

chapter

Broadband

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According to the UN Broadband Commission for Sustainable Development, 50 per cent of the world's population is expected to be connected to the internet by the end of 2019. This leaves the other half – an estimated 3.8 billion people – unconnected and unable to benefit from key social and economic resources in an expanding digital world. In response, the commission has set what it describes as "seven ambitious yet achievable" targets in support of connecting the other half of the world's population by 2025.

The targets were launched in January 2018 at a joint meeting held in Davos between the Broadband Commission and the World Economic Forum. They specifically seek to expand broadband infrastructure, internet access and their use by populations around the world, in support of achieving the SDGs (sustainable development goals) that were established by the UN and the international community in September 2015.

By 2025, the commission says:

- ◆ All countries should have a funded national broadband plan or strategy, or include broadband in their universal access and services definition
- ◆ Entry-level broadband services should be made affordable in developing countries, at less than two per cent of monthly gross national income per capita
- ◆ Broadband/internet user penetration should reach 75 per cent worldwide; 65 per cent in developing countries; and 35 per cent in least developed countries
- ◆ Sixty per cent of youth and adults should have achieved at least a minimum level of proficiency in sustainable digital skills
- ◆ Forty per cent of the world's population should be using digital financial services
- ◆ Unconnectedness of micro-, small- and medium-sized enterprises should be reduced by 50 per cent, by sector

- ◆ Gender equality should be achieved across all targets

The UN hopes to achieve these by continuing to work with top CEOs, senior policy-makers and government representatives, international agencies, academia and organisations concerned with development. It said that the Broadband Commission engages in "high-level" advocacy to promote broadband in developing countries and underserved communities. In so doing, the UN said its commissioners work together to devise practical strategies – including private-public partnerships – that call for higher priority to be given to the development of broadband infrastructure and services, and to ensure that the benefits of these technologies are realised in all countries and are accessible to all.

Technology's role

Technological solutions will of course help the UN, international community and all stakeholders in expanding broadband connectivity. The satellite industry claims to play a unique role here.

According to the 16th edition of Northern Sky Research's *VSAT and Broadband Satellite Markets* report published in November 2017, consumer broadband will add more than 11.6 million new subscribers in the next ten years. With the UN stating that half of the world's population still lack internet access, NSR reckons satellite must "step in and play a definitive role" in connecting unserved and underserved populations.

The analyst estimates the global addressable market for satellite internet at 472 million households. With ground alternatives continuously expanding and other key barriers like affordability at play, the vast majority of these potential customers will not be captured by satellite. However, compared with today's 2.5 million active subscribers, NSR believes

there is still a "massive opportunity" ahead for satellite consumer broadband. It said that most of the addressable market resides in emerging markets in Latin America, Middle East and Africa and Asia. Collectively, NSR said these represent 90 per cent of the potential global subscribers. Having said that, the firm pointed out that a massive addressable market does not mean attracting customers will be easy and effortless. (*Also see Lluc Palerm-Serra's comments in Chapter 5, Satcoms, The Year Ahead on p68.*)

"Several of the early projects have fallen in the 'build it and they will come' trap, not putting enough emphasis on developing strong retail channels," said NSR. "Early broadband offerings from Thaicom/IPStar, Yahsat, Eutelsat and Avanti (among others) were initially met with lacklustre demand and challenging growth."

It added that awareness is another major barrier as satellite broadband is completely unknown for many potential customers. NSR also said that affordability hampers growth, but advises the industry to pay a closer look into market conditions before being discouraged by low average income levels.

"There's no doubt this is a highly elastic market and, consequently, the cheaper the price the more market that can be captured; however, satellite has obvious cost limitations and affordability will always be a barrier," stated the report.

It continued by saying that even in emerging markets with low average incomes, there are many wealthy households "eager" to subscribe to satellite broadband. As an example, NSR said HughesNet in Brazil launched a service with an entry level cost of USD70 per month, much higher than those in North America, but was still able to attract tens of thousands of subscribers in less than a year.

According to the report, the largest portion of the addressable market resides in the low-income segment. NSR said multiple projects



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have been developed using Wi-Fi hotspots and similar offers with the aim of selling small data allowances to end users through aggregation points. But it believes that, apart from the already mentioned barriers, this segment tends to be very challenging due to low penetration of devices, lack of digital skills and the actual value the end-user gets by going online and seeing relevant content.

"Despite it being feasible to build an affordable and functional solution to target these segments, barriers are still high and, many times, outside the control of the satellite distributor. Consequently, it is hard to ensure long-term recurrent revenues for these models without government sponsorships, making profitability of these models challenging."

"Wi-Fi aggregation points still need to see a big success case to validate the model. Key barriers such as digital literacy are outside of control of the satellite actors. But, with these challenges progressively alleviating, this could become a large growth opportunity."

It is interesting to note the comment about key barriers being "outside of the control" of the satellite industry. Indeed, this can be applied to all the technology specialists involved in enabling broadband connectivity. As has been constantly stated in previous editions of *The African Wireless Communications Yearbook*, the fact that half of the world's population still lacks internet access is not for want of innovation or technology solutions. But what is clear as we move forward is that expanding broadband to those that still lack access is not the sole responsibility of any one organisation or sector. What is now needed, as the UN points out above, is a concerted effort by all the stakeholders involved, and the successful establishment of public-private partnerships hold the key to the future. ■

Connecting remote communities

Mozambican technology startup company Kamaleon developed what it believes is an "innovative and engaging" way of promoting digital literacy through a shared platform. The *Tablet Comunitário* (*Community Tablet*) is a solar powered mobile computer. Built on a trailer to provide internet access to remote areas, it features touchscreen displays and virtual keyboards. Kamaleon is also offering training on how to use the internet to members of the community and the local workforce.



The solar powered *Community Tablet* is quite literally a mobile device. It is built on a trailer so that it can be towed (top), and features touchscreen displays and virtual keyboards to provide internet access to people in underserved areas (bottom).

JANUARY/FEBRUARY 2017

Towards the end of 2016, it was widely reported that Liberia had become the first country to have its entire internet taken down following a DDoS attack. Experts said *Mirai* was used – the same malware that had crippled sites such as Netflix and eBay earlier in the year. The code for *Mirai* is freely available online, and the Liberian attack is thought to have come from a single source and therefore may have been the work of a lone attacker. *Mirai* botnets targeted the companies that co-own the fibre cables into the country and flooded the network with traffic. Liberia's subsea fibre connectivity comes via ACE and this is then extended across

a national backbone developed by the Cable Consortium of Liberia which is made up of the government along with local telcos.

MARCH/APRIL

Maroc Telecom claimed a first in Morocco with the launch of its new broadband satellite internet service for residential and business customers. As a result, the company said it had become the first operator to offer full coverage of the country. It added that customers can take advantage of a "wide range" of broadband packages of up to 20Mbps priced from MAD249 (USD25) per month. Enterprise users can also choose a VPN satellite service with speeds up to 6Mbps.

MAY/JUNE

TelOne has launched what's said to be Zimbabwe's first Tier III data centre. It unveiled two new mirrored facilities in Harare and Mazoe in late March. Built at a cost of USD4m, they are part of the state's National Broadband project and were funded by a USD98m loan arranged with China's Export Import Bank two years ago. TelOne said it is in the process of transforming its business model from a fixed landline provider to a fixed mobile converged company with emphasis on broadband, cloud and digital services. Ring fibre connectivity links user branches to the data centre via VPN or dedicated leased IP lines.

distributions to convey life saving information. Kamaleon founder and CEO Dayn Amade said: "A few years ago, anyone who could not read and write was considered illiterate. But today, this concept goes further, encompassing people who do not know how to use ICT."

"Health organisations and schools in Africa often face a unique set of obstacles, including a lack of access to much-needed health education and counselling platforms. The *Community Tablet* was created to help solve these problems."

Following the launch failure of Spacecom's AMOS-6 satellite last year, **Eutelsat** said its African broadband initiative was back on track thanks to an agreement with **Yahsat**. Under a multi-year deal signed on October 2016, Eutelsat said it would roll out broadband services during the first half of 2017 using capacity on up to 16 Ka-band spot beams on Yahsat's 1B satellite. Further expansion will be supported later using capacity on 18 spot beams on Yahsat's third satellite, Al Yah 3, which was launched in January 2018. The capacity replaces the payload Eutelsat previously contracted on AMOS-6 which was lost in September 2016 following a launchpad explosion.¹

Eutelsat originally set up its *Broadband for Africa* initiative in 2015 and re-branded it as **Konnect Africa** in November 2016. By working in close partnership with local partners to promote high-quality broadband at affordable prices for homes and businesses, the company said its aim is to accelerate satellite broadband connectivity across the continent. On 6 June 2017, Konnect Africa launched services in Benin, Cameroon, Kenya, Lesotho, Nigeria, South Africa, Swaziland, Tanzania and Uganda. Rollouts were also planned for: Angola, Côte d'Ivoire, Congo, DRC, Ethiopia, Ghana, Madagascar, Mozambique, Rwanda, Senegal, South Sudan, Togo, Zambia and Zimbabwe.

Eutelsat said customers would benefit from "innovative" services including packaged offers

inspired by 'pay-as-you-go' models and Wi-Fi hotspots schemes. It claimed hotspot access will be available for a "few cents" while family offers will be optimised for a "few dozens" of dollars. High-grade enterprise services were also proposed to enable video-conferencing, data storage, multimedia content development, and safe and reliable communication.

Some of the first partners to support Konnect Africa included: AfrikaNet GoSat; Bentley Walker; China Telecom (which is establishing communication links between Africa and Asia-Pacific); Terrace Projects, a managed satellite service solution provider in South Africa; amongst others. Eutelsat said it will give partners the means to succeed through dedicated commercial, marketing and technical support. The company added that it will also train and reward local installers to enhance service quality and drive more talent into the industry.

With the successful launch of Konnect Africa during the first four months of 2017, Eutelsat said it will revert to its initial business plan of a revenue contribution of EUR15m in 2017-18 and around EUR25m in 2018-19.

In August, we reported that **Kenya's Communications Authority (CA)** had awarded contracts to three companies to roll out high-speed internet connectivity to schools under the first phase of projects financed by universal service funds. Liquid Telecom, Xtranet Communications and Commcarrier Satellite Services will undertake the KES836m (USD8m) Education Broadband Connectivity Project which includes giving 898 rural secondary schools access to 5Mbps internet speeds. They beat 11 other firms in a competitive tendering process.

CA chairman Ngene Gituku said: "The project will greatly improve education through digital learning by enabling access to online content by student and teachers. This will be actualised through creation of an education portal with digitised KCSE [Kenya Certificate of Secondary Education] curriculum."

The schools were identified using 'e-readiness' criteria agreed upon between the CA and the Ministry of Education. Qualifying institutions were expected to have: secure electricity supply from Kenya Power or a constant diesel/solar powered generator; secure computer lab with an uninterruptible power supply; at least 10 computers in good working order along with a printer and projector; and at least one full-time accredited teacher for computer studies.

The education project is one of two key initiatives recommended for immediate implementation following an ICT Access Gaps study commissioned by the CA in 2016. This also identified a need for more 2G voice infrastructure in selected sub-locations. According to the study, 5.6 per cent of Kenya's population (about 2.66 million people) have no access to telecom services; about 418 sub-locations have less than half of their population covered by services, while another 164 sub-locations have no access to 2G mobile services. The study also established that 3G and broadband services are limited to urban areas. It found that only 2,454 sub-locations have 100 per cent population coverage of 3G and broadband, while 1,244 sub-locations have no access at all.

In other developments, **Global-IP** and **Hughes Network Systems** announced a partnership to bring broadband to millions of people in sub-Saharan Africa. Global-IP planned to use Hughes' JUPITER satellite platform to bring high-performance connectivity to mobile devices across the region. This will provide 100 per cent of the capacity on Global-IP's GiSat-1 150Gbps high-throughput satellite which is expected to enter service in 2019. It's claimed to be the first VSAT system to support DVB-S2X which is widely recognised as the most bandwidth-efficient standard available.

¹ African Wireless Communications Yearbook 2017, pp74-76.

JULY/AUGUST

MainOne is aiming to become West Africa's largest internet hub with a new interconnect service for carriers, enterprises and ISPs. The launch of *Open-Connect* follows the partnership of MainOne's data centre company MDXi with the Nigerian Internet Exchange to improve national transit traffic (see page 92). The company reckons it now "guarantees the best cross connect services in Nigeria", enabling customers to bypass the public internet and connect directly to partners, cloud and SaaS providers with secure, reliable and flexible direct connections. It also means internet traffic

originating and terminating on any network in Nigeria can remain in-country.

SEPTEMBER/OCTOBER

More than 8,000 companies and individuals on the continent are said to have so far registered for the new .africa internet address. Lucky Masilela, CEO of the ZA Central Registry (ZACR) which is responsible for administering the domain name, described .africa as "valuable virtual real estate". He said: "Leading continental and international brands are snapping up .africa domain names because they recognise the importance of being associated with Africa's bright future online. ZACR appeals to all

Africans to take ownership of .africa, because it truly belongs to us all."

NOVEMBER/DECEMBER

Guinea's Authority for Posts and Telecommunications (ARPT) said the local Consumer Union had sued Orange Guinea for compensation following the operator's redesign of its internet passes. The union alleged damage to consumers who had already purchased packages. After several months of discussions mediated by the ARPT, Orange Guinea agreed to compensate customers who had purchased passes when the new packages were put into service with online credit.

BROADBAND: YEAR IN REVIEW



Hughes is supporting Global-IP's mission of bringing high-performance connectivity to mobile devices throughout sub-Saharan Africa.

Hughes will supply 11 gateway stations in Europe using a centralised architecture for routing traffic in and out of the internet, as well as its HT2500 and HT2600 terminals. Beyond supporting high-quality Wi-Fi access, the company claimed that its "powerful" terminals are designed with LTE acceleration technology to meet MNOs' demanding requirements, making it economical for data delivery anywhere.

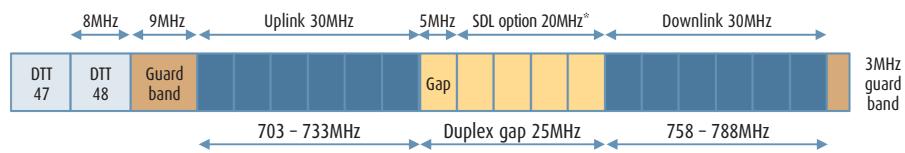
Due to be launched by SpaceX during Q4 2018, GiSat-1 is currently being built by Boeing² and will be the first in a series of satellites from Global-IP. The company said its network will have multiple gateways located in Europe for connectivity to the internet via Tier 1 fibre backbones. It claimed GiSAT's advanced digital payload capabilities will allow the deployment of multiple in-country gateways and terminals for customers who wish to have local connectivity.

The **Tanzania Communications Regulatory Authority** (TCRA) is planning to allocate digital dividend spectrum by June 2018. In October, we reported that following the successful migration from analogue to digital television, the authority had released the 700MHz frequency range which was now available to be assigned for mobile broadband services.

² See Chapter 5, Satcoms, p62.

The year ahead: There is certainly no shortage of means to deliver broadband connectivity in Africa and the foreseeable future certainly looks bright.

2018 has so far already seen a number of key satellite launches that promise to boost broadband access across the continent. They include *Al Yah 3* from Yahsat which, despite having some launch issues, still looks on track to begin commercial services later this year. Eutelsat's much vaunted *Konnect Africa* broadband initiative – which will start by using connectivity on *Al Yah 3* – is also expected to begin rollouts in the coming months and aims to cover most of sub-Saharan Africa by 2019.



*The SDL option of zero or up to four blocks of 5MHz provides an approach that offers flexibility for other options being considered.

Tanzania's regulator planned to implement European Conference of Postal and Telecommunication channel arrangements – APT 700MHz lower duplex – 3GPP Band 28.

The authority plans to sell 2 x 30MHz of FDD through an auction process subject to a reserve price. Further details of the process were expected to become available after the authority conducted consultation exercises with key stakeholders during 1Q18. To ensure that consumers benefit fully from access to mobile broadband services, the TCRA said it will include coverage obligations as part of the assignment process.

As well as helping to further Tanzania's National ICT Policy, the authority said the sale of 700MHz spectrum will bring a number of benefits to the country. Along with socio-economic benefits, it believes mobile communications costs will fall due to savings as a result of deploying fewer base stations for wider coverage, and that more people, especially those in rural areas, will be able to access mobile broadband services.

Boosting traffic

MainData Nigeria (MDXi) and the **Internet Exchange Point of Nigeria (IXPN)** teamed up to expand the peering of internet transit traffic within Nigeria. MDXi is the region's only Tier III certified data centre and is operated by MainOne which also owns and runs an open access 4.96Tbps submarine cable system.

With its IP transit network already connected to the Lagos, Accra, London and Amsterdam internet exchanges, it's claimed MDXi will give IXPN the capacity to connect directly with the

"greatest number" of IP transit and content delivery networks in West Africa. IXPN CEO Muhammed Rudman said this will enhance local internet performance, lower costs, and minimise traffic bottlenecks for internet traffic in Nigeria.

According to MainOne, its vision is to improve connectivity across West Africa. The company's CEO Funke Opeke (*pictured*) said:

"MainOne is committed to the penetration of high quality and affordable broadband internet services in West Africa, and bringing the IXPN closer to our network plays an important role in helping us realise that vision not only for Nigeria, but for all of West Africa.

Further north in Egypt, **Vodafone** is aiming to enhance customer experience for its 39 million fixed and mobile subscribers with the help of **Procera Networks**. The operator said the vendor's solutions will enable it to dynamically deploy analytics capacity to ensure customers are receiving a high-quality broadband experience across its entire network footprint.

Under a multi-year, multi-million dollar deal, Procera is supplying its analytics solutions. It said the solutions take advantage of the "superior" visibility provided by its *PacketLogic DRDL* engine to enable the delivery of fine-grained application identification, despite the increasing use of encryption on the internet.



Further connectivity from space will also be provided by O3b which added four more satellites to its medium Earth constellation in March 2018, as well as Avanti Communications which successfully launched *HYLAS 4* satellite just a few weeks later.

Terrestrial-based networks are also seeing expansions with MNOs across the continent continuing to rollout services to underserved and unserved areas. For example in Namibia, MTC is busy building more than 500 new towers mainly in rural parts of the country and is aiming to cover 100 per cent of the population as part of its *081Every1* project.

Meanwhile, MTN and Vodacom have

both begun trialling 5G in Africa, with the latter operator also stating that it is now on a mission to connect all rural users. Speaking last August, Vodacom Group CTO Andries Delport said: "It is our firm view that broadband penetration has transformative power and is an enabler for economic and social growth and, as such, makes it an essential tool for empowering people in rural areas."

Given all the ambitions of the wireless industry – not to mention the ongoing introduction of fibre in many countries – Africa's broadband penetration looks set to see a marked improvement this year and beyond.

Vodafone is also using Procera's ScoreCard technology. This is claimed to provide a unique view of quality, with high-frequency performance measurements in categories that subscribers can relate to, such as web surfing, streaming video, social media, real-time gaming, upload/download, and voice applications. Procera said the operator will be able to use the data gained from analysing ScoreCard results to guide investment into network capacity and identify service creation opportunities for network planning teams. According to the vendor, with regional operators competing on network quality, reducing the cost and increasing the deployment flexibility of analytics through virtualisation is a "business imperative".

Towards the end of 2017, the **African Union** (AU) published a study which said that more than half of the UN's SDGs (sustainable development goals) cannot be tracked in Africa due to data constraints. Universal broadband access is one of the key SDGs.

The *2017 Africa Sustainable Development Report: Tracking Progress on Agenda 2063 and the Sustainable Development Goals* was jointly published by the African Union Commission, African Development Bank, the UN Economic Commission for Africa (ECA), and the UN Development Programme. It was described as the first comprehensive appraisal of its kind since the adoption of the SDGs and Africa's own *Agenda 2030* and *Agenda 2063* targets.

The report said that the continent needs to sustain efforts to eradicate extreme poverty and gender inequality and also improve its statistical capabilities to implement and track progress towards these objectives. The study called upon African nations to "harness the data revolution and upgrade the continent's statistical capabilities". It said they should address the gap in the region's data collection capacities, as these are seen as "critical" for the evidence-based policy-making and tracking of progress towards the goals and targets stated in *Agenda 2030* and 63.

"Six out of every 10 SDG indicators cannot be tracked in Africa due to data constraints," said ECA executive director Vera Songwe. "Strengthening our data ecosystem is therefore imperative not only for performance tracking but for informed policy-making."

The report estimated that USD1bn is needed annually to allow 77 of the world's lowest income countries to establish reliable statistical systems that are capable of measuring and sustaining SDGs. It added: "The increasing demand for data and statistics under the 2030 and 2063 Agendas is an opportunity for Africa to embark on the data revolution in order to improve statistical capacity in all domains." ■



**Mark Rotter,
Treasurer,
Dynamic
Spectrum Alliance**

The Dynamic Spectrum Alliance (DSA) is a global organisation advocating for laws and regulations that will lead to more efficient and effective spectrum utilisation.

Its membership spans multinationals, small- and medium-sized enterprises, as well as academic, research and other organisations, all working to create innovative

solutions that will increase the amount of available spectrum to the benefit of consumers and businesses alike. Mark Rotter explains what progress the alliance and its members made in Africa last year.

"TV White Space (TVWS) technology continued to be the band of choice in 2017 for dynamic spectrum developments in Africa. We saw continued organic growth on existing projects such as those in Botswana, Kenya, Malawi, South Africa and Zambia.

"On the regulatory front, we saw various country regulators taking TVWS and the use of dynamic spectrum more seriously and applying their minds to spectrum use for scaling to larger projects with multiple service providers. This has led to more interest in how to manage and control the available spectrum by means of Dynamic Spectrum Databases.

"For example, one DSA member, Nominet, has started to see increased interest in simple TVWS database services as both a planning tool by implementation partners as well as a spectrum assessment tool by regulators."

Rotter said that the adoption of TVWS as a broadband technology was initially hampered by a lack of understanding of where best to deploy it in the network. But over time, he said this has developed into a more normalised approach where the technology has found its natural cost/benefit place within network solutions.

"These kind of hybrid networks – where traditional fibre, high-speed microwave or satellite links are used as backhaul combined with lower-bandwidth microwave and TVWS links to extend the network coverage to community end-points where users connect to WiFi – are now becoming more prevalent.

"It's also becoming clearer that a more integrated approach is needed to provide connectivity to increasingly remote areas to ensure affordability. So there have been examples deployed of e-health solutions which range from electronic patient registration, to the storage and handling of detailed medical records between clinicians at regional clinics, doctors and regional hospitals.

"Also, where TVWS is used to achieve rural connectivity goals, there is now typically an education context where we have seen the

technology contribute to affordable broadband access to rural schools and deliver learning material and curated curriculum content in a cost-effective manner."

Rotter continued by saying that the DSA is seeing focus shift from investigating and piloting TVWS to increasingly scaling and commercialising the technology in an affordable manner for the benefit of operators as well as end users.

"One of the more innovative ways we have seen this being done is by means of a hybrid commercial model where the network traffic is segmented into 'eHealth', 'education' and 'social' traffic. This sharing model allows for different types of content to be identified and network costs to be recovered across the broader base of customers.

"This in turn means increased impact from universal services funds (USFs) on a variety of government service delivery commitments and increased connectivity to users in remote areas. With regulators and USFs increasingly being able to optimise such funding to achieve better sharing of backhaul infrastructure, it can bring significant price savings to end users in remote areas while also keeping the network running costs low.

"Another issue that we see investors grappling with is how to leverage standardised regulations across multiple countries to accelerate opportunities and drive down costs with increased volumes and reduced overheads. Traditionally, regulators in each country have needed to invest significant time and effort on a costly multi-year investigation to draft, revise, review and publish their own dynamic spectrum regulatory frameworks. This resulted in slight variations from country to country which contributed to delayed investment, adoption and rollout of TVWS technology within each country.

"In a bid to help reduce the cost and time regulators needed to get regulations into market, the DSA released version 2 of its Dynamic Spectrum rules in January 2018. This policy has been written in such a way that regulators can more easily adopt our document in whole or in part, and quickly progress to being able to release a set of TVWS regulations within their country no matter which global region they are in."

When asked about what the DSA's hopes and plans for the continent are over 2018, Rotter said that the alliance sees widespread publication of simple regulations that keep the unused TV spectrum free and unlicensed.

"In countries that take this approach, the barriers to entry for operators to use that portion of broadcast spectrum are as low and affordable as possible, so we expect this to lead to investment for new and existing projects in ever more remote and hard to reach

areas. This should stimulate the adoption of TVWS technology immensely.

"Hand-in-hand with this greater adoption, we are seeing the cost per unit for the TVWS network radios continuing to fall – driven by both increased adoption and technical advances in the field.

"Finally, it is expected that all the key radio producers will release their technology to combine individual channels in the next 12 months. This will effectively double the throughput as inbound and outbound traffic is separated into discrete channels."



Farhad Khan,
CCO,
Yahsat

When we last spoke to Farhad Khan in 2016,³ he had only just joined Yahsat having worked with MTN for a number of years. We caught up with him again a year later and, with 12 months experience of the satellite industry now under his belt, we asked what differences he saw between Africa's cellular and space markets.

"I think there is a 100 per cent correlation across a couple of dimensions, and the first of these is elasticity and the elasticity of behaviour between GSM (or fixed, for that matter) and satellite. If I take the behavioural analysis studies that we did for churn, for example, I can overlay the same hypotheses into a satellite environment. However, what is different is the underlying technology, because by and large this either adds an opportunity or a limitation in terms of the market.

"In the traditional cellular environment, where it was predominantly circuit switched, you had the limitation of maybe seven people per sector of an antenna. In satellite, you don't have that limitation; the only limitation is literally the type of quality that you want to give to customers. And with advancing technology, we can discriminate by customer type and segment, so I can actually give a [high-end] service to an enterprise customer while giving a basic GSM-type service to a low-end consumer at the same time. That is the beauty of satellite technology that we have never been able to achieve in the GSM or fixed line connectivity space."

So how does Khan answer critics who say that such a service comes at a high price?

"We are burdened by a legacy which says that with any satellite connection you had to have a minimum of USD1000 per month in perpetuity, and you had to have five or ten thousand dollars to actually have the antenna and the gateway itself. So if you had asked me that question 18 or even 12 months ago, I would have said yes,

you're right, because we were in uncharted territory. Ka-band is different, and it was a learning curve for me when I first joined.

Yahsat uses Ka technology for two reasons: one is that the efficiency in frequencies and spectrum utilisation allows us to have multiple users concurrently without deteriorating the service in any way. And the second and perhaps most important criteria in the differentiation between Ku- and Ka-band is cost. Take South Africa as an example. In the most outlying area of the Northern Cape – which is the least connected province in the country – I can give you a connection at less than USD300 and at less than USD2 per gig. This is unprecedented and will light up the eyes of any subscriber who understands the need for internet and broadband access. USD300 is the price of a mid-end smartphone. The current price for 4G in a built-up urban area is just over one dollar per gig, and I am giving you two dollars per gig in the middle of nowhere. And I can do it consistently to all the customers in that area without a single additional dollar of capex because my infrastructure has been invested in already.

"I will admit that, today, we will never be able to compete in an urban area. In one or two years' time, the conversation is different. But today, we cannot compete on a dollar per meg basis with the 4G and fibre players. And that is fine, because my value proposition is most relevant in the underserved and unserved areas."

Khan goes on to describe his definition of underserved and unserved. "Underserved for me is any subscriber who has less than a 4G or a 3G connection. Today, if you had to make network decisions on the basis of accessibility, quality and speed, my proposition is better on those three dimensions. It is second to none. On the price dimension alone I may be found wanting. But no decision in the broadband space is made on price alone. It is made on accessibility, quality and speed.

"And then, if I take the unserved market, as I move from served, underserved to unserved, the size of the market becomes less purely as a function of affordability. Even if my affordability quotient in an unserved market is, say, one per cent of the total population, it is still too big for me to be able to satisfy the total market.

"For example, the total market size in South Africa today with the current affordability rate of a Ka connection is between 60,000 and 100,000 subscribers. My growth aspiration in the next five to 10 years is less than 60,000. That means that at present, even if I have the right channel partner, I will not be able to satisfy the bandwidth needs of an underserved population."

So does that suggest that all the satellite operators will end up competing for the same, ever-dwindling piece of market share? Khan dismisses this and says it is not relevant today

because the competition in Ka-band satellites is very limited. "The players and competition in Ka are Avanti and shortly Broadband For Africa [Eutelsat's initiative now known as 'Konnect Africa']. So the number of companies that can compete in this category is very limited. But that is good because now there will always be the pressure and scrutiny on price and on the qualities of your signal and partner. That's a good harmony to maintain."

For Khan, the more worrying competition comes from traditional sources such as fibre and firms like Dark Fibre Africa venturing into rural markets. "The day that fibre becomes ubiquitous is the day that I don't have a business case. But we all know that there is no return on investment for fibre or even for GSM to be ubiquitous in Africa. As long as there is that divide or vacuum, Yahsat remains relevant."

Khan continues by saying that while satellite currently may not be able to compete with mobile technologies in urban areas, the evolution of Ka technology means that in four years time the availability of Ka-based broadband and the capacity will be sufficient to justify a price parity environment.

"Previously, our CPE used to be in the USD400 mark. In the last 18 months we have carved it down to 300, and in 2018 it will be 200, and so on. I would not overlay a Moore's law onto satellite CPE but it has a very similar characteristic. My opinion is that the ideal price point for a satellite connection on Ka is around the USD100 mark. If you were to ask me how big should the market be at that price, I would say without hesitation, 200,000 to 300,000 subscribers. Because today, with the current insights that we have in terms of disposable income, that is the number of people that have that kind of money to spend on the CPE."

Since speaking to Khan at AfricaCom in November 2017, Yahsat launched its third satellite, *Al Yah 3*, on 26 January 2018. While the launch was successful, the company issued a press statement at the time which said: "The mission experienced some challenges during the launch stages which resulted in the satellite

"The day that fibre becomes ubiquitous is the day that I don't have a business case. But we all know that there is no return on investment for fibre to be ubiquitous in Africa."

³ African Wireless Communications Yearbook 2017, p83.

being inserted into an orbit that differed from the flight plan. However, the satellite is healthy and operating nominally."

Yahsat added that a revised flight plan will be executed in order to achieve the operational orbit and fulfil the original mission, but at the time of writing this chapter of the yearbook in mid-March 2018, the company had not publicised any further updates. *Al Yah 3* was scheduled to begin delivering commercial services later in 2018 and may still be on course to do this.

Khan said that unlike its two predecessors, Yahsat has not pre-booked capacity for Africa on the new satellite and has instead created a pipeline of partners for all the countries on the continent. However, *Al Yah 3*'s footprint will also cover Brazil as well as Africa, and here the operator has pre-booked capacity. "We are selling more managed capacity there because we have a license in Brazil. I think almost 40 per cent has been pre-booked. You don't need licences in Africa so for every country that we have footprint here, we now have partners lined up. We are now at the stage where we are looking at how much capacity we can commit to them, country by country."

"The overlap countries for *Al Yah 2* and *Al Yah 3* are Nigeria, South Africa and Angola which is perfect because we knew that these would be the three highest uptake countries in Africa. *Al Yah 3* will give us a lot more coverage and a lot more depth. It increases our capacity threefold."

While Yahsat operates a fleet of satellites that are in conventional geostationary Earth orbit, is the company interested in alternative satellite technologies such as MEO or LEO missions? "We believe that the best way is to have a partnership type of approach, and that way you have alignments and affiliations with different technology types. I say that because the pace of technology change is far too rapid to take a static position at an investment level. And I don't think that is the optimal way to realise shareholder value. From a long-term sustainability point of view, it is in our interest to partner with as many technology vendors as possible so that we can actually have access to all these types of satellite technologies."

And while fibre may be satellite's 'enemy', many operators have invested in connectivity technology that is both high above the Earth as well as buried within it. Is Yahsat interested in such a hybrid future? "In serving the underserved and unserved markets in Africa we can identify clusters and communities where the type of technology that we use to give them connectivity will not necessarily be restricted to satellite. And I think that in some of these communities, once we have identified them, we are hoping to harness different technology types in order to deliver a single solution to them. You will see a lot more announcements about this during 2018."



Caroline De Vos
Co-founder & CCO
SatADSL

Since being set up by a handful of engineers in 2010 and reselling capacity on Telesat's *Telstar 11N* satellite in Western Africa, SatADSL now offers capacity from 10 satellites operated by the likes of Arabsat, Avanti, Eutelsat, Gazprom Space Systems, Yahsat, amongst others. The company also works closely with satellite technology specialists such as iDirect, Hughes and Newtec.

Caroline De Vos explains that since the outset, the company decided that by not having any upfront investment or capex, it could remain flexible in answering market needs. "We would just buy raw capacity and resell it. We had started in the consumer market but grew to the corporate market."

Working through a network of partners that, within Africa, include 75 different local partners in 40 countries, the company has built-up a reputation for providing affordable and reliable IP communication solutions to banks, telcos, MNOs, etc., across the continent.

According to De Vos, 2017 was a key year for SatADSL. In November, the company launched what was claimed to be the industry's first multi-hub *Cloud-based Service Delivery Platform (C-SDP)* with C-, Ku- and Ka-band capability. "We created this huge software beast that is in the cloud and hosted in a data centre in Brussels," she said. "The platform allows us to buy raw capacity as a VNO from any satellite operator and buy that in bulk. The capacity then goes through the C-SDP where we manage it and shape it into what the customer needs."

C-SDP is described as a complete OSS/BSS, carrier-grade, fully redundant platform. SatADSL said it will enable telcos and service providers to offer, for the first time, cloud-based satellite services over any frequency band. The platform includes a network management system that allows IP traffic to be shaped and routed to and from different hubs, while a built-in end user tool allows users to monitor their own customers. It also features a hotspot management system to enable remote hotspot networks to be configured, managed and monitored.

SatADSL clearly has high hopes for C-SDP as it means that the company can now not only add new revenue streams to its traditional business of re-selling capacity, but also has something that gives it the edge over rivals.

"The platform is multi-satellite, multi-frequency and multi-technology, and we offer it to users who have VSAT equipment installed from any vendor. We have this layer of added value services which are included in the platform. It gives us a big differentiator,

especially with Liquid Telecom which is still really focusing on the consumer market whereas we are focusing on hotspot systems with integrators.

"We did a great project in Ghana where we equipped 50 schools. There was a network with a studio in Accra with a teacher being filmed, and lessons were broadcast to the schools. We also developed hotspot functionality so that the community could use the infrastructure to access the internet which they could pay for using an integrated mobile payment system or through vouchers. So this is all included as a value-added service on top of just offering internet connectivity."

De Vos continues by saying that the C-SDP also enables users to monitor their traffic. "So, for example, if you are a bank, you can control private internet usage during lunchtime or out of office hours. These little extras make a difference. The platform also includes a full, end-to-end billing system."

On the subject of pricing, when asked if this is coming down, De Vos says that it is, adding that SatADSL also has the advantage of having a voucher system which enables users to connect. "We are putting the satellite operators in competition because if one company's price is too great we can go to another and buy from them if it's cheaper. We buy capacity sometimes from the operator or sometimes from the teleport operator if they have better prices. For example, we buy capacity on Arabsat from a teleport operator and not from Arabsat themselves because the teleport has a better price than we would have directly. The satellite operators can of course sell directly to the end user, but none of them offer what we offer."

She adds that one thing that characterised the satellite year in Africa in 2017 was the availability of Ka-band satellites which have "drastically" lower prices than what SatADSL currently has in Ku-band. "Because we can offer frequency independence, our offer will be one fourth of the price tomorrow compared to what we had in 2017."

With the launch of the C-SDP, SatADSL believes that it can now not only offer something new to its ISP partners, but also has something to offer back to the operators. "Since we announced the C-SDP in November, a lot of the satellite, mobile and teleport operators have shown interest in having it. They want to purchase it and we say no way! This is our differentiator, our extra added value."

"So our new business model is to offer the operator the possibility to use this platform, and instead of putting a retail price on it we'll offer a revenue sharing model. This is separate to what we are continuing to do in terms of selling IP connectivity."

"Say, for example, we buy capacity from SES. We will use that capacity and everything

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goes through the C-SDP. SES then either gets back 80 per cent and we keep 20 per cent, or if they want to sell directly to their customers via the platform with all of its value-added services, they will pay us 20 per cent of what they invoice to their customers for the usage, support and maintenance of the C-SDP."

While the platform is currently located in Brussels, because SatADSL is connecting to different operators in different parts of the world, De Vos says the company is now duplicating the setup in PoPs in Russia, Hong Kong, and Singapore. In Africa, there will probably be a C-SDP PoP in Nairobi or Johannesburg.

So what about fibre – is that having an impact on the company's satellite business? "Fibre has been in our business plan since 2006 and the numbers are still fairly similar today. Okay, we know about the projections and that the cables are coming around Africa and in every city. In some of the capitals you have fibre everywhere but we still had, for example, a project in Accra where we needed to connect to fibre. The first 200 metres are included in the price and then for everything after that you pay USD900 per metre just for laying the cable. So it is still quite costly and the fibre operators are making the end user pay for that. Plus, it takes a lot of time to dig holes in the street."

"In the city of course, there is mobile and fibre, and these are our competitors. But there are still more corporations who are putting branches in remote areas, and these people need connectivity as well."



Amr Kamel,
GM, WECA &
Indian Ocean
Islands,
Microsoft

Africa is cloud computing's next "great frontier", according to Amr Kamel. He believes this is being driven by mobile growth, decreasing connectivity costs, and more international and local vendors offering a variety of new services.

In a mobile- and cloud-first world, Kamel says Microsoft is "deeply invested" in Africa, and that it continues to educate businesses and government organisations across the continent about the benefits of cloud. But he acknowledges the need for technology companies, communities and governments to work together to achieve Africa's digital ambitions.

As a contribution to this, Microsoft published a book last year entitled *A Cloud for Global Good*. This details 78 public policy recommendations in 15 categories to help make cloud technologies more trusted, responsible and inclusive.

"By encouraging the adoption of cloud computing, we are also committing to the SME sector – the backbone of the African economy,"

says Kamel. "SMEs are at the heart of our 4Afrika initiative. This was launched in February 2013 to aid in accelerating the continent's economic development and also to improve global competitiveness. Through this, Microsoft has been able to deliver on its promise to develop affordable access to the internet, skilled workforces, and innovation to increase economic opportunities in communities."

Here, Kamel cites *Project Mawingu* in Kenya as a key highlight. *Mawingu* (the Kiswahili word for 'cloud') started five years ago in collaboration with the Global Broadband and Innovations Alliance, a partnership between USAID and NetHope. It was the first time TVWS frequencies were combined with solar-powered base stations to provide internet access to communities in the surrounding countryside at rates as low as USD3 per month.

Microsoft 4Afrika currently has around 15 TVWS connectivity pilots running across six countries in Africa which, as well as Kenya, also include Botswana, Ghana, Namibia, South Africa and Tanzania.

Kamel says there are several examples of how entrepreneurs and countries are using Microsoft and wireless comms technologies to act as digital enablers and accelerators across all sectors. "For example, CHIFCO is a Tunisian tech startup specialising in the IoT and M2M. By using Microsoft's Azure platform it has developed technological infrastructure that allows users to connect their daily devices to the internet, therefore enabling them to be in control of their surroundings, wherever they are, and whenever they want.

The adoption of IoT and wireless technology is also present in Ethiopia where individuals can walk into clinics using a biometric scanner to check in. This technology can also pick up their previous visits as well as check their medical records. After examination, prescriptions can be sent wirelessly to the nearest pharmacy."

Other examples include Botswana where Microsoft and its partners are introducing specialised telemedicine services along with a cloud-based records management system for women at local clinics. In Namibia, the company is working with MyDigitalBridge to connect three provincial regions across a 9,000km² area, and is also bringing 28 schools online.

Working with Africa's educators is clearly another key focus for the software giant. For instance in Ghana, it is working with SpectraLink Wireless to deliver affordable campus-wide internet access and cloud services along with device financing to university students for the first time. And in 2016, the company teamed-up with the Ministry of Education in Rwanda to develop employment skills among students and educators through its *Partners in Learning* programme.

"The programme helps teachers and schools around the world improve students' experiences and skills through technology,"

explains Kamel. "It has already reached 12 million educators in 134 countries worldwide. In sub-Saharan Africa, over 13 million students have benefitted from the programme to date."

He continues by saying that showcase schools have been introduced in Kenya. "This is a global community of schools engaged in digital transformation to improve learning outcomes. Showcase schools create immersive and inclusive experiences that inspire lifelong learning, stimulating development of essential life-skills so students are empowered to achieve more."

"In Africa, 42 schools were selected as *Microsoft Showcase Schools* for 2016, boasting the highest intake in any region across the globe. It is our goal that in five years time every African country with a national technology deployment will have a core 'army' of 21st century-ready schools. These will model new competencies and accompany other schools in their journey to transformation."

When asked about the challenges in Africa over the foreseeable future, Kamel says organisations are now managing data that is more diverse and greater than ever before. "It is estimated that by the year 2020, 30 million devices will be connected to the internet. This will include 30 billion connected 'things' that are largely driven by intelligent systems collecting data."

"In terms of the IoT, modern organisations in Africa will continue to face a variety of challenges. Microsoft recognises that advancements in technology can be exciting but also challenging to assess from a business perspective. However, with the correct tools, organisations can ensure that these new technologies generate profit. The valuable information that is obtained from these tools, along with the appropriate skills, will aid companies across the board to achieve more."

In conclusion, Kamel believes that a society that is "digitally savvy" will not only consume technology but create it: "With the onset of digital transformation comes the concept of the smart cities and digitally transformed governments. Government policy in many territories is leaning towards the creation of smart nations through cloud technology, data analytics and IoT."

"One of the ultimate goals of smart nations is to reduce costs for all stakeholders, increase the efficiency in delivery of services, and democratise technology."

"We base our theory of the smart nation on four basic citizen rights which smart cities must be able to deliver – education, healthcare, freedom and social justice and equality. This, coupled with attention to infrastructure, investment climate, innovation and execution capability, must all be underpinned with technology for a smart nation to be achieved." ■

The above interview is based on an article first published in the June-July 2017 edition of Northern African Wireless Communications magazine.