chapter
Satcoms
5

Daniel Batty,
space and spectrum policy analyst,
Access Partnership

Satellite in Africa

Satellite networks have undergone significant innovation and advancement in recent years. While all the traditional services remain core components of satellites services, such as geostationary orbit (GSO) broadcasting, internet, and communications, as well as navigation and maritime distress communications, new services have emerged which present exciting opportunities and benefits for users, governments, and industry. These include Direct-to-Device satellite communications, non-geostationary satellite orbit (NGSO) broadband internet, and narrowband Internet of Things (IoT).

The number of satellites launched into orbit has dramatically increased over the past few years. This statistic is easily addressed by the emergence of the large NGSO constellation operators, such as Kuiper and SpaceX – each intending to operate constellations of thousands of satellites – but it does not paint the whole picture. Alongside the emergence of the large NGSO constellations, there has been a renewed interest in space and a revitalisation of national space programmes and international cooperation in space activities. With this renewed interest in space, we are witnessing the birth of new space powers in India, China, and Japan.

Africa has not bucked this trend. It is also investing in domestic and regional space programmes, with the local market expected to exceed US$10 billion by the end of 2024. The Africa Space Industry Annual Report from 2021 paints an impressive image of the future of African space missions, with 125 new satellites on backlog to be launched by 2025 spread across 23 different African countries.

By the close of 2022, Africa had collectively launched 52 satellites, contributing to the continents' growing space expertise. South Africa has been the largest contributor to the launches with 12 satellites, followed by Egypt's 10 launches.

African satellites are providing a range of services including communications, broadcasting, weather monitoring, and a suite of Earth observation services, which I will discuss in more detail.

Partnerships and investment

To set the scene, however, we first need to outline the international investment and cooperation picture.

It is no secret that the growth of the African space sector has attracted the attention of the international community looking to expand investment opportunities on the continent. China remains the largest investor in African space missions and has expanded beyond monetary and infrastructure investment to offer upskilling through engagements between African youths and Chinese astronauts.

The European Union has also not missed the opportunity presented by a growing Africa space economy and has invested US$29 million into the development of satellite technology in Africa.

While the national budgets of African space programmes do not match those of larger economies like the USA, India, and the European Union, they have steadily increased as more African states seek to stake their claim beyond our atmosphere. The largest African space budget is South Africa's at US$154 million. The South African National Space Agency has an established history in operating satellites, conducting radio astronomy and monitoring space weather. Nigeria is Africa's second largest space budget at US$68 million while Egypt comes in third with US$40 million.

Space services in Africa

The typology of space activities in Africa illustrates the needs of developing nations and the key role satellites play in achieving the sustainable development goals and maximising the impact of investment. The most significant ones are Earth observation and remote sensing, and satcoms.

Earth observation and remote sensing

Earth observation and remote sensing are a group of technologies that integrate successfully into many African economies, as they address important needs. From management of vast coastlines to tracking deforestation, monitoring soil quality, erosion, and agriculture efficiency, Earth observation is most effective in providing actionable insights to developing countries. As such, it is little surprise that Earth observation and remote sensing remain the largest market for space services on the continent.

The African Earth Observation Challenge is a unique example of a programme targeted at developing the private African Earth observation market, which is currently dominated by State players. The challenge focuses on innovative solutions which either provide or make use of Earth observation data to develop a strong business case.

Digital Earth Africa (DEA) is another example within the African Earth observation sector. DEA provides an open-source platform on which Earth observation data is hosted, processed, and shared together with key insight reports. Digital Earth South Africa is an offshoot programme focused on Southern Africa and integrated with the South African National Space Agency's (SANSA) ARD data.

As the continent's oldest space agency, SANSA alone has 30 years of experience in Earth observation and makes use of the data generated to provide a suite of services in South Africa, including crop yield monitoring, settlement expansion monitoring, water quality and vegetation status monitoring, along with coastal monitoring.

Finally, as one of Africa's fastest growing economies, Kenya has seen the potential and launched their first '3U' Earth observation satellite in April this year. 3U provides data to

support policy development and decision making on food security, natural resource management, climate change, and disaster management.

Satellite communications

Of course, one of the most vital uses of satellite services on the continent is to aid communications, be it direct satellite links or backhaul for IMT. With the emergence of Direct-to-Device technology, satellite looks to be one of the key technologies for plugging the coverage gap. Satellite networks' service operates at a relatively low cost-per-user, thanks to their large coverage area, meaning the usage gap may in part also be addressed by the continued development of satellite communications networks.

The emergence of large constellations capable of providing high-speed broadband Internet across the globe present an additional important development for African communications. The deployment of high-speed stable fibreoptic networks on the continent is limited to large cities and is particularly lacking in inland countries, owing to the cost of deployment.

The Regional African Satellite Communication Organization (RASCOM) is a prime example of a home-grown African satellite communications company providing communications and broadcasting services across the continent. RASCOM's objective is to limit Africa's dependency on international networks and serves as a prime example of an African solution.

In conclusion, the overarching trend is clear: space is a vital staging ground for further development on Earth. Through the continued development of new technologies and increasingly extreme weather caused by climate change, satellites provide essential services in a robust and secure way. These services have proven themselves vital to all regions of the world, including Africa, and their importance is only set to increase. With the emergence of Direct-to-Device, high-speed satellite broadband, and the endless use cases made possible by narrowband IoT, it is no surprise that African countries are moving to capitalise on them and the opportunities they present to increase the rate of development. ∎

Ayooluwa Adetola,
editor, Space in Africa

Africa's space industry

The African space economy showed remarkable growth in 2022, reinforcing the possibility of achieving the projected valuation of US$22.6 billion by 2026. The industry is firmly on track to reach this target and is supported by the substantial progress witnessed across various segments. These individual segments have contributed to the overall growth of the space economy, showcasing promising advancements and opportunities.

Many African nations actively invest in their space programmes to support their growing space aspirations. In 2023, African countries allocated US$425.01 million to fund space activities, representing a 14.96% and 18.77% decrease compared to the revised budgets of US$499.76 million in 2022 and US$523.3 million in 2021, respectively. Africa's space budget witnessed a notable decline in 2023, which can be attributed to various factors, including
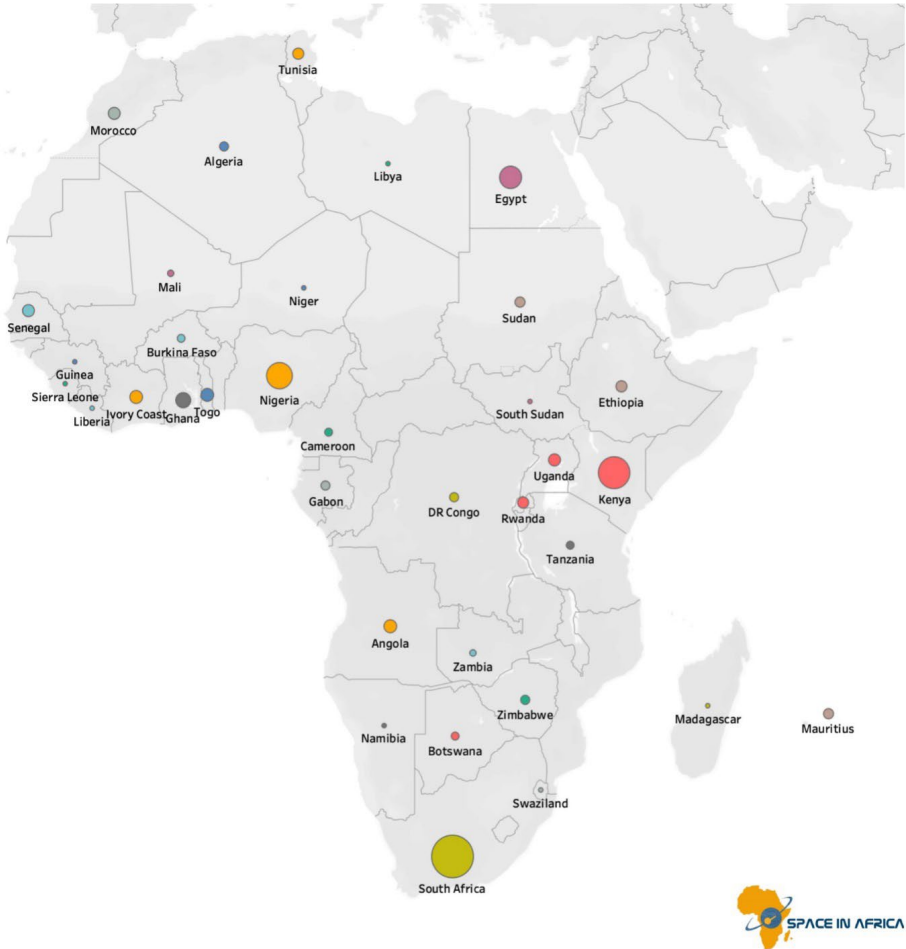
31 African countries have entered the NewSpace sector, encompassing a variety of origins, including university research spin-offs, government-backed startups, and commercial ventures

fluctuation in foreign exchange rates and the completion of national space projects. This decline reflects a shift in government priorities, economic constraints, reallocation of funds to address pressing national issues and the evolving nature of space programmes as they move into different stages of development.

As of June 2023, 15 African nations (including three multilateral satellites) have invested over US$4.71 billion in 58 satellite projects. The launch of an additional 105 satellites by 2026 is anticipated. Africa's space assets and infrastructure are expanding significantly, including launch facilities, ground stations, teleports, and astronomy infrastructure. Presently, the continent hosts 355 ground stations, 60 telescopes, 22 planetariums and over 11 renowned observatories. Of the 11 African launch

facilities, which include previously used rocket launch sites, only three are currently operational, three are proposed, and five are inactive.
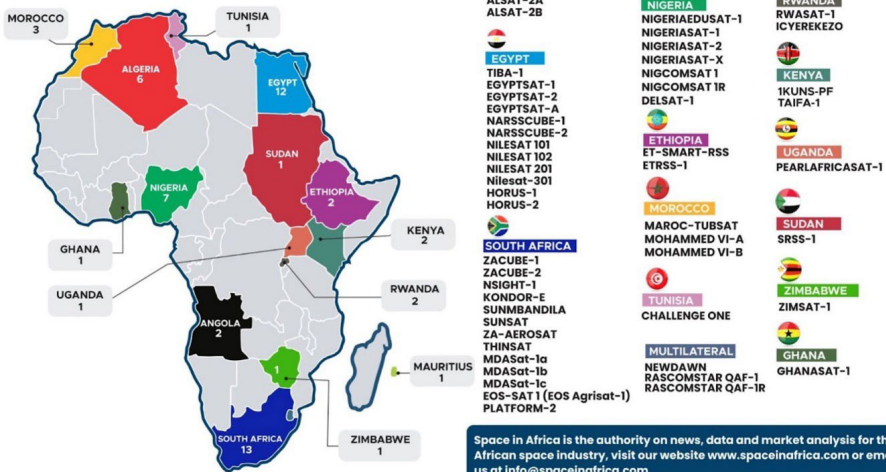
As space technologies become more crucial for achieving sustainable development in Africa, more countries are establishing or strengthening their space programmes to realise the benefits of space technologies in their national goals. Moreover, space is directly linked to the 17 United Nations Sustainable Development Goals and the 20 goals of AU's Agenda 2063 (Africa We Want), a strategic framework for the continent's socio-economic transformation over the next 50 years. Since African participation in space is geared towards sustainable development, it is natural that each country's priorities are in tandem with its current and future needs, some of which include Earth observation applications and digital inclusion.

318 NewSpace companies are charting the course of space democratisation on the continent. These companies are involved in emerging technologies such as AI/ML, robotics, big data analytics, small satellite constellations, and spacecraft propulsion. Since 2022, at least two NewSpace start-ups have secured pre-seed funding to support their research and development efforts and initial entry into the market. Furthermore, an increasing number of companies are well-positioned to take advantage of monetary and non-monetary resources from foreign sources, enabling them to scale up their businesses and gain greater visibility. This progress has allowed many African NewSpace companies to transform their business models significantly, expand their market reach and capitalise on emerging opportunities. This has also influenced the creation of an inclusive and supportive environment for African NewSpace founders. These companies are involved in emerging technologies such as artificial intelligence/machine learning, robotics, big data analytics, small satellite constellations, and spacecraft propulsion. As the continent embraces

AFRICA'S LAUNCHED SATELLITES

African countries have launched 58 satellites from 1998 until June 2023. 55 of these satellites were launched by 15 African countries, while the remaining 3 involved several African countries in a multilateral project.

MOROCCO 3

TUNISIA 1

ALGERIA 6

EGYPT 12

SUDAN 1

NIGERIA 7

ETHIOPIA 2

GHANA 1

KENYA 2

UGANDA 1

RWANDA 2

ANGOLA 2

MAURITIUS 1

SOUTH AFRICA 13

ZIMBABWE 1

ALGERIA
ALCOMSAT-1
ALSAT-1
ALSAT-1B
ALSAT-1N
ALSAT-2A
ALSAT-2B

EGYPT
TIBA-1
EGYPTSAT-1
EGYPTSAT-2
EGYPTSAT-A
NARSSCUBE-1
NARSSCUBE-2
NILESAT 101
NILESAT 102
NILESAT 201
Nilesat-301
HORUS-1
HORUS-2

SOUTH AFRICA
ZACUBE-1
ZACUBE-2
NSIGHT-1
KONDOR-E
SUNMBANDILA
SUNSAT
ZA-AEROSAT
THINSAT
MDASat-1a
MDASat-1b
MDASat-1c
EOS-SAT 1 (EOS Agrisat-1)
PLATFORM-2

ANGOLA
ANGOSAT-1
ANGOSAT-2

NIGERIA
NIGERIAEDUSAT-1
NIGERIASAT-1
NIGERIASAT-2
NIGERIASAT-X
NIGCOMSAT 1
NIGCOMSAT 1R
DELSAT-1

ETHIOPIA
ET-SMART-RSS
ETRSS-1

MOROCCO
MAROC-TUBSAT
MOHAMMED VI-A
MOHAMMED VI-B

TUNISIA
CHALLENGE ONE

MULTILATERAL
NEWDAWN
RASCOMSTAR QAF-1
RASCOMSTAR QAF-1R

MAURITIUS
MIR-SAT1

RWANDA
RWASAT-1
ICYEREKEZO

KENYA
1KUNS-PF
TAIFA-1

UGANDA
PEARLAFRICASAT-1

SUDAN
SRSS-1

ZIMBABWE
ZIMSAT-1

GHANA
GHANASAT-1

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space technologies and harnesses their potential across various sectors, it also opens numerous avenues for investors to explore and consider.

Over the past few years, several new as-a-service providers in different industry segments have emerged. Most of these service providers operate proprietary ground stations and satellite constellations, enabling them to cover various infrastructure services using the same model. Although some of these companies have partners in Africa, they are all non-African organisations serving the global market. The as-a-service business model has emerged as a transformative approach in the African space industry, offering flexible and cost-effective access to space-related services, resources, and technologies. With its numerous advantages and the involvement of diverse stakeholders, this model is revolutionising

how organisations engage with space capabilities.

Between 2000-2023, African nations have engaged in over 166 bilateral space agreements involving more than 100 institutions from 32 countries worldwide, 90% of which are international agreements with non-African stakeholders. 89 of these agreements were signed over the last three years. Africa offers a promising investment landscape, with more than 45 ongoing research and development projects across 10 African countries, focusing on various Sustainable Development Goals. The bilateral agreements between African countries, foreign nations, and organisations have proven mutually beneficial. Some countries have secured contracts that exceed their investment in the continent, while others invested more than they have received. ∎

Martin Coleman,
COLEM Engineering

Alex More,
Trust CPD Lead Sherborne Area Schools Trust, teacher, trainer and consultant

The talent acquisition and skills gap facing space & aerospace Industries

This year, there has been a focus on the shortage of satcom engineers and the discussions within the satellite communications industry got me thinking about my involvement with a local school here in the UK. Shaftesbury School is taking a different approach through the innovative 'Future Classroom' project.

Launched after the COVID-19 pandemic, this project has been a revelation from the get-go. Each year, the school has a steady stream of students opting to study maths, engineering and scientific subjects, with a view to a career in the space and aerospace industries. Encouraging

school students to take an interest in these key subjects is a passion for me, and that's why I have been working to take action to help fill the skills gap in our space communications industry.

What does this have to do with Africa?

One teacher had a dream about what a transformed classroom could offer to his students and then dared to make that dream a reality. That teacher is Alex More, who has been instrumental in pioneering the 'Future Classroom' concept at Shaftesbury School. This has led to an expansion of the school's horizons. Lessons now include exciting and innovative elements such as TEDx talks and the

school is engaging with great organisations for educators such as HundrEDorg.

Alex is now linking up with a school in Ghana that has taken an interest in the Future Classroom and this has resulted in shared learning between pupils and teachers. Here is a snippet from a recent Sub Stack blog post Alex shared on the progress of the project.

It is Wednesday, 2pm. The classroom is quiet as the students selected for this project are yet to arrive. The screen above me crackles and within seconds fifteen sets of eyes are looking directly at me. The smiles follow. 'Hello, Alex - can you hear me?' I see Daniel (the teacher) on the screen and the class behind him, sat patiently. This is the highlight of my week…

Despite being divided by 8,000km, an ocean and a continent - there is only an hours' time difference between the UK and Ghana. With a little imagination, the world has become our classroom, and it is a fascinating place to learn.

Why Ghana?

Africa is a place of huge contrasts and easy headlines. A few years ago, a teacher in Ghana reached out to me via the HundrEDorg. Daniel had seen our Future Classroom and was intrigued about the technology and how we organised the learning. After a few initial Zoom calls, we decided to try a live lesson. Post-COVID-19, live lessons, or 'hybrid' as they are now known, were not uncommon. However, connecting learners between countries is rare - but, it doesn't have to be.

The first live lesson was a failure. I quickly learned that Daniel was working with limited resources (he joined the lesson via a single cell phone). The class were huddled around a device and the sound was poor. Every now and then the connection would drop and we would lose the flow of the lesson. Regular storms make internet accessibility hard in the Battor

Dugame region of Ghana where is the school is based. Daniel was relying on a generator to power connection. Despite this, his class were attentive and keen to learn.

Lessons were organic, we kind of made up the objectives based on what interested the students. One week we would be focusing on climate change, the next automation. Everything was led by the students. Lesson lasted approximately 30 minutes. I would start with some content to shape the discussions, then students on both sides of the screen would work on solutions in teams. Most lessons ended with some interactions between learners in the form of presentations, questions or competitions. This was the most powerful part. As relationships formed, the young people drove this project with an infectious energy, keen to learn from each other.

I had underestimated the raw power of this project. The cultural richness such learning provides is hard to find elsewhere within our curriculums. Students were fascinated by each other - from home life to hobbies. Despite being worlds apart, kids are kids and they connected on many levels. For the children in Ghana, the lure technology was irresistible and at the time, out of reach. They wanted to know about virtual reality (VR), artificial intelligence (AI) and robotics. Lessons started to focus more on technological solutions and the science of the future. One lesson on the topic of VR and immersive technologies stands out as it changed everything. A young lady called Brightness said 'Hey, Mr Alex - we want to try VR in Ghana, that is my dream.'

That comment alone lit a fire. Shaftesbury School students started to fundraise. We started a Crowd Funding page and reached out to our Future Classroom sponsors. Within months we had raised enough funds to create a Future Classroom in Team, just outside of Accra in Ghana. One of our students was born in Ghana and travelled there every summer with her family. They kindly offered to transport all the technology to save on huge import taxes. It worked. Daniel found a suitable space and Future Classroom Ghana was born.

The lessons continued and the impact was immediate. The connection speed improved, as did the sound and visuals. Daniel was able to use the new technology to inspire other children in the region.

This got me thinking about how a project like this essentially relies on communication links.

So, how does this all relate to communication in Africa?

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We have come full circle and are back to the topic of "can we connect a continent?"

The talent pool in Africa is huge but largely untapped because it is not as well connected as we would like. Education is key everywhere in Africa and now is the time for our industries and nation schools to pull together and make it happen. If a school in the UK can make a massive difference to a school in Ghana then we have a working model already in place.

Connecting the African continent is fundamental to its success in a digital world. This can only be achieved by connecting Africa's Education and Health systems through schools, universities, colleges, hospitals, surgeries, health authorities and associated professionals. It is so doable. It's ambitious, but not out of reach. The benefits to all globally are huge.

Alex once said: "now a teacher myself, I have a chance to disrupt and make good trouble. I use the curious phrase 'good trouble' often to describe how innovation can be used as a transformative force, one that improves the learning for everyone involved. The Future Classroom is my attempt to disrupt the stagnant nature of learning and it is working!"

If one man can achieve this amount of success, then connecting Africa's education and health systems is simple.

One of the easiest ways to connect quickly is via satellite. And, right now this easier than ever with addition of LEO constellations available and with many more to come. Satellite provides that vital layer of communications that provide us all with safety, disaster recovery, medical/healthcare, education and, of course, navigation and tracking through the various GPS services available. Satellite delivers effective broadband and fast, thus it's ideal for connecting education and health within the African continent and globally.

Governments and their regulatory departments need to make it possible by allowing satellite infrastructure, especially LEO, landing rights in each country. In major towns and cities, fibre and 4G/5G are likely candidates for fast connection. If governments take that first step to concentrate on education and health, this alone would allow immediate and cost-effective connection. As more communication infrastructure becomes available it will simply add to the connection possibilities and increase speed, capacity and use cases.

Making education and health the priority will lead to a connected African continent. My hope for 2024 is that African countries, governments, schools and health authorities will start to develop better connectivity and connect as soon as possible. Global reach is simply a byproduct. Job done!

The outlook for the mobile, broadband (terrestrial and satellite) and wireless markets remains bright for the coming years. The continued expansion of 5G and satellite networks, the adoption of fibre and other high-speed broadband technologies, will make connectivity in all sectors much easier.

However, challenges related to spectrum allocation, infrastructure costs and cybersecurity will require ongoing attention to ensure the sustainable growth and resilience of these markets. The governments and their regulators must take charge now and open the doors to allow communications technology to flourish.

Africa is an incredible continent, with such rich diversity, culture, spirit and talent. That's why it's so important that connectivity enables the African people to take part on the world stage in terms of education, health, commercial ventures and global politics. Satellite technology can enable this with a cost-effective and efficient means of eliminating the digital gap that still exists across so much of the region. Through initiatives like the Future Classroom and encouraging dialogue and sharing of ideas and information, the future prospects for young Africans can be limitless. ∎

Victor Meadeb,
SVP global partnerships, Africa Development, Commercis (formerly Talia Communications)

Africa has been a land of ample opportunity for Commercis.

Since we started offering services across the continent, we have been extremely blessed with the trust of our customers and partners.

We have been serving customers in more than a handful of countries, namely Chad, Cameroon, DRC, Nigeria, Ghana, Equatorial Guinea, Uganda, Sudan, and South Sudan. We serve a variety of market verticals through local partners, including the energy sector, mining, enterprise, government, and NGOs.

There are many opportunities across the continent due to the rapid digitalisation of society in general. Africa has the youngest population in

"Africa has remained in the 'long' time - Africans by and large are in no rush to make decisions. Therefore, it is counterproductive to try to be pushy to get certain things done quicker The two main requirements to operate in the continent are patience and adaptability. The two main requirements to operate in the continent are patience and adaptability."

"There are many opportunities across the continent due to the rapid digitalisation of society in general. Africa has the youngest population in the world – this will be the generation that will build the continent using digital tools that are becoming accessible to all."

the world – this will be the generation that will build the continent using digital tools that are becoming accessible to all.

In terms of trends, we see the growth of bandwidth usage across the population and the increased coverage supported by governments efforts from the private sector.

We are also seeing new investments coming from traditional industries like banking, energy and mining, and the arrival of retail, which is starting to invest seriously in the African market.

In order to support this effort and transformation, Commercis is partnering with major technology providers to bring the solutions to where they are needed most.

Of course, there are also challenges operating on the continent - the main one been the stability of certain countries, mainly in West Africa.

For these unstable countries, priorities are elsewhere and the only opportunity we have is to provide support through our governmental and NGO customers.

The regulatory environment is always changing and constantly adapting to new trends and solutions as and when they're deployed.

> "We are working with our Ghana partner to provide connectivity for schools so that they can implement this tutoring platform across Ghana (for now) and potentially other countries after the initial rollout."

I'd say that one of the biggest obstacles to the deployment of new technology is the regulatory component. Each country is different and will have its own way to adopt new solutions. Some will be faster, and others will be cautious.

In general, we are confident and see a bright future for all Africa thanks to the empowerment through technology.

Each African country has its own unique requirements; there are huge differences between each country.

In my experience, the major difference is the approach to time. Africa has remained in the 'long' time - Africans by and large are in no rush to make decisions. Therefore, it is counterproductive to try to be pushy to get certain things done quicker.

The two main requirements to operate in the continent are patience and adaptability.

The main trend we see across Africa is the development of low Earth orbit (LEO) constellations that will bring fibre like connectivity at a competitive price with complete coverage across the continent. This will certainly change the consumer internet market in the next few years.

It will also impact the enterprise world, allowing fast forward digitalisation independently of the development of local infrastructure. This will make solutions like AI, AR/VR, cloud computing to be accessible to anyone who needs them. That is a huge revolution.

We are investing a lot of time and resources in future proof solutions that will democratise these new technologies.

Thanks to the new LEO constellations we will see connectivity moving from a luxury to a commodity for most of the population and its organisations.

We believe in the amazing social impact of this new type of connectivity; it will allow better economy, better institution, better healthcare, and better education for populations that so far have been left behind.

In 2023, we completed a very interesting project in Ghana. We have connected two of our partners - one is doing IT solutions in Ghana, and another is providing a mathematics tutoring platform to help children develop their skills through a tailor-made online course. We are working with our Ghana partner to provide connectivity for schools so that they can implement this tutoring platform across Ghana (for now) and potentially other countries after the initial rollout. ∎

Looking ahead: Africa is the youngest continent in the world, and we have a strong belief that a lot of innovation will come from the continent now that we are all working on making available the tools to help empower population development. We also foresee acceleration in the digitalisation of African society. We hope for political stability that will allow economic growth, to ensure that all African nations benefit from recent technical developments.

We believe that a Pan-African success is the way to a bright future for all Africans.

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Doreet Oren,
senior director, solutions marketing
& product marketing, Gilat

Africa is a mosaic of diverse cultures, languages, and landscapes. However, it is also a continent marked by disparities in infrastructure, connectivity, and access to essential services. Addressing these disparities has become crucial for the continent's growth and development. Satellite communications is a powerful tool to bridge these gaps and unlock a world of opportunities for Africa.

Gilat Satellite Networks is a vital partner in Africa, driving forward multiple social inclusion projects across the continent, and ensuring connectivity in the most remote areas. These initiatives span various domains, each contributing significantly to Africa's development.

Education is the cornerstone of development. Yet the challenges of providing education in remote regions of Africa are immense. These areas often lack reliable internet connectivity, leaving students and teachers isolated from the wealth of information available online. Additionally, the absence of modern IT infrastructure compounds the problem, limiting the potential for interactive and engaging learning experiences. As such, one of the most pressing applications of satellite communications in Africa is in the field of education.

Satellite connectivity connects these underserved areas to the internet and much more. By enabling e-learning platforms in rural areas, Ministries of Education (MoEs) are breaking down barriers to education by ensuring that all teachers, regardless of where they are located, have access to the same materials, knowledge, and training. Teachers in local villages can provide the same level of education as their counterparts in main towns and cities.

E-learning in Africa has also unleashed the power of self-learning. Instead of students just internet surfing on their own, they now have access to specially curated digital resources like videos, tutorials, and interactive quizzes to explore subjects and interests autonomously.

Gilat Satellite Networks is playing a pivotal role in transforming education in remote areas where traditional infrastructure falls short. Solutions include the implementation of a Learning Management System (LMS) and the development of essential IT infrastructure. The LMS, hosted on the cloud, effectively manages students' academic achievements and requirements. It is complemented by a suite of applications designed for both students and teachers. These applications facilitate seamless communication, assignment submissions, and access to a wealth of educational content. Cloud-based storage contains lesson plans aligned with the MoE's curriculum, ensuring that the educational material is both relevant and effective. This digital interface empowers both students and educators by providing a centralized hub for learning resources, communication, and progress tracking.

This holistic approach, including laptops, desktops, tablets, WiFi, power boards, printers, servers, etc. ensures that not only do students gain access to information, but they also have the tools and resources to make the most of it. Moreover, Gilat also helps local authorities receive the funding they need to deploy these critical projects via multi-year financing through loans from banks and other financing resources. By combining connectivity, infrastructure, and financial strategies, Gilat is actively participating in Africa's journey towards a more inclusive and educated society.

Access to quality healthcare is a fundamental human right, yet it remains a challenge for many

"Satellite communications are transforming the African continent by advancing social inclusion, improving education and healthcare, streamlining governance, and bolstering security."

in remote areas of Africa. Limited access to medical facilities and specialists often results in inadequate healthcare, leaving communities vulnerable to preventable diseases and health crises. In remote areas with limited access to medical facilities, telemedicine enables remote consultations, allowing patients in rural areas to connect with healthcare professionals located in urban centers.

In regions where connectivity is limited, establishing a government-owned satellite communication solution at rural schools, which often serve as polling sites, offers substantial advantages. During elections, this infrastructure can be repurposed for secure and reliable data transmission, supporting automated election systems. This not only ensures the integrity of the electoral process but also reduces the need for costly dedicated election networks.

Furthermore, the same satellite network that facilitates education can be harnessed for broader e-government initiatives. Digital platforms enable citizens to access government services, pay taxes, and participate in administrative processes online, reducing the bureaucracy and corruption often associated with traditional paper-based systems.

The security landscape in Africa demands modernization and efficiency in homeland security and defence solutions. Satellite connectivity is a powerful tool that can significantly enhance both national and local security. Establishing a robust communication network that links village police stations with the country's ministry of interior or other security agencies opens the door to a comprehensive approach to addressing crime. This empowers law enforcement agencies to respond swiftly and effectively to local incidents, ultimately leading to an improved security landscape. Real-time access to critical information, seamless coordination of resources, and efficient communication facilitate more thorough prosecution. Satellite connectivity creates safer and more secure environments, instilling confidence in the capacity of local law enforcement and national defense to safeguard their communities and their country. ∎

Looking ahead: Satellite communications are transforming the African continent by advancing social inclusion, improving education and healthcare, streamlining governance, and bolstering security. Gilat's integrated approach to these initiatives holds the promise of long-term sustainability and growth for Africa. And we have a long history of successful projects in the region; most recently, we were selected by Ethio Telecom of Ethiopia to enable enhanced satellite-based 4G cellular backhaul capabilities and enterprise communications for remote regions of the country. This project, as well as many others on the African continent, exemplifies Gilat's dedication to extending the benefits of satellite communications to the farthest reaches of Africa, bringing connectivity, economic opportunities, and progress to underserved communities.

The impact of satellite communications extends beyond immediate connectivity; it touches the lives of millions in profound ways.

Nabil Ben Soussia,
group CCO, IEC Telecom

Valued at $19.49 billion, the African space economy employs a workforce of 19,000+ with the government sector leading tremendous growth opportunities in the industry. Projected to grow by 16.16% by 2026, the rate at which the African space economy is flourishing is beyond even Africa's GDP growth. Moreover, the industry is well aligned with the Sustainable Development Goals (SDGs) and thriving in an environment that hosts well over 400 technology hubs, quite a few of which have gained international recognition.

IEC Telecom has been steadily expanding its presence in Africa. We have been actively growing our distribution network across the continent, building fruitful relationships with regional service providers, and have opened a new service hub in Tunisia. With a 24/7 operating center, it is home to our technical development and customer support. Today, our network engineers, IT specialists, and diverse support team operate under one roof to fuel innovation and digital transformation in Africa and across the globe.

IEC Telecom believes in deeply immersing itself in the communities that it operates in. We believe that connectivity serves a greater social cause and paves the way towards prosperity. We are committed to supporting e-learning opportunities, e-medicine, and food security in Africa. With our satellite communications portfolio, we have been able to empower women's education in the Maasai community and remote settlements in Kajiado Central Constituency. In a region where less than 20% of girls enroll in school, IEC Telecom saw an opportunity to provide connectivity services to enable Memusi Hope Foundation's education programme, which saw 21 students graduate in November 2022. From a lack of infrastructure in an isolated community to being able to access digital libraries and communicate with educators over videoconferences, it is heartwarming to build an avenue for more girls to access basic education over satcom solutions.

In the healthcare sector, our satellite-based connectivity solutions can enable governments, NGOs, and private healthcare institutions to extend their medical programmes to remote communities. This is a fantastic prospect in sub-Saharan Africa, which constitutes 13% of the world's population yet consists of merely 2% of its doctors. This skewed ratio can start to be balanced out with digital services – whether it is equipping field teams with telemedicine kits, creating access for consultations in real-

"Approximately 45% of Africa's population lives more than 10km away from any fibre optic network infrastructure. 16 countries, including Chad, Ethiopia, and Botswana, are landlocked. This is where satellite communications can offer a reliable connectivity experience and complement existing terrestrial and sub-marine networks."

time, or setting up health hubs and remote clinics in underserved areas.

IEC Telecom is also dedicated to delivering IoT solutions to the government sector for crop monitoring and predictive analysis. This is a great means to increase agricultural yields in a region that is facing a long-standing drought and has been severely affected by geopolitical circumstances. Compounded by the possibility that sub-Saharan Africa's population can double by 2050 and already 85% of the current population cannot afford a nutrient-rich diet, food insecurity is a matter of critical concern. According to the World Food Programme (WFP), there has been a 60% rise in acute food insecurity in East Africa and a nearly 40% rise in West Africa – meaning that a lack of food is putting lives in immediate danger.

Approximately 45% of Africa's population lives more than 10km away from any fibre optic network infrastructure. 16 countries, including Chad, Ethiopia, and Botswana, are landlocked. This is where satellite communications can offer a reliable connectivity experience and complement existing terrestrial and sub-marine networks.

Presently, satellite services are indispensable in rural and remote areas, where 30% of households rely on them. Moreover, 20% of households across Africa depend on satellite services for telephone and internet access.

According to the African Space Industry Annual Report 2019, satcom generates $6.5 billion in Africa annually. Besides bridging the connectivity gap, satellite communications deliver opportunities for digitalisation – and, therefore, increasing levels of economic and social development.

Mobile missions for humanitarian operations and government programmes are the norm in Africa. This necessitates a multi-channel approach for connectivity services. As such, seamless network switches and hybrid systems are gaining popularity – from GSM to satellite communications in areas where coverage is limited or unavailable. Network management solutions, such as OneGate by IEC Telecom, blend a few networks under one umbrella, automatically routing traffic over the most cost-effective link. This enables continuous connectivity while saving costs.

Business continuity is a key priority for the satcom sector. Besides communications, it is also about the ability to run digital processes no matter where operations take place. MSS terminals that are commonly used for mobile missions operate on L-band (up to 700Kbps) and will not be able to support applications designed for GSM networks. Recognising this trend, IEC Telecom delivers a whole portfolio of optimised applications that can be used under 90Kbps – from videoconferencing for e-learning and public service delivery to remote CCTV surveillance and telemedicine. ∎

Looking ahead: With increasing LEO technology adoption, the market dynamics of Africa will change significantly. Presently, Starlink is available in five countries and more roll-outs are expected soon; OneWeb offers services above 25' N and below 25' S and the coverage is expected to span the whole continent by the end of the year.

At $7.3 billion value, the satellite ecosystem in Africa is geared towards increasing its own satcom capacity. It is expected that Africa will have launched at least 110 satellites by 2024. As of 2022, 13 African countries have manufactured 48 satellites.

Rhys Morgan,
VP and general manager, EMEA
media and networks, Intelsat

Africa contains some of the most important growth markets globally embracing digital transformation. As the first satellite operator to provide satellite communications services on the continent, we've been leading the development of a reliable and widely available communications network in Africa. We have relationships in Africa that go back to 1965, enabling critical communications infrastructure.

Africa's connectivity requirements are unique and we are continually integrating innovative new technologies into our advanced global network to make it as easy and affordable as possible to seamlessly connect people, businesses, and communities when and where they need it.

There is no single business solution that overcomes all the barriers to connectivity, but we're committed to solving the problem. That's why we strive to pair our technology innovations with creative ways to economically expand broadband and WiFi networks.

Thanks to our managed-services approach, we are making it as easy as possible for mobile network operators (MNOs) to incorporate disaster-proof satellite communications into an integrated network of networks, as either a primary or redundant communications option. This relieves operators of the burden of managing the nuts and bolts of the network, for which many lack the resources. For instance, we have been working with the largest operators in the DRC to deliver a wide range of applications including trunking, cellular backhaul, and enterprise services. We've also helped a leading

MNO in West Africa build a new network that can serve both consumer and enterprise users in the market.

We believe in a connected Africa where rural Africans will have access to healthcare, education, and financial services, for an improved quality of life; that's why we're working on the infrastructure of the future. This communications infrastructure will be fuelled by our investments in standards-based design and integrated, high-throughput and software-defined architecture, which will help us respond to the booming connectivity needs, more easily and at an accessible cost.

Ensuring underserved populations have access to broadband is critical. Without access, millions of people risk falling irretrievably behind the rest of the connected world. Governments across the continent have understood this challenge as they try to deploy their digital strategy and significant government investment in fibre networks has already been made, enabling to successfully establish broadband connectivity.

However, the digital divide persists because there are many barriers to expanding coverage and encouraging usage. In regions where there is little or no mobile broadband infrastructure, the challenges are mainly economic. Satellite backhaul is often the only practical and cost-efficient means for providing life-changing connectivity in such areas. A key benefit of satellite backhaul is the ability to right-size connectivity for individual sites and avoid costly overbuilding of fibre or microwave capacity that could go largely unused. Helping to close the business case are standardised tower/RAN platforms that make installations quicker and easier. Increasingly, this includes using solar-powered components to support off-grid regions.

Combining different technologies into

hybrid solutions can offer the best of all worlds. Building out the continent's network infrastructure requires a fresh approach, fully integrated hybrid networks, new business models and creative partnerships. The development of standards will be essential.

We believe hybrid networks are the future. That's why we've invested upwards of US$2 billion to refresh our network, both terrestrially and in space. The new network will be software based, rather than hardware, and will be built on a 5G core. Our open architecture design which integrates multiple orbits supports virtually any access technology, while the multi-layer approach ensures no single point of failure in the system by creating redundancy - the assurance of continuous high-level service. The construct of our network - cloud-based, fully virtualised, and software-defined - enables ground and space systems to interact seamlessly, no matter the orbit or band. Software-defined satellites provide 'follow me' capacity that dynamically allocates based on prevailing and predicted demand. The network enables frictionless connectivity with global roaming and easy integration with the growing 5G networks of the world, including common hardware platforms. ∎

Looking ahead: Africa is among the most complex environments for any communications service provider seeking to deliver high-quality and consistently available connectivity to the people who need it. While 3G remains the most dominant technology in the region, the adoption of 4G has accelerated and should more than double to 45% over the next five years. 5G momentum is also growing with Burundi, Tunisia and Cote d'Ivoire planning commercial launch of 5G services in 2024 and GSMA expects that 5G will contribute in 2030 $11 billion to the sub-Saharan African economy, accounting for more than 6% of the overall economic impact of mobile. The success of these deployments will, however, depend on their geographical reach, as it is important that everyone, even those in the most remote areas, benefits from the 5G revolution.

Countries like Nigeria and the DRC have really accelerated their development with many more sites connected, while Rwanda is planning to connect all villages by 2024. Countries might evolve differently but connectivity has become a priority for governments and the next couple of years should be crucial in that development.

One success story from 2023 is the partnership between Intelsat and Africa Mobile Networks (AMN).

This long-time strategic partnership that started in 2018 has enabled to connect more than ten million people in rural Africa. The past year has been significant with AMN expanding the number of sites connected to Intelsat's network, enabling citizens and businesses in any community to have access to the education, social, and economic benefits of telecommunication services. AMN's business model based on Network-as-a-Service solutions and revenue-share model, combined with Intelsat's multi-satellite African coverage, means that MNOs can grow their subscriber base and expand their network coverage deep into rural and remote areas without having to invest in their own tower facilities and operations staff.

It was great to see recently the industry at MWC Africa discussing the continent's challenges and we hope to see increased cooperation over the next few years. A governmental drive for digitisation, innovative business models and solutions making satellite easier to access and more affordable are the perfect combination to accelerate access to connectivity over the next few years. Our goal is to continue to enhance day-to-day network quality and help deliver secure and affordable connectivity across the continent.

Ziga Kvas,
regional account manager, STN

Over the past year, STN has seen promising growth in the African market. Our fortunes have been positive, with an increase in demand for our services across the broadcast industry. We've established strong partnerships and expanded our presence in the key region of Ethiopia, contributing to our overall success.

Challenges we've experienced include navigating complex regulatory environments, infrastructural limitations, and competition. On the flip side, we saw significant opportunities in the growing tech-savvy population, increasing digitalization, and a hunger for innovative solutions across sectors such as TV in particular religious channels.

We've observed the rise of mobile, the adoption of digital payment solutions, and the emergence of e-commerce platforms. There is a growing interest in renewable energy solutions, advancements in telemedicine, and an increased focus on data analytics to drive business decisions.

The African market is unique in its diversity and complexity. It varies significantly from region to region, with varying economic conditions, languages, and regulatory frameworks. Understanding these differences and tailoring solutions to local needs is crucial. Africa also presents unique growth opportunities due to its youthful population and untapped potential.

Connectivity and digital infrastructure are expected to continue driving the African market in the coming years. Expanding access to the internet and improving digital literacy will open up opportunities across sectors, enabling innovation and economic growth.

In 2023, a standout success story was our partnership with a bundle of Ethiopian television networks. Through this collaboration, we extended their channel viewership on our MENAFLIX OTT platform and added our STN Live cloud-based service. These cutting-edge solutions have enabled them to connect with the younger demographic and offer convenient access to their content on smart TVs, mobile devices, and tablets, catering to the tech-enthusiastic youth residing in major cities and less populated regions.

Regulatory environments in Africa have been evolving, with some countries making positive strides to facilitate business growth. However, challenges related to inconsistent regulations and lengthy approval processes still exist. The regulatory landscape varies by country, requiring a tailored approach to compliance in each market.

Cross-border cooperation has been a mixed experience, with some regions embracing it more than others. We expect this cooperation to continue improving, driven by regional economic blocs and a growing recognition of the benefits of collaboration. Strengthened partnerships will facilitate market expansion and regional integration. ∎

Looking ahead: We anticipate continued growth in East Africa, particularly countries like Kenya and Ethiopia, which have been investing in technology and infrastructure. West Africa, with its large population and growing economies like Nigeria and Ghana, also holds immense potential. These regions have been active in embracing digital transformation.

We are optimistic about our prospects in Africa for the upcoming years. We expect to grow as we focus on tailoring our solutions to meet the unique needs of each market. With ongoing investments in technology and infrastructure, we believe Africa will remain a dynamic and exciting market, offering ample opportunities for innovation and expansion.

Caroline Kamaitha,
vice president for the Africa enterprise & cloud, SES

A longstanding challenge for residents in rural and ultra-rural areas of Africa is staying connected. Recent advancements in satellite communication technologies are poised to revolutionise the continent's connectivity landscape. As investments into the satellite industry continue to grow, leveraging satellite connectivity is becoming easier than ever – making digital transformation and digital inclusion in this region more achievable than ever.

Challenges in the African connectivity landscape stem from the digital divide rooted in insufficient network coverage and affordability challenges. Satellite connectivity emerges as a crucial solution, providing much needed primary and backup services. While fibre penetration is rising, reaching only 55% of the population within a 25km range underscores the difficulty and expense of achieving full coverage.

"There is a shift towards 'meaningful connectivity,' signifying a deeper emphasis on network improvement. This shift aligns with the African Union and the World Bank Group's ambitious goal of achieving universal connectivity by 2030."

SES's commitment to enhancing connectivity in the region is highlighted by our success in enabling mobile network operators (MNOs) to roll out mobile backhaul services in remote areas, where the total cost of operations is typically high (relative to the average revenue per user). This, in turn, expands connectivity to previously underserved and unserved communities – elevating the competitiveness and efficiency of key sectors across the continent, including education, banking, agriculture, and mining.

The African continent presents unique challenges due to its diverse countries grappling with political, economic, and regulatory challenges. Africa's vast and challenging landscape and varied connectivity levels make it one of the most underserved regions globally, with only 43% internet penetration. While some countries are well-connected, many need help in basic connectivity, exacerbated by the limitations in communication networks, reliable power, and infrastructure. SES plays a pivotal role in addressing these challenges, tailoring solutions to Africa's diverse needs with both geosynchronous (GEO) and medium earth orbit (MEO) satellite connectivity.

These solutions encompass latency-tolerant services, as well as high-speed, low-latency communications for 3G, 4G and broadband access for key industries across Africa, such as mining, oil and gas, and especially agriculture – an industry that accounts for 23% of the continent's GDP and accounts for over 55% of its employment. In this space, the improvements in speed and accuracy of information delivery can contribute greatly to the growth of this crucial sector. Furthermore, SES solutions are also poised to enable governments across Africa to strengthen public services in e-health and e-learning, while also

"The African continent presents unique challenges due to its diverse countries grappling with political, economic, and regulatory challenges. Africa's vast and challenging landscape and varied connectivity levels make it one of the most underserved regions globally, with only 43% internet penetration."

enhancing capabilities in defence and security.

Our collective success story in Africa has so far been driven by our over 70 GEO satellites and 20 O3b satellites (our current MEO constellation). Over the past decade, SES has revolutionised connectivity in Africa,

working with key partners like Moov and Gilat and enhancing connectivity in over 30 African countries. Collaborations with pioneers like Gilat Telecom in the DRC and Orange in the Central African Republic have enabled the extension of high-performance connectivity, including 3G and 4G cellular services.

This is set to change with our recently launched second generation MEO satellite constellation, O3b mPOWER. With just six satellites, O3b mPOWER is set to provide high throughput, low latency and uniquely flexible connectivity services in the second quarter of 2024, driving Africa's digital transformation and supporting the growth of its rapidly expanding digital economy.

Separately, the O3b mPOWER gateway in Gandoul, Senegal that was built in partnership with Sonatel to more effectively serve customers across Africa, is now ready to deliver high-performance, low-latency, and cloud-optimised connectivity services for our enterprise and government customers across the continent. ∎

Looking ahead: Despite the enthusiastic adoption of technological advancements in Africa over the last two decades, a significant digital gap persists. 70% of the continent still needs to be connected, with over two-thirds of sub-Saharan Africa requiring connectivity due to affordability challenges. Influenced by geographical and societal factors, the sharp digital divide emphasises the need for lowered data and handset prices.

This digital landscape is further complicated by the growing demand and sophistication of African consumers. Africa is a global leader in mobile money and mobile phone user numbers, and as such, the demand for connectivity is strong. Also, as the continent moves towards 4G and even 5G, there is a growing expectation

for a level of experience that is consistent with global standards. However, for many African countries, basic connectivity remains a challenge due to geographical obstacles, unreliable power, limited infrastructure, challenging terrain, and other factors that hinder the expansion of network infrastructure.

In response to these challenges, there is a shift towards 'meaningful connectivity' (more than 10Mbps), signifying a deeper emphasis on network improvement. This shift aligns with the African Union and the World Bank Group's ambitious goal of achieving universal connectivity by 2030. SES aims to play a pivotal role in this transition, recognising satellite connectivity as an ideal solution to address the root causes of the digital divide.

Michel Dothey,
co-founder and CCO, neXat

Ernest Sheka,
senior VP Sales, Africa, neXat

Today, rural areas are the most important markets for the satcom business. The need for internet connectivity is continuously growing everywhere, but the competition with mobile and fibre terrestrial operators is challenging. Nevertheless, our African business has experienced solid growth over the last 12 months, especially for our C-band services for enterprises.

The African market is not so different from the others, however, the lower average revenue per inhabitant is lower, making this market more demanding in terms of cost, flexibility, and efficiency.

The main challenge we see now is the arrival of Starlink. Thanks to the development of our SD-WAN aggregation solution, this has also become an opportunity to expand and develop our offering for the terrestrial mobility market, such as rail and maritime. Our SD-WAN mobility offers seamless aggregation of Starlink connectivity with 4G/5G, while offering complete monitoring via our OSS/BSS platform, such as geo-positioning of the coverage journey on a map.

There is a clear increase in demand for satellite connectivity as it becomes more affordable. The arrival of LEO constellations like Starlink and now OneWeb is clearly changing the picture, but traditional GEO satellites are not dead.

Driving the African market forward will be a mixture of technologies rather than one in particular. LEO, MEO and GEO technologies will find their niches. GEO will remain important for C-band for applications needing a very stable service that is not achievable with LEO; Ku-band for broadcasting (even if slightly decreasing); and in Ka-band with the broadband ultra-high throughput satellites (UHTS) whose cost is lower than the LEO and hence very well suited for low earning regions. GEO Ka-band, for example, combined with multicasting, provides additional drastic cost reduction, and is potentially The solution for large scale e-learning, especially for rural areas in Africa facing a dramatic lack of teachers. This is also an area where we intend to play a major role in the coming years.

The most vibrant African countries are those with the fastest growing per capita income, and those that realise the potential benefits of satellite technology for their population, and refrain from applying prohibitive taxes that are counterproductive.

Our most exciting success from 2023 is related to the new business line we are opening, making our sophisticated OSS/BSS platform, available for teleport and satellites operators. It's letting them realise dramatic cost reductions of their operations by maximizing automation at all levels while helping their distributors to resell their services more efficiently.

We didn't see a lot of changes to the regulatory environments in 2023: prohibitive taxes are still in place for GEO and we noted that Starlink succeeded to win licences in several countries. Starlink is also accessible in countries where it holds no license though – we encourage a 'same rules' for all approach so that there is equal opportunity for all businesses. We believe the sky should be open for all, without restrictions nor discriminations. ■

Looking ahead: At neXat, we plan to continue our legacy satellite service business worldwide, but with the additional development of a highly secured version of our OSS/BSS platform, we will focus on the governmental markets going forward.

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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 $25.5^0E/26^0E$ 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, playout, 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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Hughes Network Systems, LLC, an EchoStar (Nasdaq: SATS) company, provides broadband equipment and services; managed services featuring smart, software-defined networking; and end-to-end network operation for millions of consumers, businesses, governments, airlines, 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, mobile network operators and military customers. Hughes products and services have helped bring in-flight video and broadband to thousands of aircraft for over twenty years.

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IEC Telecom Group is a leading international satellite service operator with nearly three decades of engineering expertise in end-to-end low and high-throughput cyber-secure voice and data services for land and maritime use. The brand's portfolio includes a wide range of hybrid satellite and LTE products, solutions, and value-added services.

IEC Telecom enables digitalisation for remote units on land and offshore. For urban networks, the Group provides powerful satellite back-up to ensure the business continuity of customer enterprises.

IEC Telecom has strong commercial and technical relationships with major satellite operators across the world, including Starlink, Eutelsat, Intelsat, Inmarsat, Iridium, Thuraya, Yahsat and more. With a multi-networks approach, the Group covers requirements across the complete communications lifecycle no matter where customers choose to do business.

IEC Telecom Group has offices across eight countries: France, UAE, Kazakhstan, Norway, Singapore, Sweden, Turkey and Mallorca. For more information, see the website: iec-telecom.com

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Stratosat, 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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