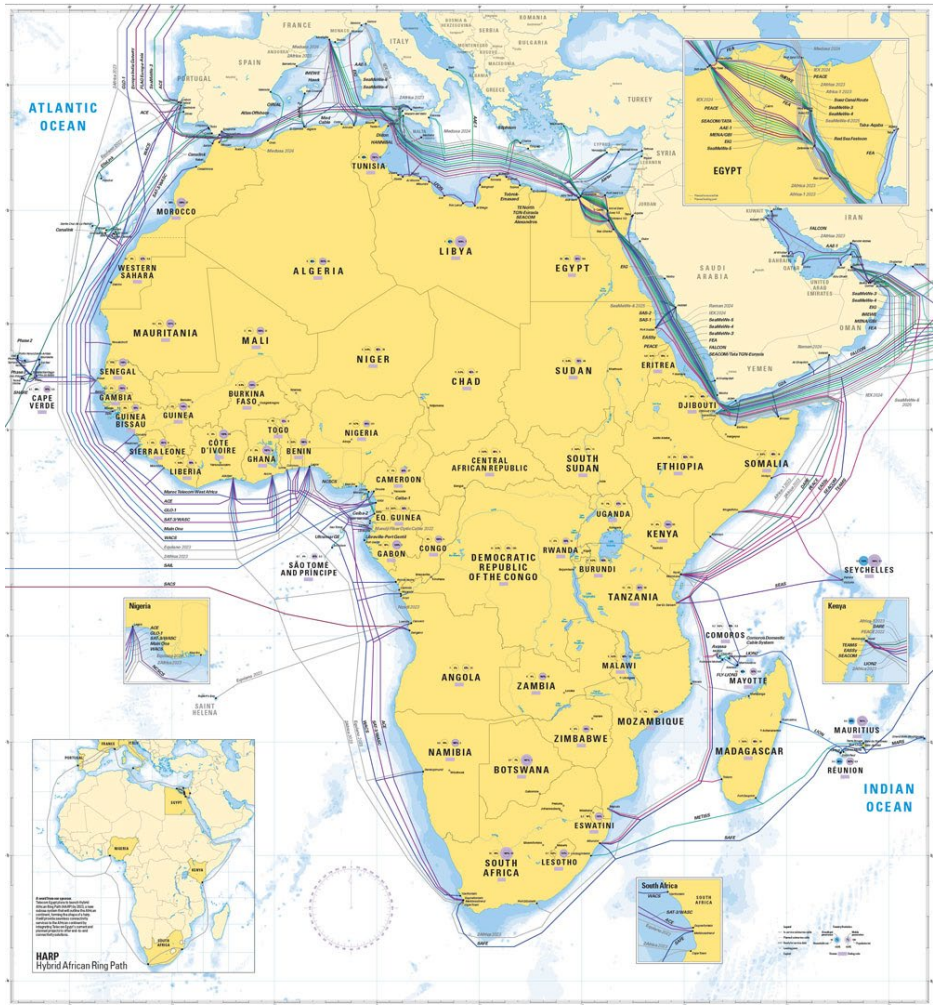
In May 2022 the Nigerian Communications Commission confirmed that the winners of last December's 3.5GHz spectrum auction, MTN Nigeria and Mafab Communications, had each been officially issued with their spectrum licenses. Network rollouts are now underway.

5G networks are forecast to be serving almost 350 million subscriptions in Africa by the end of 2028. ■

AFRICA TELECOMMUNICATIONS MAP 2022

TeleGeography

telecomegypt



Map supplied by TeleGeography: <https://africa-map-2022.telegeography.com>



Sylwia Kechiche,
principle industry analyst,
enterprise, Ookla

South Africa spearheads 5G

Narrowing the digital divide for wider societal benefits

According to GSMA Intelligence, there were almost one billion mobile connections across sub-Saharan Africa (SSA) in Q1 2022. Unfortunately for those users, mobile performance and coverage in Africa have been subpar.

Affordable 4G smartphones and targeted financing for underserved demographics are key for bridging the digital divide, but that's not the only benefit: a World Bank Study found that 4G coverage can help cut poverty by up to 4.3%. Additionally, the International Finance Corporation estimates a 10% boost to mobile broadband penetration in Africa

could lift GDP per capita by 2.5%.

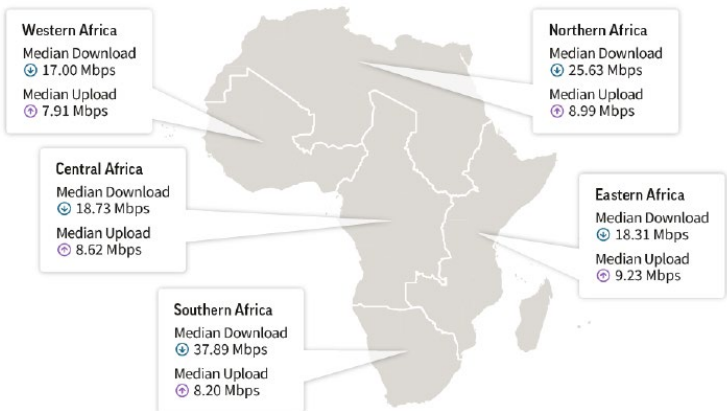
Using Speedtest Intelligence® data, we analysed mobile performance on modern chipsets during 2021 (full year) across the African continent. Modern chipsets include all mobile tests, regardless of connection technology used, if they are taken on devices that are identified as being capable of achieving the fastest speeds available in a market.

We aggregated speeds across countries that fall within the five African regions as defined by the United Nations. When looking at median download speeds in 2021, Southern Africa ranked first, with a median download speed of 37.89Mbps, followed by Northern Africa at 25.63Mbps, Central Africa at 18.73Mbps, Eastern Africa at 18.31Mbps, and Western Africa at 17.00Mbps. Eastern Africa had the fastest median upload speed at 9.23Mbps, followed by Northern Africa at 8.99Mbps, Central Africa at 8.62Mbps, Southern Africa at 8.20 Mbps, and Western Africa at 7.91Mbps.

To support the growing demand for faster speeds there is a growing investment in both surface and undersea cables. Google's new subsea cable,

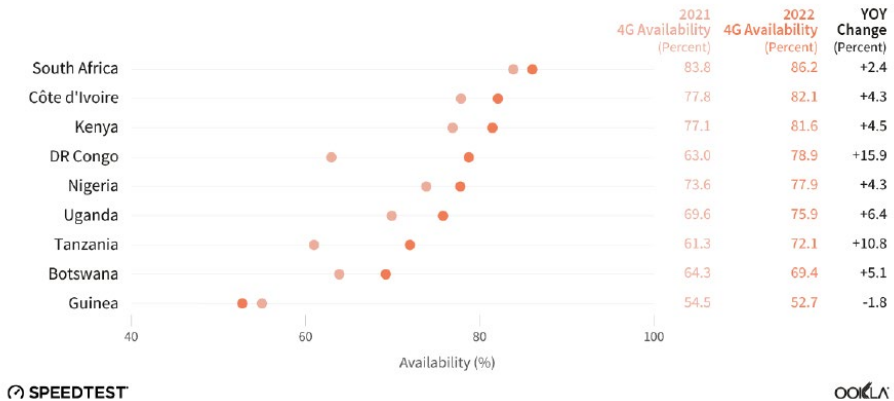
Mobile Performance Across Regions in Africa, Modern Chipsets

Speedtest Intelligence® | 2021



4G Availability Across Select African Markets, All Devices

Speedtest Intelligence® | Q1 2021–Q1 2022



Equiano, landed in Togo in March 2022 and Nigeria in April 2022. The cable is set to become operational by the end of the year and is expected to bring connectivity to areas such as Namibia, South Africa, and neighbouring regions.

We have chosen nine countries for our analysis as they were home to over half (56%) of the region's connections, including:

- Eastern Africa: Kenya, Tanzania, and Uganda;
- Southern Africa: Democratic Republic of Congo, South Africa, and Botswana;
- Western Africa: Côte d'Ivoire, Guinea, and Nigeria.

Analysis based on data from Speedtest Intelligence shows that mobile speeds varied widely across African countries during the first quarter of 2022. When looking at mobile performance on modern chipsets across the nine countries of the sub-Saharan African (SSA) region, our results showed that median download speeds ranged between 11.11Mbps (Tanzania) and 48.76Mbps (South Africa). Median upload speeds were between 6.45Mbps (Tanzania) and 12.58Mbps (Botswana).

4G availability describes the percentage of users on all devices who spend most of their time connected to 4G technology both roaming and on-network. Across the nine countries we looked at, 4G availability exceeded 50% across the board. South Africa had the highest 4G availability at 86.2%, followed by Côte d'Ivoire (82.1%), Kenya (81.5%), Democratic Republic of Congo (78.9%), Nigeria (77.9%), Uganda (75.9%), Tanzania (72.1%), and Botswana (69.4%). Guinea ranked last at 52.7%, largely because only Orange Guinea offers 4G services. According to Ookla Map Elements®, Orange's LTE network covers 14% of the Guinean population. However, that should change soon with MTN being awarded a 4G operating license in February 2022.

When it comes to speeds in African capital cities, Johannesburg was fastest with a median download speed of 65.54Mbps — nearly 35% faster than that of the next-fastest city, Cape Town at 48.27Mbps. Gaborone stood out for posting the third-fastest median download speed on the list at 42.29Mbps. Meanwhile, Nairobi, Kampala, Lagos, and Abuja ranked closely together in terms of

median download and upload speeds, with median download speeds ranging between 27.77Mbps and 33.38Mbps, with upload speeds ranging between 8.48Mbps and 11.92Mbps.

The early days of 5G in Africa show green fields for operators

As 4G continues to expand in Africa, 5G is on operators' radar. In SSA, the 5G journey has already begun, but it is still early days for 5G deployment and commercialization.

South Africa was the first country in the region to launch 5G and has since been joined by a handful of countries: Seychelles, Zimbabwe, Botswana, Mauritius, Madagascar, and Togo. According to GSA, there were nine commercial 5G networks in seven markets across the region by the end of May 2022. In these markets, 5G coverage remains limited to major cities. Furthermore, just over two dozen operators are either planning, or testing 5G technology or are already in the deployment stage. Regulators across the regions have also started to make spectrum available for 5G.

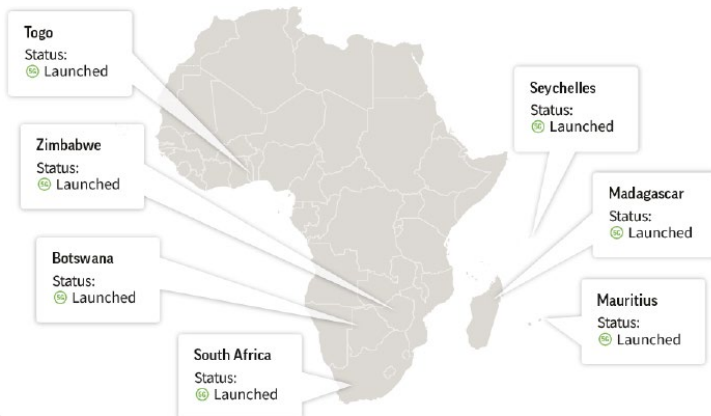
Botswana: In February 2022, the Botswana Communications Regulatory Authority (BOCRA) offered operators an opportunity to apply for spectrum in 5G frequency bands, which will allow operators to expand their existing 4G networks and roll out 5G. Operators are allowed to re-farm their existing spectrum to augment new spectrum to enable them to roll out 5G. Shortly after, Mascom launched four 5G sites in the capital Gaborone as part of plans to roll out 111 sites across Botswana by the end of 2022.

Kenya: The Communications Authority of Kenya (CA) developed a roadmap to facilitate 5G deployment. CA is preparing to reallocate spectrum in the 3500MHz band, which was previously assigned for FWA networks in Kenya but will be re-farmed for 5G by June 30, 2022. In May 2022, Safaricom was allocated 60MHz of spectrum in the 2600MHz band, which was previously used by the security agencies but has been released following a change in the technology that they use.

Nigeria: In December 2021, MTN and Mafab Communication won 100MHz TDD each in the 3.5GHz spectrum band. The telcos are expected to

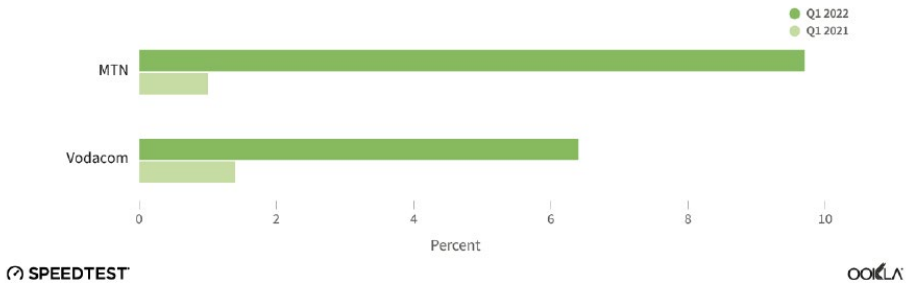
5G Networks Status Across Africa

Source: GSA



5G Availability Among South African Operators

Speedtest Intelligence® | Q1 2021 vs Q1 2022



commence the rollout of their 5G networks from 24 August 2022. While Airtel Africa pulled out of Nigeria's 5G auction, its CEO stated they have sufficient spectrum in other bands to launch 5G.

South Africa: In March 2022, the Independent Communications Authority of South Africa (ICASA) completed a delayed 5G auction, selling spectrum across 700MHz, 800MHz, 2.6GHz, and 3.5GHz bands. Rain and Vodacom got new low-band frequency assets in the 700MHz band while Telkom and MTN gained spectrum in 800MHz.

MTN leads on 5G in South Africa

Even though the 5G spectrum auction was completed in March 2022, Vodacom and MTN had both launched 5G services beforehand using emergency, temporary spectrum allocated during the COVID-19 pandemic.

In May 2020, Vodacom launched the first 5G network across Africa, in partnership with Nokia in the 3.5GHz band. At the time of launch, the network was available in three cities — Johannesburg, Pretoria, and Cape Town — with a total of 190 5G sites. MTN followed in June 2020, using spectrum across 1800MHz, 2100MHz, and 3500MHz bands. In its latest report, MTN said that in 2021, it had over 1,000 5G sites across several

spectrum bands with plans to significantly scale up with 3.5GHz spectrum.

Using Speedtest intelligence data, we compared operators' 5G performance in the first quarter of 2022 against data from the same quarter of 2021. In Q1 2022, MTN's median 5G download speed reached 213.37Mbps — decreasing by a third when compared to Q1 2021 (320.10Mbps). Median upload speed suffered a nearly 40% decrease, going from 46.05Mbps to 27.32Mbps. When we examined the State of 5G Worldwide in 2021, we concluded that it's common to see new mobile access technologies slow down as adoption scales, particularly early in the tech cycle. As such, the downward tendency in MTN's performance is not surprising. Vodacom, on the contrary, almost doubled its median 5G download speed from 69.93Mbps to 132.11Mbps.

5G availability, which describes the percent of users on 5G-capable devices that spend most of their time on 5G, continues its upward trajectory across South Africa, from just 0.9% in Q1 2021 to 5.6% in Q1 2022. MTN had shown a stronger improvement to its 5G availability in the Q1 2021 to Q1 2022 period than its rival, growing from 1.0% to 9.7%.

Since the award of temporary spectrum in 2020, MTN has intensified its investment to increase

network coverage, improve speeds, and enhance the overall customer experience. It has also invested in an expansion drive into rural and peri-urban areas and a major 5G rollout, reaching 15% of South Africa's population at the end of 2021. MTN is also planning to extend its 5G coverage to 25% of the population by the end of 2022, and 60% by 2025. As part of its 'Modernization of Network South Africa' (MONZA) project, MTN has allocated a budget to extend network reach into rural communities, support 5G expansion, and restore vandalized infrastructure: ZAR624 million for Eastern Cape, ZAR749 million for Western Cape, ZAR820 million in Limpopo and Mpumalanga.

Vodacom's 5G availability had grown from 1.4% in Q1 2021 to 6.4% in Q1 2022. Vodacom reported in its FY 2022 results (for the year ended March 2022) that in South Africa, capital expenditure was directed at improving capacity and resilience of the network and increasing 5G rollout. As of March 2022, the operator's 4G network covered 97.9% of the population, and it had also extended 5G sites to 624.

This investment drive is paying off. According to ICASA, 5G population coverage reached 7.5% in 2021, an increase from 0.7% in 2020. However, there is a disparity between urban and rural population coverage. 5G was present across all urban provinces, with Kwazulu-Natal in the lead with 20% 5G population penetration, while only three regions (Free State, Gauteng, and Western Cape) reported 1-2% population coverage in rural areas.

Having invested into spectrum and network rollout, the operators look for ways to monetize 5G. MTN has partnered with Australia's Emerge Gaming to allow people to play cloud games on their Huawei P40 Pro phone using MTN's 5G network. This is all to attract more consumers, especially video games' enthusiasts. MTN also partnered with Huawei South Africa, Miniandante Mining, and Minetec Smart Mining to transform old mining processes using 5G.

African nations still face many hurdles to modernizing networks

It is still early days for 5G across most of Africa. One of the key challenges across Africa in terms of network rollouts regardless of technology relate to the cost of mobile base stations, the backhaul technology that connects mobile sites to the core network, and energy supply, as outlined by a recent World Bank Report.

To alleviate the challenges operators are taking steps and looking to innovative approaches to improve the situation. Orange DRC partnered with NuRAN to construct and operate 2,000 solar-powered mobile towers, with a particular focus on rural communities, which will cover at least 10 million people in rural areas. These lower cost 'light towers' are better suited to covering remote locations with small populations and come with significant cost savings thanks to the use of solar renewable energy.

Device affordability is another issue. There are currently a few initiatives across the continent aimed at expanding connectivity to areas where it's lacking.

Google partnered with Safaricom in Kenya for a program that allows customers to pay for 4G-enabled phones in installments, while MTN Uganda reinforced a partnership with M-Kopa in March 2022 to introduce 4G smartphones on installment payment terms. MTN also inked a partnership with M-Kopa in 2021 that facilitated the sale of more than 70,000 smartphones, financing over 2 million customers across Africa.

Orange in Cote d'Ivoire launched a similar initiative in partnership with Yabx and Cofina. Yabx, a Dutch firm that offers credit across multiple countries in Africa, will provide the technology and manage the complete customer journey that will enable Cofina, an Ivorian financial institution that provides SME financing, to launch plans for Orange subscribers. Bringing 5G devices into the African markets will be even more challenging.

Originally published [here](#). ■



Martha Suarez,
president, DSA

Digital inclusion across Africa: establishing reliable connectivity for all

Over the past year, we have seen significant advancements from governments and regulators across the globe when it comes to enabling reliable broadband connectivity for all, but the great strides made in Africa have been especially valuable in beginning to bridge the digital divide. It is now vital that regulators within the continent retain the good practices learnt because of the COVID-19 pandemic, such as valuing the importance of fixed broadband connectivity within the home, whilst recognising the need for enhanced connectivity within public spaces. This includes libraries, schools, airports and more.

Bridging the digital divide is a constant, ongoing challenge; more and more countries across the world are now showing the benefits of dedicating additional spectrum for WiFi, as a powerful complement to other technologies such as mobile, fixed wireless, satellite, and fibre. At the start of 2022, Southern Africa was the region with the highest internet penetration rate in Africa, at 66%. The share of people using the internet in this part of Africa was even above the world average, which stood at 62.5%. This is promising, but more can still be done to promote digital inclusion. Eastern and Middle Africa, for example, recorded the lowest rates across the continent with 26% and 24% respectively. The end goal for countries in Africa should be digital inclusion, and one of the crucial pillars for this

is affordable broadband connectivity, making sure no one is left behind.

Africa's digital future

The African Telecommunications Union (ATU) Task Group on Emerging Technologies recommended at the start of the year that African administrations should review their national ICT policies, broadband and digital economy strategies, and recognize that the continent is at a pivotal point regarding the future of WiFi and other relevant technologies.

To drive productivity, economic growth, and societal development through the deployment of the next generations of WiFi, it is essential that the regulatory framework ensures that Africa can respond to the expected increased demand for WiFi connectivity and unlock the digital innovation enabled by this technology, in particular for start-ups and small and medium enterprises (SMEs), which should be at the forefront of digitalization.

WiFi is key to the digitalization across society (public services, SMEs, industries, etc.) and is the primary way citizens and businesses access the internet. Thanks to their low cost, easy deployment, and enhanced performance, WiFi 6E (designed to operate in the 6GHz band) and WiFi 7 (the new standard in the pipeline) networks will support the widespread adoption of new digital applications and services that will enhance African productivity.

This year the Communication Authority of Kenya's (CA) decision to publish guidelines enabling the use of short-range radio devices within the 6GHz band has led them to become the first sub-Saharan country to allow partial access for wireless technology. This is a welcome decision from the government, and as certain radio frequencies can now be used for different types of wireless electronic equipment in homes and

businesses, we expect crucial connectivity across the region to be improved. Adaptable connectivity for wireless broadband services, security applications and wideband data transmissions leads to delivering affordable connectivity for the millions of people where it is required most.

The guidelines authorize the use of short-range radio devices (SRDs) within the 6GHz band to provide low-cost communication solutions, including many different types of wireless equipment used in data collection such as local access networks (LANs), ultra-wideband sensors and radars, and other types of common electronic equipment that rely on such transmitters to function.

This is a significant step in the right direction and should be applauded. We expect other countries in Africa to soon follow suit, and even decide to follow prominent economies and digital pioneers around the world such as the US, Canada, Korea, Brazil, and Saudi Arabia that have already led the way on this front releasing the entire 6GHz (5925-7125MHz) band for WiFi.

There remains a coverage gap of over 840 million people with no access to reliable and affordable internet access. The guidelines in Kenya will go a long way to reduce this number, but for clear-cut results, unlicensed access to the entire band remains the optimal way to achieve great change.

Taking the next step

The importance of the 6GHz band for wireless internet service providers (WISPs) cannot be understated. Wireless Access Providers Association (WAPA) recently collaborated with the DSA in South Africa for a report which identified that the country could benefit by up to nearly US\$58 billion over the next 10 years by getting ICASA to enable 1,200 license-exempt megahertz in the 6GHz band, helping the country to bridge the

digital divide, as well as improve access to remote education, work, and commerce. This has yet to be released by ICASA, but hope remains this will be done soon to enable huge economic benefits.

Studies published by the DSA, conducted by Telecom Advisory Services LLC and with funding by the FCDO demonstrated the staggering benefits of enabling unlicensed access to the 6GHz band, and we hope the governments and regulators across the region pay heed to this. By providing affordable paid services and free access over WiFi hot spots, over 1.4 million unconnected Kenyans would be able to gain access to the internet by 2030. The economic value associated with enabling license-exempt access would add up to US\$20.29 billion to the Kenyan economy over the next 10 years, equating to 1.35% of the country's current GDP.

Should South Africa enable the same level of access to the 6GHz band, it would mean over 1.25 million of the population would be predicted to gain access to the internet by 2030. By the same year, the effects of licence-exempt access to the 6GHz band would add US\$57.76 billion to the South African economy, representing 1.39% of the country's GDP.

For Nigeria, the allocation of the entire 6GHz band to unlicensed use would result in a similarly significant contribution to a reduction of the country's digital divide. Around 1.2 million Nigerians would be able to gain access to the internet by 2030, as equipment capable of operating within this band continues to develop. The economic benefits are numerous, and an estimated US\$72.14 billion would be generated within the next ten years, so long as unlicensed access to the full band was granted.

If regulators within these countries – and Africa as a whole – implement these recommendations, we can see a brighter and more connected future for the region. ■



Amy Saunders,
editor, *African Wireless
Communications Yearbook*

Broadband speeds: the next bastion of the digital divide?

The development of connectivity infrastructure in Africa has historically lagged behind other world regions, held back by underinvestment and hindered by civil turmoil, insurgencies and environmental phenomenon like droughts.

Today, the story is quite different. Heavy investment from governments and private sector actors is transforming the African continent bit by bit. New installations across the cable, fibre, satellite, and cellular sectors are seeing increasing proportions of the African population coming online, and with ever-faster speeds. Policy makers are addressing barriers to access, and some markets are maturing.

The delivery of high-speed connectivity to Africa is essential for the continued development of the 54 countries on the continent. Over and over, we hear how increasing connectivity, bridging the digital divide, drives huge economic benefits and positive societal impacts, expanding opportunities for improved healthcare, education, global market competition, job opportunities, etc.

Broadband speed has been identified as one key aspect of the digital divide. Those who remain underserved by fixed and mobile connectivity remain subject to the negative impacts caused by the connectivity gap.

Interestingly, the Federal Communications Commission in 2015 defined 25Mbps down and 3Mbps up as the bare minimum connectivity

speeds required to meet the definition of 'broadband.' Earlier this year, FCC chairwoman Jessica Rosenworcel has proposed that these speeds be increased to 100Mbps down and 25Mbps up, in line with the increasingly bandwidth-heavy requirements for modern life such as working from home, video conferencing, content streaming, etc.

Such speeds are significantly higher than the global median of 33.17Mbps down and 9.03Mbps up for mobile broadband, and 71.39Mbps down and 30.64Mbps up for fixed broadband (Independent analysis of data published by Ookla in September 2022). The world leaders for mobile and fixed broadband download speeds right now, respectively, are Norway at 126.94Mbps and Chile at 217.43Mbps. In fact, only eight countries have mobile download speeds exceeding 100Mbps, while just 28 countries have fixed download speeds higher than the FCC's latest proposal.

Mobile and fixed broadband speeds

African nations as a whole lagged far behind average global speeds. Of all the African countries assessed by Ookla, South Africa achieved the highest median mobile broadband download speed at 34.75Mbps, while Egypt boasted the highest median fixed broadband download speed at 44.45Mbps. At the other end of the scale, Ghana had the lowest median mobile download speed at 7.16Mbps, and Ethiopia had the lowest fixed broadband download speed at 3.73Mbps.

Angola, Cameroon, DRC, Ethiopia, Kenya, Libya, Morocco, Mozambique, Namibia, Nigeria, Sudan, Tunisia, Uganda, Zambia, and Zimbabwe all had significantly higher mobile download speeds than fixed broadband

BROADBAND: INTRODUCTION

speeds. Mobile networks are faster and more cost-efficient to deploy, and with most Africans accessing the internet via mobile phone, it's only logical that MNOs have prioritised wireless networks vs fixed. In contrast, Burkina Faso, Cote d'Ivoire, Egypt, and Ghana had significantly faster broadband download speeds than mobile.

Sub-Saharan mobile performance on modern chipsets

Exploring the four leading MNOs in sub-Saharan Africa – Airtel, Orange, MTN and Vodacom – in Ookla's 'MTN Performed Best Among Operator Groups in sub-Saharan Africa' report earlier this year, Sylwia Kechiche concluded that MTN South Africa achieved the highest median download speeds in quarter two of 2022 at 65.95Mbps; however, Vodacom in Johannesburg achieved the fastest speeds across top cities at 81.36Mbps.

For sub-Saharan African nations, the differences between upload and download speeds bears a stronger relation to the country than the operator itself due to the installed (or lack of) infrastructure. Leading the pack is South Africa, with median download speeds of 65.95Mbps for MTN South Africa and 48.71Mbps for Vodacom South Africa. At the other end of the scale, the DR Congo had median download speeds of 11.15Mbps for Airtel DR Congo, while Vodacom DR Congo achieved 8.00Mbps down.

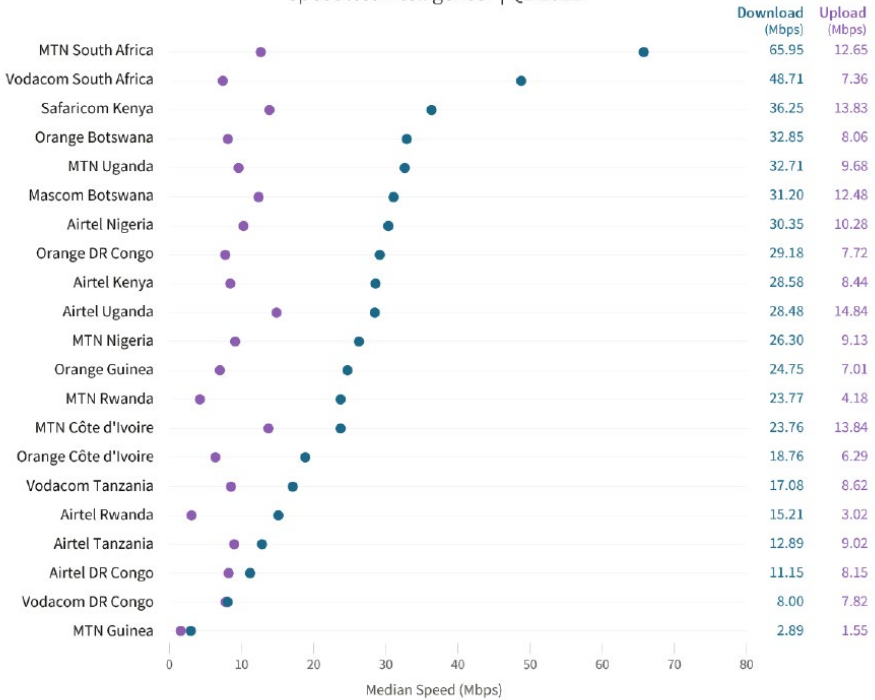
Northern African broadband speeds

In the latest update for the North of Africa in 2021, Ookla reported that every nation in the

	Mobile download speed / Mbps	Fixed download speed / Mbps
Algeria	13.01	11.14
Angola	20.39	13.19
Benin	-	15.18
Botswana	-	7.35
Burkina Faso	13.27	41.02
Burundi	-	5.19
Cameroon	12.05	7.48
DRC	18.27	10.28
Congo	-	29.01
Cote d'Ivoire	16.89	36.03
Djibouti	-	7.25
Egypt	23.07	44.25
Equatorial Guinea	-	5.21
Ethiopia	18.11	3.73
Gabon	-	38.31
Gambia	-	6.01
Ghana	7.16	27.00
Guinea	-	6.72
Kenya	16.92	8.92
Lesotho	-	18.93
Liberia	-	7.45
Libya	12.37	8.26
Madagascar	-	33.88
Malawi	-	9.02
Mali	-	21.29
Mauritania	-	17.73
Mauritius	20.59	25.46
Morocco	32.52	16.96
Mozambique	17.43	5.96
Namibia	19.86	8.26
Niger	-	4.05
Nigeria	19.37	10.69
Rwanda	-	9.39
Senegal	16.29	20.94
Seychelles	-	33.64
Sierra Leone	-	11.05
Somalia	10.78	8.87
South Africa	34.75	37.22
Sudan	10.62	4.14
Tanzania	11.86	11.79
Togo	34.15	30.45
Tunisia	23.06	8.31
Uganda	20.82	10.18
Western Sahara	-	14.85
Zambia	12.13	7.30
Zimbabwe	11.23	7.80

Data sourced from Ookla Speedtest Global Index September 2022. Note: data for Cabo Verde, Central African Republic (CAR), Chad, Comoros, Eritrea, Eswatini, Guinea-Bissau, Sao Tome and Principe, South Sudan was not available.

Mobile Performance Among Operators Across African Markets, Modern Chipsets Speedtest Intelligence® | Q2 2022



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region improved upon their fixed and mobile speeds year-on-year.

Speedtest Intelligence data revealed that while speeds vary widely across North Africa, every country in the region except Egypt has faster median mobile download speeds than fixed broadband. Mobile download speeds were highest in Morocco at 25.53Mbps, followed by Tunisia at 21.28Mbps, Egypt at 14.95Mbps, Libya at 11.65Mbps, and Algeria at 9.76Mbps. Compared with data from 2020, Libya showed the largest percentage increase at 67.4%, followed by Algeria at 65.1%, Morocco at 10.7%, Tunisia at 10.0% and Egypt at 0.1%.

Data sourced from Ookla Speedtest Global

Index September 2022 showed a small order difference for this year: while Morocco still came out ahead in the second quarter of the year at 32.52Mbps, Egypt had leapfrogged to second at 23.07Mbps, leaving Tunisia down a place at 23.06Mbps, Algeria up one spot at 13.01Mbps, and Libya down one at fifth with 12.37Mbps.

For fixed broadband download speeds, Egypt had the fastest median speed in the first quarter of 2021 at 26.58Mbps, followed by Morocco at 10.01Mbps, Libya at 8.71Mbps, Tunisia at 6.95Mbps and Algeria at 4.82Mbps. Every Northern African country saw fixed broadband download speed improvements greater than 25% year-on-year except Tunisia.

“Load shedding has had a significant impact on network operators and consumers in 2022, with rolling blackouts hindering the delivery of services nationwide.”

Algeria’s speed increased by 105.5%, Egypt by 94.6%, Libya by 59.8%, Morocco by 28.5% and Tunisia by 12.3%.

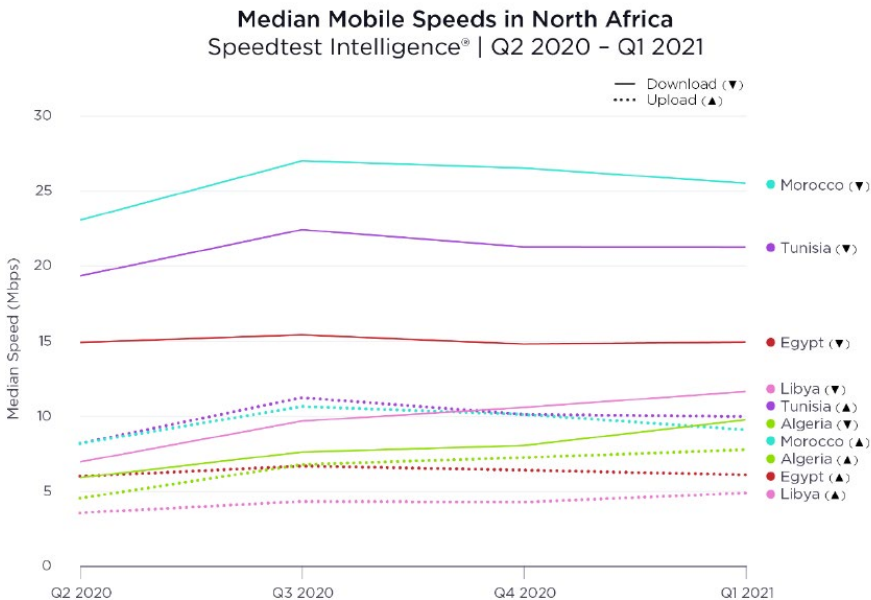
Again, data from the Ookla Speedtest Global Index September 2022 showed a small order difference for this year: Egypt remained on top with the fastest speed in the second quarter of 2022 at 44.25Mbps, followed by Morocco at 16.96Mbps, Libya at 12.37Mbps, Algeria

up one place at 11.14Mbps, and Tunisia down a spot at 8.31Mbps.

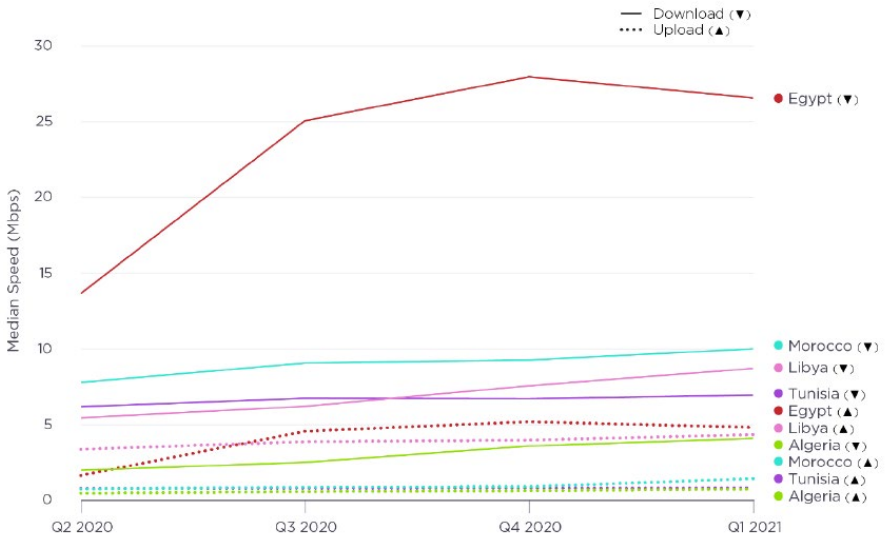
Load shedding woes

Despite leading the way on both median download and upload speeds for mobile broadband in the second quarter of 2022, South Africa has been severely plagued with load shedding this year, to the extent that in October, the Pan South African Language Board (PanSALB) named ‘load-shedding’ as the 2022 South African Word of the Year.

“Ultimately, the SA Word of the Year reflects the preoccupations of South Africans for that given period, and this year South Africans had to contend with the impact of the energy crisis in the country. The term ‘Load-shedding’ has superseded the first runner-up, Phala-phala, with over 40,000



Median Fixed Broadband Speeds in North Africa Speedtest Intelligence® | Q2 2020 – Q1 2021



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clip counts and mentions across a broad range of media,” said PanSALB CEO, Lance Schultz.

Load shedding has had a significant impact on network operators and consumers in 2022, with rolling blackouts hindering the delivery of services nationwide. Such outages have naturally impacted on connectivity speeds. During the second quarter of 2022, Vodacom customers reported 46,810 incidents and MTN customers reported 34,882. The top two issues reported for Vodacom, according to Kechiche, were no signal (46%) and no mobile internet (36%), while for MTN, more customers reported no internet (43%) than no signal (40%). Total blackout reports of 7% for Vodacom and 5% for MTN were highlighted.

Both MNOs have enacted contingency plans against outages due to load shedding, with networks of generators and batteries now in place.

A long way to go

It’s clear that there remains a long path ahead until mobile and fixed broadband connectivity reaches the levels required, both in coverage and speed, to truly close the digital divide.

However, some countries have made positively alarming progress in recent years amidst a backdrop of uncertainty – pandemic, war, fuel crises – demonstrating that it’s perfectly possible to connect the world, fill the digital inclusion gap, in the years to come.

With new infrastructure rolling out every month, and giant technological leaps forward delivering new mobile generations, more efficient connectivity, at lower costs, Africa is truly on its way to a digital future. ■



John Tenidis,
marketing director, wireless
solutions portfolio, Intracom Telecom

Intracom Telecom is a global telecommunication systems and solutions vendor present in the African market since 2010. We serve the telecom markets of the continent through offices in Johannesburg and Dubai. Our company provides support and maintenance for networks, and we now see new investments in the expansion of these networks.

We supply networks for fixed wireless access (FWA) to ISPs and telcos, for wireless transmission to cellular operators, control and management networks for electricity companies, private networks for armed and police forces and for the mining industry.

The last 12 months have been a period of transition from the sudden halt caused by the COVID-19 pandemic, and gradual return to normal. Despite the crisis and the devastation, the COVID-19 pandemic motivated our clients to think proactively about the capacity and expanse of their networks as well as addressing the demand for more remote than physical interaction in business and private lives. We see this in our booked business for the last 12 months and our forecast looking ahead.

Since our establishment in African telecom market, we have taken into consideration the diversity between the countries on the

continent and the impact that this has on business conduct. To address the demands from customers coming from so many different countries, we must understand and embrace the different cultures and mindsets. With our local sales teams and network of partners in various countries we meet this challenge.

As we recover from the COVID-19 restrictions, it will be possible to spend more time again with our clients, listening to their problems and presenting solutions from our portfolio of telecommunication products. Having addressed adequately the challenges of the past we are now ready to face those of the future. Our customers now have a completely different mindset about the way they want to operate and expand their network.

We are bringing our experience gained globally and adapting that for local use in Africa. We offer mature, yet innovative solutions, based on the international standards of the telecoms industry. In some cases, our African customers were frontrunners in technology adoption compared to other parts of the world, and we learned from them while adjusting our products. Thinking globally and acting locally is not as easy as it sounds!

We see a big opportunity in building networks for quality of service at the epicenter. High quality pays back quickly and increases ARPU, while lack of quality causes frustration and subscriber churn.

We are proposing solutions from our mature product portfolio for our clients' networks, whether this is for FWA or for wireless transport networks connecting machines to machines, allowing human administrators to manage every part of their assets. Our portfolio of products, the WiBAS™ for multipoint access, the OmniBAS™ and the UltraLink™ for point-to-point connections and the un|iMS™ for

**“Having addressed adequately
the challenges of the past
we are now ready to face
those of the future.”**

network lifecycle management and automation have simple yet modular architectures to cater for many different applications at the field of operation.

We see demand from telcos and ISPs for fast and reliable connection to the internet, and we meet demand from utilities and enterprises to connect their assets for control and monitoring. These two segments have our uninterrupted attention, and this is what we expect to drive our growth in Africa for the next 12 months.

The pandemic taught everyone a big lesson - that of being connected with people and assets at any time. If physical presence is not possible then remote access must be possible. This is causing a trend for the build-up of public and private networks. We see the increased demand for access to people, to services and functions, which drives the expansion and the upgrade of networks.

Although some will claim that quality of service does not matter when reachability is the primary objective, we are trying to help our customers think proactively; quality when designing a network for long reach and connecting the digitally unserved and underserved is important. We see this trend

“The pandemic taught everyone a big lesson - that of being connected with people and assets at any time. If physical presence is not possible then remote access must be possible.”

in our two leading African markets, South Africa, and Nigeria. We are also developing new markets which are influenced by this trend, and we will be able to announce more success stories in the coming 12 months.

Intracom Telecom expects to significantly grow its PMP business throughout the African continent to address the constantly increasing bandwidth demand, frequency spectrum congestion and the failure of the currently used unlicensed technology to meet the required quality of service. The company is a familiar brand for Tier-1 operators and wireless ISPs of the continent, and this is used as the foundation of the promotion strategy for the new generation of ultra-broadband products, such as the new series of WiBAS PMP systems and E-band Ultralink radios. ■

Looking ahead: We hope that the COVID-19 pandemic is behind us and will not create any further devastation from the loss of human lives, nor disruption of private and business routine.

We firmly believe in Africa's huge potential to invest in modernizing and expanding telecommunication infrastructures. The vastness of the land, the diversity of the population and the magnitude of nations on the continent has no comparison on our planet, yet with one distinct characteristic; the wide gap between those who have connection and those who do not.

We see a tremendous opportunity for our solutions enabling access to communication networks, ones that provide real broadband and uncompromised quality to citizens no matter where they are.

During the past years, our industry has focused on improving connectivity while on the move and neglected fixed location services. Our solutions come to fill the gap and we are striving to develop technologies which bring ultra-broadband connectivity to the populations of the great nations of Africa.



Obehi Okosun,
CEO CBNL Africa

Africa has always been a goldmine for the telecoms market. The potential is enormous but getting to the high value business takes time and a great deal of effort.

I see change in two major areas. The rise of 5G has produced bottlenecks in capacity which has forced the second area of growth – network operators are now forced to make changes in their backhaul and wireless offloading technology mix. The current generation of PTP microwave backhaul does not provide the required capacity. Accordingly, we now see huge investment in fibre being deployed, towing capacity lanes constructed, and upgrades to existing networks to connect 5G sites.

Most countries are focusing more on enterprise and home delivery FTTx solutions. Metropolitan fibre is now being introduced where before commercial backhaul technologies like microwave were used.

We have come to understand the impact the investment in fibre backhaul has had on 5G mobility performance; we are very interested in the costs. Both time and money costs are major factors in doing effective business in Africa. Since fibre is costly and timely to deploy, we have been working to introduce new 5G Fixed Wireless Access (FWA) radio technologies to assist with offloading 5G from

mobility networks, to enhance capacity and handset user experience. Such 5G FWA solutions require high capacity and long range, robustness, be fast to deploy and cheap to fully complement rather than compete with FTTx. 5G FWA will eventually work alongside fibre to provide a more efficient TCO for last mile connectivity.

We've seen two significant areas of challenge this year.

With the rollout of 5G, different countries are implementing different policies resulting in frequency reshuffling between operators, which is affecting service delivery. These new regulations are seeing operators needing to swap out infrastructure, equipment, etc. and replacing it with new technologies. Although we can't control this, it offers an opportunity to strategize, to really think about when you use those technologies.

The second challenge is currency exchange. Rates have become very changeable, and it has impacted on business. When a customer has ordered products at a specific cost, because of fluctuations in exchange rates, you could make a % loss when orders are delivered.

The continent's government regulators and financial institutions must find a way to enable telecoms suppliers and operators to ensure 5G adoption is as seamless as possible and that target TCOs are realized. Only when this happens will Africa become the true economic and technological powerhouse it could be. ■

Looking ahead: The African market is very dynamic, so you need to also be very dynamic in your approach, particularly when doing business with Tier 1 operators.

To make our customers' uptake faster and easier, we want to begin to deliver our brand of technology as a service. Thus, our customers would not have to pay outright for a solution; they could

receive a network as a service and pay over time.

We want to gain more ground in Africa and offer more services with more effective, efficient delivery. Our clients in West, East, South and Central Africa have always preferred to do business with us locally. For 2023, we plan to have more open offices, so that we will be on hand for any key issues that arise.



Vaibhav Magow,
vice president, Asia Pacific, Middle
East/Africa, Europe and Russia/CIS
regions, Hughes

According to the World Bank, less than a third of the African population has access to broadband connectivity. That digital divide exists in large part due to underserved or unserved populations in rural areas without access to reliable internet service, yet the demand for connection is greater than ever before. The stark contrast of those with and without adequate internet access was especially apparent in rural areas of sub-Saharan Africa during COVID-19, where students and teachers often lack both electricity and digital devices.

Even though Africa has the lowest internet penetration rate in the populated world, its telecommunications market is among the fastest growing, and much of that growth is driven by satellite solutions. Laying fibre takes considerable time and can cost US\$30,000 per mile. Satellite is an affordable, near immediate solution for bridging the divide for those who live outside the densely populated urban centers.

In late 2021, the National Company for Telecommunications Services (NCTS) in Egypt selected the Hughes JUPITER™ System to deliver the ground segment requirements for operation of the Ka-band TIBA-1 satellite. The deployment of the Egyptian government-owned TIBA-1 satellite

is a major milestone in the country's mission to connect the unconnected; the Hughes JUPITER System will enable delivery of internet and telecom services to millions of people in remote and rural areas of the country.

Hughes has a proven track record of successful private partnerships in Africa. In 2018, the company entered a joint venture with Yahsat to provide satellite broadband services across Africa, the Middle East and Southwest Asia. Today, the YahClick partnership continues to provide unserved and underserved communities with reliable, high-speed broadband service over Yahsat's Al Yah 2 (AY2) and Al Yah 3 (AY3) Ka-band satellites leveraging the capabilities of the Hughes JUPITER™ System for ground services. In South Africa alone, thousands of Hughes terminals support connectivity for consumers and enterprises.

Hughes also provides the ground system technology that enables service from Eutelsat's Ka-band Konnect satellite, which became operational in late 2020. Hughes has delivered more than 60,00 VSAT terminals to date to support the Konnect service in Africa, and there are more to come, including locally operated gateways (employing local labor) in Nigeria, Ethiopia and South Africa. The partnership between Hughes and Eutelsat has helped deliver high speed internet coverage to 650 million people in rural and urban areas across 22 countries in Africa with speeds up to 50Mbps and 100Mbps. ■

Looking ahead: The biggest growth market for satellite in Africa is mobile backhaul.

Thanks to the emergence of new ISPs, Africa may no longer be a 'mobile-only' market, but it is certainly mobile-first. According to Gallup, internet access in Africa rose significantly between 2019-2021 due to the increased affordability of mobile

devices and the need for connection during the pandemic. Making sure those mobile users have reliable coverage is a daunting task.

With the expanded coverage provided by new LEO constellations, satellite is a more convenient than ever solution for backhaul and will continue to drive solutions to help bridge the digital divide.



Nehal Osman,
fixed network business center lead,
network infrastructure business
group, Nokia MEA

A lot has changed in the broadband market over the last 12 months. Broadband has been growing enormously post COVID-19, so 24+ months now. That's not only in Africa, but all over the globe.

Still, a digital divide remains between developed and developing countries. Technology fitting the needs of users is critical, but broadband deployment also depends on structural market characteristics, such as competitiveness and purchasing power, international connectivity, geography, and several other factors.

In certain markets, we have seen how the move to XGS-PON is accelerated to give end customers high speeds and a better experience especially with the increased data demand day after day due to various applications such as VR gaming, 4K and even 8K TV and many other applications and content that require more speeds as well as throughput. Gigabit fibre broadband services are available in the world today for many customers and even

residential 10Gbps broadband is available in some countries such as South Korea, Singapore, Norway, Switzerland, and the US.

In Africa, more fibre deployments have been happening during the last two years with more investments and governmental funds that are provided to drive economic growth and provide services to more people - not just homes, but businesses and enterprises as well.

Indeed, we can confidently say that fibre is the fastest, greenest, and most widely deployed broadband technology. However, we are seeing 5G deployments becoming more mature with fixed wireless access (FWA) as the main use case to offer fixed like services using the 5G spectrum. In a nutshell, we can say that fixed and mobile broadband connectivity is expanding globally.

With COVID-19 and the subsequent lockdowns, digital connection suddenly became a critical resource for work, school and staying in touch. For service providers, sustaining connectivity and high data rate demands have never been more critical. That created a great challenge in demand and supply to cope with the unpredicted increased demand timely to expand networks, upgrade networks or even build new networks.

The potential for digital growth opportunities in Africa is enormous and now, more than ever, Africa is looking to digital solutions to increase productivity and drive development.

Although we've seen increased broadband connectivity and related infrastructure development in Africa during the last years, the continent remains behind much of the rest of the world in terms of fibre network and broadband connectivity, as well as spectrum and data centre processing capabilities. Indeed, COVID-19 pushed to accelerate the

“The potential for digital growth opportunities in Africa is enormous and now, more than ever, Africa is looking to digital solutions to increase productivity and drive development.”

digital growth across the continent.

All of that created many opportunities for investments and growth.

We are experiencing one of the significant developments today; broadband is everywhere and for everyone. Perhaps the ultimate trend in advanced wireline and wireless broadband technologies is the ability for users to access networks seamlessly, whether at work or at home, in shops or restaurants, on planes, trains, at sea and in the most remote areas.

Broadband connectivity is expanding globally, and connectivity is no longer a luxury, but it has become a basic need especially with the human impatience and high demand for data day after day.

When it comes to Africa, the potential for digital growth opportunities is vast, but it will depend critically on ensuring that digital access is affordable and widespread which is a key factor.

Given the time, cost and resources required for the deployment of wireline broadband, wireless is still more likely to be the broadband solution for users in many cases in the developing countries, particularly in rural and remote areas.

Nokia is committed to innovation and

technology leadership across mobile, fixed and cloud networks. For fixed access technologies, Nokia is a leading global equipment vendor delivering copper, fibre and wireless access technologies. Our focus will always be to offer sustainable broadband through offering innovative solutions, to protect our customers' investments. Our leading position in openness adds to our credibility and authenticity when helping our customers decide what's right for their business. Also, our ability to take our customers beyond the network termination point and deliver gigabit broadband throughout the home is another factor and focus area.

Sustainability is a key component of Nokia strategy and purpose. We believe digitalization and connectivity solutions are critical to resolving many of the global problems facing society today – environmental, social, and economic. Nokia embraces environmental, social and governance (ESG) principles while providing secure, reliable networks to operators and enterprises to enable digital transformation. Nokia builds the critical networks with sustainable technologies for meaningful digital transformation in fast-growing and evolving markets. ■

Looking ahead: The most important trends driving broadband networks in the coming year are a natural extension of the progress and challenges during the last two years. In particular, the global response to COVID-19, building momentum in network investments, and continued innovation in broadband technology are all contributing to the next phase of evolution in broadband.

Technology will continue to evolve year over

year, and connectivity will more and more become a basic need leading to continuous growth in broadband especially fibre deployments.

Fibre to the home is a major growth phase which will continue growing. So, fibre deployment expansions, continued bandwidth growth, and extended access to broadband will shape the investments and growth in coming years.

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FibrePoynt manufactures and sells solar-powered wireless broadband antennas, termed HomePoynts, that enable the implementation of a telecommunications network infrastructure system for last mile delivery of broadband data services to underserved high-density residential communities

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Hughes Network Systems, LLC (HUGHES), an innovator in satellite and multi-transport technologies and networks for more than 50 years, provides broadband equipment and services; managed services featuring smart, software-defined networking; and end-to-end network operation for millions of consumers, businesses, governments and communities worldwide.

The Hughes flagship internet service, HughesNet®, connects millions of people across the Americas, and the Hughes JUPITER™ System powers internet access for tens of millions more worldwide. Hughes supplies more than half the global satellite terminal market to leading satellite operators, in-flight service providers, mobile network operators and military customers.

A managed network services provider, Hughes supports more than half a million enterprise sites worldwide for customers ranging from petroleum retailers to financial institutions to mobile network operators. Headquartered in Germantown, Maryland, USA, Hughes is owned by EchoStar. To learn more, visit www.hughes.com or follow HughesConnects on [Twitter](#) and [LinkedIn](#).

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Intracom Telecom is a global telecommunication systems and solutions vendor operating for 45 years in the market. The company has become the benchmark in fixed wireless access and it successfully innovates in the 5G/4G wireless RAN transport and small-cell SON backhaul international arena. Intracom Telecom offers a comprehensive revenue-generating software solutions portfolio and a complete range of ICT services, focusing on IoT, SDN/NFV, Big Data analytics & data-driven intelligence, and Smart City solutions. Moreover, it addresses the Energy & Utilities industry, emphasizing on smart metering and end-to-end IT solutions. Intracom Telecom is also active in the defense sector providing security integrated systems for critical infrastructure protection and border surveillance. The company has extensive know-how and a proven track record in the market, serving fixed and mobile telecom operators, public authorities and large public and private enterprises. Intracom Telecom maintains its own R&D and production facilities, and operates subsidiaries worldwide.

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Parallel Wireless is a leading provider of centralized RAN over cloud-based Open RAN technology for wireless network operators. We design our Centralized RAN solution to introduce new innovations and reduce total cost of ownership (TCO), improve scalability options, and increase power efficiency for global MNOS.

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Stratosat Datacom, established in 2002, provides cost effective tailor-made turnkey satellite and microwave communication solutions in Sub-Sahara Africa. We have rendered products and services to the majority of Telco and Satellite Operators in Africa.

Our customer focussed team provide expertise in equipment supply, installation, systems integration, commissioning, handover, training, maintenance, support and network monitoring.

Stratosat's main solution offerings are:

- High-Speed Satellite Managed Broadband Connectivity, Mobility (CoTM & CoTP),
- Managed Services,
- Tailor-made Communication Network Solution Design, Project Management,
- Satellite Equipment Supply & Distribution and Implementation & Management of Large Astronomy Projects (SKA / MeerKAT).



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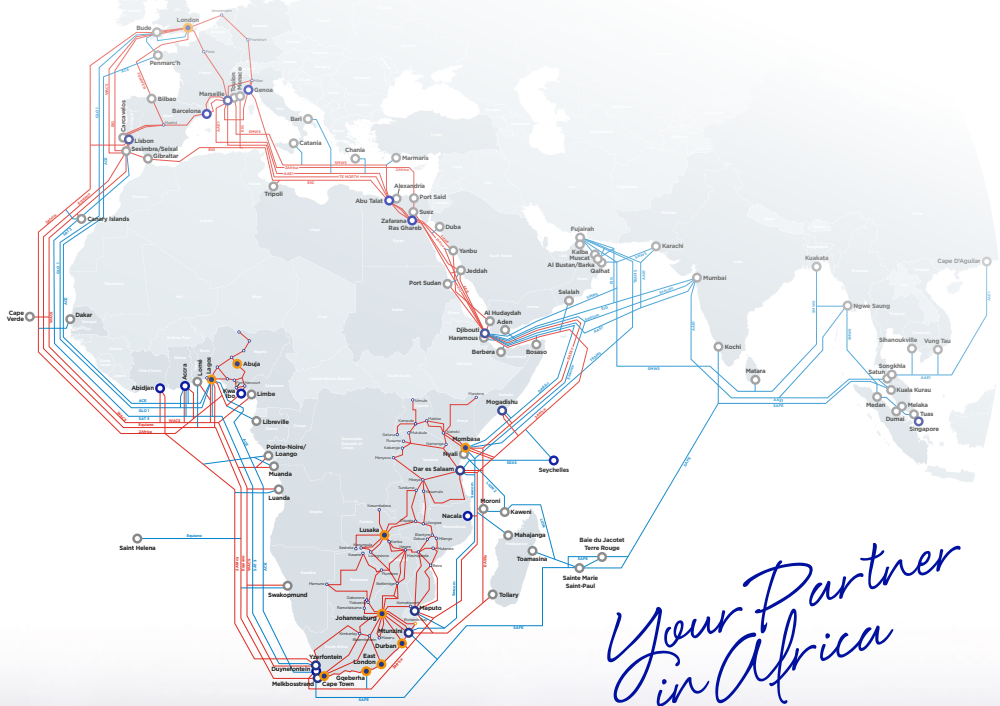
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- Commercial fleet management
- Public transport & bus management
- Smart cities & smart highways
- Remote monitoring & surveillance
- Mining & exploration
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chapter 7

Fibre



Paul Hamilton,
managing director,
Hamilton Research Limited

Terrestrial transmission network

Africa's total inventory of operational fibre optic network reached 1,184,028km by June 2022, compared to 820,397km in 2017 and 412,729km in 2012. In the twelve months since June 2021, an additional 34,474km of fibre optic network has entered service, an average of 95km of new fibre optic network entering service per day. In addition, there was in June 2022 a further 119,062km of fibre optic network under construction, 125,541km planned, and 69,352km proposed.

Approximately one-fifth of the total fibre inventory in sub-Saharan Africa is within cities: of the inventory of 1,184,028km of operational terrestrial fibre in June 2022, at least 256,107km was metropolitan fibre rings and FTTH/B (fibre-to-the-home/ building) networks. These metro rings distribute bandwidth from fibre optic nodes to districts and suburbs around each city. The

FTTH/B networks provide the last mile access, delivering fibre bandwidth right to the door.

Fibre reach

The landing of new submarine cables and expansion of terrestrial transmission networks is bringing additional countries, regions, cities and towns within reach of fibre networks for the first time. In the last ten years, network expansion has brought more than 324 million more people within access to high capacity national and international backbone networks.

In June 2021, 57.1% of the population in sub-Saharan Africa (669 million) was within a 25km range of an operational fibre optic network node. This compared to 56.7% (647 million) in 2021, 55.9% (620 million) in 2020, 55.2% (584 million) in 2019, 54.2% (556 million) in 2018, 55.2% (522 million) in 2017, 48.1% (469 million) in 2016, 45.8% (436 million) in 2015, 44%, (410 million) in 2014, 41.8% (371 million) in 2013, and 40% (345 million) in 2012.

Once the fibre network, which is currently under construction, enters service, the fibre reach of sub-Saharan Africa will increase to 57.9% (679 million), and once the network which is planned

or proposed enters service it will increase to 62.3% (730 million).

International internet bandwidth

Africa's total inbound international internet bandwidth reached 26.9Tbps by December 2021. This compared to 20.4Tbps in 2020, 15.8Tbps in 2019, 12.0Tbps in 2018, and 8.2Tbps in 2017. This total of 26.9Tbps in 2021 was split between sub-Saharan Africa, which increased by 32% to reach 16.6Tbps, and North Africa which increased by 34% to reach 10.3Tbps.

Almost two-thirds of all this bandwidth to sub-Saharan Africa is supplied to its three largest markets. South Africa's inbound international internet bandwidth was reported at 5.598Tbps in 2021, Kenya was reported at 2.941Tbps, and Nigeria had an estimated 1.950Tbps.

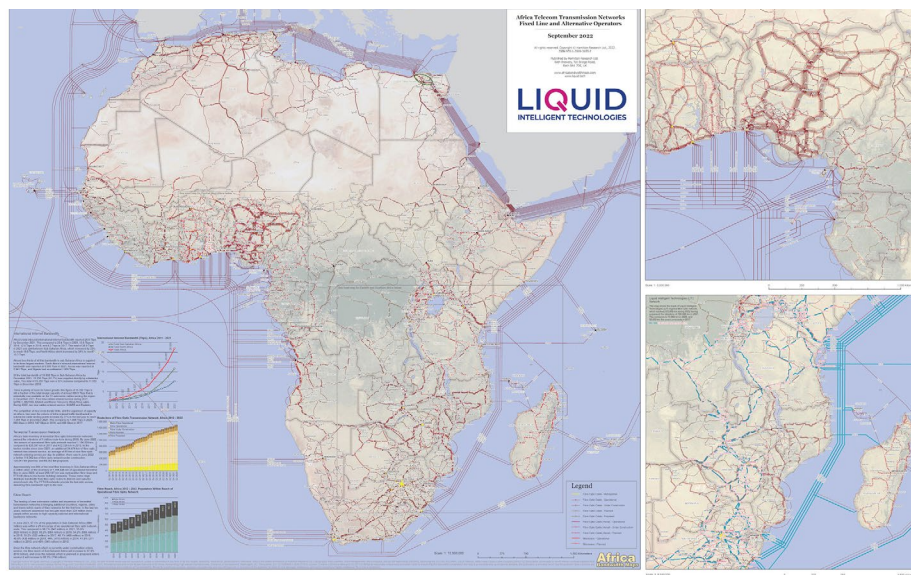
Of the total bandwidth of 16.630Tbps in sub-Saharan Africa by December 2021, 15.255Tbps (91.7%) was supplied directly by submarine

cable. This total of 15.255Tbps was a 32% increase compared to 11.555Tbps in December 2019. There is plenty of room for future growth: this figure of 15.255Tbps is still a fraction of the total design capacity of at least 406.5Tbps that is potentially now available on the 31 submarine cables serving the region in December 2021.

Four new cables entered service during 2021: DARE 1, METISS, Ellalink and Maroc Telecom's West Africa cable. So far during 2022, the SHARE submarine cable has also entered service.

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 27% in the last year to reach 1.354Tbps in December 2021. This compares to 1,066Tbps in 2020, 690Gbps in 2019, 547Gbps in 2018, and 400Gbps in 2017.

Map credits: 2022/3 Africa Telecom Transmission Map. Republished with kind permission of Hamilton Research Ltd www.africabandwidthmaps.com ■





Mike Last,
group chief marketing officer,
WIOCC Group

Developments in subsea fibre

Whilst 2021 saw the completion of several ‘infill’ subsea cables - DARE1, connecting Kenya, Somalia, Somaliland and Djibouti; METISS, reinforcing connectivity between the islands of Madagascar, Reunion, Mauritius, and South Africa; and Maroc Telecom West Africa, linking Gabon, Benin, Togo, Cote d'Ivoire and Morocco - 2022 has very much been the year of the African mega-systems. Two new 140+Tbps subsea cable systems are currently in deployment around Africa's coast, bringing a huge boost to Africa's subsea capacity inventory.

The 12,000km Google Equiano cable has 12 fibre pairs and 144Tbps design capacity. The system - which landed in Togo in March, Nigeria in April, Namibia in July and Melkbosstrand, South Africa in August - is roughly 20 times larger than the last cable system built to serve Africa's western seaboard.

The Meta-led 45,000km 2Africa cable, with a design capacity of up to 180Tbps on key parts of the system, is also currently in deployment and will operate 27 landings in 19 African countries. Its first Africa landing took place in Djibouti in May 2022, and it has since also landed at Ras Ghareb in Egypt, in November 2022.

In addition to boosting inter-continental and inter-country connectivity, both subsea cables bring further benefits. Designed and implemented over cable routes that are diverse to existing subsea systems and with numerous

new landing points on Africa's coastline, the cables offer capacity purchasers the opportunity to build greater resilience into their networks and service offerings to customers. Additionally, with both systems based on open access principles, service providers will be able to access capacity at carrier-neutral data centres and open-access cable landing stations on a fair and equitable basis, supporting the development of healthy internet ecosystems.

Equiano is expected to be operational early in 2023; with 2Africa coming online by end 2023 (East) and end 2024 (West).

The other mega-system in deployment throughout 2022 is PEACE: a 12,000km multi-Tbps system (up to 192Tbps on some segments) linking Pakistan, Kenya, Egypt and Europe. The Pakistan - Egypt - Europe segment went live earlier in the year, with construction of the Kenya segment completed in November 2022.

Finally, SHARE - Senegal Horn of Africa Regional Express - came online in March 2022, linking Senegal to Cape Verde.

Terrestrial fibre on the rise

The impending increase in international subsea capacity is one of the key drivers for further investment in terrestrial infrastructure. Additionally, wider deployment of advanced 4G/5G mobile technologies underpinning broadband rollout, the increased need to support remote working practices necessitated

“The impending increase in international subsea capacity is one of the key drivers for further investment in terrestrial infrastructure.”

by the COVID-19 pandemic, and the growing migration of services and applications into the cloud all demand further investment in terrestrial fibre infrastructure.

According to Hamilton Research, Africa's total inventory of operational terrestrial fibre-optic network reached 1,184,028km by June 2022. This increase of 34,474km compared to 12 months previously was distributed across multiple countries. In addition, in June 2022 a further 119,062km of fibre-optic network was under construction, 125,541km planned and 69,352km proposed.

Approximately 20% of this total fibre inventory - approximately 256,107km - is within city boundaries, as metropolitan fibre rings and fibre-to-the-home / fibre-to-the-building (FTTH/FTTB) networks. These metro rings distribute bandwidth from fibre-optic nodes to districts and suburbs around major cities. FTTH/FTTB networks provide the last-mile access, delivering fibre bandwidth right to the doorstep.

Pan-African operators including Airtel, Liquid Intelligent Technologies, MTN, Paratus and WIOCC have all announced network builds in numerous countries during the year.

Many of the 38 fibre network operators (FNOs) in South Africa, have continued to build out national backbone routes and have significantly extended their FTTH/FTTB networks. A report published in August showed FNOs had passed approximately 3.9 million of South Africa's 17 million homes with fibre. Additionally, 460,000 of South Africa's 860,000 business premises now have access to fibre. Leading operators Vumatel and Openserve have increased the number of homes passed by 400,000 and almost 300,000 respectively.

West and Central Africa has also seen significant network deployments. In January,

construction started on a 285km fibre-optic route interconnecting Congo with the Central African Republic (CAR). This link forms part of the Central Africa Backbone (CAB) project, which was further extended in May with the first cross-border terrestrial fibre-optic route to connect Congo with neighbouring Cameroon. The 347km fibre route - started in mid-2020 - runs from Ouesso via Paris, Biesse, Sembé and Souanké to Ntam. In November, CSquared announced a partnership with USAID to build a 350km national fibre backbone in Liberia, extending from the capital city, Monrovia, to the borders with Côte d'Ivoire and Guinea, connecting at least 13 cities en route.

In the East Africa region, South Sudan and Djibouti signed a Memorandum of Understanding (MoU) earlier in the year to build a cross-border fibre-optic link between Juba and Djibouti via Ethiopia. The Kenyan Government has announced plans to construct over 100,000km of fibre-optic infrastructure throughout the country over the next five years. Bandwidth and Cloud Services (BCS) announced deployment of a submarine fibre-optic cable through Lake Tanganyika to connect towns in Eastern DRC (Democratic Republic of Congo), and to serve as an alternate gateway in Eastern and Southern Africa.

At WIOCC, we have invested in fibre pairs on 2Africa and Equiano and expanded our terrestrial infrastructure in key countries, particularly in South Africa and Nigeria - where we have our own 16Tbps-ready national networks - and across much of the SADC region. These investments ensure that we continue to have the low-cost base and massive on-net scale needed to remain the hyperscale partner of choice for the ongoing capacity needs of our cloud operator, telco, ISP and other wholesale clients. ■



Chris Wood,
group chief executive officer,
WIOCC Group

This year, WIOCC has continued to extend its network which comprises high-capacity pan-African terrestrial infrastructure integrated with strategic investments in major international subsea systems serving Africa. This network has established itself as Africa's digital backbone; with open infrastructure that supports delivery of reliable, fully scalable national and international connectivity to cloud operators, content providers, telcos, and internet service providers (ISPs). Our most recent investment has secured full fibre pairs on the new Equiano and 2Africa high-capacity subsea cable systems, each of which will add more than 100Tbps of capacity. As of November 2022, the cables are in deployment around Africa's coastline and scheduled to be operational by end-2022 (Equiano) and by end-2023/4 (2Africa).

WIOCC was chosen as a landing partner for both open access cable systems. Through WIOCC Group company Open Access Data Centres (OADC), it is hosting landing stations within carrier-neutral, open access data centres in Nigeria (with the Equiano cable landing directly into OADC Lagos) and South Africa (the 2Africa cable is scheduled to land directly into OADC Durban in January 2023, and WIOCC's fibre pair on the Equiano cable is being extended into OADC Rondebosch in Cape Town from the landing point in Melkbosstrand, to the north of the city).

Looking ahead: Demand for digital connectivity will continue to rise, driven by further business migration of operations into the cloud and consumers using more of the ever-increasing number of connectivity-driven applications, products, and services. Our fibre pair ownership

We are increasingly focused on implementing a unique core-to-edge data centre proposition for Africa, together with what we are calling 'WIOCC 2.0': delivery of the converged open digital infrastructure demanded by our clients and needed to expedite the digital transformation of the continent.

We are seeing an opportunity not only to meet carriers, cloud operators and content providers' increased demands for reliable, high-speed international connectivity, and single-sourcing these together with high quality colocation capabilities, but through OADC's transformational core-to-edge data centre proposition to also enable in-country broadband, mobile operators, ISPs, the cloud and content community, enterprises, and government departments to:

- Store, manage and process their data locally in open access DCs that provide security, power backup, field services, roof access (to site antennae) and connectivity, all on an OpEx basis
- Cost-effectively extend their network reach
- Migrate content closer to the point of consumption at the network edge
- Process large data sets closer to their point of origin, saving on transmission costs
- Take advantage of our locally-hosted disaster recovery capabilities.

We are seeking opportunities to secure operating licences in new markets. We are also exploring other areas of business, with announcements in this area to be made early in 2023. ■

in 2Africa and Equiano, together with our existing infrastructure and the expansion of our terrestrial networks in Malawi, Nigeria, South Africa, and Zambia, will create many opportunities for us to continue to meet our clients' connectivity needs across Africa.



Pete Hall,
regional managing director, Ciena

In the last twelve months we have seen an increase in bandwidth demand in the telecoms market overall across MEA. This has been driven by increasing demand for cloud-based services, mobile broadband connectivity, and user desire for bandwidth-hungry services like HD video, gaming, and remote work applications.

Ciena achieved several milestones over the last year. The most recent being teaming up with WIOCC, a leading provider of digital connectivity and infrastructure across Africa, to expand open access digital infrastructure with high-capacity submarine cable connectivity between Europe, Nigeria, and South Africa.

Our collaboration with WIOCC has allowed us to activate a fibre pair on the new Equiano submarine cable system, now in deployment, scheduled to go live in stages throughout 2023 and 2024, landing directly in the new carrier neutral OADC facility in Durban.

“Our customers – network operators - have been challenged with the need to maintain and support the world’s fastest growing bandwidth demand, and, to deliver an acceptable Quality of Experience (QoE), as more bandwidth-intensive applications come to market.”

This cable will run a total of 15,000km from Portugal along the African west coast, making Equiano one of the largest cables serving Africa, with 12 fibre pairs delivering a total of 144Tbps of capacity; substantially reducing the transported cost per bit to satisfy surging digital demands regionally, improve connectivity to Europe, the Americas, the Middle East, and Southeast Asia. We are proud to be providing turnkey planning, design, and deployment services to ensure project success - all vital, as we expand our ability to support the cloud and wholesale community in Africa.

Another success in 2022 for Ciena in the MEA region was delivering GeoMesh Extreme, end-to-end network architecture powered by WaveLogic 5 Extreme to EASSy’s Submarine Cable Network - a 10,000km submarine cable system traversing Africa’s east and south coasts. This network upgrade will migrate legacy traffic, as well as manage and support its network operations center (NOC) in South Africa. It also helped to double network capacity from 18Tbps to 36Tbps across the system and maintain pace with voracious and ongoing bandwidth growth in sub-Saharan Africa at a lower overall cost. Placing EASSy in a better position to expedite the closing of the digital divide for Africans who are increasingly dependent on cloud-based services.

Our customers – network operators - have been challenged with the need to maintain and support the world’s fastest growing bandwidth demand, and, to deliver an acceptable Quality of Experience (QoE), as more bandwidth-intensive applications come to market. This means that delivering reliable and secure networks that rapidly scale and offer low latency is just as critical as supporting the capacity needs and the cost per bit as there has been price erosion over time, resulting in a lot of competition

“The importance of a broad and vibrant ecosystem should not be overlooked, and we will start to see greater focus on this in the industry in the future.”

between submarine cables.

Another involves the physical placement when it comes to submarine cables. For transoceanic network services, submarine cables contribute most of the total end-to-end latency due to its routed distance of several thousands of kilometres and the fixed speed of light. This makes the selected route for a new submarine cable critical when designing low-latency networks, since once its laid upon the seabed, its latency is essentially fixed over its lifespan, typically 25 years or more.

Emerging opportunities in the telecoms and networking industry that we’ve seen and can build on is doing our part to improve network connectivity in Africa, as prospects are plentiful. It is a market that we are certainly going to continue to see a bigger focus on. As a key enabler

of innovations that drive network connectivity, Ciena is relentlessly focused on helping our customers provide a high-performance low-latency adaptive network that can satisfy the continents growing bandwidth demands.

We have seen a trend towards investment in network assets to help manage, scale, and provide the low latency that the region really needs.

The importance of a broad and vibrant ecosystem should not be overlooked, and we will start to see greater focus on this in the industry in the future. There has also been an increase in submarine network capacity utilisation following the significant growth following the global pandemic, which looks to expand into more countries. ■

“Emerging opportunities in the telecoms and networking industry that we’ve seen and can build on is doing our part to improve network connectivity in Africa, as prospects are plentiful.”

Looking ahead: For us, the next twelve months will see ongoing international bandwidth growth, with Africa far surpassing any other region worldwide. According to consultancy Telegeography, Africa experienced the most rapid growth of international internet bandwidth in recent years, “growing at a compound annual rate of 44% between 2018 and 2022.”

With the fastest growth rate over the last four years and numerous new submarine cables being deployed, this is an emerging market with plenty of opportunity and new infrastructure projects.

A large part of Africa’s bandwidth growth comes down to the population size – as the world’s second largest continent, networks will play an extremely important role – with clear appetite amongst consumers who have a hunger for the latest content, video streaming and other digital applications.

In addition, the networking industry will play an instrumental role in helping Africa to remain connected to the rest of the world and help to create a viable and sustainable economy as we continue to progress in the digital world.



Gaëtan SOLTESZ,
CEO, Silicone Connect

2022 has been phenomenal for Silicon Connect. We secured the network concession to the north, through a joint venture called DATACAB. This network connects Cameroon, the Republic of Congo, and the Republic of Centrafrique to a state-of-the-art DWDM network. We kicked off a project to modernize the Silicone Connect backbone between Pointe-Noire and Brazzaville, upgrading speed to 2x200G and opening market in new cities. This effort will complete during the first quarter of 2023. Kinshasa and Brazzaville were connected with two new high-capacity fibre optic cables laid at the bottom of river Congo.

Business always wants (needs!) to move faster than regulatory issues, and we started slow due to the contractual work needed to finish first. The role of the infrastructure provider is not well understood here, as some traditional operators sell to multiple markets concurrently. This made it a challenge to establish our position on the market. We are nonetheless proud to have signed our first deals with operators and hope to connect many more soon.

Looking ahead: DATACAB needs to focus on its mission to connect operators in Cameroon and in Centrafrique. The network is brand new so this will be a debut year for the company. We need to ensure the right processes and know-how are deployed right away to succeed.

Silicone Connect needs to continue making further investment into its infrastructure, to bring 100G and up across the entire network. This modernization will ensure the right services can be offered to Operators with market SLAs.

The Republic of Centrafrique is a virgin market for infrastructure with immense potential. DATACAB is bringing the first fibre optic international gateway to the country in December 2022. This will provide regional operators 10x speed and massive reduction on price, and the national population with much-needed economic empowerment. We are also seeing operators present in neighbouring countries wanting to transit across the Congo to connect their OPCOs together. This is only possible with the meshed network with multiple international connections which we have.

Throughout the market, we are observing consolidation and rationalisation. It is no longer possible to succeed in Africa by keeping services local. Operators must invest, go big and conquer the larger market by expanding internationally through investments and partnerships. Those who don't risk being made irrelevant by emerging threats such as Google and Meta landing their high-capacity cables to African shores, Starlink, OneWeb and Amazon launching dense LEO constellations.

We will consolidate our network during 2023, taking it to the next level in speed and reliability to fully address the need of operators within the Congo and in neighbouring countries. We will also consider strategic national and international expansion where it makes sense. ■

At the end of 2023, our focus will shift towards commercial and operational streamlining as well as strategic partnership building. 2024 and beyond will see new challenges through demonetization of bandwidth and always-increasing capacities, putting pressure on operators' margins. Operators ought to prepare through streamlining and consolidation of their operation. Also, size does matter: the market will see survival of the fittest, hence the importance of growth and consolidation to build resilience.



David Eurin,
CEO, Liquid Dataport

Liquid Dataport has had one of its busiest years in 2022, working hard to ensure that connectivity across the continent improves to enhance and empower the lives of Africans through digital technology.

However, as a business of Cassava Technologies, we believe that our work is not done until every African individual has affordable and reliable internet access, which we believe can transform and uplift lives.

The spread of connectivity for social and economic upliftment continues to be a priority on the continent, and reliable, fast, and widespread affordable connectivity is crucial in maintaining forward momentum. As a result, the telecommunications space is playing a more significant role than ever before in helping the growth of Africa's many economies.

From enabling access to mobile banking and communication tools used by employees working at multiple sites across the globe to interlinking the formal and informal economies, in 2023 we have a responsibility to empower our customers and help them to take

“Because the new sea cables are enabling a step-change in the amount of international capacity available, we foresee a much-needed drop in internet connectivity prices and improved quality.”

control over their network.

Multiple sea cables are landing on African shores, but at the same time, several are reaching the end of their lifespan. Because of this, international players like Google, Meta and PEACE have already launched newer, more technologically advanced sea cables to Africa.

Liquid Dataport has acquired a fibre pair on Equiano, the new West Coast submarine cable, capable of delivering up to 12 Terabytes of new internet capacity. This is set to significantly empower the development of businesses in Southern African countries through improved access to high-speed, affordable connectivity and increased access to digital technologies.

This acquisition is yet another addition to our steadily growing pan-African telecommunication network, which includes satellite connectivity, subsea links, and our cross-continent terrestrial fibre network – the largest independent network of its kind in Africa. It also adds to our ability to deliver cybersecurity, data centres, cloud services, renewable energy, and fintech services to our customers directly and indirectly, whether they are enterprises, small medium enterprises (SMEs), or governments.

This is a huge step towards addressing many of our customers' challenges. Lack of access to affordable internet connectivity across the African continent, be it in the largest cities or the remotest villages, remains a hurdle for Africans and organisations in adopting digital technologies. High costs and rigid networks that provide users limited control over their networks have also proved challenging to the uptake of connectivity in many communities.

The additional capacity we are bringing in through the Equiano, 2Africa and PEACE subsea cables augments Liquid Dataport's existing pan-African fibre network is a vital element to leverage the digital economy.

Because the new sea cables are enabling a step-change in the amount of international capacity available, we foresee a much-needed drop in internet connectivity prices and improved quality in South Africa, Nigeria, Kenya and many neighbouring landlocked sub-Saharan countries.

In our considerable efforts to enable our customers to take control over their network, we are bringing new technologies to their doorstep. Liquid Dataport established itself as the first African organisation to launch and commercialise its Software Defined Network (SDN) platform called Dataport. This will be deployed in South Africa, Kenya, Tanzania and Europe in its first phase, with more regions set for coverage in the near future.

Through the newly launched Dataport, we also see increased opportunities to connect smaller and medium-sized businesses that can now pay for only what they use. In addition, because our new SDN offering allows customers to choose

“Our work is not done until every African individual has affordable and reliable internet access, which we believe can transform and uplift lives.”

“Lack of access to affordable internet connectivity across the African continent, be it in the largest cities or the remotest villages, remains a hurdle in adopting digital technologies.”

packages based on their size and requirements, more and more people should be able to access stable, high-speed and affordable connectivity irrespective of their size.

Customers will get instant quotes and be able to order services online, as the SDN platform orchestrates service provisioning to configure their service requirements automatically on the Liquid network, making Dataport the most extensive ‘One Africa digital network’. This is empowering customers to take control of their network, tailor-making it to suit all their connectivity requirements, app usage and costs.

At the same time, Liquid maintains that cybersecurity should be at the centre of every online conversation, and we remain steadfast in our efforts to mitigate any threats our customers may face. The high level of security is implemented by Liquid’s own cybersecurity teams. ■

Looking ahead: Africa is a unique continent with countries at different levels of digital transformation. This presents unique opportunities and challenges. We must be mindful of customers’ ability to leverage our technologies and deal with government and regulatory policies simultaneously.

As the largest independent fibre network provider

in emerging markets globally, delivering services in over 30 countries across Africa, we created 100,000km of fibre routes to transport data across the length and breadth of the continent. We will make technology affordable and universally accessible across Africa and drive this vision of a digitally connected future that leaves no African behind.

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FibrePoynt manufactures and sells solar-powered wireless broadband antennas, termed HomePoynts, that enable the implementation of a telecommunications network infrastructure system for last mile delivery of broadband data services to underserved high-density residential communities

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The Carrier and Cloud neutrality advantage allows customers to manage traffic to get better value, lower latency, and higher resilience and creates an open market for partnerships between customers, networks, cloud and content providers, the Internet Exchange Point of Nigeria, and managed service providers.

Rack Centre's clientele includes 57+ telecommunication carriers, Internet Service Providers (ISPs), global Tier 1 networks, and pan Africa international carriers, including direct connections to all five undersea cables serving the South Atlantic Coast of Africa including Equiano, 2Africa and every country on the Atlantic coast of Africa.

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WIOCC is the leading player in the deployment of carrier-scale, future-proofed network infrastructure into Africa. We have the flexibility and scale to meet the ever-growing demand for reliable, high-speed capacity throughout Africa, driven by end consumers, enterprise users and the ecosystem that supports them.

Our policy of continual investment in our network to create Africa's first, truly hyperscale network infrastructure means ongoing investment for growth, ensuring our readiness to meet the future data volume demands of end users throughout Africa.

Operating exclusively as a wholesaler, we have revolutionised the delivery of high-capacity connectivity between Africa and the rest of the world. Widely recognised as Africa's carriers' carrier, we offer carriers, content providers, cloud operators, ISPs and mobile operators reliable, seamless, high-capacity connectivity between more than 30 African countries and key global financial and commercial centres.

Our focus on building and maintaining strong, long-term relationships with each client enables us to develop bespoke solutions that meet their current requirements and have the capability to match future demands for growth, extra resilience and geographical expansion.



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chapter 8

Fixed Wireless Access



Paul Colmer,
EXCO member, Wireless Access
Providers Association (WAPA)

How many Africans have connectivity and could therefore reasonably participate in the digital economy? Just 22% according to the International Finance Corporation (IFC), a member of the World Bank Group. Statista paints a more optimistic picture, suggesting that as many as 43% of Africans have internet access as of December 2021.

The African Union has committed to the laudable goal of connecting every African, business and government on the continent by 2030. What remains to be seen, however, is the method by which they hope to support that achievement.

Even Statista, the more optimistic of the two sources, reveals that the global average is 66% of people have internet access, reaching as high as 80% in Europe. There is clearly room for improvement.

Mind the gap

The reality today is that there are 26 submarine cables that connect from Africa's East, West and

Mediterranean shores to the rest of the world. The latest, Equiano, currently provides the biggest chunk of throughput at 144Tb.

Together, Equiano and all the other undersea cables have delivered several benefits for Africans, not the least being more affordable connectivity. That benefit alone supports numerous other downstream benefits, including business and industrial growth, as well as new jobs. The IFC says that some areas have experienced employment growth as high as 10% as a direct result of increased connectivity. The East Africa Submarine Cable System (EASSy) for example, says the IFC, "contributed to a 14% increase in East Africa's GDP since 2009."

We recently collaborated with the Dynamic Spectrum Alliance (DSA) on a study in South Africa over several months. Three further studies were simultaneously conducted by the DSA and its partners for Nigeria, Kenya, and Indonesia, all with similar findings. The findings show that South Africa alone could benefit by up to nearly US\$58 billion over the next 10 years by enabling 1200MHz license-exempt in the 6GHz band, known as WiFi 6E, helping the country to bridge the digital divide, as well as improving access to remote education, work, and commerce.

It clearly demonstrates that international

connectivity must be made accessible at regional and local levels to convey its benefits to bridging the digital divide. Over 160 wireless internet service provider (WISP) members at WAPA use fixed wireless access (FWA) to connect communities. WISPs are the backbone of connectivity in South Africa's outlying centres, providing hundreds of thousands of people with connections and including them in the digital economy.

In fact, we conducted a census of the industry in South Africa and released the report in November 2021. WAPA member WISPs generate over R3 billion in annual revenues, connect more than 200,000 homes, and directly employ 3,000 people.

Challenges galore

One of the major hurdles is the cellular stranglehold on connectivity in many regions across the continent. Mobile operators appear to take an aggressively optimistic view of broadband cellular coverage. In South Africa they claim 99.9% coverage using 3G, 97.7% on 4G, and 7.5% on 5G as of 2021, as published by the Statista Research Department. However, the inability to complete an uninterrupted conference call while on the move may bring these figures into question.

Regardless, coverage paints only one half of the picture. Accessibility is the other half, and cost precludes many from participating online. Two of the five most expensive places in the world to buy 1GB of data are in sub-Saharan Africa and, the Worldwide Mobile Data Pricing 2022 report by Cable.co.uk says, sub-Sahara Africa is the "second-most expensive place in the world for mobile data generally." The average price in sub-Saharan Africa is US\$4.47 per gigabyte, according to the report.

This is even more onerous for a majority of the population that has among the lowest per capita incomes worldwide. Yet another disadvantage is the per-gig billing model that is perhaps overdue for

some of the industry's famous innovation.

Even though poverty levels have generally declined in Africa from 2010 to 2019 according to the United Nations Conference on Trade and Development's (UNCTAD) Economic Development in Africa Report 2021, 34% of African households still survive on less than US\$1.90 a day. 59% do so on less than US\$3.20 per day and 80% on less than US\$5.50 per day.

There are 1.3 billion Africans, which means that a shade over 1 billion Africans survive on less than US\$5.50 per day, all of them people the African Union has committed to connect by 2030. The opportunity is to lift a billion people out of poverty, by today's count, and they would thereafter contribute billions of dollars to the economies where they live, every year.

But that's not going to happen if you try to charge them US\$4.47 for 1Gb of data. It's over 80% of their daily income. Consider that, to be a part of the global digital economy, the average American consumes 34GB of data every day, says the New York Times. Verizon UK's website has a handy calculator that suggests just 30 minutes of web browsing per day will use 1Gb in a month. Add another 30 minutes for streaming movies, music, calling via an app, and social media and you get to 25GB. That's barely even trying, considering that most meetings are now conducted online. In fact, Fortune Magazine says people spend 21.5 hours a week in meetings.

Based on those numbers it's easy to see why so many Africans are excluded from the digital economy.

Hurdling the obstacles

There is unlikely to be any significant change if we continue doing things the way we always have in the past. Mobile operators have no history that indicates they will close the digital divide in Africa.

Developing the solution

The WAPA project that investigated the use of TV White Space (TVWS) as part of an international consortium, including the United States Development Agency (USTDA), unearthed many interesting concepts. Not least was a sustainable new connectivity model.

The model is unsuitable for the incumbent mobile operators because it would disrupt their one-fee-for-all, per gigabyte billing model. However, it is sustainable for smaller service providers, community-oriented entrepreneurs, and start-ups like the WISPs. For the equivalent of about US\$0.60 a day or less we proved that it is feasible to provide uncapped connectivity. That's affordable for households earning incomes of less than US\$180, which puts it within reach of the 80% of Africans who earn US\$5.50 per day.

What could be

This is the potential game changer that Africans need to sustain the backbone of an inclusive

digital economy. Already back in 2011 a McKinsey report showed that the internet accounted for 21% of GDP growth for mature economies in five years. The World Bank's World Development Report 2016 noted that connectivity fosters education, business, work, and job opportunities. These aspects partly formed the foundation of how Singapore was transformed from a third-world country when it gained independence in 1965 into the economic global powerhouse it is today.

So much is possible when we transform connectivity and digital inclusivity. Poor farmers might, for example, be reliably assessed for credit by major financial institutions using mobile phone records. It could release them from being forced to pay the ruinous interest rates of local moneylenders.

WISPs could charge much lower fees than current cellular prices for uncapped connectivity, which is ultimately what people need to participate in the digital economy. But it requires the release of underused spectrum without attempting to opportunistically capitalise to the detriment of marginalised members of our society. ■



Amy Saunders,
editor, *African Wireless
Communications Yearbook*

Connectivity across the African continent has come on in leaps and bounds in recent years, with billions of dollars of investments helping deliver digital transformation for both voice and data markets.

In MENA, the GSMA reported that mobile internet users reached 307 million in 2021; 50% of the population is expected to be online by the end of this year. 4G, MENA's leading technology, accounted for almost 270 million or 41% of

connections in 2021. This is expected to hit 44% by 2025. 5G adoption, meanwhile, is expected to account for 17% of the market share by 2025, some 116 million connections.

Meanwhile, in sub-Saharan Africa, 28% of the population, 303 million people, had subscribed to mobile internet in 2020, according to the GSMA. This is expected to grow to 40% by 2025. 4G accounted for 17% of connections in 2021, forecast to expand to 33% by 2025. An additional 41 million connections, 4%, are expected to be 5G by 2025.

It's clear that internet use among African inhabitants has been increasing, however, most of this internet connectivity is mobile.

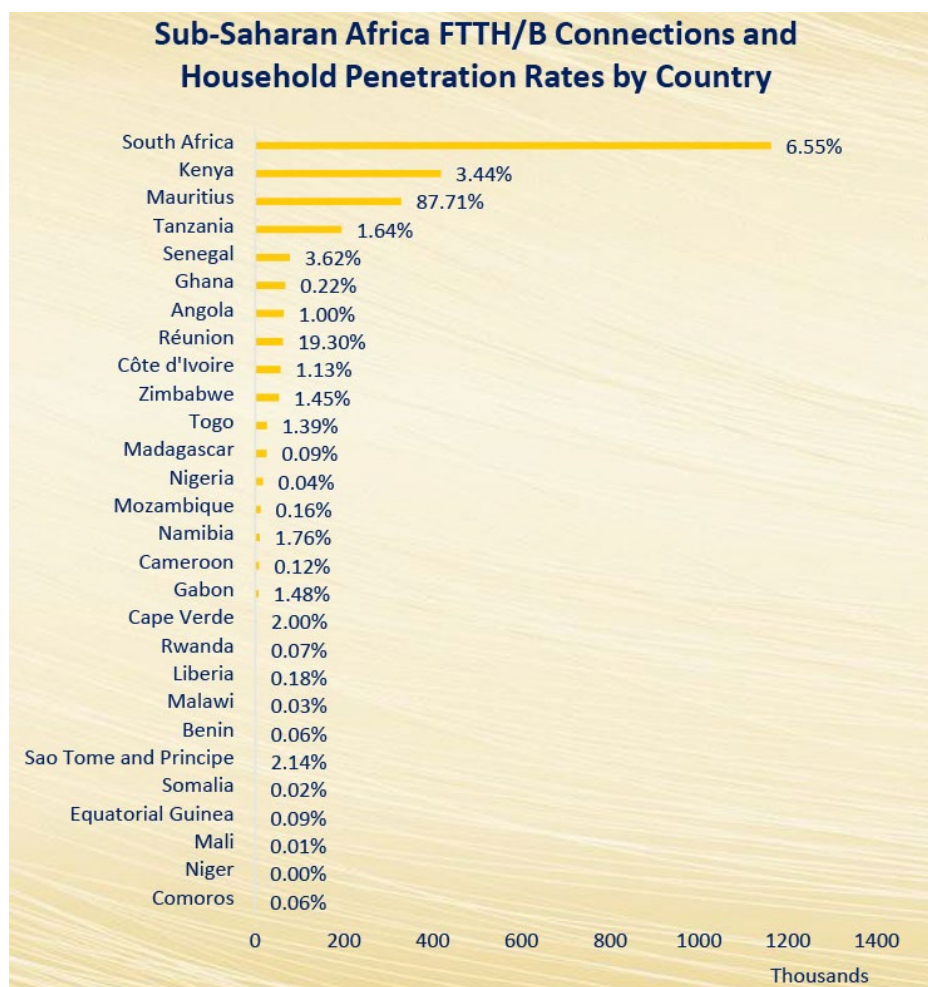
Unfortunately, mobile broadband is unable to meet the download speeds and latency levels of a fibre connection, meaning millions of African users remain underconnected.

Unmet connectivity needs in sub-Saharan Africa

According to the 'Africa Digital Infrastructure Market Analysis 2021 Report,' the COVID-19

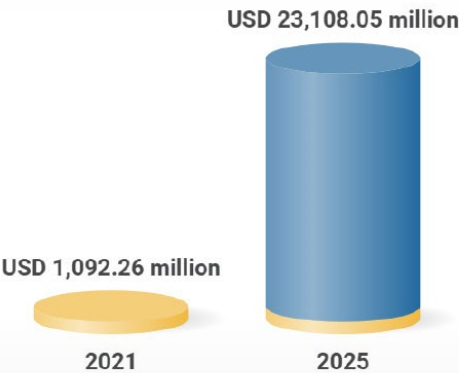
pandemic highlighted some major gaps in the digital divide within Africa. The African Economic Outlook 2021 reported that the information and telecommunication sector was the only sector in Africa with a growing GDP during the 2020 lockdowns.

Many markets in sub-Saharan Africa, especially Niger, Central African Republic, Chad, and South Sudan are underdeveloped. sub-Saharan Africa has just 15% 4G mobile connections. Social



Global 5G Fixed Wireless Access Market

Market forecast to grow at CAGR of 114.5%



<https://www.researchandmarkets.com/reports/5440761>

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media penetration in Chad, Niger, Central African Republic, South Sudan, and Malawi is less than 3%. Central Africa Republic has just 20.76% of network coverage. In South Sudan, only 14.67% of the population own a mobile device. Many regions either do not have access to the internet, have poor quality internet or affordability of data and internet connecting devices remain high.

To narrow the digital divide in sub-Saharan Africa, urgent government intervention is necessary. 500 million first time mobile subscribers require targeting and a huge percentage of the population aged over 15 years old has yet to buy their first own mobile devices. More than 1 billion people live in areas that are not covered by mobile broadband. Development of 4G to provide higher bandwidth, lower latency and improved spectrum efficiency is needed.

In most markets in sub-Saharan Africa, fibre broadband is a niche service focused on main cities and urban areas. Household penetration of

fibre broadband remains below 2% in most sub-Saharan African countries except for Mauritius, South Africa and Kenya. South Africa is the only country in sub-Saharan Africa that exceeded 1 million fibre broadband subscribers as of 2021, while Mauritius has achieved almost ubiquitous fibre coverage with over 87% of the households enjoying the fibre broadband.

Fixed wireless access

Fixed wireless access (FWA) is considered an enabling technology for delivering fast, cost-effective connectivity for enterprise, businesses, hospitals, homes, etc. in areas where the laying of fibre is prohibitive due to price, physical environment, etc. The next stage of FWA uses 5G technology like mmWave spectrum and beamforming, providing a significant boost to wireless broadband services.

FWA has proven a promising technology the

world over, with ResearchAndMarkets' '5G Fixed Wireless Access Global Market Report 2021: COVID-19 Implications and Growth' stating that the 5G FWA market is expected to grow at a compound annual growth rate of 114.5% from US\$538.9 million in 2020 to US\$23,108 million in 2025. The increasing adoption of 5G is expected to fuel 5G FWA growth during the period.

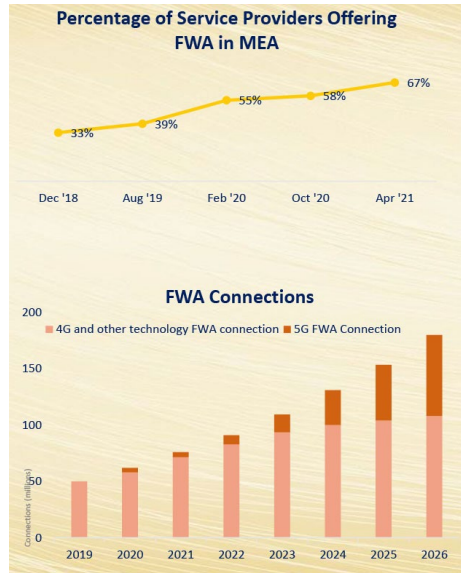
FWA is expected to prove a particular boon to African nations, where fibre connectivity is lacking due to high investment costs and low population density in rural areas. Expected to deliver fibre-like services with improved download and upload speeds and latency, 5G FWA allows for the relatively rapid establishment of affordable broadband, helping close the digital divide and bringing Africa's diverse economies into the digital now.

The advantages for deploying FWA for operators include:

- Fast time to market - deployment is less complex and costly than cable/fibre, and subscribers can be brought onto the network more quickly, delivering a fast return on investment (ROI).
- Ease of deployment - FWA is suitable for sparsely populated or remote areas as well as urban and suburban environments, supporting multiple use cases and deployment scenarios.
- Plug and play - FWA is very simple to install.
- Low cost - existing cell towers can be adapted to offer FWA.

The 'Africa Digital Infrastructure Market Analysis 2021 Report' states that FWA is a fast solution to meet growing broadband service demand, particularly in the areas outside fibre coverage.

Ericsson reported that more than 70% of all service providers were offering FWA services, globally in 2021. Connections are forecast



to exceed 180 million by the end of 2026, accounting for more than 20% of total mobile network data traffic globally. Out of these, 5G FWA connections are expected to grow to more than 70 million by 2026, representing around 40% of total FWA connections. Service providers' adoption of FWA offerings has increased by 12% during the last six months of 2021, and more than doubled since the first measurements in December 2018. Almost 90% of service providers that have launched 5G also have a 4G and/or 5G FWA offering.

Over 2021, the highest regions for FWA growth were those with the lowest fixed broadband penetration, namely the Middle East and Africa, Central and Eastern Europe, Asia Pacific and Central and Latin America.

Network slicing

With the rollout of 5G and 5G FWA, additional pressure is being placed on networks, adding

strain in maintain quality of service (QoS). Duly, network slicing is expected to be paired with 5G FWA to enhance both monetization and utilisation of the new service, enhancing average revenue per user (ARPU) and average revenue per account (ARPA).

Network slicing enables operators to divide a network into multiple virtual ‘slices,’ which can be optimized for a specific target application or service. Network slices are isolated and provide resources (bandwidth, latency, edge computing resources) requested by a particular application. The end user of each network slice can then be serviced with different priorities, routing, levels of network performance and security capabilities. Slices can be managed and deployed in minutes, and each has key performance indicators used for service assurance. Potential applications of network slicing include extreme mobile broadband (eMBB); ultra-reliable low latency communications (URLLC); and massive machine-type communications (mMTC).

Africa gained its first 4G/5G FWA network slicing in August 2022 in a pilot by Nokia and Safaricom over Safaricom’s commercial network in Kenya. The trial utilized a multi-vendor network environment and included RAN, transport, and core as well as software upgrades.

Safaricom is now able to support new types of enterprise network services, including fast lane internet access and application slicing. In addition, Nokia is enabling secured FWA slice connectivity to enterprise locations, as well as to private or public application clouds. Nokia’s 4G/5G slicing solution supports LTE, 5G NSA and 5G SA technologies with slice service continuity between the networks. This enables slicing services for all LTE and 5G devices.

This is just the beginning of network slicing in Africa, and indeed the world. More progress can be expected soon, and more R&D outlining

which applications and use cases can be best supported by the technology.

Is FWA the answer to Africa’s connectivity challenges?

FWA still has a long way to go, in Africa and abroad.

Key factors limiting market growth include standardisation of spectrum allocation; high infrastructure costs; opposing impact of mmWave technology and the environment; compatibility challenges between traditional and 5G networks; power dissipation in MIMO; and inter-cell interference.

Big picture proponents believe that in the long run, FWA will be unable to compete with multi-gigabit fibre, however, it will still play a valuable role in bridging the connectivity gap, and certainly represents a viable solution for the 10-30% of the global population who will never have access to fibre – many of whom reside in Africa.

Ovum (now OMDIA) reported in its ‘Fixed-Wireless Access Drives Broadband Development in sub-Saharan Africa’ that while FWA technologies are readily accessible, prices have remained out of reach for many, meaning mobile broadband is still more accessible. Moreover, service providers have primarily targeted urban and semi-urban regions, or specific industrial targets, where they feel they will achieve the greatest return on investment (ROI).

However, Ovum estimated that in future, there will be an addressable market of around 142 million households for FWA in sub-Saharan Africa. The analyst recommended that for operators wanting to make FWA services more accessible and affordable, flexible tariff choices and manageable CPE costs are required. In doing so, they may also win mobile customers using 4G to affect a household broadband connection via a MiFi device or smartphone tether. ■



Mpho Sefalafala,
CEO, FibrePoynt



Justin Farnell,
business development, FibrePoynt

Following the very challenging circumstances of the previous two years of lockdowns, we have thankfully seen quite a healthy recovery in the South African economy in 2022. The telecoms sector has experienced a strong pick up with fibre network rollout leading the way, together with surging demand for data connectivity. The belated issuing of 5G spectrum to the major mobile operators has also been very welcome and should help the MNOs meet demand and reduce their cost of delivery.

That said, all the major South African fixed and mobile service providers have still not fundamentally addressed the elephant in the room: namely how to offer genuinely affordable internet connectivity to the broader population, who are struggling with the soaring cost of living. 1Gb of prepaid mobile data is still around R70 and a typical uncapped 5G or fibre monthly connection is R500 plus: this is simply too expensive for the

“South African fixed and mobile service providers have still not fundamentally addressed the elephant in the room: namely how to offer genuinely affordable internet connectivity to the broader population, who are struggling with the soaring cost of living.”

majority of South Africans.

FibrePoynt (a division of Poynting Group based in Samrand, Gauteng) has developed and patented a fixed wireless solution that significantly reduces the capital cost (by half in the case of FTTH) of delivering broadband access whilst offering low cost, fast WiFi data access. They have identified over 5 million homes across South Africa that can afford an uncapped router connection of around R300 and have an average mobile spend of between R70 to R100 a month. The prime market for these services is the townships, but we are also looking to connect densified rural communities and old towns.

The approach that FibrePoynt has taken is to focus on designing and manufacturing an end to end, solar powered WiFi solution: from the beamforming antenna and ruggedized enclosure, the meshed networking and WiFi chipset, IoT controller for the solar panel, the cloud billing and authentication platform and android mobile subscriber application, to automated dashboard and analytics. This is a significant differentiator from the plethora of WiFi vendors currently in the market, who tend to focus on either the hardware or the software components, rather than enabling a systems integrator or business partner to deploy a fully operable and licensed solution rapidly and brand the service as their own.

Our business development efforts over the past year essentially focused on signing up value added resellers (VARs) to take the solution to market (under their brand) in designated territories across South Africa that we feel are both densified, under serviced and suitable to deploy outdoor WiFi.

We targeted areas where the air isn't too congested with other WiFi providers. To date, we have deployed MRO-networks in areas ranging from Tongaat in Kwa Zulu Natal, to Soshanguve, Soweto and Cosmo City in Gauteng. The Cosmo City site is earmarked as a flagship site for massive growth in coverage.

The emphasis has been on working with predominantly black business entrepreneurs who have strong roots in the neighbourhood they wish to own and operate networks. Gaining the community's acceptance and support of a new service provider requires on the ground engagements, marketing, and promotions. The response has been fantastic, the community

“The key to technology adoption is one of trust and education transfer.”

sees the value of the service we provide, and our infrastructure investment is in safe hands. It really is Ubuntu in action.

Furthermore, the key to technology adoption is one of trust and education transfer. On both fronts, the bottom-up community engagement approach is really delivering results. Going forward some of the many learnings from this year, and the traction we've gained, I believe will be major drivers in the year ahead. ■

Looking ahead: One of the most remarkable features of building a sustainable and profitable WiFi business has been the level of digital token transactions we are seeing across the networks.

The FibrePoynt mobile application has been integrated with the Flash 1Voucher which enables subscribers to purchase their mobile or router WiFi data packages electronically at a retail point of sale. Besides removing the need to collect physical cash in the townships, the solution goes to the heart of why the Kasi Economy is booming. The Flash vendors (many of which are self-employed Spazas) are paid a commission every time they sell a voucher, the customer has the option to purchase electricity, DSTV, mobile data and now our partner WiFi data. Once the transaction is completed, FibrePoynt has a transparent and auditable ledger that is all managed through the cloud billing platform. These digital transactions currently represent over 80% of revenues and this trend is expected to grow even more next year. The opportunities for Pan-African expansion are massive. Just look how MPESA transformed Kenya mobile commerce. So, we see enormous potential

for taking the solution into Africa in 2023.

As mentioned earlier, the FibrePoynt solution is solar powered. Besides being the greenest network in South Africa, there are other key benefits, most notably the fact that in a country beset by loadshedding, FibrePoynt's networks are off the Eskom power grid! It speaks to a huge opportunity in provisioning internet and solar power to low-cost housing across Africa, in one integral solution.

Finally, it's one thing to offer the townships with low-cost WiFi but the greater challenge is still reaching the towns and villages in South Africa that don't enjoy access to the fibre backbone in the Metros. The cost of backhaul to these communities is still prohibitive, and it will only be when the likes of Elon Musk's Starlink is given license to operate in South Africa that we will see a game-changing drop in the cost of connecting the more remote locations across the country. Will it happen next year? Probably not, but the day we can drop a 30cm dish into a village in the Transkei and break out with FibrePoynt WiFi access will certainly be a case study I'd love to feature in this magazine!



Lux Maharaj,
director of sales, Africa, Parallel
Wireless

Parallel Wireless' OPEN Ran Urban Solutions continues to expand in both LATAM and NA markets, as well as in Europe, the Middle East, and Asia. Parallel Wireless anticipates deployment of its Urban Solution in several OPCOs in Africa by the end of 2023 following extensive and successful lab and field testing with Tier 1 MNOs. We are currently moving forward with Open RAN projects in Nigeria, Tanzania, and the Democratic Republic of Congo.

The topic of moving from legacy network architectures to ORAN is not a new one. There is an ongoing misconception that Open RAN lowers costs compared to traditional RAN vendors. However, the true benefit of Open RAN is the freedom of disaggregating between software and hardware. If an operator acquires a network from a closed RAN vendor, and would like to switch to an alternative vendor, this will result in swapping hardware and software while with Open RAN the operator might replace the software vendor without the need to swap the hardware. This allows MNOs to own their hardware investment even if they decide to switch vendors.

The cellular network industry is undergoing significant changes, with Open RAN being the next logical step in network evolution. Parallel

Wireless is committed to being a disruptive force that moves the industry forward with innovative solutions. Moving to cloud-based solutions is a natural progression for telecom companies, and Parallel Wireless is poised to lead these opportunities. The emerging opportunities we're seeing are with network operators that haven't yet expanded to 4G and or 5G, or operators that want to upgrade their existing network to a new network, or operators who would like to expand their coverage.

One trend we're noticing is the shift toward Open RAN. This approach results in a reduction of OPEX and CAPEX in the long term. MNOs are now becoming more confident in introducing Open RAN as an alternative to traditional deployments. We're also seeing the emergence of RAN Cloudification, which can provide significant saving in site operations, removing all data processing from the site to a central data centre/cloud.

The cellular industry is undergoing significant changes and will undoubtedly move to Open RAN. Parallel Wireless sees itself in this process and will be a leading disruptor of the industry. The shift to cloud-based solutions provides new opportunities for innovation and disruption of the industry. The key benefits of Open RAN include simplified operations, increased flexibility, and scalability. These factors will contribute to reducing the total cost of ownership (TCO) over time. ■

Looking ahead: The pandemic forced the industry to rethink its strategies, business opportunities and plan more effectively.

The expectation is that Open RAN will be deployed in the new 5G deployments in parallel to the existing 4G networks. This structure seems to be the best way for CSPs who gradually want to deploy 5G networks with no interruption to the

current service.

At Parallel Wireless we provide unified ALL G (2G/3G/4G/5G) software-enabled solution. Our innovation and excellence in multi-technology, open virtualized RAN solutions, have been recognized with 65+ industry awards. Our customers include 50+ leading CSPs worldwide and we were recently named a 'best performing vendor.'



Ted de Boer,
regional sales director,
southern Africa, Siklu

The growth of Gigabit-speed fixed wireless access (FWA) services based on the millimetre wave (mmWave) frequencies of 60 and 70/80GHz (the V- and E-band, respectively) continued apace in South Africa in 2022. Significant progress was achieved in multiple markets and service applications, including residential broadband (particularly in the townships), network enhancements for WISPs and heavy industry. Still, much work needs to be done to realise its full potential.

2022 has shown that there is a need to expand into the V- and E-bands as even licensed frequencies are in reality 'full up' or cannot deliver enough capacity due to other factors like competing traffic loads and noise. For instance, the 5.x GHz bands for shorter range, 'last mile' hops (e.g., 500–1500m) are congested and new technologies that can deliver the required capacity are too expensive for the average integrator.

Recent studies have shown that using 5G FWA bands such as V- and E-bands costs 80% less than fibre, with the assumption of a lack of existing fibre available for leasing or sharing. In suburban areas, the costing comes out as 70% less, based on a fibre deployment requiring new poles or trenching. In urban areas with little existing fibre infrastructure, FWA would save up to 45%.

Siklu is seeing intense interest in using mmWave for applications such as backhaul using E-band for the longer hops from a fibre PoP and using V-band for neighbourhood connectivity to provide lower-cost internet service to townships in lower LSM areas

(the SAARF 'Living Standard Measures' classifications). It has been great to see the innovation coming from South African entrepreneurs and Siklu offers expertise and technology options to help them fully explore these opportunities.

Using municipal WiFi style projects to address the digital divide is another area where mmWave connections can deliver the needed capacity faster and more cost-effectively. One issue in these scenarios is filling in 'fibre gaps' and the WISP TCS took that to a new level by establishing hops as short as 300m. TCS have their own fibre backbone network and have been deploying wireless networking to create cost-effective backhaul links from customer premises to the backbone. Extending the fibre to fill these 300m gaps was considered, but even at that modest distance, TCS and Siklu determined that an E-band wireless option would still be considerably less expensive and faster to install.

Another factor with E-band links is that ICASA has enacted a 'lightly-licensed' scheme to use these bands – giving a user up to 30 days in which to register – and have taken other measures to facilitate access to them. It is also less expensive than other licensed bands at less than R1,400/year for a 10Gbps link. Another interesting point is that traditionally E-band has been used for much longer links – as much as 20km in certain conditions – and the TCS solution effectively demonstrates the versatility of E-band technology.

A further area of growth for mmWave resides in the critical communications connectivity requirements for mining and harbour operations. mmWave can provide the high capacity and 'uptime' required for these drivers of economic growth, which is a highly desirable benefit given the current constrained economic

conditions in South Africa and globally. Mining operations are in remote areas and there are options of building a private LTE network or teaming with an MNO for connectivity. However, private LTE, 5G or commercial cellular networks operate well for narrowband IoT connections but may run into bandwidth or latency issues for direct HD camera connectivity or backhaul. Fibre can meet these requirements, but it is often prohibitively expensive to deploy.

mmWave systems operating in the 60, 70/80GHz bands present an excellent solution. mmWave radios have extremely narrow beams, which is a key advantage when deploying and upgrading wireless networks. Narrow beams and abundant spectrum (over 24GHz to choose from) make it easier to design a network that would have zero impact on other wireless systems. When it comes to this type of RF planning, mmWave radios excel with regards to several considerations.

For instance, mmWave has the flexibility to provide both ‘blanket’ coverage and the required data performance where needed. Networks at critical infrastructure sites are more uplink than downlink and the narrow beams of mmWave make signal and interference modeling and planning much easier. This will prove useful in cases where it might be necessary to increase transmit power. mmWave radios offer complete coverage of an area and hard to reach places with a combination of both point-to-point and point-to-multipoint configurations.

2022 has been marked by lots of evangelizing to promote the value and benefits of mmWave technology. Working in conjunction with WAPA, Siklu representatives have travelled throughout the country to visit existing and new customers and are meeting with regulators to explain how regulations can be updated to include the mmWave bands for a variety of service offerings. ■

Looking ahead: ICASA has made progress in granting greater access to E-band and we are hopeful that they will address the current limitation on using V-band for point-to-multipoint outdoor deployments. We expect such action as, with regards to the formulation of the National Radio Frequency Plan of 2021, multiple responses for the release of 60GHz bandwidth for outdoor PTMP use were submitted – but not acted upon. The omission of these applications from the new regulations has caused a delay in the roll-out of connectivity options that would help close the digital divide in South Africa.

Using V-band could greatly benefit the SA Connect program, which aims to provide 80% broadband connectivity in communities and government facilities with a minimum speed of 10Mbps, and 100Mbps for high-demand facilities

such as Home Affairs. ICASA remedying this situation would enable Siklu and partners to use the most cost-effective equipment to deploy fast internet service to the areas that need it most.

We see a tremendous opportunity for the municipalities of South Africa to ‘get smarter’ by leveraging their lighting infrastructure. As seen in a recent project in Tampere (Finland), Siklu is providing the mmWave broadband component of the new ‘BrightSites’ solution, from Signify. BrightSites is converting streetlights into a wireless connectivity grid which can facilitate a range of digital city services, such as: IoT, security and traffic monitoring, 4G/5G small cells, as well as ‘digital inclusion’ initiatives including municipal WiFi and residential broadband access.

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We achieve this through full RAN centralization, RU-DU separation, and power efficiency. We are engaged with over 50 global MNOs and have been recognized with over 74 industry awards. We believe the power of software can unlock amazing opportunities for the telecom industry by helping customers reimagine their networks. At the core of what we do is our team of re-imagers who value innovation, collaboration, openness, and customer success.

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FibrePoynt manufactures and sells solar-powered wireless broadband antennas, termed HomePoynts, that enable the implementation of a telecommunications network infrastructure system for last mile delivery of broadband data services to underserved high-density residential communities

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The background of the advertisement is a collage of diamond-shaped images. These images show a city skyline at night, overlaid with a complex network of red and blue lines and dots, representing a global communication or data network. The diamonds are arranged in a larger diamond pattern, with some solid blue and grey diamonds interspersed among the network images.

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chapter 9

Value Added Services



James Williams,
Mobile Ecosystem Forum

Talk to the average person on the street about the world of telecommunications and it's highly likely you'll find their eyes glazing over within a few seconds. But take away their mobile phones, laptops, tablets, games consoles, access to mobile gaming, messaging, payments, internet access etc. - I think you catch my drift - and you'll soon grab their attention. It's telecommunications that powers so many things we rely on in our daily lives, yet most don't give it a second thought, taking them completely for granted. And like most things you take for granted, you only miss them when they're gone. Global spending on telecommunication services is now getting on for US\$1.5 trillion so it's a vast business too.

Value added services (VAS) across Africa is a huge and expanding component part of telecoms spend. It would be remiss not to tackle the issue of the definition of what VAS actually is. VAS is a popular telecommunications

industry term for non-core services, or, in short, all services beyond standard voice calls and fax transmissions. The original value-added service was voicemail and in swift succession, when it went truly mainstream, came SMS text messaging as a method of voicemail notification. SMS then spread rapidly into the world of person-to-person (P2P) communications and the rest is history. But today say 'VAS' and you'll find it actually encompasses a whole lot more.

VAS today has grown to encompass mobile, expanding to include e-commerce, mobile money, entertainment in so many guises, sports, chat apps, mobile advertising and far more. The global mobile value-added services market is expected to grow more than 50% from its current value of US\$800 billion within only the next four years but as an industry we have a lot to do to ensure that Africa can claim its rightful share of this growth, having a chance to keep pace with faster growing regions beyond.

Africa is a young continent with 24% of Africans belonging to the 18–24-year-old demographic. This is nothing new; Africa has been the fastest-growing continent by population since 1967, a trend set to continue for many years to come.

Projections from the UN see sub-Saharan Africa alone contributing more than 50% of the global population increase anticipated through 2050. This means there is a huge and growing potential market of consumers ready and willing to consume the myriad of services available to them via mobile channels. Yet this amazing opportunity could be missed if the basics are not covered. And by basics, I mean connectivity.

When it comes to the internet (the backbone of the major part of the VAS world), Africa lags and is the least connected continent. Less than 30% of the population in sub-Saharan Africa is connected to the mobile internet and this region makes up around 40% of the world's uncovered population. Digital services being at the heart of so much as already noted, there needs to be a real urgency to bring unconnected communities online, in particular vulnerable groups. The problem is not one-dimensional only and needs to be tackled in a variety of coordinated ways.

If somebody is not using the internet, it's a logical step to think this would primarily be down to there simply being no coverage for them to access, but three-quarters of the digital divide is not a coverage issue. The digital divide is far from being only a connectivity or technology issue. The elephant in the room is rather the much bigger 'usage gap' with more than 3 billion people living in areas covered by 3G+ networks but who are not using internet services. Barely one in four people in Africa have access to the internet each day. As in so many areas of our lives, the primary reason for not using services within our 'physical' reach is affordability.

The GSMA's latest Intelligence's report showed mobile phone subscribers stood at 46% in sub-Saharan Africa, while smartphone adoption was at 64%. The increase in smartphone customers globally is driving the growth of the mobile value-added services market and whilst there has

been a surge in their usage during the COVID-19 pandemic, there is plenty of headroom for their penetration growth across Africa. There has been real innovation by manufacturers to design a new generation of ultra-low-cost devices, costing US\$30 or less and such efforts need to continue. Not wishing to gloss over the fact that that is undoubtedly still a lot of money for so many, the REAL issue is the cost of the actual mobile data, internet. One guess as to which area of the world has the highest mobile data cost. You guessed it - sub-Saharan Africa...

Internet access is increasingly (and perhaps justifiably) being viewed by so many as a basic right, but the high price of data is fast becoming a hot issue that can no longer be ignored. Factors driving high pricing are admittedly many but in order to ensure services that have the power to truly transform people's lives for the better can truly be used by the masses, policymakers have to make it worthwhile for telecoms companies to cut prices – whether it's by reducing licence fees and/or allowing them to reduce costs by using government-funded infrastructure, no stone should be left unturned. Policymakers need to become enablers.

Of course, a lack of content in local languages and digital skills and literacy are also factors that cannot be ignored – there aren't many continents on which 2,000 languages are spoken! However, closing the 'coverage gap' is above all an economic challenge. Resolve the challenges and the economic opportunities (as well as education, career and so many more areas) are practically limitless. Now is the time all stakeholders across the mobile industry truly need to come together to ensure the area of VAS becomes the financial powerhouse for Africa it rightfully should. Beyond the amazing areas of mobile money and mobile payment in which Africa truly excels, leading the world, the continent should not be left out and left behind. ■



Oliver Bruff,
research analyst, Analysys Mason

Opportunities for operators

The results of an Analysys Mason consumer survey in 2022 highlighted opportunities for MNOs from mobile handset trends.

Handset shipments in developed markets are expected to plateau in the long term with devices being kept for longer, likely because recent innovations in technology have not led to radically different features that would incentivise consumers to upgrade their existing handsets. Moreover, global chipset shortages have caused smartphone prices to rise, which may have led consumers to delay replacing their mobile phones.

Additionally, the penetration of mobile handsets is so high in developed markets that most purchases are made to replace existing handsets. Indeed, 99%, 97% and 98% of respondents in Europe, developed Asia Pacific and the USA, respectively, reported owning a smartphone in 2021. Growth in the total volume of handset shipments in these countries will likely fall as consumers upgrade their handsets less frequently.

Operators looking for growth could expand their handset distribution activities into countries with low smartphone penetration, such as those in sub-Saharan Africa (SSA). Analysys Mason expects that the smartphone share of mobile connections in SSA will grow rapidly from 45.9% in 2020 to 72% in 2026.

Affordability is major barrier to smartphone penetration in SSA because many consumers are unable to meet the high upfront costs. Survey

respondents in Nigeria and Kenya are more likely to own handsets from low-cost Chinese brands than respondents in Europe and the USA. As such, operators can facilitate growth in the take-up of smartphones in SSA by improving affordability. Some operators have already done so, including Orange, which has launched the Sanza Touch with an upfront cost of US\$32. Many African MNOs also offer smartphone financing plans that allow consumers to pay in instalments. Examples include Safaricom's Lipa Mdogo Mdogo plan in Kenya and MTN's Pay Mpola Mpola in Uganda.

Business messaging is another revenue growth opportunity for telecoms operators in the Middle East and Africa (MEA) because most application-to-person (A2P) messaging currently relies on SMS. However, consumers are increasingly using IP-based messaging to communicate with brands. 26% of the respondents to Analysys Mason's consumer survey in MEA use social media or OTT apps as a customer service channel, compared to 12% for SMS. This migration to digital channels will start to erode the value of the A2P market as more OTT players like Meta look to monetise their messaging platforms and ecosystems. Operators should update their messaging propositions to remain relevant and should consider extending their mobile messaging and wallet platforms to support digital business-to-consumer (B2C) communications.

Businesses worldwide rely on messaging solutions to communicate directly with their customer bases. Sending messages via SMS, apps, websites, OTT communications and social media services is an efficient means of confirming transactions, communicating promotions, and resolving customer service enquiries. The A2P messaging market will continue to grow strongly in terms of traffic

VALUE ADDED SERVICES: INTRODUCTION

and business spending in all regions worldwide between now and 2025.

SMS is the main channel for A2P messaging in MEA thanks to its universal handset support and the widespread adoption of mobile money services that use SMS for notifications, authentication, and authorisation. SMS will remain a key channel in terms of traffic and businesses' A2P spending until at least 2025. However, SMS's share of A2P traffic will fall from 88% in 2021 to 70% in 2025 as the use of OTT IP-based messaging (including operator IP messaging using technologies such as rich communication services (RCS)) grows.

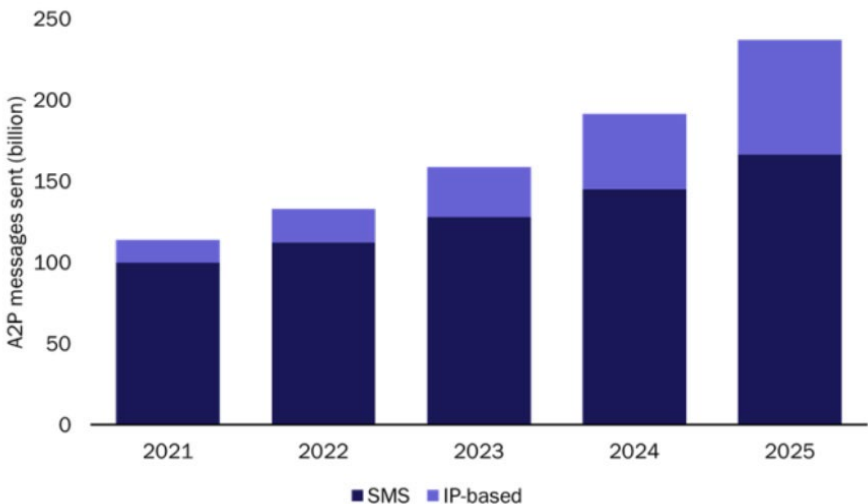
Consumers' rapid adoption of digital channels will increase OTT players' share of both business A2P spending and consumer spending on OTT services (through cross-selling of other services such as e-commerce). The migration towards high-volume, low-cost, IP-

based services will also contribute to the erosion of the value of A2P SMS messaging. Operators must evolve their core offerings to protect their share of the increasingly competitive business messaging market.

The rich features of social and chat apps, such as the ability to send images and videos, are used by an increasing number of businesses to communicate with their customers. Major social and chat players (such as Meta, Snapchat and TikTok) are also using their large user bases to find new ways in which to monetise their services. For example, they have been providing tools that enable businesses to establish direct relationships with their clients and are offering APIs to integrate businesses' back-end IT systems.

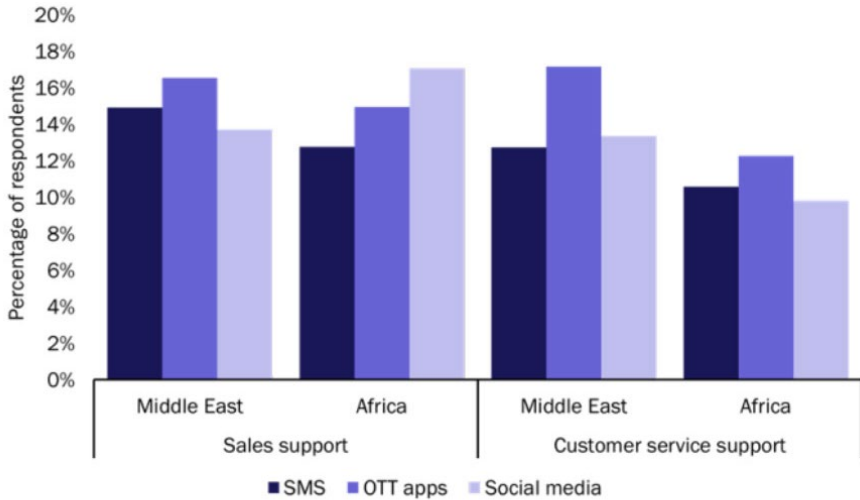
Consumers are also increasingly using digital channels to communicate with brands and government services. This has been driven

A2P messages sent per year, by channel, MEA, 2021–2025



Source: Analysys Mason, 2022

Preferred channel for sales and customer service support, by region, MEA, 2021



Source: Analysys Mason, 2022

by the increased penetration of smartphones and businesses' adoption of multi-channel messaging solutions.

Almost all the survey respondents of smartphone users in MEA (conducted between September and October 2021) use OTT apps, and on average, they use more than 2.5 such apps each. The percentage of respondents that used OTT apps and social media to learn about products and promotions and to access customer service in 2021 was also higher than the proportion that used SMS. Conversely, SMS was the main channel for support with both sales and customer service in the 2020 edition of our survey.

Operators will benefit from the growth in A2P SMS traffic in the next five years. However, they must be proactive to avoid missing out on the growth in the adoption of digital channels for B2C communications. There are two main approaches that they can take to enrich their A2P propositions.

Enhance the messaging experience: Operators can enhance the messaging experience by developing a native mobile messaging application using technologies such as rich communication services (RCS). A few operators in MEA, including 9Mobile, MTN (Nigeria), Orange and Vodacom, have been deploying RCS since 2019. However, OTT alternatives currently have the lead in terms of penetration, and it is unclear how long it will take for RCS to be accessible via a sufficiently large base of smartphones to be competitive.

Build on the success of existing applications. Operators that have developed their own self-care or messaging apps or have deployed an app-based mobile financial service should consider adding A2P messaging features. Operators can differentiate from global OTT platform providers by supporting local languages and dialects, and by working more closely with local content developers and businesses. For example, MTN deployed the Ayoba messaging app in 20 countries in MEA and had 10 million active users

by the end of 2021. The app supports gaming, music, entertainment, news, payments, and money transfers (through MTN's MoMo mobile wallet). MTN has also provided open APIs and two developer portals (one for Ayoba and one for MoMo) to enable merchants to create their own sales channels.

SMS will continue to dominate the B2C

messaging market in MEA for the next five years, but operators that wish to capitalise on the long-term revenue growth opportunity from A2P messaging should look beyond SMS. They should consider developing digital alternatives to compete with the major OTT players and should create opportunities for new partnerships with local brands and marketing agencies.■



Amy Saunders,
editor, *African Wireless
Communications Yearbook*

Mobile money: a key differentiator

Value added services (VAS) have exploded in recent years, with popularity growing on a truly global scale. StrategyR has forecast that the global mobile VAS (MVAS) market could reach US\$1.1 trillion as soon as 2026, expanding at a compound annual growth rate (CAGR) of 13.3% from US\$723.4 billion in 2022. As global mobile voice revenues continue to decrease, telco operators are opting for new revenue streams to bolster their business model. Incorporating VAS into their offerings, telcos stand to benefit from:

- Increased demand for core services
- Higher profit margins by expanding time and data spent
- Enhanced customer experience, growing loyalty and reducing churn
- Differentiation from competitors
- Growing average revenue per user

(ARPU) by gaining more revenue streams for their customers,

- benefits include enhanced convenience, personalisation, and greater digital inclusion and connectivity. What's not to love?

In the current market, VAS include e-commerce, entertainment, mobile advertising, location-based services, mobile email, sports, chat apps, SMS and MMS, etc.; however, it's the mobile money segment that is truly leading the pack.

Mobile money services

It's easy to see why mobile money has been so popular. Convenience has a major role to play for users across the world, and the COVID-19 pandemic further accelerated the trend for cashless payments.

The GSMA reported that the volume of global mobile money accounts grew by 12.7% year on year (yoy) to 1.21 billion in 2021. Account activity grew too; more than 300 million monthly active accounts exist, and for the first time, the global value of daily transactions exceeded US\$2 billion. In total, more than US\$1 trillion was processed for the entirety of 2021.

While proving popular the world over, the mobile money market has boomed across Africa,

with 70% or US\$701.4 billion of the global market value concentrated across the continent in 2021. The African marketplace is uniquely well-suited for mobile money advancement. With such a significant amount of the population unbanked or underbanked – only around 50% of adult Nigerians have their own bank account – but with comparatively high mobile phone ownership rates, mobile money service providers have been able to fill this gap, enabling widespread financial inclusion for the first time.

Indeed, the GSMA reported that sub-Saharan African transactional volumes grew by 23% yoy to 36.6 billion, transaction values grew by 40% yoy to US\$697.7 billion, and the number of active accounts grew by 12% yoy to 183 million. Meanwhile, in the Middle East and North Africa, transactional volumes grew by 74% yoy to 242 million, transaction values grew by 49% yoy to US\$13.7 billion, and the number of active accounts grew by 68% to 5 million.

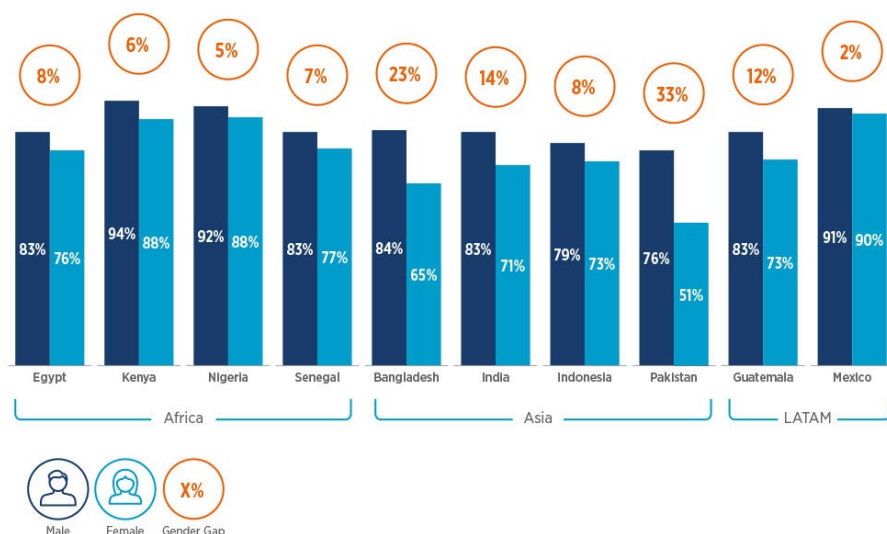
Financial inclusion for all

Throughout the world, women still have less access to both traditional money and mobile money services than men. Potential reasons include not owning a mobile phone, not knowing about mobile money, and lower literacy, digital and financial skills. However, women stand to benefit from mobile money disproportionately, since they often face barriers to using traditional financial services – cultural, lower wages, family responsibilities – that men do not.

As per the GSMA State of the Industry Report on Mobile Money 2022, mobile money has greatly helped women and their families in LMICs since the start of the COVID-19 pandemic. Women have been able to establish microbusinesses, receive emergency funds, send funds to relatives, etc. Indeed, making sure that women have equal access to mobile money as men will assist in the expansion of the

Male and female mobile ownership, by country⁶⁶

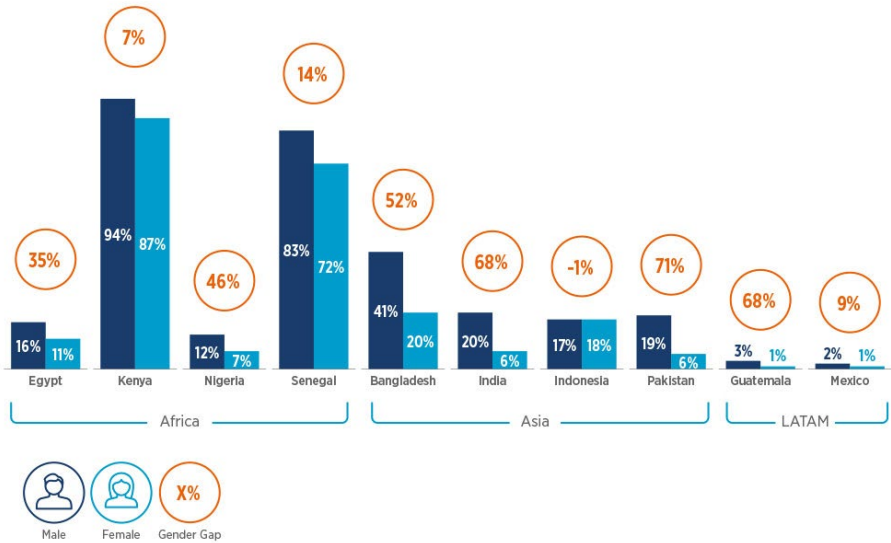
Percentage of total adult population



VALUE ADDED SERVICES: INTRODUCTION

Male and female mobile money account ownership, by country⁷²

Percentage of total adult population



mobile money VAS, contribute to the economy, and help meet Sustainable Development Goal (SDG) 5 – but more on this later.

Recognising the opportunity, 26 MNOs across Africa, Asia and Latin America have made formal commitments to reduce the gender gap in their mobile money customer base since 2016 as part of the GSMA Connected Women Commitment Initiative.

Of the four African nations included, the GSMA reports that Nigeria had the largest gender gap in mobile money adoption at 46%, followed by Egypt at 35%, Senegal at 14% and Kenya at 7%. However, it should be noted that those two countries with higher gender gaps also have low rates of mobile money adoption: 12% for men and 7% for women in Nigeria, and 16% of men and 11% of women in Egypt; compared with 83% for men and 72% for women in Senegal, and 94% of men and 87% of women in Kenya.

Beyond the gender gap, mobile money services have also proven popular amongst groups with literacy challenges. The GSMA states that for a 30-day period, 71% of adults in Senegal had used mobile money services, but almost half self-reported either great difficulties reading and writing or a complete inability to do either. Clearly, those mobile money services designed clearly and simply with lower literacy and/or digital skills in mind have ample opportunity to expand their market reach.

Mobile phone adoption

Mobile phone ownership has a key impact on VAS uptake in Africa, and of course the world at large. No phone = no VAS, and definitely no mobile money.

Ownership rates vary widely across the continent with variations in affordability, literacy and skills, and even within countries

between men and women. Across LMICs, women are 7% less likely than men to own a mobile phone. The gender gap is, according to the GSMA, 8% in Egypt, 7% in Senegal, 6% in Kenya and 5% in Nigeria, however, these gaps are from mobile mature markets, where mobile phone ownership averages at 80% or more.

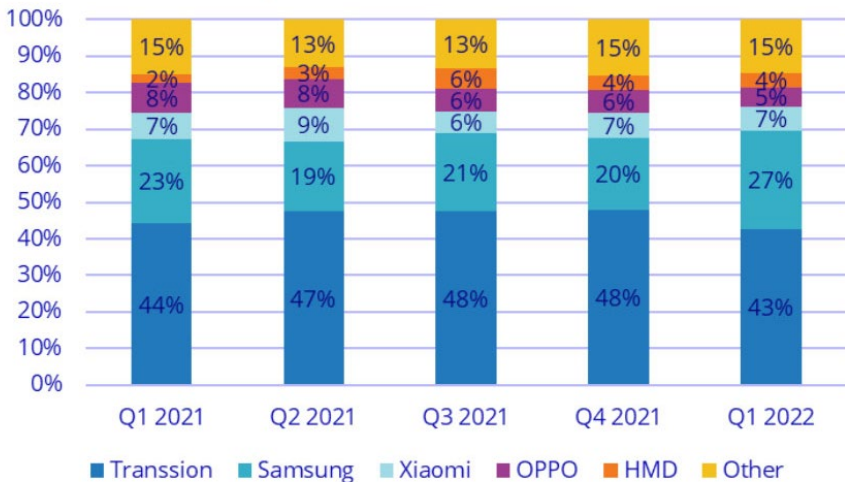
With the uncertainty experienced across the world this year, supply chains and logistical challenges have resulted in a 15.7% yoy decline to 19.7 million smartphone shipments across Africa for the first quarter of 2022, the third consecutive quarter drop, as reported by the Quarterly Global Mobile Phone Tracker report from the International Data Corporation (IDC).

Other contributing factors included concerns about inflation, economic instability, rising costs of components and transportation, and lockdowns in China.

The biggest quarterly decline was reported for Egypt, where shipments fell by 43.2% yoy. The government moved to introduce new import regulations including a new 10% customs charge on mobile phones. In Nigeria, shipments fell by 19.6% yoy. Two countries reported increased shipment volumes, namely South Africa and Kenya, at 3.7% and 4.5% yoy respectively, however, this comes off the back of a very low base in the first quarter of 2021 when they were severely impacted



Africa Smartphone Market – Top 5 Vendors by Unit Share (Q1 2022-Q1 2022)



Source: IDC, 2022

by stock shortages.

Despite the challenging conditions, smartphone vendor rankings remained more or less stable, indicating that the issues facing the segment are vendor neutral. Affordability, however, has taken a hit, with the share of smartphones priced at less than US\$100 falling from 45.4% in the fourth quarter of 2021 to 37.2% in the first quarter of 2022, a pretty shocking fall in just a few months. Meanwhile, the share of smartphones priced at US\$100-200 grew from 35.7% to 41.4% during the same quarters. Additionally, the share of 5G enabled smartphones shipped in the first quarter of 2022 grew to 5.6% from 4.3% in the fourth quarter of 2021.

Mobile money: addressing the Sustainable Development Goals

Established in 2015 by the United Nations General Assembly, with achievement planned for 2030, the Sustainable Development Goals (SDGs) comprise 17 global goals to act as a 'shared blueprint for peace and prosperity for people and the planet, now and in the future.'

According to ITU's Global Connectivity Report 2022, mobile money is making great strides in addressing many of the sustainable development goals throughout Africa and indeed the world:

SDG 1: No poverty. In Burkina Faso, mobile money users are three times more likely to save for emergencies, shielding them from economic shocks, while in Uganda, mobile money helped small businesses to save and make payments, benefiting owners and workers.

SDG 2: Zero hunger. Mobile money can help farmers increase productivity by demonstrating creditworthiness to buy equipment and can help to reduce food insecurity by providing financial services used to purchase food.

SDG 3: Good health and wellbeing. Mobile money allows individuals to save for health emergencies, purchase health insurance, and pay bills, enabling increased access to health services.

SDG 4: Quality education. Mobile money helps households to manage their savings for education and make school payments efficiently, also lowering cost for providers. It can additionally lower the cost and risks of schools making payments to teachers.

SDG 5: Gender equality. Mobile money empowers women by giving them control over their money and reducing cash insecurity. In Côte d'Ivoire, men are twice as likely to have a traditional bank account as women, but there is no such gap with mobile money accounts. Mobile money also helps women to get credit to start businesses.

SDG 6: Clean water and sanitation. Pay as you go (PAYG) solutions enable users with mobile money accounts to pay for water, including a loan for their initial water connection, allowing users to pay in small instalments and have access to services.

SDG 7: Affordable and clean energy. PAYG solar panels enable the use of mobile money to pay for electricity in small amounts, when it is needed, and purchase the solar panel over time, enabling children to study and businesses to operate after dark.

SDG 8: Decent work and economic growth. In addition to using mobile money for payments, individuals earn income by becoming mobile money agents – there were 7.7 million in 2019. Small businesses use mobile money to receive payments efficiently and safely from their customers and pay their vendors, increasing their revenues.

SDG 10: Reduced inequalities. Financial remittances are important for migrants and

their families, and the cost of sending them is significantly lower using mobile money. The average cost is below the 3% target of SDG 10.C. These remittances contribute to progress across many of the SDGs with increased income and resources.

SDG 11: Sustainable cities and communities. Mobile money enables easy access to public transportation and enables payments for ride-sharing platforms to lower the cost of commuting.

SDG 16: Peace, justice and strong institutions. Mobile money transfers help reduce fraud and theft. When the Afghan National Police began to be paid with M-PESA instead of cash, salaries increased up to a third for some officers, while payments to ghost workers were stopped.

The availability and convenience offered by mobile money technology renders it a fantastic platform for achieving the SDGs.

Mobile money fraud

Today there exist more than 173 mobile money services in Africa, and with a now trillion-dollar industry, it's no surprise that bad actors have come onto the scene. Mobile money fraud is estimated to cost US\$4 billion in Africa alone. According to Evina, 51% of transactions were identified as suspect in Kenya, 30% in South Africa, and 10% in Cameroon.

Mobile money fraud is growing faster even than the number of new transactions each year. In 2020, Uganda experienced a US\$3.2 billion loss to hackers using more than 2,000 SIM cards; however, this pales in comparison to the US\$53 million loss by MTN Nigeria's new MoMo Payment Service Bank back in May, wherein some 700,000 unauthorised transfers to 8,000 accounts in 18 Nigerian banks were recorded.

Fraud is one of the biggest limiting factors when it comes to mobile money adoption. It's a

tough environment to secure due to a complex ecosystem; each operator has their own network, which means that weak ID verification systems, inadequate security resources, poor training, poor customer awareness and limited access to best in practise fraud detection tools can be magnified, opening the door to bad actors. Phishing, vishing, SMiShing, clickjacking, malicious apps, identity theft, PIN sharing and agent-driven fraud are all very real challenges faced by providers and customers right now.

It's not all bad news though. Impartial organisations and associations, service providers, MNOs, traditional financial institutions, and government/policy makers are cracking down hard across the continent, tightening security measures to prevent cybercrime in mobile money transactions. Progress will be slow in the face of ever-evolving threats, and will require a multi-pronged, holistic approach, however, such measures are necessary to ensure the continued adoption of mobile money services continent-wide, aiding financial inclusion and improving quality of life.

A mobile future

The benefits of mobile money are extensive, holding the possibility of transformed lives across the continent. Financial inclusion for the vulnerable, including women, stands to have a major impact on continent-wide economies.

Going forwards, service providers can be expected to provide more inclusivity for the underserved, while focusing on tightening up their security to protect both themselves, and their customers. Retaining consumer confidence is essential for the future of both mobile money and MNOs offering such services, for that trust will spread beyond mobile money services to the core mobile network itself. ■



Mo Firouzabadian,
CEO of Lifecycle Software and Vas-X

The digitalisation journey in Africa is making strong advancements, and the telecom sector is no exception. 2022 has been a particularly good year for us at Lifecycle Software and VAS-X, as we have been looking at how recharge distribution and recharge selling can be improved.

You can essentially buy telco credit and store it in a wallet that can then be used to resell credit to customers. This allows us to open lots of channels of distribution and is proving to be a big success for us in the African market.

The biggest challenge we have been facing is in relation to locating and onboarding talent. There is an incredible opportunity in Africa, especially in some markets, but the volume of the talent pool is not keeping pace with the size of this opportunity. There are companies willing to keep their workforce in Africa, but sometimes that's difficult to do. A central part of this issue is the 'brain drain.' There are very qualified people, whether they are from Algeria, South Africa, etc., who want to move to places like Canada, the US, the UK, and Europe. We must find ways to create competitive and rewarding conditions for companies and employees to remain in the region.

The digitalisation of economic sectors is starting a new growth era, and in the telecommunications sector, this is particularly evident. There are African-founded companies that have a deep understanding of local markets that can bring niche propositions to the African market. We see more and more of our customers using that telecom relationship as a billing channel to monetise other services.

Cloud has long been a trend in telecoms, and this year we saw cloud computing come to Africa. There have been big investments made by cloud vendors into building data centres in South Africa, for example. This is supporting better connectivity, supported by undersea cables that run down the west coast of Africa and connect the continent to the rest of the world. Cloud vendors have put data centres next to those key points of presence. It's a significant infrastructure improvement and opens new doors in telecommunications.

The impact of digital transformation on telecoms has resulted in a general trend towards modernising the billing stack on operators. To respond to the market's needs, operators must become more customer centric, digital, and move to cloud-based software stacks.

Moreover, there is a willingness from governments and regulators to open countries to MVNOs. Doing so will create more competition that will drive down prices, introduce value for customers, and increase the quality of service. ■

Looking ahead: As mentioned, the digitisation process in Africa is experiencing a real boost. The rise of a digital economy is going to transform societies and enhance connectivity between people, societies, governments, and organisations. In that regard, the cloud is a big move and it's positive

to see cloud vendors establishing data centres across the continent. In the telecommunications area, African operators can explore new ways of monetising their networks and leverage local talent to build digital services. It's an exciting time and we foresee a lot of innovation in the sector.



Shanks Kulam,
co-founder, x-Mobility

We all know the value of advertising revenues, especially from the world's biggest companies. We also know about the increasing African consumer buying power. Global brands and advertising agencies are constantly looking for ways to bring those two together – creating relevant, targeted ads that will reach out (and persuade) African consumers. We also know that almost any statistic we hear about SMS tells us that over 90% of messages are opened almost immediately.

Greater advertising in Africa will not only benefit the brands but would also bring wider economic growth to the region. A fairer distribution of global advertising spend would not only see African revenues increase but would also give Africa greater prominence in the minds of brands

“Greater advertising in Africa will not only benefit the brands but would also bring wider economic growth to the region.”

and advertisers. It would also provide additional support and an economic boost to the region's fastest growing economies.

Ideally for the brands these ads will be highly targeted, highly relevant and reach individuals on a one-to-one basis to showcase their products and services.

All this potential revenue and growth is controlled by the African mobile network operators (MNOs) and the wider telecoms sector in the region. We know that for advertisers the goal is for highly targeted and personalised advertising – nothing is more personalised and targeted than communicating with consumers through their mobile phone.

SMS is a more immediate, direct, personalised and ultimately a more opened form of communications than email or any other type of messaging. The power of SMS is huge – and therefore unbelievably valuable. Even when the messages are automated or created by algorithms, the response is very strong. But only if they are local numbers - that open rate, engagement and ultimately value to the advertiser is not going to come from messages sent from a US or UK number, or a number withheld. Global brands can only build local relationships with local numbers.

The time is right for African MNOs to fully open their number ranges to the global providers so that they can attract global advertisers. ■

Looking ahead: The first and most obvious benefit for MNOs is an increase in revenue and most importantly, creating an ongoing revenue stream. Not only will there be termination fees when the numbers are used for messages (or even for voice), but this model usually includes regular monthly payments of the numbers being used. For any MNO with surplus numbers in their number range (and that is nearly all of them), this is a terrific

opportunity to extract revenue from that surplus.

To access that revenue MNOs must make their numbers available to the global aggregators who deal with the global brands and can make the global sales. This is not something that they can do alone, they need an aggregator with the reach and experience – for example x-Mobility has already enabled over 1 million UK numbers for the global market.



Teniola Stuffman,
executive director, business
development and marketing,
VAS2Nets Technologies

The global market for mobile VAS and payment is experiencing growth on the back of increasing demand for customized services, increasing smartphone ownership, expanding digital media, rising demand for entertainment services and ease of payment. Particularly for VAS2Nets, interoperability of the payment channels and consumers' appetite added to the general cause of the growth pattern.

Despite economic activities decline and the challenging business environment during the second quarter of 2022, the mobile VAS and payment sector still observed appreciable growth in revenue. The direct cost-to-income ratio was at a peak in the quarter one, averagely at 99% year on year, due to the global market challenges. The trend subsided in quarter two, easing the pressure on operating expenses.

The mobile VAS market in Nigeria alone had an estimated value of US\$453 million in 2021, and the projection surpasses US\$1.6 billion by 2027. The mobile payment market was estimated at US\$500 million in 2021 and should reach US\$1.2 billion by 2025. However,

“Despite economic activities decline and the challenging business environment during the second quarter of 2022, the mobile VAS and payment sector still observed appreciable growth in revenue.”

the market remains crowded. The competition is intense, with more than 100 players operating in Nigeria and over 500 active operators across Africa. Financial inclusion brings about the fast-paced adoption we are experiencing.

VAS2Nets is a mobile VAS and payment operator that facilitates content across all telco subscribers and payments across B2B. VAS2Nets acquired a microfinance banking license in 2021 and a payment solution and service provider license (PSSP) to enable digital banking with the goal of more retail penetration within the VAS and payment sector. The company differentiates itself as a wireless application and infrastructure, payment and service provider for telecoms, financial institutions, health, agriculture, transport, government, and other sectors with a unique goal to provide an end-to-end platform for the consumer.

The business space is highly innovative and driven by a huge market base. VAS2Nets has harnessed an open innovation strategy that allows it to grow faster. Harnessing some of the principles of open innovation that helped Amazon achieve dominance on the e-commerce platform, VAS2Nets aims to gain prominence in the mobile subscription space.

For instance, Nike shoes are no longer just for running; they've connected mobile devices. They host analytics in the cloud, and suddenly, their customers no longer have a simple product, but instead an entire ecosystem. In this social community, they can log runs, join teams, engage in challenges, and start to create more value on top of the core product. The VAS rendered in this case is dependent on data and the network.

VAS2Nets has its core products and services but, most importantly, aggregates content, product and services for different providers worldwide, which is a sustainable strategy for the organization. Ensuring the aggregating

platform is unique enough to attract innovation from content, solution and service providers has made VAS2Nets what it is today. VAS2Nets has many innovators beyond Africa's shores, rendering services for the African market through its platform.

60% of adults with wallet accounts leverage digital services. In Nigeria, 47 million adults are banked, 14 million are actively targeted within the informal sector, and 38 million are financially excluded. The market still has access gaps, particularly among women and rural locations; the goal is to provide solutions and services that will thin out the gap.

The growing demand for customized services is anticipated to have a positive influence on service providers particularly in the education, advertisement, IT and telecommunications sectors. Mobile VAS are expected to expand

significantly across all industrial verticals due to increasing ownership of smartphones.

With the increase in the number of devices capable of supporting digital media along with increased internet speed, consumers can now access media content of their choice from anywhere. Rising demand for gaming services on mobiles devices is expected to boost revenue growth in the market between 2021 and 2030.

The mobile telecommunications industry in sub-Saharan Africa is being shaped by key trends:

- Growth in the adoption rate of 4G, which is estimated to reach 28% in 2025
- Open RAN testing and deployment
- Increasing shift in consumer preference towards digital platforms evidenced by the presence of over 1,200 digital platforms on the continent ■

Looking ahead: Growth in digital banking in Africa will peak in South Africa, Nigeria, Egypt, Angola & Morocco, driven by major critical success factors like mobile, pricing, convenience, efficiency etc.

Banking as a Service (BaaS) will continue to show significant growth with an increasing number of non-bank players entering the sector, extensively leveraging mobile VAS and technology, and more content aggregation partnerships to aid financial inclusion. VAS2Nets will continue to harness an open innovation strategy that allows it to grow more quickly within the VAS and payment space. VAS2Nets will prioritize its environmental sustainability goals because therein lies its sustainability.

It continues to build its reputation and trust with the regulators and stakeholders, increase energy efficiency, improve diversity and inclusion, and improve rural mobile service and

financial inclusion.

The vision is to provide an ecosystem channel that cuts across all African countries without any barriers; provide services without telecom bearers by leveraging all channels for content and payment purpose, e.g., USSD channel, SMS, RCS, WAP, IVR, and shortcodes; content aggregation platform as a service via OTT; unique solutions for clients; and payment services for both formal and informal sectors.

One of the most exciting ways that VAS2Nets platforms will pursue growth and trajectory activity is to have fine-grade data that can be observed as innovators act and operate on its platform. If innovators prove that the VAS2Nets platform is core and central to their mission and objectives, as a result of the platform enhancing the appeal to end users, VAS2Nets will pursue a merger or acquisition in the future.



Werner Lindemann,
enterprise sales senior vice
president for growth markets,
Clickatell

As we entered 2022, the world was collectively holding its breath, hoping that we could finally put the COVID-19 pandemic behind us. After the initial rush to roll out digital channels to serve customers remotely, many of the early digital adopters began building long-term business cases around newer technologies, and we saw chat applications and commerce in particular move from pandemic saviour to business staple.

During 2022, our teams identified three key trends. First, we saw chat commerce become mainstream for customer experience for businesses across industries. While CIOs and chief digital officers were dabbling with chat technology in previous years, 2022 saw chief marketing officers (CMOs) and heads of customer experience fully grasping the business benefits of chat commerce as a powerful complementary channel in their omnichannel strategies and acting on the opportunity.

For many CMOs, this year was when the penny truly dropped that this advanced business messaging channel could drive revenue generating engagements and transactions with consumers. We have seen a big demand for our new Chat 2 Pay solution that enables merchants to securely accept payments in chat messaging, with 93% of conversations transpiring on Clickatell's Chat Commerce Platform ending in a transaction.

Thirdly, we saw companies turn to chat to deflect traffic from their traditional call centres. This was spurred on by the need to minimise staff in call centres during COVID-19, and companies quickly realised that consumers preferred self-help channels over call centres.

One of the reasons why companies were encouraged to advance their chat aspirations this year was the very solid data coming out of existing deployments.

The most obvious measurable benefit of using chat is the convenience factor. Studies by eConsultancy show that 79% of consumers preferred chat over other channels (e.g., call centres and apps) because of its convenience and efficiencies. Our own experience with clients has backed this up. We have seen campaigns where customers respond to just 3% of messages coming through an email or SMS, while WhatsApp campaigns have had response rates of above 30% (and in some instances as high as 65%). This is because they know it is less likely to be spam. What's more, we know that when customers are satisfied, they are less likely to switch to a competitor, and so the reduction in churn comes as an additional benefit.

When it comes to cost, we have seen chat channels this year coming in three to four times cheaper than traditional call centres, allowing companies to confidently scale down their labour-intensive operations. In addition, the use of automation is having a revolutionary impact on support teams, cutting down on repeat tasks, like password resets, that are an easily avoidable cost.

More than just cost savings, chat deployments have a big impact on billing opportunities with one customer making 100% more revenue by shifting sales from channels like USSD onto WhatsApp.

There is a great case for chat deployment in every sector, but 2022 saw real growth in a few key industries.

Work we have done with African insurtech, aYo Holdings (a subsidiary of MTN), is just one of the deployments this year that highlights the opportunity chat commerce delivers when it comes to driving business and better serving

“Trying to find a balance between workers who had fully embraced the benefits of remote working, with the need to ensure teams had adequate face-to-face time has been a real challenge.”

customers. aYo's new chat channel allows their customers to submit relevant claim documents and access content like FAQs, videos, voice notes, and brochures, using WhatsApp. In the next phase of development customers will be able to sign up for cover and even submit claims.

This is the sort of automation and self-help option that companies are looking for, and we have seen particular interest from the healthcare, travel and hospitality industries as well as the retail sector.

It continues to be our passion to find solutions that improve people's lives throughout the

continent, and it was a big highlight this year when we were recognised for our innovation and contribution to growth in the Nigerian ICT industry by Nigeria Communications Week.

Unfortunately, every year brings its unique challenges. The legacy of COVID-19 left many business leaders scratching their heads when it came to hybrid work policies. Trying to find a balance between workers who had fully embraced the benefits of remote working, with the need to ensure teams had adequate face-to-face time has been a real challenge.

Added to this, many sectors, including ours, have been forced to get creative when it comes to attracting and retaining skills. Time and again we have had customers about to greenlight a new project, only to find they don't have adequate internal skills to manage the new deployment going forward. To help address the issue we have beefed up our own project implementation capability and this has helped us position us and our customers for future success. ■

Looking ahead: As the world settles down into its post-pandemic new normal, we believe companies will find new use cases for chat to augment their omni-channel strategies. This will largely be driven by the consumer, as evidenced by research from PwC, which shows that customers don't only value speed, convenience, as well as helpful and friendly service; they are prepared to pay up to a 16% premium for businesses that can provide these.

Companies must respond to these preferences and, for those that do, real revenue wins await. Juniper Research predicts sales made via conversational commerce channels (like chatbots, digital voice assistants, and messaging), will grow sevenfold, from US\$41 billion in 2021 to US\$290 billion by 2025.

Serving your customers where they are is

especially important for African businesses. They must shift their delivery to ensure they are catering to a predominantly younger demographic, who see chat as their ubiquitous means of connecting with each other, and increasingly with their favourite brands.

Clickatell is responding to this surge in interest. We had a very successful funding round in 2022, raising US\$91m in an oversubscribed Series-C funding. This will be used to fuel expansion and accelerate product innovation. We can expect many companies to lean on technology to help combat the challenges of inflation in the coming year. Fortunately, we have used much of 2022 building both our global skills as well as our growth capital and we are confident we, and our partners, are set for excellent growth in 2023.



Zoran Lazarevi,
chief technology officer, Ericsson
Middle East & Africa

Since the onset of the pandemic, public-private partnerships and regional government initiatives that foster digital development have kept the spark of digitalization alive in Africa. The region's digital transformation momentum is stronger than ever before.

The digital revolution holds great promise for large-scale socioeconomic advancement to keep Africa well equipped to thrive in the digital economy. African leaders work towards ambitious objectives for inclusive and sustainable socioeconomic development set in the African Union's Agenda 2063.

The African Union Commission, its member states and development partners recognize the critical role digital technologies play in these objectives. Since 2022 they've been working to achieve the benefits of the pan-African Digital Transformation Strategy across a variety of sectors like agriculture, education, and health. Ericsson contributes to this with its technology expertise and market intelligence for the development of sector-specific strategies.

A member of the Smart Africa Alliance, Ericsson has contributed to continental flagship projects like Africa's Smart Broadband Access 2025 roadmap and will continue supporting this type of joint public and private sectors effort to deliver the benefits of digital transformation.

The capabilities and services this revolution is enabling are enhancing society and improving livelihoods. Mobile financial services hold tremendous significance in Africa as they generate financial resilience and facilitate higher savings for households. As they electronically record all transactions, they not only improve payment

security, investments, and other financial services, but also facilitate transparency and foster the formalization of the economy. In the long term, mobile financial services can also reduce poverty and increase financial independence.

Digital technologies will soon transform the continent's industrial control and automation systems, planning and design processes, and field devices. The deployment of automated, cloud-based solutions at factories will help manufacturers streamline process flow, access helpful analytics, improve decision-making capabilities, and avoid costly rework and downtime. It will also simplify performance monitoring, enable detailed digital product representations, and will help manufacturers deliver to markets faster.

We strongly believe ICT is the catalyst for digital transformation, with mobile networks like 4G and 5G being crucial in increasing Africa's economic competitiveness globally. Being enablers of digital technology, cellular networks are at the core of Africa's digital transformation as they propel technological adoption. In the case of mobile financial services in sub-Saharan Africa, our 'Mobile Financial Services on the Rise' report showed that nearly 70% agree that faster transactions would encourage them to use mobile financial services.

We have been working relentlessly with our regional partners to deploy enhanced networks and bolster digital infrastructure. In Mozambique, we worked with TMCEL to upgrade their mobile financial services service through our Ericsson Wallet Platform, which is set to broaden the financial transaction community and financially empower residents. We have also partnered with MTN and Orange Middle East and Africa to offer mobile financial services across the continent to accelerate financial inclusion, an important driver for attaining social inclusion by offering the possibility to bring millions into the formal

economy, boosting individual livelihoods and transforming economies.

We collaborated with Econet earlier this year to launch 5G in Harare, Zimbabwe, opening numerous opportunities for consumers and businesses and broadening access to financial inclusion in urban and rural areas. We also marked a significant milestone towards 5G introduction in Angola by completing a 5G data call in the country, showcasing the potential 5G will have in bridging the digital divide.

Open collaborations are a key contributor to accelerating the utility and impact of mobile technology. For example, we publish Mobile Money Application Programming Interfaces that allow third parties to create additional value-added financial solutions enabled by Ericsson Wallet Platform. Through Ericsson Together Apart Hackathons in countries such as Egypt and Nigeria, and global Ericsson Innovation Awards, we encourage technology-driven solutions that create tomorrow's solutions from today's challenges.

To prolong momentum of digital adoption, reduce the connectivity gap, and ensure the strong social impact of connectivity and digitalization, a strong ecosystem of partnerships and collaboration is crucial. Governments and communication

service providers must strengthen coordination frameworks, align policies and sector regulations, and scale up investments and resource allocation to achieve effective digital transformation. We have been working with the African Telecommunications Union on spectrum recommendations that focus on transforming Africa into a knowledge economy.

While 4G rollout enabled major progress towards wider access to broadband, 5G is now offering new opportunities for fibre-like speed and sector-specific applications. Many African governments are taking steps towards enabling mobile operators to start implementing 5G. Key is for them to grant operators access to large enough (at least 100MHz) and continuous blocks of frequencies (between 1GHz and 6GHz) that can achieve the expected performances. As these amounts are bigger than before, government pricing of these spectrum resources will have a direct impact onto the significant investments required to upgrade mobile networks and the affordability of services. This foundation will need to be supplemented by additional frequencies which travel further (those below 1GHz) also used by 2G, 3G and 4G to reach out more efficiently less populated areas. Much higher frequencies will also be needed for later steps of 5G rollouts. ■

Looking ahead: Ericsson is committed to innovating its 5G solutions to help regional telecom operators leverage 5G to enable new capabilities that create sustainable growth opportunities for individuals and businesses.

With digital skills being a ladder to opportunities, Ericsson has been running its flagship educational initiative 'Connect to Learn' across Africa to empower teachers, students, and schools to deliver a quality 21st-century education and provide young people with digital skills. Moreover, with connectivity being the key to better digital skills and educational outcomes, Ericsson has been working with UNICEF

and the International Telecommunication Union (ITU) on the Giga initiative to bridge the digital divide.

Realizing a world where limitless connectivity improves lives, redefines businesses, and pioneers a sustainable future is central to Ericsson's 2030 ambition. In the coming years, Ericsson remains committed to aiding in the deployment of next-generation networks and infrastructure that address the continent's unique challenges, bridge the digital divide and further the economic development of Africa.



Renaud Ganascia,
sales director for Africa, Digital Virgo

Over the last year, Digital Virgo has expanded its operations in French and English speaking Africa answering key challenges of mobile operators and merchants by implementing powerful monetization ecosystems.

The reach of carrier billing and mobile money has grown, addressing a larger range of services that are constantly evolving. We know that alternative payment methods are essential to address Africa, and that the key is to add expertise such as local adaptation, user acquisition and international settlement. Digital Virgo's goal is to continually grow and expand in Africa, seizing on the opportunity to make local and international key partnerships and offer solutions, through mobile payments and content distribution.

Global strategy is key and local teams are essential. Our teams truly understand what merchants and mobile operators need to integrate or deploy locally to be relevant according to the specificities of a territory. Our motto of "Think

"Our motto of "Think Global, Act Local" sets the standard for how we handle all our partner and client challenges. There is no one size fits all solution, especially for a continent that boasts over 1 billion people with an 85% mobile connection rate."

Global, Act Local" sets the standard for how we handle all our partner and client challenges. There is no one size fits all solution, especially for a continent that boasts over 1 billion people with an 85% mobile connection rate.

We are also very concerned by customer satisfaction, offering a secured and efficient user journey and a universal access to payment. In the post pandemic climate, digital payments are the preferred method due to its fast, secure method and global reach. Digital Virgo has prioritized offering telcos an innovative technological solution that can position them at the centre of a digital convergence and connecting them with merchants to expand their business aligning with consumer demands. Our solutions are supporting the growth of these companies in Africa by expanding payment solutions for digital services to increase cross-border expansion and engagement.

Alternative payment methods such as mobile money are key to reaching many that have been neglected by the financial sector. Connecting mobile operators and merchants is the target to providing an avenue for growth that allows them to reach new customers, retain current users and grow their revenue.

Over the last year our teams in Africa reached new heights with their partnerships. The award-winning success case with YouScribe, which provides access to digital content through the largest on-line library to mobile devices, proves that expansion in Africa is a growth lever for companies.

Using an integrated mobile payment, YouScribe is now available in 10 African countries including Burkina Faso, Mali, and South Africa. YouScribe is continuing to grow with four other African countries expected to access it in 2022. In just one year, YouScribe has gained more than 650,000 subscribers, 50% growth. Our team

also integrated more than 150 local editors to deliver relevant local content to subscribers.

One of the biggest growths has been in gaming and the eSports industry. An industry which provided Euro€2.53 billion in revenue this year from mobile gaming alone, with an expected growth of more than 32% in 2025. This industry is supported by a community of over 233 million players with a growth expectation of more than 26% by 2025. Africa is becoming a dominant force in this sector, with Egypt and Nigeria leading the way.

Digital Virgo is also celebrating its recent partnership with Etisalat Misr, the Egyptian Telecom company and its new eSports platform. Egypt is currently one of the African countries with the highest revenue in mobile gaming. To leverage this, Digital Virgo Egypt created strategic partnerships with Anubis Gaming, World Champion Egyptian eSports team and GB Arena, the top eSports tournament creators in Egypt. This was crucial to working with Etisalat as our team brought the best local talent that Egypt has to offer.

We have also worked with leading global games developer, Garena, to expand its mobile battle royale game, Free Fire, to inwi, Maroc Telecom and Orange subscribers in Morocco.

“Alternative payment methods such as mobile money are key to reaching many that have been neglected by the financial sector. Connecting mobile operators and merchants is the target to providing an avenue for growth that allows them to reach new customers, retain current users and grow their revenue.”

Digital Virgo has been able to show the strength of direct carrier billing when reaching mobile gaming audiences to telecom companies as well as merchants. Mobile payments have been at the heart of an internationalization strategy to a continent that has over 1 billion mobile connections.

Through maintaining and developing our leading position in the carrier billing ecosystem, our local teams have been able to create opportunities and revenue for our clients. Africa continually provides opportunities for growth. ■

Looking ahead: The mobile payment ecosystem is continuing to experience a revolution thanks to the rapid changes over the last few years. Digital Virgo has kept its finger on the pulse of Africa and has worked hard to create partnerships to deliver innovative solutions.

As the world looks to Africa, the explosion of ecommerce and international transactions offer massive growth potential. Digital Virgo is looking to the future for payment solutions that can flourish with the ever-changing ecosystems in Africa. The

game changing mobile money can provide the next step in this journey to expand into new markets in a secure way. This positions telcos as a key player in the payment ecosystem. It has already been used for cross-border payments including developing businesses and paying bills according to a recent GMSA report. Digital wallets are already setting the standard for financial inclusion in Africa and its effect continues to grow exponentially in the post COVID-19 era. This payment method can open doors for many that have been left out of traditional financial ecosystems.



Wayne Nelson-Esch,
Africa regional director of
operations, Avatar World Group

The African audience has become more mature and more demanding. We have improved and enlarged our entertainment offering by providing top class services, with localized content, renowned brands, and artists.

Users are becoming more precise in their choices of content and entertainment, and to be attractive for them, our services must be comparable to other OTTs and SVODs in Africa. Users are a lot more powerful now and they know it. More content, better streaming, more titles, local coverage; they are raising the bar for content service providers.

We have tried to address these audiences by looking into their interests and building services that provide content which meets their needs and expectations. An example of this has been the launch of two of our premium digital content services in partnership with MTN South Africa, In Concert and MTN FC. Both were launched to create unique and bespoke localized content over and above the international content offering.

This has created a value proposition to MTN's customers that they can only experience and enjoy on these platforms. The services have specific catalogues of South African and African content as well as curators from South Africa that allow the

service to have a local approach, with local culture as a driver for the services.

The commitment to creating bespoke and unique content is a long term undertaking but the value proposition over time is what has made us and will continue to make us one of the leading digital services companies on the continent. We believe that investing in local culture will be a key element to driving successful value-added services.

Africa's video-on-demand subscriptions are expected to reach over 5 million by the end of 2021, and the figure is expected to triple to 15 million by 2026 according to Digital TV Research.

Since launching our African business in South Africa in 2016, we have focused on building world class digital content and entertainment services and products. We recognise that the future of digital entertainment will be in creating unique and bespoke services that create value and entertainment. ■

"Creating bespoke and unique content is a long term and challenging undertaking but the value proposition over time is what has made us one of the leading digital services companies on the continent"

Looking ahead: The digital landscape is changing rapidly. As it changes, we need to adapt and continue to be at the forefront of innovation, technology, and content. A prime example of this has been the growth of our cloud gaming service through AWG Games which has started to gain momentum as mobile operators start to roll

out 5G. We see better and more specific content and service offering to each audience, with more local content, and a better user experience and user engagement. Traditional content offering appears to be over, and only those companies with premium services, and who are willing to go the extra mile, will be able to continue a growth trend.



Kim Buller,
president/CFO, Alchemy Telco

If you're in any doubt that Africa is a mobile-first continent, just look around you. Everyone is using a handset. And why wouldn't they? Nearly everything gets easier when you do it by phone.

Text messaging has been particularly transformational. SMS is the most personal and immediate communications channel ever invented. The African people understand this. Do African enterprises? Have they grasped the opportunity to 'talk' to – and hear back from – their customers in real time?

Yes, some have. But plenty more have yet to see the light. And we should know. Alchemy is a Gambia-based mobile intermediary dedicated to enterprise mobile communications. Since 2015, we've been working with companies and government departments across Gambia, Senegal and Sierra Leone. We've helped them to set up and run their own A2P (application to

“Text messaging has been particularly transformational. SMS is the most personal and immediate communications channel ever invented. The African people understand this. Do African enterprises? Have they grasped the opportunity to ‘talk’ to – and hear back from – their customers in real time?”

person) messaging activity as an alternative to email, TV, radio and, well, doing nothing at all.

You might think that switching to SMS would be an obvious strategy. TV and radio work well for big generic campaigns but are utterly ill-suited for targeted messages or service alerts. Email is better at customer care. But it is limited by reach. Millions of West Africans cannot access the internet.

That leaves SMS. It's the perfect medium for notifications and alerts because it goes direct to the pocket of the customer. Industry data suggests 96% of texts are read. And, just as important, SMS is asynchronous. Recipients can store a text and reply to it later. That is a major advantage over voice, which is more intrusive and demands an immediate response.

These benefits explain why businesses all over the world are embracing messaging. The global numbers are pretty staggering. According to Mobilesquared, enterprises are on target to send 2.8 trillion A2P SMS messages this year – an average of 25.1 received per subscriber per month.

Analysts expect this activity to grow fast over the next decade – not least because MNOs and aggregators are now adding rich messaging (WhatsApp, RCS, Apple Messages for Business etc.) into the mix. In fact, Markets and Markets predicts the global A2P messaging market will grow from US\$6.1 billion in 2022 to US\$72.8 billion by 2025.

We are confident that African businesses can benefit enormously from this boom. The source of our confidence is personal experience. Before we launched into mobile messaging, we were in the wholesale cashew nut business. We learned on the job that SMS was easily the best way to update on customers on fast-moving prices and availability. We even developed our own technical platform on which to manage

our own text traffic. It proved transformational. Eventually, we realised this could work for other companies. We pivoted the whole business to A2P mobile messaging.

It hasn't been plain sailing. Our first task was to get regulatory approval from Gambia's Public Utilities Regulatory Authority (PURA) to operate as a mobile intermediary. Even with this in place, we then had to convince the region's telcos to allow us to connect to their SMS systems.

Next, we had to persuade enterprises to try mobile as a customer care channel. While a certain amount of technical work is needed to connect a business to our automated messaging systems, the biggest barrier has been cultural. Quite simply, few businesses want to be first to try something new – even when it offers as many benefits as enterprise SMS.

For this reason, we have concentrated our efforts on one sector in particular: financial services. Happily, this has been a great success. In Gambia, just 30% of people are banked.

And yet a huge number of citizens still need to collect funds from financial institutions and money transfer services every day. The remittance business is huge, thanks to the large cohort of Africans sending money home from overseas. Typically, local banks will distribute these funds via agents and shops near to where people live. But they face the challenge of how to alert these recipients that there is money waiting for them. Needless to say, text solves this.

With an SMS, a bank or credit union can tell a customer that he or she has outstanding funds. It can give the name of the sender and supply a code that the recipient can take to an agent to release the cash. Thereafter, the bank can update the customer with his or her remaining balance.

Today, we are working with companies such as Trust Bank, Standard Chartered, GT Bank, Prime Insurance, BSIC Bank and Bloom Bank. We currently send around 500,000 messages a month on behalf of these enterprises, and the volumes are expanding all the time. ■

Looking ahead: Quite simply, text-based customer care makes everyone's lives easier. For banks and credit unions, it speeds up the time and cost of distributing funds and information. For 'ordinary' Africans it dismantles the obstacles that otherwise prevent them from redeeming their money.

The benefits speak for themselves. It's why we believe we can quickly scale from 500,000 to 1.5 million messages a month. Firstly, there are more banks/credit unions we can target. Second, there are further services we can facilitate for our existing clients. Two-factor authentication is one promising area, for example. Here, we automate the sending of a one-time passcode to the mobile, which helps to identify and approve the recipient. We can also do more to generate automated notifications for the

smaller number of customers in the region that have a smartphone and bank by app.

While enterprise SMS is a key focus for us now, we are also aware of the potential of IP voice calling. We have the systems in place to help Gambian enterprises switch from limited physical 'on-premise' phone systems to cloud-based platforms. This allows for features such as IVR, remote working, customer information displays, call record keeping and more. We believe it can transform the ability of government departments in particular to serve the public with timely and accurate information. We still face some technical and regulatory hurdles here. But once we overcome them, we are confident that turning voice services into software will become a powerful agent of progress for enterprises across west Africa.

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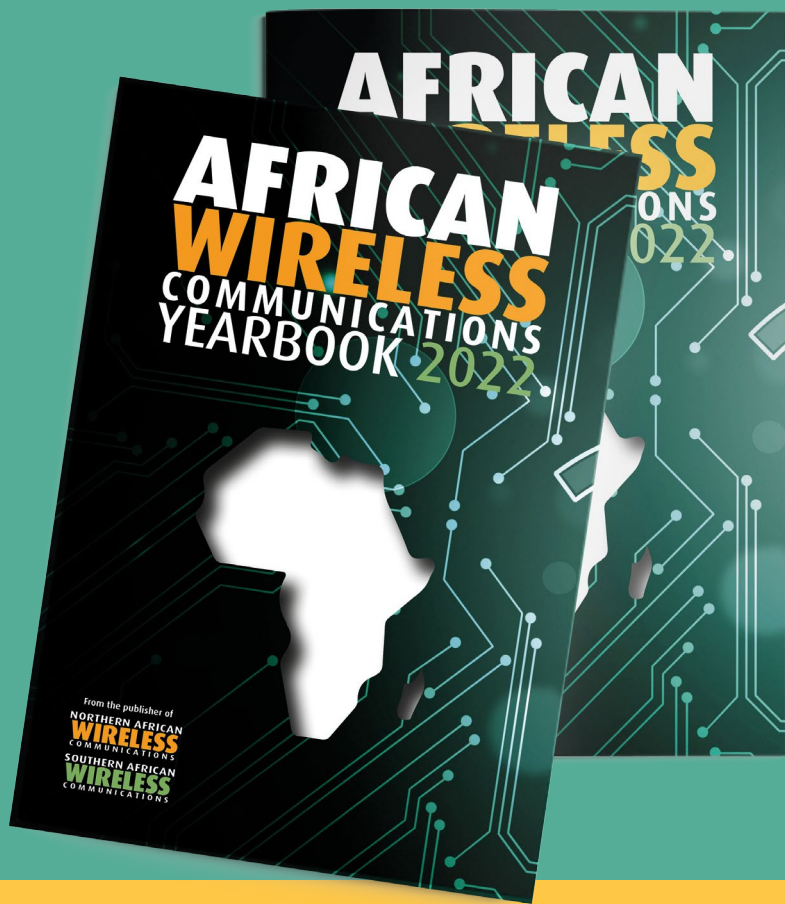
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As publisher of both Southern African Wireless Communications and Northern African Wireless Communications, we look forward to continuing this partnership within the regular issues throughout 2023 and as part of africanwirelesscommms.com – please keep in touch!

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Africa Data Centers Association

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About data centres

Our services

News

Map

The Africa Data Centers Association (ADCA) is the trade organization for data centers in Africa. It provides a platform for data centres actors in Africa to get together, with the aim of promoting and developing growth for the industry, as well as being a catalyst for Africa digital development.

ADCA helps members sharing knowledge and experience to further establish and improve best practices. ADCA communicates about African data centres excellence abroad, facilitating international actors in coming to Africa.

ADCA promotes its members' views to Governments, stakeholders, media and society on the continent. ADCA operates under a strong set of values in terms of ethics, education, environmental responsibility and governance processes

Our Vision: Creating thriving world class African data centre & cloud infrastructure eco system as a catalyst for economic transformation.



Colem Engineering

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Colem Engineering has been a part of Satellite since 1992 and I, Martin Coleman, have worked in the telecoms industry since 1970 starting with international switching centres in London then BT satellite infrastructure projects including work at Madley and Goonhilly.

Colem is a technology innovator specialising in network management and automation systems, RF system design and troubleshooting. Currently working with NOAA and Cobham Satcom in the US, Arabsat and the Satcoms Innovation Group (SIG, originally IRG).

Colem offers events, workshops & training packages including planning of content & sessions, chair, facilitator & moderator roles. All types of communication projects are undertaken: engineering design & planning and networks & control of satellite ground infrastructure, including LEO.

Problem solving & consultancy: a single point of expertise.

Colem engages with local schools through **STEAM** (*Arts inclusive STEM*) helping to mentor and educate students from primary school to university for a career in telecoms.



CritComm Insights

Contact:

info@critcomminsights.com

Website:

www.critcomminsights.com

Analysis

Events

Services

Who we help



CritComm Insights is an industry research firm focused on mobile wireless critical communications technology that supports governmental public safety operations and enterprise life-safety processes. With global market research that covers public safety broadband networking (PSBN), TETRA, and Project 25, CCI is the leading voice on the technology transformation from land mobile radio/professional mobile radio to mobile broadband. In addition to research on radio evolution, CCI tracks the emerging software technologies built upon the mission-critical broadband capabilities of LTE and 5G. These technologies include situational awareness tools, digital command systems, and personnel location capabilities.

Dynamic Spectrum Alliance

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Beaverton, OR 97006
USA

Josh Planton

Telephone: 1 503-619-0505;

admin@dynamicsspectrumalliance.org

**Dynamic Spectrum
Alliance webpage**

**Latest DSA
whitepapers and
reports**

**'How do Europeans
connect to the
internet?' full
whitepaper**

**Submission to
Governments and
Regulators**

The Dynamic Spectrum Alliance (DSA) is a global cross-industry, not-for-profit organization advocating for laws, regulations, and economic best practices that will lead to more efficient utilization of spectrum and affordable broadband for all.

Consumer demand for wireless connectivity is surging, and spectrum is a finite source. Through communication with governments and regulators, the DSA promotes licence exempt access to the spectrum and the sharing of underused spectrum bands to unleash economic growth and innovation.

Through technical materials, events and workshops, the DSA highlights the potential of spectrum sharing. Our regulatory responses and whitepapers are available to view on the DSA website. A recent report, entitled 'How do Europeans connect to the internet?' explores the vital role spectrum will play in delivering gigabit fibre connectivity to all households across the continent.

The DSA also hold key workshops with regulators like ANATEL to discuss and debate innovative spectrum sharing methods and models.



ACKNOWLEDGEMENTS

Global mobile Suppliers Association - GSA
www.gsacom.com
Admin@gsacom.com

GSA (the Global mobile Suppliers Association) is a not-for-profit industry organisation representing companies across the worldwide mobile ecosystem who are engaged in the supply of infrastructure, semiconductors, test equipment, devices, applications and mobile support services.

We actively promote the 3GPP technology road-map – 3G; 4G; 5G – and we are a single source of information for industry reports and market intelligence. The website <https://gsacom.com> is used by industry professionals and organizations from over 200 countries globally as a single source of information on 4G & 5G. Users, who can register for free on the web site, download over 220,000 reports, charts and presentations annually.

The GAMBoD databases, are a unique search and analysis tool we developed to provide the industry with up to date information on the growth and expansion of the mobile broadband ecosystem of devices and networks. The GSA research team constantly updates GAMBoD with new 4G and 5G devices and shows progress of 3GPP technology adoption and spectrum usage by mobile operators. The data can be searched and filtered to give technology, device and regional analysis that can be used in your reports or presentations.

**Free registration
for industry reports**

**GSA industry
databases - by
subscription**



GVF
is headquartered in London,
with a regional office in
Washington, DC.

www.spacebq.org

**Join satellite's only
global association**

**GVF Member
Directory**

GVF Online Events

GVF Training

GVF is the only global non-profit association of the satellite industry, bringing together organisations from around the world across the breadth of the satellite ecosystem. GVF members are at the forefront of the satellite industry and are engaged in the development and delivery of satellite technologies and services for consumers, commercial and government organisations worldwide, creating the path for others to follow. Founded in 1997, GVF's aim is to facilitate expanded access to satellite-based connectivity solutions globally, which is achieved through regulatory, policy and spectrum advocacy; training and certification; product quality assurance; and collaboration with user groups and other satellite stakeholders. In addition to 'GVF Training' which covers technical topics, GVF (in partnership with SatProf and SSPI) has introduced non-technical training and certification – the **SBQ**, or 'Space Business Qualified'. Online and self-paced, **SBQ** enables students to master the fundamentals of the business of space.

GVF

Satellite. Solutions. The World.

International Data Corporation (IDC)

Contact details: Hazel Jeffery at hjeffery@idc.com

IDC MEA upcoming events

IDC MEA latest research

Explore our consulting services

Meet our IDC MEA analysts

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets. With more than 1,100 analysts worldwide, IDC offers global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries. IDC's analysis and insight helps IT professionals, business executives, and the investment community to make fact-based technology decisions and to achieve their key business objectives. Founded in 1964, IDC is a subsidiary of IDG, the world's leading technology media, research, and events company. To learn more about IDC, please visit www.idc.com. Follow IDC on Twitter at @IDC.

IDC in the Middle East, Turkey, and Africa

For the Middle East, Turkey, and Africa region, IDC retains a coordinated network of offices in Riyadh, Nairobi, Lagos, Johannesburg, Cairo, and Istanbul, with a regional center in Dubai. Our coverage couples local insight with an international perspective to provide a comprehensive understanding of markets in these dynamic regions. Our market intelligence services are unparalleled in depth, consistency, scope, and accuracy. IDC Middle East, Africa, and Turkey currently fields over 130 analysts, consultants, and conference associates across the region. To learn more about IDC MEA, please visit www.idc.com/mea. You can follow IDC MEA on Twitter at @IDCMEA and IDC Sub-Saharan Africa on Twitter at @IDC_SSA.



MEF (Mobile Ecosystem Forum)

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+44 208 819 0554
www.nec.xon.co.za

Global reach and member diversity

A wealth of MEF and Members reports

Platform for discussions and networking

Industry collaboration to reduce the impact of fraud

MEF (Mobile Ecosystem Forum) is a global trade body established in 2000 and headquartered in the UK with members across the world. As the voice of the mobile ecosystem, it focuses on cross-industry best practices, anti-fraud and monetisation. The Forum provides its members with global and cross-sector platforms for networking, collaboration and advancing industry solutions.

MEF runs six market-specific programmes enabling members to share best practice, create new initiatives and meet new partners.

- Enterprise Communications
- Payments
- Connectivity
- Mobile IoT
- Personal data & identity
- Content & advertising

Activities areas:

- Insight

MEF members' expertise helps create reports, white papers, enterprise surveys etc. MEF carries out its own annual global consumer survey of smartphone users.

- Interaction

MEF members collaborate with, and learn from each other, and the wider industry, via events, working groups, networking etc.

- Impact

Collectively, MEF members impact the future of their sector via best practice schemes, registries, consultations and more.



ACKNOWLEDGEMENTS

Northern Sky Research (NSR)

Kristen Kloster-Grady
VP, Marketing
NSR (an Analysys Mason company)
Kristen.Kloster-Grady@analysysmason.com

NSR's Bottom Lines

NSR's Multi-Client Reports

NSR's Non-GEO Constellations Analysis Toolkit 3.0 (NCAT3)

Northern Sky Research (NSR) is the leading global market research and consulting firm focused on the satellite and space sectors. NSR's global team, unparalleled coverage, first to market coverage and a transparent, dependable approach sets NSR apart as the key provider of critical insight to the satellite and space industries.

NSR primary areas of expertise include satellite and wireless networks, emerging technology, and media applications. Our services and clients cover the entire globe. With extensive expertise in all geographic regions, NSR is a leading provider of in-depth market insight and analyses. Since each NSR product is based on future perspectives, our analyses allow our clients to stay a step ahead of the competition and plan for future opportunities in all markets.

NSR is an Analysys Mason company



Open Access Data Centres (OADC)

Email: enquiries@openaccessdc.net

Our sites

Services

Connectivity

Client insights

Open Access Data Centres (OADC) has been established to transform the provision of data centre services in Africa. As a WIOCC Group company, it leverages strong existing relationships with clients in Africa and well-established delivery capabilities across the continent, together with the proven and long-standing data centre expertise of the OADC Executive team.

The company is implementing a world-class, pan-African, carrier-neutral data centre footprint that will deliver an unparalleled client experience offering expert assistance and support, partnership in tailoring bespoke solutions and leading-edge information systems to support client business decision-making.

OADC is deploying its open-access, Tier III core data centres at major cable landing locations and in key business hubs throughout Africa. OADC EDGE data centres are being deployed into smaller locations, serving the ongoing need to support service providers in extending network reach, and the growing requirement for content storage, processing, and delivery at the network edge.

OADC is an environmentally responsible company and as such is pursuing a wide range of environmental and management accreditations.



Omdia

[Contact Us](#)

Omdia Service Providers & Communications Overview

Discover Omdia's World Information Series – Service Provider (WIS-SP) Spotlight Service

Omdia Consulting - Solve Real-World Challenges Today

Connect with Omdia Analysts Today

Omdia is a leading research and advisory group focused on the technology industry. With clients operating in over 120 countries, Omdia provides market-critical data, analysis, advice, and custom consulting.

Omdia was formed in 2020 following the merger of IHS Markit, Tractica, Ovum and Heavy Reading. Sitting at the heart of the Informa Tech portfolio, Omdia reaches over four million technology decision makers, influencers and practitioners that form part of the wider Informa Tech community and has specialist research practices focusing on Enterprise IT, AI, Internet of Things, Communications Service Providers, Cybersecurity, Components & Devices, Media & Entertainment and Government & Manufacturing.

For more information about Omdia, please visit <https://omdia.tech.informa.com/>

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OMDIA

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TeleGeography

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Our Global Research

Interactive Submarine Cable Map

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TeleGeography is a telecommunications market research and consulting firm. We conduct in-depth, primary research on a limited number of key subjects, and provide users access to these data through online reports and databases.

Research areas include:

- International networks, undersea cables, service providers, and wholesale circuit pricing
- International Internet networks, service providers, capacity, traffic, and IP transit pricing
- Enterprise MPLS VPN, Ethernet, dedicated Internet access, and international private line service providers and pricing
- International long-distance traffic, service providers, cost, and pricing
- Retail mobile, broadband, and fixed-line service providers and markets

Research services include:

- Data sets and analysis in online reports and databases
- Telecom wall maps
- Custom research, consulting, and map creation
- CommsUpdate – A free daily email summary of the top telecom news stories globally
- Interactive Submarine Cable Map – A free resource that depicts active and planned submarine cable systems and their landing stations.

TeleGeography



ACKNOWLEDGEMENTS

TCCA

www.tcca.info
www.critical-communications-world.com

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[@CritCommsSeries](https://twitter.com/CritCommsSeries)

**TCCA Critical Update
webinar series**

**Critical
communications
white papers**

**Join us – find out
more**

**News from TCCA
members here**

On behalf of its members TCCA supports all standard mobile critical communications technologies and complementary applications. Our members are drawn from end users, operators, and industry across the globe. TCCA members design, manufacture, build, implement, utilise, analyse, promote, develop, and deploy critical communications worldwide. Collectively we have created the critical communications of today. Together we are shaping the critical communications of the future.

We believe in and promote the principle of open and competitive markets worldwide using open standards and harmonised spectrum. We drive the development of common global mobile standards for critical broadband and maintain and enhance the TETRA Professional Mobile Radio (PMR) standard. TCCA is the 3GPP Market Representation Partner for critical communications and our members actively contribute in 3GPP working groups. TCCA supports the ETSI MCX Plugtests™, is a member of the MCS-TaaSting project, supports the Mission Critical Open Platform (MCOP) project.



Wireless Access Providers Association (WAPA)

Lesley Colmer,
secretariat@wapa.org.za

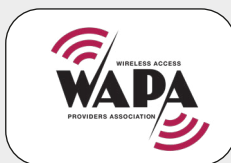
Resources

**Find a Wireless
Internet Service
Provider**

**Become a member
of WAPA**

**Read the latest
news**

Wireless Access Providers Association (WAPA) is a non-profit trade association established in 2006 as the collective voice for the wireless industry. Its primary objective is to promote wireless industry growth through self-regulation, promoting best practices, and educating members and the markets on new wireless technologies and business models. WAPA offers members regulatory advice, technical training, code of conduct, a forum for knowledge-sharing and business enablement opportunities. WAPA positions itself to interface between the government regulator (ICASA), network operators, service providers, and consumers. The organisation regularly submits and presents to government on regulations affecting the wireless industry. It tirelessly lobbies for more progressive and efficient spectrum management in South Africa and is focusing on the possibilities of TVWS spectrum for interference-free access.



WIOCC Group

www.wiocc.net
www.openaccessdc.net

Contact:

info@wiocc.net
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Networks

Solutions

Client services

Blog

WIOCC Group is a leading digital connectivity provider in Africa. It offers connectivity services through its extensive open-access, carrier-neutral digital infrastructure to cloud operators, content providers, broadband and mobile network operators (MNOs) and internet service providers (ISPs) across Africa, which in turn provide voice, data, applications, content and fibre access services to their end users and subscribers. The company is a strategic investor in hyperscale terrestrial networks, and in multiple subsea cables including 2Africa, Eastern Africa Submarine Cable System (EASSy), Equiano and the West Africa Cable System (WACS). Through WIOCC Group company Open Access Data Centres, it is establishing a rapidly growing data centre footprint in Africa, comprising 35 new facilities including hosting cable landing points for both 2Africa and Equiano.

WIOCC
Africa's Digital Backbone

World Teleport Association (WTA)

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Since 1985, the World Teleport Association (WTA) has been the only trade association that focuses on the business of satellite communications from the ground up. At the core of its membership are the world's most innovative operators of teleports, from independents to multinationals, niche service providers to global carriers. WTA is dedicated to advocating for the interests of teleport operators in the global telecommunications market and promoting excellence in teleport business practice, technology, and operations. Companies that do business with teleports also find that WTA is the best investment they can make to open new channels to the industry.

WTA Membership

WTA Certification

WTA

ACKNOWLEDGEMENTS

African Telecommunications Union (ATU)

www.atu.africa

The African Telecommunications Union (ATU) is the leading continental organisation fostering the development of information and communication technologies infrastructure and services. The mission of the ATU is to promote the rapid development of information and communication technologies in Africa to achieve universal access, and full inter-country connectivity. The ATU envisions an Africa that is empowered as a full and active participant in the global information and knowledge society.

EMIS

www.info.emis.com/emis-africa

The African Telecommunications Union (ATU) is the leading continental organisation fostering the development of information and communication technologies infrastructure and services. The mission of the ATU is to promote the rapid development of information and communication technologies in Africa to achieve universal access, and full inter-country connectivity. The ATU envisions an Africa that is empowered as a full and active participant in the global information and knowledge society.

Hamilton Research Limited

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www.africabandwidthmaps.com

Hamilton Research is a specialist provider of research, analysis and GIS cartographic services for telecom markets in Africa and other developing regions. We undertake customised research and consulting projects for a range of clients, with projects ranging from the research and production of maps-to-order and the development of market metrics.

Analysys Mason

www.analysismason.com

Analysys Mason is the world's leading management consultancy focused on telecoms, media, and technology (TMT). We give clarity and confidence in answering our clients' biggest commercial questions. What strategy will best enhance value? What implementation plan will be most successful? What is the optimal positioning for five years' time? We bring together commercial and technical expertise across four interconnected consultancy practices strengthened by globally respected research.

Ericsson

www.ericsson.com

Ericsson is one of the leading providers of information and communication technology (ICT) to service providers. We enable the full value of connectivity by creating game-changing technology and services that are easy to use, adopt, and scale, making our customers successful in a fully connected world.

International Telecommunications Union (ITU)

www.itu.int

The International Telecommunication Union (ITU) is the United Nations specialized agency for information and communication technologies – ICTs. Founded in 1865 to facilitate international connectivity in communications networks, we allocate global radio spectrum and satellite orbits, develop the technical standards that ensure networks and technologies seamlessly interconnect, and strive to improve access to ICTs to underserved communities worldwide. ITU is committed to connecting all the world's people – wherever they live and whatever their means.

Brookings Institute

www.brookings.edu

The Brookings Institution is a non-profit public policy organization based in Washington, DC. Our mission is to conduct in-depth research that leads to new ideas for solving problems facing society at the local, national, and global level.

GSMA

www.gsma.com

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: industry services and solutions; connectivity for good; and outreach.

Knight Frank

www.knightfrank.co.uk

Founded in 1896 and headquartered in London, UK, Knight Frank is one of the world's leading independent real estate consultancies.

Oxford Business Group

www.oxfordbusinessgroup.com

Oxford Business Group (OBG) delivers tomorrow's growth markets today. The global economic landscape is changing, and since 1994 OBG has been at the frontier of mapping new waves of emerging economies. OBG now operates in many of the world's fastest growing markets, offering internationally acclaimed intelligence on regions that are shaping the future balance of economic power.



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