chapter 2 Cellular networks

Joe Barrett, President, GSA

In its quarterly *LTE Evolution to 5G* report published in January 2018, GSA (Global mobile Suppliers Association) identified 848 operators investing in LTE including pre-commercial trials. Of those, 651 have commercially launched either LTE or LTE-A in 202 countries across the world.

In North Africa, 13 operators have launched LTE and of these, six have launched LTE-A with one operator in a testing phase. In the larger sub-Saharan Africa region, 139 operators are investing in LTE, with 98 networks launched; 17 of these have deployed LTE-A. Globally, the African region as a whole now accounts for 17.5 per cent of the total operators investing in LTE and 17 per cent of the commercially deployed networks.

The sub-Saharan region has also seen a number of operators deploy LTE-TDD technology mode in unpaired spectrum. Here, 23 operators have now launched commercial services.

Generally, Africa has been keen to adopt the 3GPP standards and LTE technology, although most of the countries globally that are currently without LTE are either on the continent or islands in the Pacific and Atlantic Oceans. In total, there are 54 countries around the world that have yet to deploy LTE and 18 of these are in sub-Saharan Africa, equating to 32 per cent of the total. They are: Burkina Faso, Cape Verde, Central African Republic, Djibouti, Equatorial Guinea, Eritrea, Guinea, Mali, Mauritania, Mozambique, Niger, São Tomé and Príncipe, Senegal, Sierra Leone, South Sudan, Swaziland, Togo and Western Sahara.

Even so, Africa has increased its share of LTE networks and operators investing in the technology during the past two years as the technology has gained a reputation globally as the most advanced mobile broadband platform. LTE was first launched in Angola in 2012 and Africa has benefited from an established ecosystem of infrastructure and devices. Growth was initially slow, but in the past two years a slew of MNOs have launched commercial services.

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

African subscriptions

According to Ovum, the number of mobile subscriptions in Africa passed one billion in September 2017.[1] LTE subscriptions reached 22.6 million, almost doubling the number from September 2016. However, 3G is still the dominant technology in Africa which is the only world region increasing the number of new subscribers here. 3G accounted for almost 80 per cent of the growth in new users on the continent, while GSM and CDMA technologies are both experiencing declining subscription numbers (which is the general trend globally).

LTE is still gaining a foothold in Africa, especially in the sub-Saharan region but as it becomes the preferred technology, eventually delivering a Gigabit service, GSA expects a migration from 3G to 4G/LTE and then 5G as new devices come to market.

Spectrum

In Northern Africa, the predominant LTE spectrum used is in band 3 (1800MHz) and band 20 (800MHz) with band 3 utilised for LTE by more than 70 per cent of operators. In sub-Saharan Africa, 34 per cent of operators are using band 3, followed by band 20 (19 per cent) and then the TDD band 40 (2300MHz) (17 per cent).

Due to the size and topography of the continent, the sub-1GHz bands have become popular and interest in deploying LTE in band 31 (450MHz) is prevalent due to the reduction in number of cell sites required to cover sparsely populated areas. But while there has been discussion and consultations around the lower bands, progress in this area is slow.

A large number of countries in different regions, including Africa, are exploring the opportunities for IMT, in the 3300 to 4200MHz frequency range (sometimes also referred to as C-band spectrum). Countries are taking action in order to reach 200 to 400MHz of contiguous bandwidth in this range, especially when thinking about 5G. Based on national circumstances, it is also expected that a given regulator may make different portions of the 3300 to 4200MHz range available at different times, incrementally building large contiguous blocks. This large amount of spectrum will enable contiguous spectrum assignments to operators in the order of 100MHz or more, allowing them to reap the full benefits of 3300 to 4200MHz frequencies for 5G.[2]

5G for Africa

Network vendors and operators are currently testing 5G in multiple locations around the world and GSA reports on these trials and the spectrum that is being used.

It is not too early for African operators to think about 5G and there are several South African MNOs that have tested or trialled pre-standard fifth generation technology.

For instance in October 2017, Comsol revealed plans for a fixed wireless access

[1] Ovum Global subscriber numbers 3Q 2017.
[2] For further reading here, see the GSA white paper *The Future of IMT in the 3300-4200 MHz Spectrum Range* at gsacom.com.

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5G trial. The 280MHz of spectrum that the company holds in the 28GHz band could enable a commercial point-to-multipoint network capable of delivering 1Gbps speeds for its customers.

MTN has partnered with Ericsson to trial 5G in the first half of 2018 after they agreed an MoU at AfricaCom 2017. They say the first lab trial achieved 20Gbps throughput with five millisecond latency, and MTN is now investigating what the first applications and use cases could be.

Meanwhile Nokia is working with Vodacom, which has close to 70 million customers in Africa including almost 40 million in South Africa. Both companies see 5G as a way to help cope with the mobile connectivity boom that is happening in the region. ■

About the GSA

The Global mobile Suppliers Association tracks and reports the progress of mobile technologies. The association has been representing the mobile supplier ecosystem since 1998, producing mostly free to download reports on technologies, networks, spectrum and the phenomenal expansion of mobile broadband devices. GSA intelligence is regularly referenced by the broader mobile industry, and the organisation is also very active in numerous spectrum forums around the world, including Africa. https://gsacom.com/

Going to the next level with LTE

With advancements in 4G continuing across Africa in 2017, we began last year with news about what was claimed to be the first Gigabit Class LTE network on the continent.

Ericsson and **Qualcomm** said they had successfully demonstrated the technology in South Africa with the use of licensed spectrum. Gigabit Class LTE (LTE Category 16) enables the delivery of up to one billion bits of information delivered to a mobile device in one second. It utilises three-carrier aggregation (CA) with 256 QAM, and by applying 4 x 4 MIMO across 40MHz of spectrum.

It's claimed that during the demo, peak data speeds of more than 900Mbps were recorded using Ericsson's RAN equipment and Qualcomm's *Snapdragon X16* LTE modem mobile test device which supports LTE-A Pro. According to the latter firm, its modem can receive 10 streams of LTE data simultaneously using four antennas. Qualcomm adds that the device uses better signal processing to extract more bits out of every LTE transmission, boosting the throughput of each of the 10 streams to around 100Mbps.

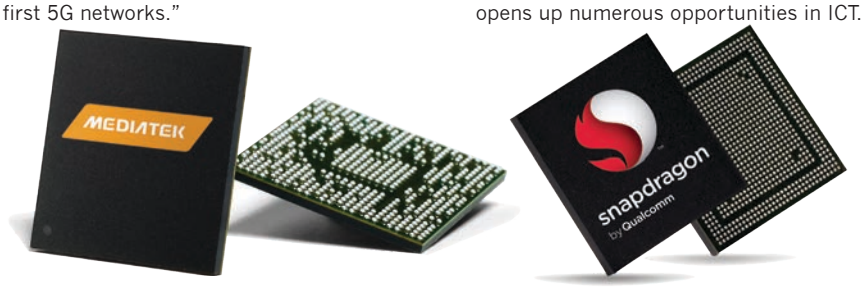
Speaking at the time, James Munn, VP of business development at Qualcomm's South African branch, said: "This achievement of Gigabit Class LTE download speeds with Qualcomm Technologies and Ericsson is an important milestone on the road to Africa's first 5G networks."

In a separate development, rival mobile chipmaker **MediaTek** also teamed-up with Ericsson to make LTE-A features available in mainstream mobile devices across the continent.

According to Ericsson, most, if not all the LTE networks that are currently live in Africa, are expected to evolve to LTE-A (4.5G or 4G+) over the next few years. However, devices that can currently support this technology can cost as much as USD800. MediaTek said its smartphone chipset technology, which enables consumers to take advantage of the benefits of CA, will be available on affordable handsets that are powered by its silicon for the region's mass market.

Staying in Southern Africa, **Zamtel** launched a 4.5G network in Zambia's Copperbelt Province. Using LTE-2300 technology, the government-owned telco rolled out the network in Kitwe, Kalulushi, Chambishi, Chingola, Chililabombwe, Mufulira and Solwezi.

Speaking at a launch event held earlier in Kitwe, the country's transport and communications minister Brian Mushimba said that the rollout was part of the advanced delivery of the Universal Access Phase 2 Project that the government is implementing together with Zamtel and Huawei Technologies. He said: "The successful implementation of this project by Zamtel signifies the transformation of the ICT industry on the Copperbelt, redefines internet services, and opens up numerous opportunities in ICT."



Right: The demo used an LTE modem with Qualcomm's first chipset to support LTE-A Pro. Left: Ericsson also teamed up with chipmaker MediaTek to bring affordable LTE-A handsets to Africa.

JANUARY 2017

The Communications Authority (CA) of Kenya denies local media claims that it is deploying a regulatory device management system (DMS) with the express intention of accessing private mobile data. CA director general Francis Wangusi said the implementation of the DMS was driven by the need to curb the illegal termination of traffic and counterfeit handsets, as well as phone models that have not been type approved to work in Kenya.

FEBRUARY

Méditel in Morocco has now been re-branded as Orange. The country contributes nearly 10 per cent of revenues within the French telco's MEA footprint, and with 14.2 million subscribers as at the end of September 2016, it provides services to the second-largest number of customers for the group in the region after Orange Egypt. The Orange Group has backed Méditel since December 2010 when it acquired 40 per cent of the company. In July 2015, it increased its holding to 49 per cent.

MARCH

Facebook has appointed HYLA Mobile to collect high-end smartphones for re-distribution in emerging markets as part of its *Smart Restart* initiative. It's claimed the re-distribution of devices will have a major impact in many parts of Africa where device affordability is a major barrier to mobile broadband adoption. For example in Kenya, Facebook has been working with Medic Mobile to deliver smartphones to frontline health workers in Isiolo County. Devices collected through *Smart Restart* and refurbished by HYLA are being donated to 120 community health workers. US-based HYLA Mobile reckons the global secondhand device market is worth around USD17bn.

APRIL

ZTE has launched what it claims is the most advanced network operation centre (NOC) in Uganda. The centre will serve MTN's entire national network. ZTE says it will support the operator with a full scope of managed services

Sudani said it now offered Sudan's fastest mobile data speeds.

In May, **Sudani** went live with an LTE-A network in Sudan. After completing an introduction in Khartoum, the Sudatel subsidiary planned to expand the network to other major cities and towns throughout the year. It worked with Huawei on the deployment, and is using LTE-FDD and CA over 1800MHz and 850MHz frequencies.

The company is offering what it claimed was a wide variety of pricing packages for both pre-paid and post-paid users, including "affordable" bundles for low-income customers. According to Sudatel Telecom Group president and CEO Tarig Hamza Zainelabdin: "We have invested a significant amount in our 4G networks as we know that fast and reliable telecoms infrastructure will help our country's economic development. We want the people of Sudan to 'Live The New Wave' and enjoy the benefits of 4G in both their personal and business lives."

Meanwhile, across Sudan's south eastern border in Kenya, Safaricom claimed that it was continuing to roll out Africa's "most advanced" mobile network following the introduction of 4G+ services in major towns across the country. In June, the operator announced that it had already activated 100 sites in Nairobi, Mombasa, Kisumu, as well as parts of Kisii, Naivasha, Kitui, Machakos, Kakamega and Kericho. More territories were scheduled to be switched on during the months that followed.

Safaricom said the new LTE-A technology, which supports CA, builds on the growing footprint of its 4G network which has gone live on more than 1,100 sites across Kenya. It said the 4G+ base stations will supplement its existing sites of which 4,677 are 2G, 3,517 are 3G, and 1,103 are 4G. The operator added that they will also complement its fibre rollout strategy that had so far seen more than 50,000 homes and 1,500 commercial buildings passed by high-speed links.

"These faster speeds not only benefit the customer, they also empower small businesses who can now use the internet for more commercial activities, democratising data access," said CEO Bob Collymore. "We expect that our network will empower more small enterprise to participate in commerce as well as drive more data use by critical sectors in the education, health and agricultural sectors."

In Algeria, **Djezzy** announced that its LTE network had now reached a total of 24 provinces and 25 per cent of the population (or 10 million people) since beginning the rollouts in October. This followed the extension of its footprint to four new 'wilayas' (or provinces) which included Annaba, Tamanrasset, Mascara and Adrar.

Djezzy had previously promised that it would eventually cover 16 million people with what it claimed would be Algeria's largest 4G network. It said the latest extension was the "concrete result" of that ambition. The company has also been reinforcing its 3G coverage, especially in urban areas, and upgrading its 2G network.

Safaricom CEO Bob Collymore said faster network speeds are "democratising data access".

Djezzy said deploying the "best network" and attracting talent will mean "nothing" without customers: it had already opened 36 retail outlets in 2017 and a further 19 were expected by the end of the year.

Djezzy is 51 per cent owned by the National Investment Fund while the rest is held by Global Telecom Holding and Veon (formerly VimpelCom). But the company regards itself as Algerian and said that it therefore aims to contribute to the nation's economic and social development, as well as its infrastructure.

Back in South Africa, **Internet Solutions** and **Rain** teamed-up to offer commercial LTE-A to the country's ISPs. According to the partners, in areas of high-density mobile coverage, LTE-A offers ISPs and their customers distinct advantages over a wired network like ADSL or fibre, particularly for ISPs that want to deliver services to customers quickly with minimal disruption during installation.

Rain (formerly known as Wireless Business Solutions) has been busy building an LTE-A network to boost fixed and mobile connectivity. From September 2016 to around mid-2017, it had so far deployed 750 active base stations extending across South Africa's major centres and metropolitan areas. Speaking earlier in

for its equipment from various providers. MTN's total number of network components are planned to increase from more than 4,000 to more than 5,000 by 2019. According to ZTE, the establishment and opening of the NOC will improve the operator's network quality and simplify its management.

MAY

Tigo has opened a new call centre in Tanzania with the claim that it is the first of its kind in the country. The cellco has migrated its facility from E1 to SIP. It says the technology allows for a wide range of functionality and offers the agility necessary to service its growing subscriber base which currently includes around 10 million customers. The centre is also said to feature embedded data security measures to protect subscribers' information and identities, and a USSD/SMS platform for query follow-up and escalation. With 100 per cent CRM monitoring of customer satisfaction, Tigo boasts that its customer service is expected to "rocket sky high".

JUNE

In Morocco, the total number of mobile subscribers shared between Maroc Telecom (Etisalat), Orange and Inwi for 2Q17 stood at 42.05 million, a 0.64 per cent increase from the previous quarter. According to the country's National Telecommunications Regulatory Agency, 4.7 million of these subscribers were 4G users, a 37 per cent rise from 1Q17. The regulator adds that compared to the same time during the previous year, ARPU was "virtually stagnant" for June 2017 and reached MAD0.23 (USD0.02) per minute.

JULY

Mobile data traffic will grow 12-fold from 2016 to 2021 in Africa and the Middle East, according to Cisco's latest recently released annual *Visual Network Index* (*VNI*). It forecasts that mobile data traffic in the region will rise from 610.3PB per month in 2016 to 7.4EB per month by 2021. Cisco says business mobile data traffic in MEA grew 79 per cent

Rain CEO Duncan Simpson-Craib said all tests were "looking good", and that the company remained on track to roll out 2,000 sites by the end of 2017.

2017, CEO Duncan Simpson-Craib said Rain was on target to reach 2,000 sites by the end of the year, expected to increase its footprint to 5,000 base stations by 2018, and ultimately grow to 10,000 sites over time. He added: "In future, we will be launching a full mobile data service."

Internet Solutions will act as the open access partner for delivering the company's fixed wireless broadband service, dubbed *Rain to the Home*. The two firms believe that offering competitively-priced access to LTE-A will lead to new growth opportunities for local ISPs whose customers will benefit from fibre-like mobile connectivity.

Expanding coverage

Mobile development in Africa is not all about LTE, and the continent's major cellcos were also busy expanding their 2G and 3G networks in 2017 as part of ongoing efforts to increase capacity and access to mobile connectivity, especially in rural areas.

For example in June, **MTC** (Mobile Telecommunications Company) said that it had built more than a dozen new cell sites across Namibia in only four months. "Just in 2017 between February and May, we have erected 14 new sites in Okahandja, Rehoboth, Tschudi, Windhoek (Soweto), Otjiwarongo, Otjokavare, Fransfontein, Swartbooisdrif, Katima, Rundu Mall and Dr. Lemmer," said MTC spokesperson Tim Ekandjo.

He added that the investment was an "absolute priority" because MTC needed to keep up with the rapidly growing customer demand.

Ekandjo also said that the company was on a mission to ensure that development gets to each and every corner of Namibia, and that it will continue to build more sites throughout the course of the year with further new locations planned for both rural and urban areas.

MTC said it is investing NAD1.1bn (USD848m) on expanding its network capacity as part of its *081EVERY1* project. This is described as the "beginning of a journey towards 100 per cent population density coverage". Starting in October 2017 and running until October 2019, the company said it will build more than 524 new sites which is said to represent a 10-fold increase in its footprint. The sites will include 412 new locations in rural areas, and 88 in urban zones across all of the country's 14 regions.

MTC added that the project will also see the introduction of 3G in major rural areas. Currently, the operator mainly has 3G and 4G coverage in urban areas and limited coverage in most rural areas which have 2G.

However, Ekandjo pointed out that the company remains concerned by the fact that it takes more than six months to get environmental clearances to build sites, and warned that this could delay the rollout plans. "In as much as MTC is committed to bringing service to rural areas, patience was imperative due to the vastness of the country. We also implore authorities to speed up the process of approvals especially those that deal with environmental clearance."

According to MTC's CFO Thinus Smi (who was speaking as the company's acting CEO at the time), *081EVERY1* is geared towards future full system convergence, especially with forthcoming IoT and 5G technology. "There is a noticeable rapid growth in technology, where customers engage in an increasing number of ways with the network, and this enhanced network coverage project will aid these communications."

While MTC did not announce its technology partner(s) for the project, it previously worked with Huawei in 2016 on what it claimed was Africa's first 4.5G trial.

In South Africa, **Vodacom** outlined accelerated plans to expand network coverage for people who live in rural areas. Through continued investment in its *Rural Coverage Network Expansion* programme, the operator said it committed to expanding its footprint to cover an additional 150 small deep rural communities during 2017 alone. Most of these communities are in KwaZulu Natal, Limpopo, Eastern Cape, North West and the Free State.

By June, Vodacom claimed that it had already achieved voice coverage for 99.9 per cent of the urban and 99.6 per cent of the rural populations, and data coverage for 99.9 and 95.6 per cent of the urban and rural populations, respectively. The company said it was now looking at "innovative" ways to connect the outstanding 4.4 per cent rural population with data coverage and 0.4 per cent with voice coverage. It planned to increase network capacity, and bring faster data services to tens of thousands more people living in rural areas who only have voice and EDGE data services.

According to Vodacom Group CTO Andries Delport (*right*): "It can no longer be acceptable that multitudes of people in our rural areas watch the 'Internet Revolution' from the sidelines without being part of it."

Orange officially launched its brand in Sierra Leone in mid-September. This followed the company's acquisition of Airtel Sierra Leone together with its Senegal-based partner Sonatel which was finalised in July 2016.

With a population of around seven million people, Orange reckons Sierra Leone offers "significant" potential for growth in mobile services. Sekou Drame, CEO, Orange Sierra Leone, said: "We remain committed to taking

in 2016. It predicts this will grow at a CAGR of 52 per cent to hit 493.9PB per month by 2021, up from 60.7PB per month in 2016. The ***VNI*** also reveals that there were 1,330 million mobile-connected devices in the region in 2016, and that 59 million net new devices and connections were added to the mobile network during the period.

AUGUST

Zambian telco Zamtel says it has "continued to batter all growth barriers" as it announced that it had now reached two million subscribers. Acting CEO Sydney Mupeta says the company has recorded consistent growth since May when it became profitable for the first time in 2017. He reckons this was due to "prudent resource utilisation and exciting product offers". Mupeta adds that Zamtel will continue to invest in its fixed and mobile business segments, and "remains focused on pushing growth barriers out of the way."

SEPTEMBER

South African MNO Vodacom says that all customers affected by a recent billing systems error will be given a 500MB bundle for free, over and above any airtime and data refunds. The operator says the system error, which impacted certain pre-paid and top-up customers, was caused by a configuration change on its billing system. In an apology issued online, Vodacom Group CEO Shameel Joosub said: "An error of this kind has never happened before and we've taken steps to ensure it never recurs."

OCTOBER

On 30 September 2017, MTC announced that its tower in Leonardville, Eastern Namibia, had collapsed. Five days later, the operator announced that it had put up a temporary

CEO Sherif El Barbary told reporters that Zantel aims to deliver "best in class" services to customers and the country.

our network and services deeper into the country, right up to the doorsteps of each and every Sierra Leonean, with the aim of bridging the digital divide within the country. With the support of Orange and Sonatel we can truly deliver on this."

Earlier in 2017, the operator announced a USD33m modernisation and expansion plan to enhance the quality of its network, voice and data services in the country. By mid-October, it said most of this investment had already been realised with 30 new radio sites on air and more than half of the entire mobile network upgraded.

Zantel (Zanzibar Telecom) promised to take both its customers as well as Tanzania to new heights following the completion of its network modernisation. At the end of September, recently appointed CEO Sherif El Barbary told reporters that his company aims to improve network quality and coverage in order to deliver "best in class" services. He said Zantel was in the final stage of its network modernisation and that it now covered 22 regions across the country with 4G infrastructure.

"We have created more than 5,000 [jobs] countrywide. This is direct and indirect employment through our *EzyPesa* platform where we have more than 2,500 agents, and also have partners providing different services who also employ staff to serve Zantel."

El Barbary added that Zantel will also work on supporting the government to reach various SDG targets. Furthermore, he planned to focus on the company's wholesale and enterprises operations which he considered to be "key for business". Zantel manages the *EASSy* and *SEAS* submarine cables with landing points in Dar es Salaam.

Established in 1999, Zantel is currently 85 per cent owned by Millicom while the remaining shares are held by the government.

Burundi's state-owned **Onatel** is aiming to modernise its mobile subsidiary with the help of a multimillion dollar loan from Huawei.

ONAMOB is one of four mobile operators in the country. Together with its rivals – Econet Leo, Smart and Vietnam's Lumitel – it shares a mobile subscription base that stands at around nine million connections which represents 82 per cent SIM penetration (according to GSMA Intelligence as at February 2018).

Built in 2004, the company's network was expanded once in 2010 but has struggled to compete with rivals who have invested in more modern and efficient network infrastructure and services. In 2013, it was widely reported that the government wanted to offload a majority stake in ONAMOB. At the time, *TeleGeography* stated that the operator was running 51 sites in Burundi with claimed coverage of around 80 per cent of the population. It added that in order to achieve total coverage, ONAMOB's new owners would need to deploy a further 50 sites.

Towards the end of 2017, we reported that the country's government now hopes that with Huawei's backing, the modernisation and network extension will enable ONAMOB to better compete and improve revenues. Huawei is financing the project via a USD30m 10-year loan which government secretary-general and spokesman Philippe Nzobonariba reportedly described as "a survival investment".

State-of-the-art tech

In early March, **Vodafone Egypt** went live with what was claimed to be the first commercial NFV platform in the Middle East and North Africa Since October 2016, Ericsson's virtual *Serving GPRS Support Node – Mobility Management Entity* (*SGSN-MME*) had been handling and managing commercial mobile broadband traffic on the operator's network. The platform is designed to support multi-access technologies such as GSM, WCDMA and LTE, and interworks with Wi-Fi. Ericsson added that it also provides full feature parity and is agnostic to the underlying cloud system with support for both Open Stack and VMware.

Vodafone Egypt's network now runs using a combination of virtual and native *SGSN/MME* in the same pool which, according to Ericsson, supports efficient capacity expansion. The vendor said its system extends network capabilities to meet even the "most aggressive" traffic growth predictions, and provides "superior scalability and capacity" so that operators can optimise their operations and manage the increasing volume of traffic from mobile broadband.

"Virtualisation will enhance the speed and efficiency of services we provide to our customers which will in turn support our main goal to reach customer satisfaction," said Vodafone Egypt technology director Osama Said.

Ericsson's blade system for SGSN-MME. The company's virtualisation technology has been managing Vodafone Egypt's mobile broadband traffic since last October.

mobile site and that full GSM services had been restored for the village and its surrounding areas. It said the replacement site would continue to serve local subscribers whilst reconstruction of the fallen BST was ongoing. The operator did not offer a timescale for this or any reason as to why the tower had collapsed in the first place.

NOVEMBER

Sudatel will be the first company in Sudan to benefit from the US recently lifting a trade embargo that had been in place for more than a decade. The most prominent company that has now been dropped from the US trade ban list is part state-owned Sudatel Telecommunications Group (STG). After flying back from the US together with Sudanese ministers, STG CEO Tariq Hamza told reporters that they had held talks with representatives from the US Chamber of Commerce, the Board of Companies for Africa, Apple, Boeing, ExxonMobil and Ford. They also met with representatives from the British and German governments, as well as the IMF. He added that the next phase for Sudatel will see partnerships with major international communications companies.

DECEMBER

Viettel Global is planning to launch operations in Nigeria. At its AGM earlier in 2017, the Vietnam military-owned telco said investments in the country along with a new operation in Indonesia would create conditions for it to continue to grow its interests elsewhere. It is aiming to begin in 1Q18. Viettel reported a 21 per cent YoY decline in revenues last year, with its networks in Mozambique and Burundi particularly suffering due to forex issues. But it did see earnings growth in Tanzania, Cameroon and Mozambique.

In early 2017, **Intracom Telecom** announced that it had successfully completed a live field trial of its point-to-multipoint (PtMP) *StreetNode* platform (*pictured left*) in South Africa.

The trial took place in Johannesburg late last year, and according to Greece-based Intracom, the aim was to evaluate *StreetNode*'s "unique capabilities to provide the most advanced high-quality and high-availability services to MTN's enterprise customers".

The platform was tested in both a lab environment and external network. Software-defined operation allowed activation and reconfiguration in the field in PtMP mode, demonstrating what Intracom described as "unparalleled flexibility".

StreetNode is based on a self-organising network. According to the firm, while traditional PtMP technology only allows homing to a single base station, the trial with MTN successfully proved that its platform automatically reconnects to alternative base stations in the event of the primary site failing, thus rapidly re-establishing connectivity for subscribers.

It added that the trial also confirmed that non-technical telecom engineers could install and commission the *StreetNode* unit quickly and easily, even at night, thanks to what's described as a unique auto-alignment feature.

Intelsat introduced a managed services platform to help mobile operators provide 2G services for remote populations throughout sub-Saharan Africa.

IntelsatOne Mobile Reach Solar 2G is a turnkey package that includes all satellite, cellular and power components. It integrates satellite services from Intelsat's globalised network, a backhaul terminal solution and network deployment expertise from Switzerland-based BCom, as well as Newtec's *Dialog* equipment The service was initially available in sub-Saharan Africa with the claim that it can be rapidly deployed and easily scaled to serve populations of all sizes. BCom said that it was designed to fit each community with basic 2G GSM services and cover a larger area or population based on a "pay-as-you-grow" model.

According to Intelsat, now that smaller and more portable kits can be used with its *EpicNG* high throughput satellite platform, connecting remote and rural communities will become "easier and more cost-effective".

Regulating the networks

The **Independent Communications Authority of South Africa** (ICASA) published the findings of its review of the 2014 Call Termination Regulations (CTRs). At the start of 2017, the regulator announced that it would now conduct a review of the pro-competitive conditions imposed as part of the CTRs. These were originally proposed in October 2013 and finalised in September 2016 after protracted wrangling between ICASA and local mobile operators.

The regulations included provisions for asymmetrical symmetric pricing of call termination rates to address differences in economies of scale between operators. This would allow smaller MNOs (such as Cell C and Telkom) with less than 20 per cent share of the total minutes billed in either the fixed or mobile market, to charge up to 40 per cent more than the reciprocal rate. It is on a three-year glide path from ZAR0.20 to ZAR0.10 for mobiles, and ZAR0.12 for fixed calls within a calling area and ZAR0.19 for calls terminated outside the area.

In essence, the 2014 CTRs meant that market leaders Vodacom and MTN pay their smaller rivals more to terminate calls on their networks. ICASA said that after "careful consideration" of all submissions from the industry, it would not change the definitions of mobile termination and fixed termination markets in terms of regulation 3 of the 2014 CTRs, with the exception of the exclusion of termination of internationally originated voice calls. It said competition in the relevant markets was still "ineffective", and that all network service licensees that offer wholesale voice call termination services continue to have "significant market power" in their own networks for wholesale voice call termination

ICASA added that pro-competitive conditions imposed in 2014 remained relevant, but following concerns it extended the current glide path for 12 months and outlined the consultative approach and timeframes to determine new termination rates. Smaller operators have therefore been given five years from 2014 to grow their market share to 10 per cent of call minutes terminated. Once their share hits the threshold, they will have to charge the reciprocal rate.

Separately in early February, ICASA announced that it would be updating its National Radio Frequency Plan (NRFP) to ensure efficient spectrum use. The regulator said it wanted to ensure that the NRFP was in line with the latest version of the International Telecommunications Radio Regulations, and reflects the final agreements reached at the World Radio Conference (WRC) in 2015.

WRC-15 addressed more than 40 topics related to frequency allocation and sharing for the efficient use of spectrum and orbital resources. Among some of the key decisions taken, delegates agreed on the provision of enhanced capacity for mobile broadband in the 694-790MHz band in ITU Region-1 which comprises Africa, Europe, the Middle East and Central Asia.

Joe Barrett, President, GSA

The year ahead: According to GSA expectations, 2018 will be a major growth year for LTE in Africa. We expect a 40 per cent rise in the number of LTE commercial networks launched, taking the regional figure to 140+.

More than 50 per cent of these networks should be LTE-A as MNOs deploy carrier aggregation to increase download speeds. Also look out for more operators to follow South Africa's Vodacom in deploying 256QAM and 4x4 MIMO to deliver Gigabit LTE and a faster network for customers.

According to Ovum data, the number of new 3G subscriptions added in Africa per quarter over the past three years has remained fairly consistent at around 18-19 million. However, as LTE networks reach a critical mass in 2018, GSA expects the number of new 3G WCDMA subscriptions in Africa to slow down, following the global trend away from 2G and 3G subscriptions.

The take up of VoLTE will also increase from less than 10 operators deploying the technology at the end of 2017 to more than 30 by the end of 2018. This is in line with the predictions on VoLTE growth in Ericsson's ***Mobility*** report that suggests a doubling of VoLTE subscribers in 2018. There were more than 700 new LTE devices supporting VoLTE launched in 2017 most of which are suitable for Africa.

The dramatic upswing in LTE services in Africa in 2017 will continue with industry research showing an increase in the number of MVNOs and smaller operators introducing LTE roaming services in the region.

As more LTE networks are deployed across Africa, especially in those countries with no LTE networks yet, and the regional workforce becomes more globalised, we expect to see African companies become more relevant and competitive.

Growth in data usage, smartphones and new mobile broadband coverage will all bring positive aspects to the people of Africa and will lead to a few more 5G trials towards the end of 2018 and into 2019.

ICASA also said an update was necessary to ensure that the NRFP is consistent with SADC's latest frequency allocation plan. This aims to integrate and harmonise spectrum across the community, and was endorsed by its 15 member states in October 2016.

The **Rwanda Utilities Regulatory Authority** (RURA) imposed administrative sanctions on MTN Rwanda for what it said was non-compliance with its license obligations.

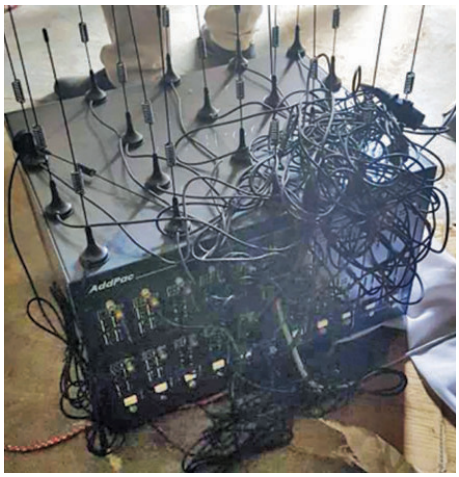
In a statement released in May, the regulator said MTN Rwanda provided services that contravened the directives that were previously issued to it in 2011. These concerned a regional IT shared services initiative where MTN Rwanda was part of the MTN South and East Africa IT hub based in Uganda. At the time, RURA instructed MTN Rwanda to exclude itself from the arrangement and said failure to do so would be considered a "serious breach" of its license obligations. Despite the directives, RURA said MTN implemented an interim phase for the hub from September 2012, and then fully "operationalised" its IT services management in Uganda in October 2014.

During a regulatory board hearing on 12 May 2017, MTN admitted the breach. As a result, the operator faced an administrative fine totalling RWF7.03bn (USD8.5m). This breaks down as a daily administrative fine of RWF5,000,000 from 26 October 2014 to 27 June 2016, and a daily fine of RWF15,000,000 from 28 June 2016 to 20 March 2017.

Following the announcement of the penalty, MTN released a press statement acknowledging receipt of the notification, and said that it had been in discussions with RURA about the issue since earlier this year. It added: "MTN Rwanda is currently studying the official notification and will continue to engage with the regulator on this matter."

In mid-October, Congolese regulator **ARPCE** (**Agence de Régulation des Postes et des Communications Electroniques**) announced that its technical teams had dismantled an illegal mobile network in Pointe-Noire, the country's economic capital. Working closely with the police, they discovered a SIM box with a capacity for 80 cards, 16 pre-activated Airtel SIMs, recharge cards worth nearly CDF50,000 (around USD32), and an electric generator. Police arrested two people who had been operating the network for some time from a wooden hut.

This latest dismantling came just a few weeks after another fraudulent network was found in Brazzaville. ARPCE said this kind of fraud causes MNOs to lose profits which amount to millions of francs. Speaking at the time, director of networks and electronic communications services Sandé Ndé, said: "One minute of international calling amounts to 170 francs, and sometimes these fraudsters total up to thousands of minutes of calling."



In Congo, ARPCE's technical teams and police found a SIM box with capacity for 80 cards.

Augustin Ngoma, head of the ARPCE departmental antenna in Pointe-Noire, also pointed out that the lack of verifying a customer's identity before he or she is sold a SIM is a major contributor to mobile fraud. "We recovered 16 activated but unidentified SIM cards from these fraudsters. They were smart enough because they bought all of these from street vendors. Otherwise, they would have been apprehended long before."

Ngoma added that as from the beginning of 2018, no SIMs will be sold by street vendors in Congo. Instead, they will have to be purchased through resellers authorised by the operators.

The quality of services provided by Benin's mobile operators is "deteriorating day by day", according to the country's regulator. In early September, **ARCEP** (**Authority for the Regulation of Electronic Communications and the Post office**) met with Glo Mobile, MOOV and MTN to discuss the reasons for the "general degradation" of the quality of service found in their networks. It said that the aim of the meeting was to find the appropriate solutions to satisfy subscribers' expectations.

ARCEP said that the blocking rate as well as the rate of call termination was "abnormally high" across all networks.

The three operators acknowledged that their service quality had deteriorated, but said a number of factors were to blame. Among other things, these included: the need for network optimisation; the on-availability of energy commercialisation; the sizing of chain cores at the level of their networks; greater network security to combat SIM box fraud; and the extension of networks to ensure complete nationwide coverage.

ARCEP's regulatory board president Flavien Bachabi said the problems listed by the operators did not exempt them from the quality of service they are obliged to provide to consumers. He added that while the operators had already been sanctioned for their poor services, such penalties were not the ultimate target. "The aim is the quality of service for all consumers. For the state, what is important is not the taxes levied on operators, but to ensure operators contribute effectively to the development of the country," said Bachabi.

Zambia plans to issue new network licenses following revised telecom laws approved earlier in 2017 to enable more voice service providers in the country.

In an RFP published in late September, the **Zambia Information and Communications Technology Authority** (ZICTA) invited applications for international network and national service licenses. It said that the international network license will authorise the holder to install and commission gateway facilities such as an Earth station, VSAT/hub, switching centres, nodes and servers. Meanwhile, the national service licensee will be permitted to provide services such as voice, messaging, internet, VoIP, VAS, tracking, amongst others.

Mobile spectrum will be available in: 900MHz (8MHz, FDD); 1800MHz (10MHz, FDD; 2600MHz (30MHz, TDD); and 2300MHz (30MHz TDD). Fixed service spectrum will be in 5GHz, lower 6GHz, 11GHz and 18GHz.

The deadline for application submissions was November 2017, while spectrum prices were calculated in ZICTA's revised Statutory Instruments document issued in June (SI 48).

The move finally paved the way for a fourth mobile operator in Zambia. In 2009, the government restricted the number of mobile voice operators in the country in order to help grow the existing companies – MTN, Airtel and Zamtel. Mobile Broadband Zambia (Vodafone Zambia) entered the market in 2016 but only as a data service provider. According to figures from GSMA Intelligence, as of February 2018 Zambia has 12.1 million connections and a population of 16.5 million people, meaning SIM penetration of 74 per cent,

In September, Zambian communications minister Brian Mushimba reportedly told parliament that the country now needed to get rid of restrictive laws to attract investors and create more jobs. He said a new operator could be in place over the next six to 12 months and that there may even be room for a fifth. ■

Communications minister Brian Mushimba said Zambia needed to attract investors and create more jobs.

Yves Bellego, Director, network strategy, Orange Group

Orange's African networks are evolving significantly along a number of different paths, as Yves Bellego explains.

"The mobile deployment continues, and we opened commercial 4G services in four new countries: Cameroon, Egypt, Madagascar and Mali.

"Fixed networks are also being deployed, and we started FTTH services in Senegal and Mali. This is just the beginning – the areas covered by the FTTH network remain limited but it is an indication of a general trend: there is a market in these countries for these technologies and these services. We also further developed our FTTH networks in Jordan and Morocco.

"We also developed network automation and centralisation of network operations, with the aim of improving the quality of our networks and to enhance customer experience. Network automation was developed with the use of C-SON (centralised self-organising networks) that automates the optimisation of the radio network. Centralisation of network operations, with the setting up of a multi-country NOC, is a way to make the best use of our experts and their skills. With these actions, we improved the quality of the network while, at the same time, the complexity of our networks increased with the deployment of new technologies (4G, IP, fibre)."

The deployment of 4G is resulting in a general shift of focus from voice and messaging towards data, and Bellego said this has meant that Orange has to rethink its commercial offers in order to get the markets "accustomed" to a new balance in value.

"It also requires us to redesign our networks. With the deployment of 4G, data traffic grows considerably, and the entire network – from base stations to international connectivity – needs to be upgraded. We anticipated this some years ago so we increased international connectivity, laying down submarine cables and terrestrial international backbones. As a result, Orange has today the largest terrestrial transmission network (national and multi-country) measuring some 20,000km."

This should certainly help the company in addressing one of the biggest challenges that Bellego, in line with all his peers in the industry, identifies for Africa. "We have to expand coverage, both mobile and fixed, in a cost-effective way. There is still a significant part of the population that does not have access to connectivity or to broadband, or does not have the financial resources to do so.

"We have tested various solutions to expand coverage in a cost effective way, using satellites, balloons, and low cost radio sites with wooden poles. In recent years, we have also deployed solar powered radio sites, which cost a bit more in terms of initial investment but bring significant savings over time.

"We have also worked with our suppliers in order to enable the introduction of low cost 4G devices to the market, and tested different models of sharing towers or outsourcing parts of the operations. However, bridging the digital divide remains a challenge that will keep us busy for the coming months and beyond.

"We will continue to work to improve connectivity, deploy broadband access, and to put affordable devices on the market. These are enablers for the development of services. I expect that in the coming months and years we will see the demand for services continue to boom, especially around content and services that are designed, developed and hosted in Africa for the African market."

Thibaud Rerolle, Director technology, Safaricom

According to Thibaud Rerolle, Safaricom's mission is to add value to its customers' lives in Kenya. He said that it is always a key highlight for the company whenever it reaches more customers with services and, in the process, bring the "transformative power of technology" to even more people.

"Backed by an increase in capital expenditure, we progressed with our network expansion in 2017 to not only provide additional geographical and population coverage, but also to meet the growing needs of our customers. This saw an additional 2.9 million customers choose Safaricom as their preferred network between September 2016 and September 2017.

"Our network grew to more than 4,800 sites, up from 4,000 the previous year. Notable was our 4G footprint which more than doubled from 635 sites to 1,450 sites, underlining growing data consumption in 2017.

"From a customer base of 29.5 million customers, we saw a 13.5 per cent year-on-year growth in data subscribers to 16.9 million. Data usage per customer per month grew a tremendous 65 per cent to stand at 382 megabytes reflecting increasing maturity in the mobile application space."

As a testament to what Rerolle described as the "growing strength" of Safaricom's network, global network speed test specialist Ookla recognised the operator as running Kenya's fastest mobile network for July to September 2017, with average download speeds of 21.25Mbps and average uploads of 9.67Mbps [Kenya's other cellcos include Airtel, Faiba and Telkom]. And in its *State of the Internet* report published in May 2017, Akamai ranked the country as having the third fastest average internet speeds in the Middle East and Africa. This placed the country ahead of Egypt and South Africa, and even Australia on a global level. [Qatar and Israel were ranked first and second respectively for the MEA region.]

"The growth in data demand is reflected in the expansion of our *Fibre to the Home* network, which at the end of 2017 reached more than 100,000 homes. We see that our customers are leading increasingly digital lifestyles and taking up smart homes, resulting in the need for fixed, always-on connectivity."

Rerolle continued by saying that increasing smartphone uptake amongst the customer base has also made it necessary for Safaricom to adapt its products and services to remain relevant in a new digital era. "We introduced a number of new innovations around *M-PESA*, starting with the launch of a smartphone application in March 2017. This app has vastly improved the *M-PESA* user experience and, in the process, increased the accuracy of transactions. It also allows us to take advantage of smartphone capabilities to introduce new *M-PESA* features such as scan-to-pay, which we are currently rolling out.

"In October, we launched *Masoko*, a vendor-agnostic platform that seeks to connect merchants and customers in Kenya. *Masoko* allows businesses to take advantage of e-commerce capabilities to reach customers anywhere in the country. More importantly, it saves merchants the need to invest in the technology, logistics, payment solutions and marketing that are required with e-commerce.

"*Masoko* provides the freedom and choice for our customers to access a variety of products and merchants from anywhere in the country. The platform further seeks to cater to emerging customer demands as more Kenyans access the internet through smart devices."

According to Rerolle, four factors have underpinned the evolution of the Kenyan communication market: growing uptake of mobile services by both private and public enterprises; deployment of new LTE networks and LTE technologies; increasing adoption of mobile payments; and increasing deployment of services and network infrastructure in the cloud.

"Evidence of growing uptake of mobile services in the enterprise is best brought out by the more than 1,670 buildings that are now connected to our *Fibre to the Enterprise* network.

"Growing cloud uptake is being driven by deployment of new services and the network on cloud-based infrastructure, providing customers and service providers with greater flexibility and resilience. The launch of *Masoko* marked one of most successful cloud use cases in the year.

"In Kenya as well as across the continent, we continued to see the deployment of new LTE networks. At Safaricom, we deployed an advanced carrier aggregation network, enabling customers with 4G+ devices to enjoy speeds of up to 300Mbps.

"Increasing adoption of mobile payments can be seen through changing customer trends, with the number of *M-PESA* deposits and withdrawals now falling below 75 per cent of transactions. Customers now want to make payments, access instant loans or affordable healthcare though new innovations such as *M-TIBA*."

Launched at the end of 2015, *M-TIBA* enables users to save and pay for healthcare services using their phones. By June 2017, the platform reportedly had more than 920,000 registered users, 450 connected healthcare providers, and generated more than KES140m in health insurance bills.

When asked what obstacles Safaricom expects to face in carrying out its mission over 2018, Rerolle said: "In the last 17 years, we have expanded our network to reach over 95 per cent of the population and 3G/4G broadband coverage to reach more than 85 per cent of the population. While it has never been more important to reach the remaining five per cent, the difficulty of doing so presents a number of challenges.

"Most of the underserved live in remote, geographically sparse areas with little other infrastructure. It is therefore necessary that mobile operators, regulators and vendors work on innovative ways to bridge this gap, especially around the design costs of infrastructure that can reach such underserved areas.

"Another emerging challenge is cyber security. Our networks form the basis on which customers run their day-to-day lives making any disruptions or infiltrations quite costly. An increasingly sophisticated digital threat-space therefore calls for more proactivity from communication providers, including increased investment in skills and tools to secure customer information. In a related matter, we have also seen insecurity incidences across the continent begin to spill over into the telecommunication sector as communication infrastructure increasingly comes under attack."

In terms of the Safaricom's hopes and plans for the continent over the year, Rerolle expects the popularity of data-rich applications to continue to grow amongst the customer base, driven especially by increasing consumption of video on social media and the emergence of entertainment applications such as *ShowMax* and *Netflix*. To support this data explosion, he said that the operator plans to further expand its fibre network, connecting more base stations to fibre and reaching more homes.

He also said that since the *M-PESA* platform launched in 2007, it has been upgraded twice, the second of which was carried out in August 2017. "This upgrade will enable us to gradually deploy new features and innovations to our customers in coming months. Many of these features are geared towards enhancing the experience of our customers. So for example in 2017, we reduced the number of steps it takes to make payments and introduced a number of enhancements for visually impaired customers. Subscribers can expect to experience more new features in the coming 12 months."

Tarig Hamza Zain El Abdein, CEO, Sudatel Telecom Group

In October 2017, the US Government announced that it had lifted the wide-ranging economic, trade, and financial sanctions against Sudan that had been imposed in 1997. Tarig Hamza Zain El Abdein, CEO of Sudan's incumbent telecoms operator, was quick off the mark in initiating the first US trade mission organised in conjunction with the Corporate Council on Africa (the CCA is a US business association focused solely on connecting business interests in Africa). Alongside most Sudanese, he hopes that overseas investment will result in economic growth across his country.

Sudatel provides both mobile and fixed (voice and data) services to businesses, residents and ISPs across North and West Africa, in addition to the provision of wholesale services to international carriers. Its best-known brands are Expresso and Sudani. El Abdein said 2017 was another solid year for the company as it achieved positive financial performance despite tough industry and market climates. And given Sudan's geographic location, he believes Sudatel will continue to play a major strategic role in connecting Africa and the Middle East to the rest of the world.

A major highlight for the company last year was the completion in April of a new fibre route that spans 3,983km from Port Sudan on the east coast to N'Djamena, the capital of Chad. El Abdein claimed this link is the largest ever fibre project completed in Northern and Central Africa, and the first continuous fibre connection to countries in the Eastern, Western and Northern parts of the continent. The network was the result of a joint initiative that was led by Sudatel and included Sotel, Tigo and Airtel in Chad, as well as the Chadian and Sudanese governments.

El Abdein explained that the new fibre link is delivering low cost, high availability telecom services to Central African countries (Chad, Central Africa, Cameroon, DRC and others) by providing an eastern route to these countries and their people. He said it is also providing the lowest latency route for Asia to West Africa, as well as an alternative route for this region in the event of a problem with the cables that are on the coast.

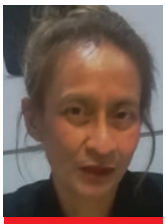
Furthermore, the network directly connects to the submarine cables on Africa's east coast, providing onward connectivity to Asia, the Middle East and Europe, as well as diverse routing for the Mediterranean crossing cables and Southern Cape (South Africa) route.

"This is a link that was long overdue as shown by the immediate usage" said El Abdein. "Traffic levels have been higher than expected with the route being used by every major operator in Northern Africa."

According to El Abdein, the network offers a "blueprint" for how operators across the region can work together to build a shared infrastructure. Work on the next phase of fibre expansion is already underway and has attracted other stakeholders, in particular operators from Cameroon and Nigeria which border Chad.

Another home-grown success story for Sudatel is a USD45m data centre that is a cornerstone in its transformation into a full ICT player. Said to be the first purpose-built facility in Northern Africa, the data centre opened in 2014 and covers some 14,000 square metres with four rooms that each have a capacity of 1,000 servers.

El Abdein added that Sudatel has always had a strong CSR programme for which it was awarded special recognition from the ITU during its conference in October in Buenos Aires. He concluded that the company remains "extremely optimistic" for 2018 with ambitious expansion and investment plans.



Rafiah Ibrahim, Head of Middle East & Africa, Ericsson

Nicolas Bixell, Head of West Africa, VP of sub-Saharan region, Ericsson

As has been well documented, it has been a tough time for Ericsson over the last few years. And for Rafiah Ibrahim and her regional team, the challenges are perhaps even greater given that she is responsible for a continent where the socio-political and economic hurdles that need to be overcome are notoriously huge.

Despite all that, Ibrahim appears cool-headed and confident, and has previously said that Ericsson's strategy refresh that it embarked upon earlier last year is beginning to pay off. Her view is that going through bad quarters is all very much part of corporate life, especially for large global organisations such as Ericsson that have been around for a long time now.

Her colleague Nicolas Bixell echoes this when asked about how the company is doing in Africa. "The key message is that Ericsson is in Africa and we are here to stay despite what you might read in the papers. 2017 was the turnaround year. All companies at one

point or another need to revise their strategy and execute it, and that is exactly what we are doing in Africa which is a key market for us."

Ibrahim explained that the company is almost going back to basics by renewing its focus on what it is good at: technology. Gone is Ericsson's emphasis on the 'Networked Society' approach, and in its place is a regional business that is all about securing technology leadership and consolidating the partnerships it has built-up with longstanding customers. That has meant less focus on offering, for example, managed services to smaller clients that have not been contributing to the top-line. These customers have been helped to migrate to other vendors.

Not to say that Ericsson is getting out of the managed services business which is still very much of the strategy going forward. Ibrahim mentioned the notion of the 'Ericsson Garage', innovation hubs that it is setting up to develop technologies in collaboration with its partners. In general, Ericsson's overall idea is to work with operators mainly on three areas which, as well as managed services, also include radio technology and core services. And, according to Bixell, it seems to be working.

"I can only speak about West Africa which for us is 24 countries from Senegal all the way down to Namibia and also Botswana, Madagascar and Mauritius because of their Francophone heritage. So for our customer unit, we have performed pretty well compared to the rest of the group because it is a more dynamic market. There is a lot of demand for data and mobile technologies in West Africa. We have 3G all over the place and some countries, like Angola, even have LTE-A. But many have not followed through and deployed 4G, as yet. So compared to the rest of the world we are behind in the evolution and rollout of the networks.

"But Africa is no different to anywhere else; 4G will come and it is being rolled out, and we are still in that growth phase. Plus, the operators are investing because they see the dynamics across the continent – the young population, many subscribers – and so all the big telco groups are present in the region."

Ibrahim would agree here, and where others see challenges she sees opportunities: "African GDP is growing and there is a young and upwardly mobile population who are demanding more digital services." She also cited Ericsson's latest *Mobility Report* which predicts that there will be 29 billion devices connected by 2022 of which 18 billion will be in the IoT. In order to reap the benefits of all this, operators therefore need to have the right technologies and services in place to help all their users, consumers and businesses alike. And that, for Ericsson, is opportunity knocking.

But of course, the Swedish company is not unique here. As Bixell said earlier, all the big telco groups are present in Africa, but so are all the players in network infrastructure and services. That makes for a highly competitive market. "We are competing on technology leadership, local presence, delivery and support. It is for the operator to make their choice whether they should do it on price or whether they should do it on the technology level, the local presence, or a mix, etc. I cannot comment on my competitors but I can tell you that they are all present and we're having a good fight!"

Bixell continued by saying that the operators understand only too well that the most important thing to have is strong network performance. "Ten years ago a friend showed he had downloaded a song on his phone and we were all amazed. Today, we can all download a song from an artist of choice, but it is too slow. So now, we all expect to be able to download content over the air interface but we want a perfect, seamless and superior customer service. That is what makes a subscriber stick to one operator. The operators have understood all that which is why they are investing in top-notch networks.

"Some have also asked the vendor to operate the network. We have the competence here, and can leverage our expertise globally from remote centres, etc., just so that the operators can focus on delivering a service and other value-added services."

For Bixell therefore, the "name of the game" is network quality. And he believes this also comes before price for subscribers who are prepared to pay a small premium for better network performance. "Smartphone penetration is rising and people are using *Facebook*, *Instagram*, etc., so they just want the network to function."

While admitting that he doesn't like the phrase, Bixell said Ericsson is basically a company of "plumbers", installing all the network and enabling "pipes" for the service provider. He is also keen to point out that the company is not coming up with technology for technology's sake, or launching solutions that then need to look for problems to solve.

"As I said, I don't like the word 'plumber', so we are thought leaders as well, right? We don't say 'here is something we have developed in our backyard, do something with it'. No. We are inventing the whole network and we are talking to the entire ecosystem, our customers first and foremost, but also other actors such as the car-makers, for example, when it comes to use cases for the IoT and 5G.

"So instead of inventing and then selling, we are working together [with industry partners] to see if it is all feasible in the first place. And because of the network development opportunities that we have, we actually enjoyed a very decent year on the business side in 2017. It is not because we are smarter, it is because the market is more dynamic and we have been responding to that."

Alisa Amupolo, CEO, PowerCom

PowerCom started life as Namibia's second mobile operator in 2007. Trading as Cell One, it was owned by Norwegian and local shareholders, Nampower, Old Mutual and Nammic. In 2009, the company was taken over by Orascom which later re-branded Cell One as 'Leo'. But just two years later, Orascom returned PowerCom to investors Investec and Ned Capital, resulting in Telecom Namibia acquiring the business in 2012 and subsequently integrating Leo into its operations in 2013. Leo is now known as TN Mobile.

PowerCom then acquired the tower infrastructure from its shareholder, and its business objectives changed from being a mobile operator to an ICT infrastructure and equipment provider, positioning it as the first MNO led towerco in the market.

Looking back over the last decade, Alisa Amupolo said it's clear that the acquisition was a success in terms of the asset-swapping and transactions that took place between the shareholder and subsidiary at an inter-company level. She said PowerCom's acquisition of Telecom Namibia's 198 towers boosted the company's balance sheet. In exchange, when Telecom Namibia acquired mobile equipment, PowerCom powered it to provide fixed mobile convergence, and fully integrated the kit into its operations.

"This has begun to pay dividends in the past year, ensuring that PowerCom is a key enabler in the growing Namibian telecoms industry and cementing our marketplace relevance in the years ahead. These have involved establishing foundations for the future, in addition to establishing a new line of business and improving our existing tower portfolio," said Amupolo.

She continued by saying that the company's focus over the last year has been to continue the good work already underway in redefining its business model and rebuilding the brand within the marketplace. "Since the acquisition of the company by Telecom Namibia in 2013, we have worked to reposition the business as a dedicated infrastructure company. We have focused particularly on building capability to deliver bespoke and dedicated infrastructure to clients who want to gain a competitive edge in their own markets. This infrastructure also has the potential for on-boarding other clients, making it carrier neutral.

"We have seen capital expenditure in this current financial year and commissioned five new sites. We have also seen an increase in new deployments on our towers from new arrivals into the market such as MTN and MTC's *081* project.[3]

[3] See Year in Review, p24.

"We have also made a concerted effort over the last year in planning to decommission duplicated infrastructure, redeploying to areas without coverage. This has aided the commitment by the Ministry of ICT to initiate 100 per cent network coverage across Namibia.

"The core of PowerCom's value proposition is that we serve as a hub of connectivity. We are at the very beginning of the value chain with connectivity for industries, starting from our infrastructure and our services.

"We power telecoms operators, allowing them to connect with their end users via various communication solutions including 2G, 3G, 4G and 4.5G. Our infrastructure also empowers broadcasters such as NBC and One Africa Television as well as radio services nationwide, whilst impacting other non-mainstream industries. For example, aviation companies are on-boarding our towers to monitor aircraft, and national rail companies are utilising our infrastructure for two-way communication between trains. We also cater to security companies. PowerCom's value lies in an ability to diversify the communications solutions that it can supply to the Namibian market.

"The wireless communications industry is consistently changing and evolving. Over the last 12 months, more players have entered the marketplace and the regulator has issued numerous licenses to broadcasters and telecoms companies. Demand has increased across the board, including the demands made of us.

"Technological advances necessarily have an impact on our services, and it's important that we're equipped to deal with these advances. This readiness can be found, for example, in our preparation of our sites and our teams to for 5G deployment. There are also interesting developments taking place in the field of radio, with a merger between One Africa Television and 99FM which will influence the broadcaster landscape in the future. PowerCom is committed to remaining ahead of the curve and serving existing and new clients in innovative ways."

According to Amupolo, there are several key challenges facing the telecoms industry in Namibia over the course of this year, and some facing PowerCom specifically.

"The national picture is shaped by the necessity to realise the 100 per cent coverage mandated by the Ministry of ICT. PowerCom must ensure that its sites are ready, including ensuring they have effective capability and the load capacity to accommodate multiple tenants.

"It is also vital that our sites are well maintained. Acquisition of assets necessarily results in towers and other infrastructure being obtained with patchy maintenance histories, and this is something that PowerCom continues to address. Doing so is important not only in terms of ensuring durability and load capability, but also as a foundation for increasing our client base.

"The PowerCom five-year plan includes strategic endeavours that we must continue to work towards. We are committed to improving our skilled and dynamic workforce, along with building relationships with partners in the vertical markets such as properties and municipalities. Such relationships will improve our lead time on roll out.

"There is also scope for technical partnerships to help improve our internal capacity on design, deployment and maintenance. Similarly, we are in discussions with various investment partners who can add value to our portfolio and improve our abilities within the marketplace.

"Our technical capabilities and our skilled workforce are the core drivers behind our brand. We also recognise the importance of a conducive environment from a regulatory and policy perspective. There is a definite domino effect available: growth will initiate further investment into existing infrastructure and assets, this then attracts more skills and improves our value to GDP as well as the economy more generally.

"Quality is key to reach these levels, and we strive towards that in all our projects and internal capacity development. As a recipient of a regulatory license, we are a company operating within parameters in terms of service and pricing, ensuring that we have accountability to our clients and the wider public."

Over 2018, PowerCom plans further capital expenditure to cover new projects and new towers, and improve infrastructure and connectivity for its clients. Amupolo said the company will also roll out smart technologies, including lamp poles, making it part of the smart city revolution.

"Our intention is to diversify into areas beyond passive infrastructure and tap into active infrastructure in continuing to be at the heart of connectivity across the continent.

"PowerCom is of increasing relevance in the booming Namibian telecoms industry, yet we have so much more potential. We'll continue to serve as a one-service and central point for all infrastructure demands and requirements in the market while looking at exploring other shared models such as data centres and fibre opportunities.

"We are even examining the prospect of providing energy solutions around our sites as a value addition and upgrading our security to incorporate world-class technology, allowing remote site monitoring, tracking access and improved reporting and business intelligence.

"PowerCom plans to evolve with the market, giving clients the stability to use our infrastructure and value-added services to improve their own competitive edge. It's an exciting time to be involved in the African telecoms industry, and we relish the changes that the future will bring to our sector."

Lux Maharaj, Sales director for Southern Africa, Parallel Wireless

Lux Maharaj was appointed as Parallel Wireless' sales director for Southern Africa in December 2017. This followed a career with Intracom Telecom[4] where he led the company's exponential growth in Africa for the past three years.

Maharaj has been focused on assisting operators and ISPs realise growing revenue streams from African corporate and enterprise markets. As a professional electrical engineer with more than 20 years in the telecoms industry, he has held positions at Ericsson, Alcatel-Lucent, and various system integrators working with mobile and fixed operators on the continent.

Headquartered in the US, Parallel Wireless has African sales offices in Ghana and South Africa, as well as active deployments in Ghana, DRC, Senegal, South Africa, Gambia, Nigeria and Tunisia. In his new role, Maharaj said his personal goal is to assist the region's governments realise their universal service obligation of bringing cost-effective connectivity to every person – even in the most remote and underserved rural areas.

"We hope to make some of these engagements public soon. Africa is a significant market for us, and we firmly believe our products and solutions are ideally suited to enable service providers to provide services at affordable rates to their subscribers, while at the same time ensuring profitability for themselves."

According to Maharaj, Parallel Wireless' products are based on what he describes as a "unique approach" of rethinking the way a cellular network is designed. "We adopt a total solution-based approach for 2G, 3G, 4G and 5G in the future, which helps us to empower telcos to better address the challenges of costly and complex install and maintenance.

"Mobile telephony is changing Africa for better. Once called the 'Dark Continent', the mobile revolution has illuminated the possibilities of economic prosperity in Africa. According to the GSMA's *Mobile Economy Africa Report 2016*, mobile technologies and services generated 6.7 per cent of GDP or USD150 billion in 2015, and this is further likely to increase to 7.6 per cent or USD210 billion, by 2020 as mobile services increase productivity.

"The launch of several new mobile broadband networks recently is a key driver of this trend. The ever-increasing demand for internet services coupled with a drop in the prices of devices is further fuelling this growth. Not surprisingly, mobile has emerged as a platform of choice for

[4] See The African Wireless Communications Yearbook 2017, p56.

consuming innovative digital solutions and services in Africa. The expansion of advanced mobile infrastructure in the region is also inspiring local and global innovators and tech entrepreneurs to come up with mobile-based solutions. It is no coincidence that Africa Internet Group or Jumi, the continent's only 'unicorn' (a private company with more than USD1 billion revenue), leverages internet technology."

Maharaj believes Africa poses varied and unique challenges for service providers, the first being severe lack of basic infrastructure in most countries. "Persistent and long power outages hamper service providers from offering more comprehensive coverage and seamless services. In the absence of continuous power supply, telecom operators fall back on the use of generators which significantly increases their operational costs.

"Being mostly an underdeveloped region, ARPU in Africa is lower compared to other markets. Operations at such low ARPU are difficult to sustain given that the cost of setting up and maintaining networks is very high. And increasing the tariff beyond a limit is not an option for the service provider as the subscriber's spending capacity remains limited – the GSMA report quoted earlier suggests that countries in Africa have among the highest total cost of mobile ownership as a proportion of income, particularly for those at the bottom of the income pyramid.

"Mobile operators in Africa need to come out with new strategies to arrest the falls in fortune. Copying network strategy which worked in developed markets may not work here. So they will have to leverage technological solutions and breakthroughs to offer services at affordable prices for the majority of the population.

"They can do so by using innovative technologies to cut cost. [For instance], cloud computing and automation provide immediate solutions to keep costs lower. Cloud allows service providers to use the basic infrastructure of a third party to offer their services without having to spend a fortune to begin operations.

"Small form-factor solutions, which are easy-to-install and support many technologies on the same platform, can further bring the cost down for service providers.

"However, unless these countries provide the infrastructure, there is limited scope for innovations. If governments cannot deliver these infrastructures on their own, they must allow new players into the market who may come up with their own support, like optic fibre, and rent it to existing players.

"The same can be done to address the power outage issue. New and alternate power solutions like solar and wind energy may help tackle this problem in many areas."

Maharaj concluded by saying Parallel Wireless' "radically different approach" includes products that are easier to deploy and designed to significantly bring down the expense of network deployment and maintenance. "In keeping with the challenges identified above, our products usually have a small form factor and try to maximise the use of available resources. We extensively use automation and software as much as possible to ensure simplification and ease of deployment of our products."

Mohamed Abdelrehim, MEA head for end to end sales & solutions, Nokia

"2017 was a busy year for Nokia in Africa. As mobile subscriber penetration continues to grow, operators are moving swiftly to roll out 4G technology. The emergence of the IoT and a keen interest in 5G are key drivers for our business going forward and this has been evident in the several new deployments we announced last year."

Abdelrehim said that these deployments included implementing *Customer Experience Management* (*CEM*) solutions to fuel MTN's transformation to subscriber-centric operations, increase efficiencies, optimise services and deliver a "superior" customer experience. Nokia also implemented and carried out a commercial LTE launch for Vodacom Tanzania. Abdelrehim claimed this has enabled the operator to deliver "world-class" mobile broadband services to subscribers.

"We also signed an MoU with Vodacom to jointly conduct lab and network trials of new services and business cases using Nokia 5G technology in South Africa. And in Rwanda, we deployed smart city systems for the government to enable the delivery of public-safety, waste-management, utility and healthcare services [see page 52].

"Nokia also continues to invest significantly in skills development in the region by supporting and participating in various initiatives. One such example was *CodeBus Africa*, a 100-day tour connecting Finnish and African innovators as part of Finland's official 100th-anniversary celebrations. The *CodeBus Africa* journey covered ten countries in total – Ethiopia, Ghana, Kenya, Mozambique, Namibia, Nigeria, South Africa, Tanzania, Uganda, and Zambia. At every stop, the team – in collaboration with Aalto University, the Finnish Embassy and several African tech hubs, schools and private companies – taught music coding and creativity to local young people, especially girls.

"Another initiative Nokia has been involved in on a global scale is *Green Light for Girls*. Here, girls aged 11 to 15 from schools in less advantaged communities are engaged and exposed to hands-on science and technology workshops and activities.

"Nokia also presented cost-effective solutions for rural connectivity using GSM. Our end-to-end portfolio includes Single RAN Advanced radio products, as well as solutions for sites, backhaul, power and energy. Basic connectivity solutions based on 2G can be upgraded to 3G and LTE when demand grows."

Abdelrehim said overall subscriber penetration is still growing in Africa, especially on the mobile side. "According to the GSMA, penetration in sub-Saharan Africa is forecast to grow from 44 per cent in 2016 to 50 per cent by 2020. We are also seeing a much faster adoption of smartphones in sub-Saharan Africa, with the GSMA predicting numbers to grow from 28 per cent in 2016 to 55 per cent by 2020.

"Access to the internet continues to be predominantly over mobile on the continent and this is where we are seeing an acceleration of 4G deployment overall. To put that into perspective, according to the GSMA, LTE was only two per cent of subscriber rates in 2016. But by 2020, this number is anticipated to grow to 12 per cent So we see a stronger acceleration of LTE with the network being deployed as we speak. Nokia is currently involved in several LTE network rollouts with the large operators on the continent."

Having said that, Abdelrehim pointed out that 3G is still the predominant technology in the region, and that 2G has yet to totally disappear and will remain strong for years to come.

But in the meantime, he said the next wave of technology is also emerging, particularly in South Africa, where Nokia announced one of the first G-Fast deployments with Telkom in 2016. "This shows that fixed technology remains very important to Nokia in South Africa, and we are seeing some growth in terms of FTTx technology in some parts of Africa. So, I would say that the future still isn't truly mobile.

"The IoT is also emerging on the continent. While it is still very nascent in Africa, some operators here have already made an announcement around deploying networks that will enable narrowband IoT technologies. These are optimised in terms of battery life and coverage for IoT. That is something very specific to emerging markets like Africa, where the use cases may not be the same as in more mature markets."

On the subject of unique challenges for emerging markets, what will the continent need to watch out for over the course of 2018? Abdelrehim said that despite the price of smartphones dropping, there is still a cost barrier to putting such a device into everybody's hands.

"While the industry is bringing economy of scale, we still see an economic barrier. Although the United Nations provides a guideline that the most affordable data packaging pricing should stand at around four to five per cent of monthly GDP per user, the economics and the need for operators to

monetise their networks means that overall mobile data and smartphone prices are still a bit too high. This has created an affordability barrier that must be overcome in Africa.

"The region can also be subject to political instability. Telecoms is a very capex intensive industry, particularly in this part of the world, and companies require access to financing and are sensitive to exchange rate fluctuations. In certain parts of the continent, that also creates export challenges for operators, making it difficult to get access to financing in order to fund the necessary investment to monetise their infrastructure.

"The industry also relies on a very scarce resource: spectrum. It is critical for the regulatory framework to enable and drive the adoption of mobile broadband by making spectrum available. By this, we mean the spectrum that is relevant for the technology requirement, that the process of assigning is fair, and that the operators have access to the same resources in a way that makes economic sense."

Challenges aside, what are Nokia's hopes and plans for Africa over the foreseeable future? Abdelrehim said two years have passed since Nokia purchased Alcatel-Lucent and that it is now reaping the benefits of what he claimed is a "truly end-to-end portfolio".

"Because of market changes and the keen interest being shown by the industry to move towards the adoption of 5G, this is the dawn of a very exciting era to see how fast we can bring this technology to Africa. Nokia has showcased a live 5G demonstration using commercial hardware and use cases such as our virtual reality camera at AfricaCom and at CairoICT.

"We have an ambitious plan to shape the future by expanding the human possibilities of technology in Africa and connecting the unconnected, pushing the limits of performance to bring services to people instantly and effortlessly.

Mahmoud Oubraham, Regional director Africa, EXFO

EXFO specialises in network testing, analysing and monitoring, and says that 90 per cent of the world's top CSPs use its solutions. In February 2018, the company added Astellia's mobile network and subscriber analysis products to its portfolio following its acquisition of the France-based company in a EUR25.9m deal.

Mahmoud Oubraham said EXFO has been working in Africa since 2003, with major groups such as Orange, Veon, Airtel, as well as local operators leading their home market. "Our market share on passive probing is above 30 per cent and we have over 30 active customers. As the continent developed, the need to better understand the changes in the business model of our customers led us to look for an improved customer intimacy. To increase this, and understand deeply the changes the MNOs are experiencing in their business model, we opened an office in Casablanca in 2016, which followed one that we had opened in South Africa in 2012.

"We cover this diverse continent with a specific approach to major countries from Morocco, Algeria, Tunisia to Zimbabwe and Mozambique, all along through Ivory Coast, Nigeria, etc.

"We started working in Africa supporting our customers in their efforts to enhance the network quality and availability for their subscribers. We moved forward with the MNOs during the last half decade towards understanding subscribers' behaviour.

"More specifically during the last year, several mobile operators moved their internal organisations to put the subscriber at the heart of their strategy and processes. We supported them deploying CEM platforms, gathering different teams to work around the same platform with unique value outcomes for each. Technical KPIs

Moving Wireless Forward

Mobile Mark is a leading supplier of innovative, high performance antennas to wireless companies across the globe. We've been in the wireless industry for over 30 years and have our roots in the early Cellular trials. We have grown and evolved over the years, along with the industry.

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

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

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

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

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

Asset Tracking & RFID

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

MobileMark
antenna solutions

We are now looking for distributors throughout Africa

Commercial Fleet Management

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

Public Transit & Bus Management

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

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

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

In 2017, a fleet of more than 1,500 buses will have Mobile Mark Antennas installed in one of INIT`s current major projects for National Express, West Midlands, UK."

Remote Monitoring & Surveillance

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

Mining & Exploration

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

Smart Cities & Smart Highway

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

Let us know how we can help

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

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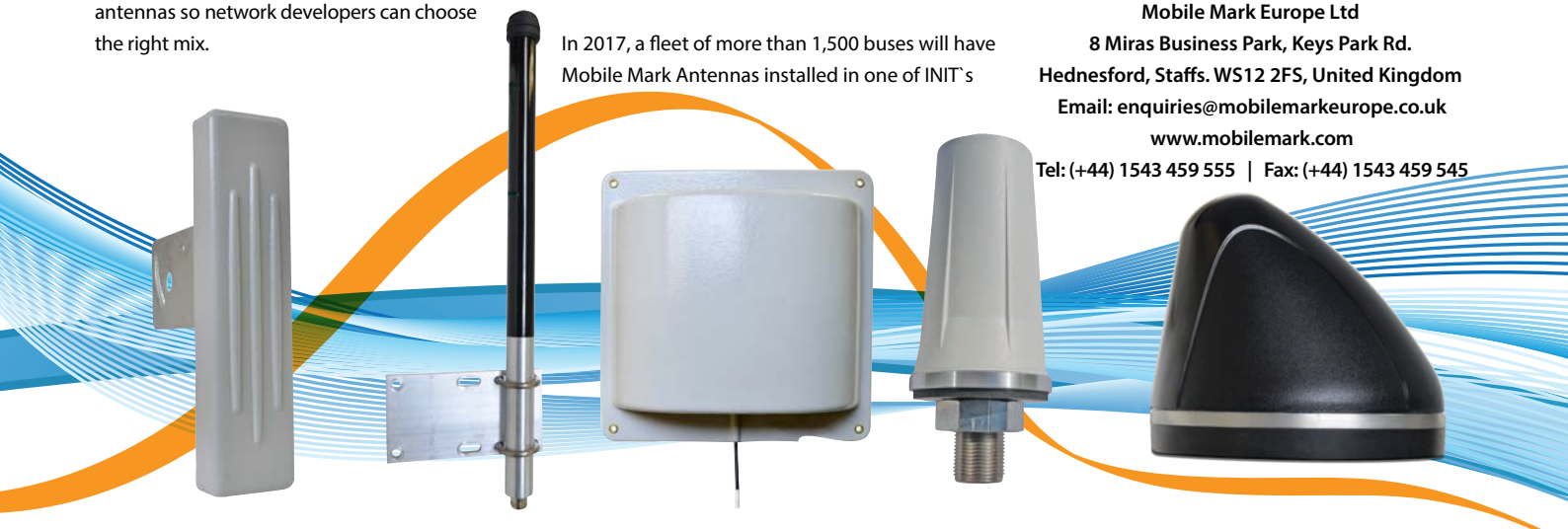

tend to be read through the subscriber experience prism. Some call centres have been equipped with a solution allowing the staff to know, in real-time, the activity and the nature of issues encountered by subscribers on the line.

"Following those efforts, the majority of MNOs are enhancing their network operations centre to create a service operations centre. That is specifically important for Africa. The operators do not have the luck to enjoy healthy ARPU, which leads them to be quite innovative in developing new revenue streams. These emerging streams are facilitated by the fact that the mobile connection, in most of African countries, is the unique communication link for subscribers. Creating innovative day-to-day subscriber services, like mobile money, knowledge sharing, logistics services, allows MNOs to be more relevant to their customers and generate new revenues."

Oubraham said the specific challenges African operators are encountering are related to the short term return on capex needed to offer services that remain highly relevant to the market. He said low ARPUs place great pressures on MNO budgets, and that the tight availability of cash coming from the market leads them to consider each project, even from the technical side of the network, as something that has to deliver a high impact on the business' KPIs.

"On the other hand, the mobile being at the heart of communications for each subscriber, gives a unique opportunity to the MNO to generate additional revenue through services which are highly relevant to, even though those services would have not been considered as naturally belonging to the telecoms industry in other parts of the world.

"For example in Zimbabwe, the biggest bank based on the number of individual subscribers is a mobile operator. And in some Western African countries (Senegal, Burkina Faso) the announcement of a birth could be done via a mobile app. These are simple examples of how mobile services are relevant to local market needs and have an impact on subscribers' daily lives."

What are EXFO's plans for the continent in the coming months, particularly now that it can also offer Astellia's products?

"Thanks to the Astellia acquisition, EXFO has the scale and differentiation to become a major player in the global service assurance market (passive and active). We are in a unique position to cover a large part of the MNO technical value chain.

"Fibre deployment is changing the game in Africa and we are very well positioned to support the efficiency and the quality of those projects. Moreover, our analytics capabilities around customer experience management, customer value management and services monitoring allow us to climb that value chain to make a unique impact on the business side of fibre.

In short, we can make the investments of our customers more efficient by showing them the right spots with the right coverage, enhance the quality of their network and services, decrease the churn by being more relevant to their subscribers based on their own usage, thereby allowing the MNO to develop new revenue streams.

"Continuously decreasing smartphone prices, the massive deployments of new mobile and wired technologies, together with the specific unanswered needs from the subscribers in their daily lives, all put the operators in the best position to profitably support the development of the whole continent. Here, the MNO can be the bank, the assurance company, the distribution network, the platform for e-health, e-education, etc. No other industry in Africa has the same access to the population and a better knowledge of behaviours, constraints and aspirations. It is a unique position for our industry across the globe.

Biren Sasmal, CEO, Subah

West Africa has seen a number of home-grown tech companies emerge over the past few years, such as fibre and data centre service provider MainOne and online retailer Jumia. The Subah Group classes itself among these players and currently ranks as the eleventh largest African tech firm by revenue according to figures from *The Financial Times' Equity Screener*.

For CEO Birendra Sasmal, an Indian ex-pat who has been based in Ghana for the past seven years, 2017 was both a personal and professional success. He was named international businessman of the year at the annual *Asian Achievers Awards* in recognition of his work in building Subah into a thriving IT, telecoms and manufacturing company with operations across West Africa.

Today, the company offers multiple services including local call, mobile and international gateway monitoring and rural telephony, and also operates an assembly plant in Accra. However, it is in the area of revenue assurance that the company is said to have really made its mark.

"Revenue assurance issues tend to be bracketed in the unglamorous category of network maintenance and expansion," said Sasmal. "However, with operator revenues continuing to be squeezed, minimising leakage is now high on the agenda of both CEOs and CTOs across Africa."

Subah has ongoing revenue assurance contracts from regulators in Equatorial Guinea and Sierra Leone as well as from the Government of Ghana. In particular, its SIM box anti-fraud system is credited with generating an extra USD1m in revenues every month for operators in Guinea with USD300,000 in extra taxes for the government. These financial rewards run alongside reductions in network congestion, improved QoS and greater transparency in cell planning and spectrum management issues.

In 2017, the company launched a number of new revenue assurance products in response to specific demand from existing and potential operator customers. It said that the most notable of these is the *Mobile Money Monitoring* suite of tools. These have been specifically developed to provide authorities with the full visibility they need to protect consumers against fraud and identity theft, and tackle tax evasion, money laundering and revenue leakage.

For Sasmal, the challenges for Africa's wireless industry are clear. Among the issues, he said most governments do not carry out periodic reviews of their national communications act and policies.

Sasmal also believes that national spectrum is not being managed effectively, and that there is not enough consideration of new technologies, innovations in spectrum management techniques, consumer demands for new services, and regional and international developments.

"Practices are mostly still based on early wireless and radio technology capabilities. In particular, evolving spectrum issues as a result of proliferation of wireless technologies are not being addressed There are few African representatives and experts in international telecommunication conventions and regulatory bodies which means that best practice is not being shared across the continent.

"Furthermore, varied legal, regulatory and tax frameworks in African nations make it more difficult to expand outside a home country. There is a lack of central coordination and resources to analyse and solve common problems, for example, interference between the wireless networks of neighbouring countries.

"Furthermore, unreliable power supply system across most regions as well as widespread theft of network equipment absorb time and money that operators should be using to expand their networks and services."

Sasmal is also particularly concerned by the lack of home-grown IT talent, citing Subah's ongoing difficulties in recruiting programmers and experienced project managers across West Africa. He added that the company has a pro-active CSR programme focused on education and training young people, and has established six ICT training and resource centres across Ghana with jobs and internships guaranteed to successful graduates.

Sasmal remains optimistic about the potential for growth in both his adopted home country as well as across West Africa: "In 2018, Subah will continue to invest in rural connectivity and work with governments to improve revenue assurance across the entire telecoms market. It will be expanding its operations to Mozambique, Nigeria and Tanzania." ■