AFRICAN
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YEARBOOK 2016

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From the publisher of
Northern African Wireless Communications and
Southern African Wireless Communications,
the continent's premier sources for the latest wireless
communications technology news, views and features.

Strength in numbers

Rahiel Nasir
Editorial director,
The African Wireless
Communications
Yearbook 2016

It has been a tumultuous year for wireless communications in Africa. We have seen MTN hit with a ludicrous multi-billion dollar fine by the Nigerian Communications Commission; the death of *AMOS-5*, Spacecom's African satellite; and much of the continent still languishing at the bottom of the ITU league tables when it comes to broadband penetration.

But things are picking up fast – quite literally.

Mobile broadband speeds are on the rise as 4G deployments continue to sprout across the continent (there's even talk of 4.5G in Namibia); next-generation satellites are on their way and promise affordable, high throughput; and even some of Africa's fibre systems have now been around long enough to warrant an upgrade (for example, WACS which saw the addition of multiple 100G wavelengths last year).

So from a technological perspective, there are solutions aplenty when it comes to connecting the continent. But then again, as I have been writing in this very column since 2006, millions of people in Africa do not remain unconnected for want of technological solutions. As regular readers know and as new ones will find out in the pages that follow, communication service providers can choose from a wide array of wireless and wired connectivity platforms when building out their networks.

There are of course many other challenges for communication service providers to overcome. These may be any combination of socio-political factors, as well as economic issues. And the global slump in oil prices has had far reaching repercussions beyond oil-based economies such as Angola and Nigeria. (At the time of writing in May 2016, a barrel of Brent Crude was around USD43 after bottoming out at USD27 in mid-January. Around this time last year it was still way below USD 100 at USD66.)

While all of those hurdles remain, what has become clearer over the last 12 months is that connecting Africa cannot be achieved by a single entity working in isolation. The word 'ecosystem' continues to crop up time and again during industry conversations, and companies who were and continue to be fierce competitors now find themselves in the strange situation of also being bedfellows.

Take rival MNOs such as Airtel, Millicom (Tigo), MTN, Orange and Vodafone/Vodacom, for example. While their individual daily battles to win and retain subscribers continue unabated, they all now have mobile money platforms that are 'interoperable' with that of their competitor's. In Tanzania for instance, *Tigo Pesa* users can seamlessly transact with users of *Airtel Money* and Vodacom's *M-PESA*.

Elsewhere, Liquid Telecom and MTN teamed up to offer what's said to be the largest wireless and fixed network footprint across Africa by accessing services on each other's networks; Eutelsat, Facebook and Spacecom have got together to offer broadband via satellite across the continent; while in Egypt, Orange (formerly Mobinil), Vodafone and Telecom Egypt are all working closely with each other to launch new mobile and fixed networks.

Partnerships have always been important in Africa. But over the last year, they seem to have taken on a greater significance as companies who are market competitors realise that bridging the digital divide requires the joint construction of, well, a bridge.

Individual companies can only go so far. But to take ubiquitous connectivity on the continent to the next level requires greater collaboration with all key players in an 'ecosystem'. As the old African proverb says: if you want to go fast, go alone. If you want to go far, go together.

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State of the market

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The challenges for African telcos

**Stefan Zehle,
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Mobile operators are the dominant force in African telecoms and most of the investment action focuses on the mobile sector. The march towards LTE mobile broadband is accelerating, and this is where most telecom investment in Africa is absorbed.

The GSMA notes that mobile broadband connections are set to increase to almost 60 per cent by the end of the decade, by which time the smartphone installed base will total over half a billion.

Although LTE is already deployed in many African countries and some have deployed LTE-A, governments are gearing up to auction new mobile spectrum to achieve digital development goals. 2016 will see several auctions for digital dividend spectrum, namely the 800MHz band, but also 700MHz, the second digital dividend band. In addition, 2600MHz is being made available in a number of countries, including Nigeria and South Africa, two of Africa's largest markets.

The deployment of LTE in new bands requires considerable capital expenditure. While the towers (passive infrastructure) have largely been built and new towers are constructed by tower companies on a build-to-suit basis, the investment in LTE radios and antennas is significant and requires funding. However, larger players generate sufficient cash to fund the development from operating cash flow and will not require additional debt financing.

The dash for mobile broadband also highlights one of the major problems in Africa: the lack of fibre infrastructure. While microwave links were fine for voice and small amounts of data, the data tsunami that will be unleashed on the continent requires considerable investment in fibre backhaul and backbone.

In Africa, LTE will be the primary means of internet access. The lack of fixed internet access means that the monthly traffic per smartphone is likely to be very high. There may therefore be an opportunity for tower companies to build a shared fibre infrastructure, however they are probably keen not to become telecoms operators and may avoid this by deploying dark fibre.

Capital expenditure

Levels of capital expenditure as a proportion of revenue have come down in some markets. For example, in Nigeria the average capex to sales in 2015 is estimated at 14 per cent, but for South Africa it was 20 per cent.

However, in line with global developments, mobile service revenue growth in Africa has slowed down. Many markets now show little increases in nominal terms, i.e. after stripping out the effect of inflation. Therefore, despite the selling of tower assets, in many markets capex to sales ratios are likely to remain in the region of 15-20 per cent.

Management focus will be very much on reigning in capex, but competition for higher spending LTE smartphone customers is likely to drive investment.

In many markets, operators face additional pressure on their capex budgets due to spectrum auctions. Some governments seek to extract unrealistic amounts from license fees. As a result we have seen failed auctions in Mozambique, Senegal and Ghana. For example in Mozambique, on a GDP-adjusted basis, the reserve price for 800MHz spectrum was around 10-times higher than prices paid elsewhere for digital dividend frequencies. Five blocks were on offer and the USD150m price tag amounted to approximately 50 per cent of total mobile industry revenue. None of the spectrum was sold. In Senegal, operators went on a bidder's strike, and in Ghana only the biggest operator, MTN, bought 800MHz spectrum.

Almost all African countries have a very narrow tax base and in many of them mobile networks have become tax collection engines. The mobile industry is facing an escalating tax burden. Furthermore, consumption taxes reduce affordability of mobile services and are likely to have a negative impact on revenue growth and investment. The tax burden also slows down the adoption of mobile broadband.

The uncertainty over spectrum license fees and taxation creates risks for investors which affects the investment climate. In addition, there may be curve balls thrown at operators. For instance in Nigeria, a huge USD3.9bn fine was imposed on MTN for non-compliance with regards to SIM registration. And in Uganda, the regulator commissioned a study which suggested that MTN and Airtel have "joint dominance", a most unusual economic concept. This may have far reaching regulatory consequences, including retail price regulation.

These episodes illustrate that the regulatory risk in African countries remains high, and investors will require appropriate returns to compensate for these risks.

Competition in African mobile markets also remains intense and we have seen new market entry in some markets from players such as Viettel and Smile Telecom in Mozambique, Tanzania, DRC, and Nigeria. As African markets are maturing, new market entry is surprising and there must be some doubt as to the return on investment generated by these ventures.

Consolidation

When markets mature, consolidation should be the name of the game, and indeed it is in a number of markets, including South Africa. Operators such as Millicom, Bharti Airtel, Orange and MTN recognise that the continued high levels of capex lead them to seek better economies of scale.

Only operators with significant market shares will generate sufficient returns on investment. Many African markets have more than three operators, whereas – depending on the size of country – three or perhaps just two operators are sustainable.

Operators with market share below 15 per cent may seek to exit. Consolidation is seen as particularly likely to take place in countries with four or more operators, such as Côte d'Ivoire, Uganda and Tanzania. As a result, 2016 is likely to see a number of deals driven by in-market consolidation. Perhaps, Telkom's acquisition of Cell C (abandoned in November 2015 over differences in the valuation of Cell C) will be revived in 2016.

The selling of towers to independent companies continues at a fast pace. This could be described as "consolidation lite". The trend is amplified by consolidation among tower cost; for example in March of this year IHS Holding agreed to acquire Helios Towers Nigeria (HTN). This adds further to the expected deal making.

The deal flow is also driven by realignment of portfolios. For example, in 2015 Orange looked into the acquisition of four African mobile businesses from Bharti Airtel.

The growth of mobile broadband creates significant opportunities for investment in digital services. We are all familiar with the success of mobile money in Africa and the role of mobile in the financial sector will grow further.

ICT DEVELOPMENT INDEX 2015 – GLOBAL TOP 20					
IDI 2015 RANK	ECONOMY	IDI 2015 VALUE	IDI 2010 RANK	IDI 2010 VALUE	RANK CHANGE
1	Korea (Rep.)	8.93	1	8.64	–
2	Denmark	8.88	4	8.18	▲
3	Iceland	8.86	3	8.19	–
4	United Kingdom	8.75	10	7.62	▲
5	Sweden	8.67	2	8.43	▼
6	Luxembourg	8.59	8	7.82	▲
7	Switzerland	8.56	12	7.60	▲
8	Netherlands	8.53	7	7.82	▼
9	Hong Kong, China	8.52	13	7.41	▲
10	Norway	8.49	5	8.16	▼
11	Japan	8.47	9	7.73	▼
12	Finland	8.36	6	7.96	▼
13	Australia	8.29	15	7.32	▲
14	Germany	8.22	17	7.28	▲
15	United States	8.19	16	7.30	▲
16	New Zealand	8.14	19	7.17	▲
17	France	8.12	18	7.22	▲
18	Monaco	8.10	22	7.01	▲
19	Singapore	8.08	11	7.62	▼
20	Estonia	8.05	25	6.70	▲

SOURCE: ITU ICT DEVELOPMENT INDEX (IDI) 2015

There are other opportunities in consumer markets, such as 'infotainment' and education, as well as in business markets, notably cloud services.

Mobile operators are not only building the access networks over which the information flows, but they also have an unrivalled capability to collect small amounts of cash from almost every person in a country. This positions them well to take advantage of the growth of the digital economy across the region.

Africa is a very diverse continent. Operating and regulatory conditions differ enormously between markets and the investment climate differs between countries. Despite the risks, the opportunity for investors to generate good returns from the fast-growing mobile broadband market remains.

Coleago Consulting is a specialist telecoms management consulting firm. Its highly experienced industry experts advise telecoms operators and regulators around the world. www.coleago.com.

Left: Global mobile penetration from 2000 to 2015. **Right:** global mobile penetration by region as at the end of 2015. SOURCE OVUM
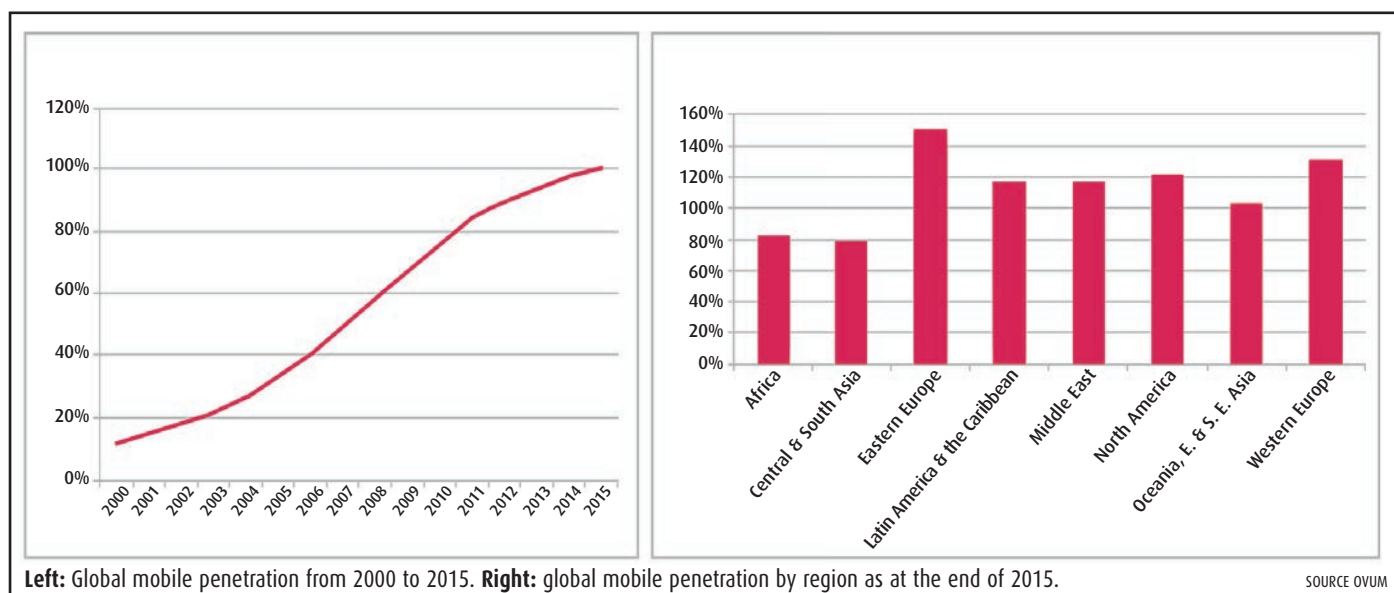
The digital paradox

While all the statistics and indicators for mobile connectivity in emerging markets continue to rise steeply at seemingly breakneck speeds, there are still billions who remain unconnected.

For example, ITU research late last year revealed that more than 95 per cent of the world's population is now covered by a mobile signal. And according to Ovum, mobile penetration reached 100 per cent at the end of 2015, meaning that on average there is one SIM card per person on the planet. Of course, this isn't a reality as multiple SIM ownership by single individuals has to be taken into account, as does a growing number of connected M2M devices.

The ITU estimates that there are still 350 million people worldwide who live outside the reach of a mobile network, and 56 per cent of the global population has yet to experience the internet.

Furthermore, Ovum points out that Africa is still 10 years behind Europe and North America as SIM penetration on the continent is still relatively low at an average 82 per cent. In a *Mobility Report* published in November 2015, Ericsson added that while countries like South Africa and Ghana have long since passed the 100 per cent penetration mark, other large markets such as Nigeria and Kenya are still below 100 per cent.

Ovum believes that the issues of availability and affordability still need to be addressed by the overall mobile industry, and forecasts that Africa as a whole will only approach the 100 per cent penetration mark at the end of this decade.

Each year, the ITU ranks 167 countries according to their level of ICT access, use and skills. In its 2015 ICT Development Index (IDI) published in November, the Republic of Korea, Denmark and Iceland occupy the top three places respectively, as shown above. There are no African countries in the top 50 and only four feature in the top 100. Mauritius is the only African nation with an IDI value above the global average of 5.03, while three others – Seychelles, South Africa and Cape Verde – exceed the average value for developing countries of 4.12.

Altogether, 29 out of 37 African states rank in the bottom quarter of the latest IDI, including the 11 which have the lowest scores of all. The union said the average rise in IDI values in Africa between 2010 and 2015 was 0.65 which is lower compared to other regions in nominal terms. However, it also said that this is from a lower base and is therefore higher in proportion to the benchmark set in 2010.

ICT DEVELOPMENT INDEX 2015 – AFRICA*

IDI 2015 RANK	ECONOMY	IDI 2015 VALUE	IDI 2010 RANK	IDI 2010 VALUE	RANK CHANGE
73	Mauritius	5.41	72	4.31	▼
87	Seychelles	4.96	81	3.98	▼
88	South Africa	4.90	88	3.65	–
93	Tunisia*	4.73	93	3.62	–
96	Cape Verde	4.62	107	3.14	▲
99	Morocco*	4.47	96	3.55	▼
100	Egypt*	4.40	98	3.48	▼
109	Ghana	3.90	130	1.98	▲
111	Botswana	3.82	117	2.86	▲
113	Algeria*	3.71	114	2.99	▲
118	Namibia	3.41	120	2.63	▲
124	Kenya	3.02	126	2.09	▲
126	Sudan*	2.93	127	2.05	▲
127	Zimbabwe	2.90	132	1.97	▲
128	Lesotho	2.81	141	1.74	▲
132	Senegal	2.68	137	1.80	▲
133	Gabon	2.68	122	2.41	▼
134	Nigeria	2.61	133	1.96	▼
135	Gambia	2.60	129	1.99	▼
137	Côte d'Ivoire	2.51	142	1.74	▲
140	Angola	2.32	144	1.68	▲
141	Congo (Rep.)	2.27	136	1.83	▼
145	Mali	2.22	155	1.46	▲
146	Equatorial Guinea	2.21	134	1.96	▼
147	Cameroon	2.19	149	1.60	▲
148	Djibouti*	2.19	143	1.69	▼
149	Uganda	2.14	151	1.57	▲
150	Mauritania*	2.07	146	1.63	▼
151	Benin	2.05	147	1.63	▼
152	Togo	2.04	145	1.64	▼
153	Zambia	2.04	152	1.55	▼
154	Rwanda	2.04	154	1.47	–
155	Liberia	1.86	161	1.24	▲
157	Tanzania	1.82	153	1.54	▼
158	Mozambique	1.82	160	1.28	▲
159	Burkina Faso	1.77	165	1.13	▲
160	Congo (Dem. Rep.)	1.65	162	1.23	▲
161	South Sudan	1.63	N/A	N/A	–
162	Guinea-Bissau	1.61	158	1.33	▼
163	Malawi	1.61	159	1.33	▼
164	Madagascar	1.51	157	1.34	▼
165	Ethiopia	1.45	166	1.07	▲
166	Eritrea	1.22	164	1.14	▼
167	Chad	1.17	167	0.88	–

SOURCE: ITU ICT DEVELOPMENT INDEX (IDI) 2015

Indices for African ITU member states. The region's top-ranking nations are listed at the top. (*Note while we have added Algeria, Djibouti, Egypt, Mauritania, Morocco, Sudan and Tunisia to the table above, the ITU does not include them in its Africa region and instead categorises them as Arab states.)

ITU AFRICAN COUNTRY REPORTS 2015

COUNTRY	POPULATION		GNI PER CAPITA	INTERNATIONAL INTERNET BANDWIDTH PER INTERNET USER (BPS)	SUBSCRIPTIONS PER 100 INHABITANTS				PERCENTAGE OF		
	TOTAL	DENSITY			FIXED-TELEPHONE	MOBILE-CELLULAR TELEPHONE	FIXED (WIRED)-BROADBAND	ACTIVE MOBILE-BROADBAND	HOUSEHOLDS WITH A COMPUTER	HOUSE-HOLDS WITH INTERNET ACCESS	INDIVIDUALS USING THE INTERNET
Mauritius	1,249,151	621.15	9,710	32,990	29.80	132.25	14.57	31.78	51.27	47.53	41.44
Seychelles	93,306	198.97	13,990	28,945	22.73	162.19	12.67	12.67	61.82	55.02	54.26
South Africa	53,139,528	44.52	6,800	149,542	8.10	149.68	3.21	46.70	28.05	37.30	49.00
Tunisia	11,116,899	70.78	4,210	25,972	8.54	128.49	4.44	47.56	33.10	28.80	46.16
Cape Verde	503,637	127.52	3,450	12,330	11.62	121.79	3.79	51.26	32.23	24.80	40.26
Morocco	33,492,909	76.01	2,980	10,768	7.43	131.71	2.96	26.82	52.50	50.40	56.80
Egypt	83,386,739	89.99	3,050	9,302	7.57	114.31	3.68	43.49	45.08	36.78	31.70
Ghana	26,442,178	117.72	1,600	3,602	0.98	114.82	0.26	59.77	39.90	29.00	18.90
Botswana	2,038,587	3.92	7,240	16,437	8.30	167.30	1.63	49.74	14.75	12.05	18.50
Algeria	39,928,947	16.35	5,480	12,460	7.74	93.31	4.01	20.79	28.21	25.94	18.09
Namibia	2,347,988	2.92	5,680	8,162	7.78	113.76	1.75	35.46	16.53	17.27	14.84
Kenya	45,545,980	78.83	1,290	25,200	0.39	73.84	0.19	9.09	12.27	16.90	43.40
Sudan	38,500,000	21.57	1,710	2,499	1.08	72.20	0.05	27.24	16.62	32.20	24.64
Zimbabwe	14,599,325	39.41	830	3,939	2.26	80.82	1.04	39.23	7.55	5.76	19.89
Lesotho	2,097,511	69.47	1,340	2,410	2.44	101.90	0.11	32.80	6.88	6.50	11.00
Senegal	14,548,171	76.21	1,040	8,349	2.14	98.84	0.71	23.74	11.59	12.60	17.70
Gabon	1,711,294	6.55	9,450	19,657	1.00	210.37	0.63	0.00	12.50	9.69	9.81
Nigeria	178,516,904	194.86	2,970	3,150	0.10	77.84	0.01	11.71	9.12	8.48	42.68
Gambia	1,908,954	190.53	440	10,928	2.92	119.63	0.12	8.04	8.26	8.54	15.56
Cote d'Ivoire	20,804,774	69.68	1,460	5,163	1.17	106.25	0.28	24.55	7.20	12.20	14.60
Angola	22,137,261	19.43	4,850	4,250	1.27	63.48	0.41	16.41	9.90	8.62	21.26
Congo (Rep)	4,558,594	13.19	2,710	185	0.36	108.15	0.01	10.81	4.92	1.93	7.11
Mali	15,768,227	14.00	660	1,879	1.00	149.02	0.02	11.30	8.20	6.74	7.00
Equatorial Guinea	778,061	29.27	12,640	1,452	1.94	66.39	0.50	0.00	18.00	8.50	18.86
Cameroon	22,818,632	48.18	1,360	1,796	4.61	75.68	0.07	0.00	9.63	6.50	11.00
Djibouti	886,313	37.80	null	8,955	2.47	32.39	2.27	3.24	17.97	7.08	10.71
Uganda	38,844,624	189.09	680	4,002	0.83	52.43	0.29	14.66	5.80	6.20	17.71
Mauritania	3,984,457	3.85	1,270	1,454	1.29	94.20	0.20	14.42	4.35	6.20	10.70
Benin	10,599,510	93.99	810	2,839	1.85	101.71	0.40	2.84	4.80	3.51	5.30
Togo	6,993,244	130.82	570	6,523	0.90	68.96	0.11	4.14	3.20	3.34	5.70
Zambia	15,021,002	21.15	1,680	4,223	0.76	67.34	0.14	1.00	6.64	6.89	17.34
Rwanda	12,100,049	459.73	700	8,517	0.41	64.02	0.11	11.12	3.38	3.80	10.60
Liberia	4,396,873	45.65	370	6,306	0.23	73.35	0.14	7.63	2.20	2.50	5.41
Tanzania	50,757,459	58.50	930	6,081	0.30	62.77	0.17	3.04	3.80	4.10	4.86
Mozambique	26,472,977	34.61	620	7,755	0.26	69.67	0.05	2.98	7.33	6.22	5.94
Burkino Faso	17,419,615	64.29	710	2,860	0.71	71.74	0.03	9.55	4.60	8.30	9.40
Congo (Dem Rep)	69,360,118	33.03	380	384	0.00	53.49	0.00	7.94	1.93	2.00	3.00
South Sudan	11,738,718	null	940	27	0.00	24.50	0.00	1.28	10.00	9.60	15.90
Guinea-Bissau	1,745,798	64.03	550	2,674	0.29	63.48	0.08	0.00	2.46	1.91	3.32
Malawi	16,829,144	177.08	250	4,237	0.38	30.50	0.05	4.09	5.19	6.23	5.83
Madagascar	23,571,962	40.52	440	267	1.06	38.22	0.10	6.09	4.52	4.68	3.70
Ethiopia	96,506,031	96.96	550	5,002	0.85	31.59	0.49	7.55	2.80	2.85	2.90
Eritrea	6,536,176	50.60	680	1,391	0.98	6.39	0.00	0.00	2.34	1.50	0.99
Chad	13,211,146	10.79	980	733	0.18	39.75	0.08	0.00	2.92	2.73	2.50

SOURCE: ITU ICT DEVELOPMENT INDEX (IDI) 2015

The ITU's ICT Development Index measures ICT access, use and skills. The above table shows some of the indicators for selected African countries.

The most significant improvement achieved by an African country was shown by Ghana. It increased its IDI value by 1.92 points and rose 21 places in the global rankings. The ITU said Lesotho, Cape Verde and Mali also substantially improved their rankings.

Growth prospects

Ericsson's *Mobility Report* said that with a population of 830 million people, sub-Saharan Africa (SSA) has been experiencing "strong economic growth driven by improved political stability, a global commodity boom and greater regional integration".

Citing the World Bank's *Global Economic Prospects* report (June 2015), it forecasts annual GDP growth of 4-6 per cent for the region between 2015 and 2018. This is said to be lower than earlier forecasts because of slower recovery in the Eurozone, as well as economic stutters in China which is not only a major destination for commodities from SSA but also a source of foreign investment.

The GSM Association (GSMA) adds that mobile operators' revenue growth is also slowing across the region because of the impact of external factors such as growing competitive pressures and regulatory action. In *The Mobile Economy, Sub-Saharan Africa 2015* report released last year, the association said that from a CAGR of almost seven per cent for 2010-2015, growth is set to slow to five per cent over the next four years.

According to the GSMA, the broader mobile ecosystem generated 5.7 per cent of SSA's GDP in 2014, a contribution of just over USD100bn in economic value. During the same year, it supported 4.4 million jobs in the region and raised around USD15bn in government revenues in the form of general taxation *(see top graph, right).*

Ericsson said SSA had reached 500 million mobile subscriptions by the end of 2015, of which 70 per cent are GSM/EDGE-only. It expects this to change by 2021 when WCDMA/HSPA combined with LTE will account for almost 80 per cent of subscriptions *(see middle graph, right).*

The GSMA reckons a migration to mobile broadband and the growth of new services will result in a regional GDP rise to 8.2 per cent by 2020. It predicts 982 million unique SIM connections (excluding M2M) over the next four years. Ethiopia and Nigeria – two of SSA's most populous countries with penetration rates of around 23 and 31 per cent respectively – will account for 40 per cent of these new subscribers. Cameroon, Kenya, Mozambique, Tanzania and Uganda are also expected to record strong subscriber growth during this period *(see bottom graph, right).*
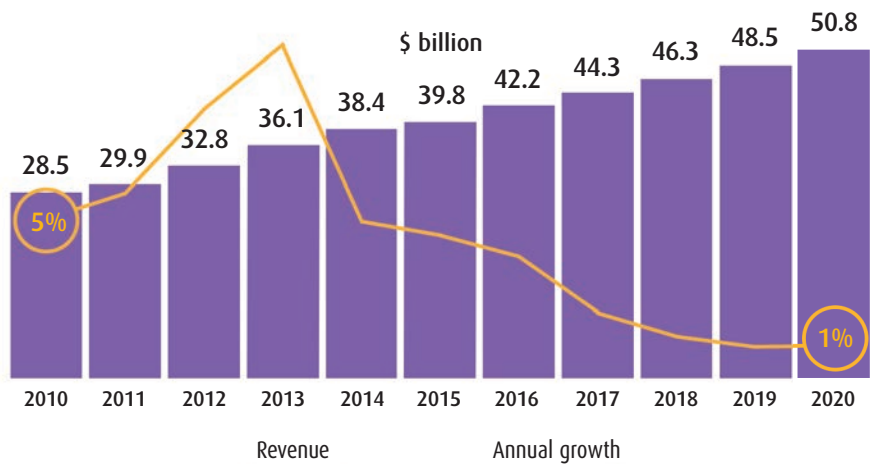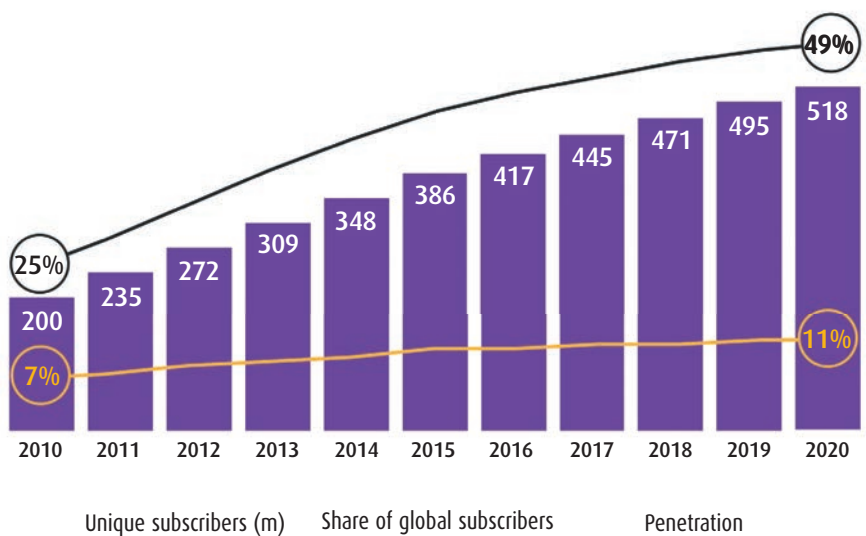

Mobile revenue growth in sub-Saharan Africa. SOURCE: THE MOBILE ECONOMY, SUB-SAHARAN AFRICA 2015 – GSMA INTELLIGENCE
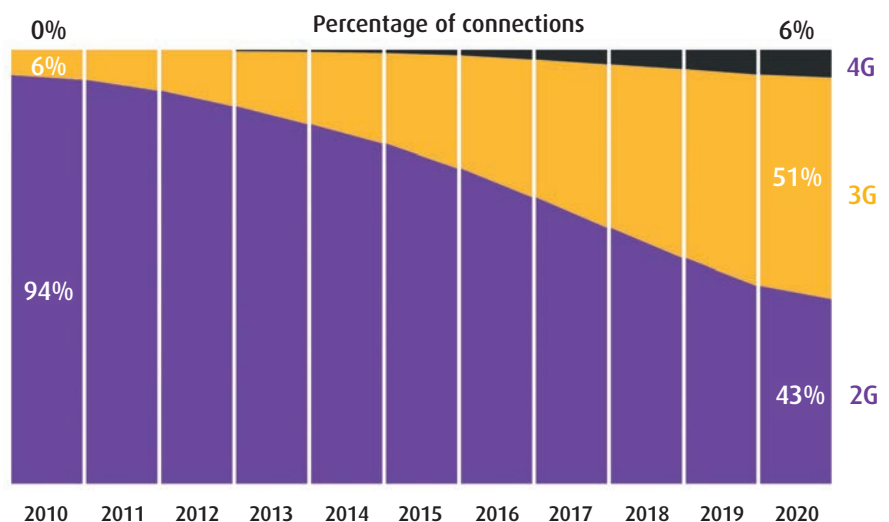
Africa's ongoing technology shift. SOURCE: THE MOBILE ECONOMY, SUB-SAHARAN AFRICA 2015 – GSMA INTELLIGENCE

Unique subscriber growth in sub-Saharan Africa. SOURCE: THE MOBILE ECONOMY, SUB-SAHARAN AFRICA 2015 – GSMA INTELLIGENCE

But the association believes that even with the predicted growth, a little more than 50 per cent of SSA's population will still not have subscribed to a mobile service by 2020. It also warned that growth rates will "slow sharply" over the next few years, coming in at around six per cent compared to 13 per cent during 2010-2015.

Mobile broadband

In March 2016, the Global mobile Suppliers Association (GSA) confirmed that the milestone of a billion LTE subscriptions worldwide had been passed during the fourth quarter of last year. It said 552.2 million users were added in 2015, meaning a 107 per cent year-on-year growth. The GSA forecasts there will be 3.8 billion LTE subscriptions globally by the end of 2020.

While APAC leads the growth, the GSMA said that it's still very early days for LTE in SSA as the technology only accounts for just under one per cent of current mobile subscriptions in the region. However, the association said 4G is "gaining traction" in several early-adopter markets, especially Angola, Mauritius, Namibia and South Africa. It said 4G adoption for the region as a whole will rise to 400 million new smartphone connections by 2020, representing six per cent of all connections.

Recent figures from GfK revealed that global smartphone sales hit a quarterly high in Q4 2015, with 368 million units purchased during the period, a rise of 14 per cent quarter-on-quarter and six per cent year-on-year. But despite a record fourth quarter and a strong performance in 2015 in general, the market-watcher said there are mixed results across countries.

"Local factors, rather than regional and industry trends, are increasingly driving markets," said Kevin Walsh, director of trends and forecasting, GfK. "Diverging economic trends, device saturation, mass market adoption, politics, social change and even sport have an impact on smartphone demand and prices at country level."

According to the firm, emerging regions such as MEA and APAC continue as "growth powerhouses", and it forecasts global smartphone demand to increase seven per cent in 2016.

Despite a slight slowdown in growth in the Middle East and Africa, GfK said smartphone unit demand in the region grew 12 per cent year-on-year in Q4 2015. Most countries saw increases but Egypt stood out with demand growing 27 per cent year-on-year.

Naturally, given APAC's increasing adoption of LTE as detailed above, the
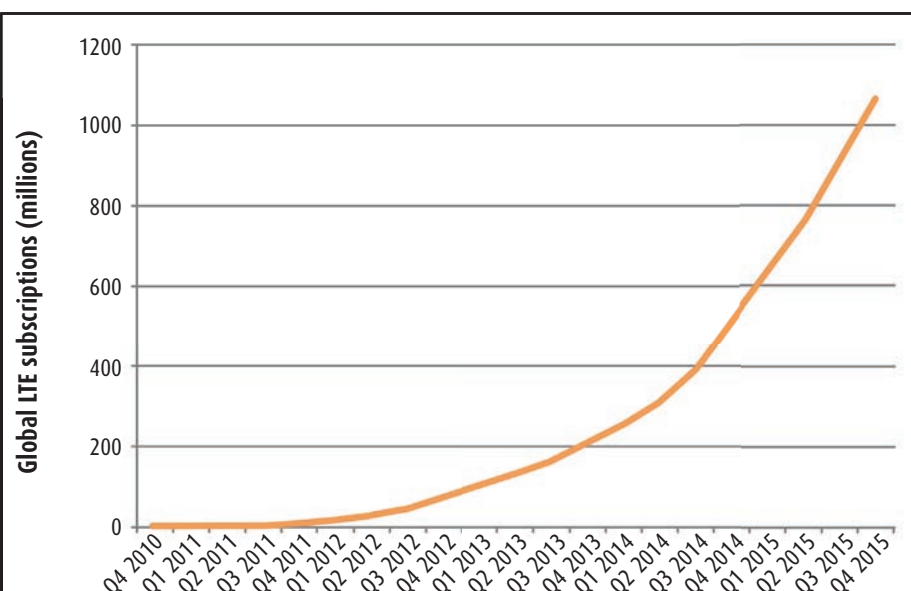
LTE subscriptions are now 14.55 per cent of the global mobile base as at Q4 2015. The GSA said they increased 155.9 million in Q4 2015, 75% per cent higher than 3G/WCDMA-HSPA subscriptions which grew 89.2 million. GSM subscriptions fell by more than 141 million in the same period

SOURCE: OVUM WCIS/GLOBAL MOBILE SUPPLIERS ASSOCIATION/WWW.GSACOM.COM
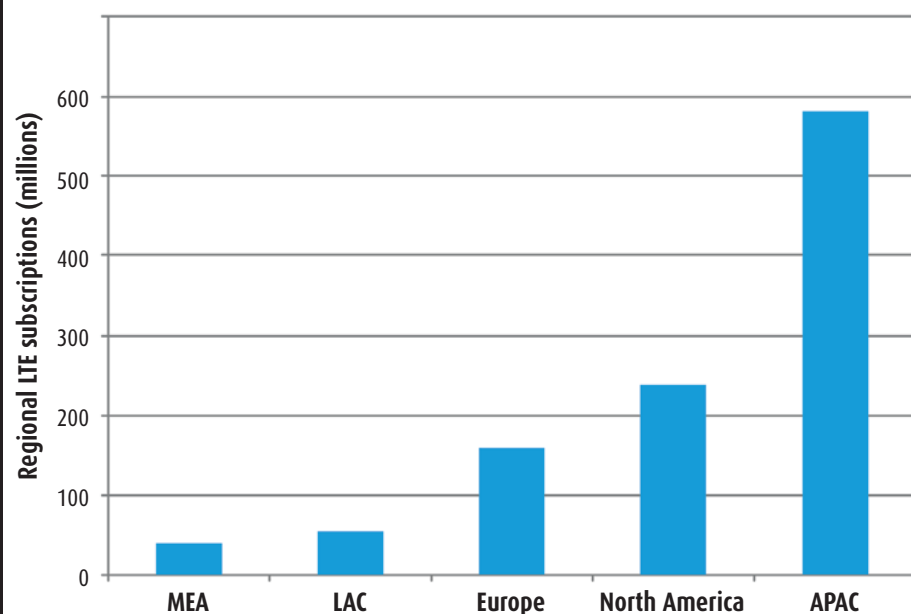
LTE subscriptions regional shares for Q4 2015. APAC leads the way with a 54.3 per cent share of global subs – China alone added 83.8 million during the period. The Middle East and Africa bring up the rear, trailing way behind North America, Europe, Latin America and the Caribbean.

SOURCE: OVUM WCIS/GLOBAL MOBILE SUPPLIERS ASSOCIATION/WWW.GSACOM.COM

region remains the primary growth driver in the global smartphone market, with 21 per cent year-on-year unit growth in Q4 2015 (*also see tables on p.15*).

Cisco is also predicting huge rises in smart mobile device adoption and connections over the next four years. In its 10th annual Visual Networking Index (VNI) released earlier this year in February, the company said these will represent 72 per cent of total mobile devices and connections by 2020 – up from 36 per cent in 2015. Smartphones are expected to

account for 81 per cent of total mobile traffic by 2020, an increase of 76 per cent in 2015. Cisco said the proliferation of mobile phones, including so-called 'phablets', is rising so rapidly that by 2020 more people will have mobile phones (5.4 billion) than electricity (5.3 billion), running water (3.5 billion) and cars (2.8 billion).

Globally, 4G connectivity share is projected to surpass 2G by 2018 and 3G by 2020. Cisco said 4G will represent more than 70 per cent of all mobile traffic, and 4G connections will

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generate nearly six times more traffic per month than non-4G connections by 2020. It said the adoption of devices, increased coverage, and demand for content are driving user growth two times faster than the global population over the next four years. "This surge of mobile users, smart devices, mobile video and 4G networks will increase mobile data traffic eight-fold over the next five years," said Cisco.

Mobile usage in MEA

Like Ericsson's annual *Mobility Report*, Cisco's VNI is often cited throughout the industry for its indicators of future mobile trends. Its global mobile data traffic forecasts rely upon independent analyst predictions and real-world mobile data usage studies. Cisco then uses this information as a foundation for its own estimates for mobile application adoption, minutes of use, and transmission speeds. Key enablers such as mobile broadband speed and device computing power are also factored into the projections and findings.

The latest report predicts there will be 5.5 billion mobile users on the planet by 2020 – that's 70 per cent of the world's population.

In Middle East and Africa, there were 708.9 million mobile users in 2015. That's 49 per cent of the region's population and represents a rise of six per cent from the previous year. According to the VNI, there will be 878.7m mobile users in MEA by 2020, a CAGR rise of 4.4 per cent.

124.1 million net new devices and connections were added to mobile networks in MEA during 2015. These included 89.3m smartphones, a rise of 45 per cent meaning that there are now around 286 million smartphone users in the region. Cisco reckons the number of smartphones in MEA will grow three-fold to reach 848 million in 2020.

4G connections in MEA are predicted to grow at a CAGR of 53 per cent over the next four years, accounting for 17.2 per cent of total mobile connections by 2020, compared to 2.9 per cent in 2015.

Meanwhile, 3G will be 59.7 per cent of total mobile connections by 2020, compared to 24.3 per cent in 2015. Third generation connections are expected to surpass 2G in the region by 2018. Cisco said 2G will make up 22.3 per cent of total connections by 2020, compared to 72.8 per cent in 2015.

In MEA, mobile data traffic grew 117 per cent and was 294.5PB per month in 2015. That's said to be the same as 74 million DVDs each month or 811 million text messages each second. Cisco predicts consumer mobile traffic in MEA will reach 4EB per month by 2020.

SMARTPHONE SALES Q4 2014 VERSUS Q4 2015						
	UNITS SOLD (MILLIONS)			VALUE (USD BILLIONS)		
	Q414	Q415	YOY % CHANGE	Q414	Q415	YOY % CHANGE
Latin America	36.1	31.5	-12.7%	9.6	7.4	-23.3%
Central & Eastern Europe	21.4	22.2	3.6%	5.1	4.5	-10.8%
North America	57.0	56.4	-1.1%	25.6	23.9	-6.5%
Emerging APAC	41.5	50.0	20.5%	7.5	8.1	8.0%
Middle East & Africa	37.7	42.1	11.7%	10.8	10.2	-4.8%
Western Europe	40.0	42.1	5.2%	17.2	17.0	-0.9%
China	95.1	106.6	12.0%	28.8	33.5	16.3%
Developed APAC	17.3	17.4	0.3%	11.0	10.6	-3.8%
Global	346.1	368.1	6.4%	115.5	115.2	-0.2%

SOURCE: GFK POINT OF SALES MEASUREMENT DATA IN 90+ MARKETS, JANUARY 2016

SMARTPHONES: 2015 SALES VERSUS 2016 FORECAST						
	UNITS SOLD (MILLIONS)			SALES VALUE (USD BILLIONS)		
	2015 SALES	2016 FORECAST	YOY % CHANGE	2015 SALES	2016 FORECAST	YOY % CHANGE
Latin America	109.7	108.8	-0.8%	27.0	25.5	-5.7%
Central & Eastern Europe	73.2	77.9	6.5%	14.8	14.5	-1.5%
North America	190.7	193.7	1.6%	77.9	77.2	-0.9%
Emerging APAC	185.2	227.0	22.6%	30.7	33.1	7.9%
Middle East & Africa	162.4	187.7	15.6%	42.0	43.3	3.0%
Western Europe	137.1	142.3	3.8%	53.6	52.7	-1.6%
China	385.3	397.2	3.1%	115.8	117.8	1.7%
Developed APAC	64.8	65.5	1.1%	37.5	37.2	-0.7%
Global	1,308.5	1,400.2	7.0%	399.2	401.3	0.5%

SOURCE: GFK POINT OF SALES (MEASUREMENT DATA IN 90+ MARKETS FOR CALENDAR YEAR 2015 PLUS GFK FORECASTS FOR CALENDAR YEAR 2016, AS AT JANUARY 2016.

REGIONAL MOBILE DATA TRAFFIC GROWTH RATES 2015–2020	
REGION	PREDICTED GROWTH
Middle East & Africa	15x
Asia-Pacific	9x
Central & Eastern Europe	8x
Latin America	8x
Western Europe	6x
North America	6x

SOURCE: CISCO VNI 2016

Last year, mobile data traffic in MEA grew 2.6 times faster than the region's fixed IP traffic. The average mobile-connected end-user device generated 231Mb of data traffic per month, up 98 per cent from 117Mb per month in 2014. In terms of business mobile data traffic in the region, the VNI said this grew 107 per cent in 2015 to reach 31.9PB per month. It is expected to increase at a CAGR of 60 per cent over the next four years to reach 330.8PB per month by 2020.

In some of its other forecasts, Cisco predicts video will account for 72 per cent of mobile data traffic in MEA by 2020, compared to 46 per cent at the end of 2015. It also said total public Wi-Fi hotspots will grow from 776,800 in 2015 to 4.2 million by 2020.

The number of mobile-connected M2M modules grew 1.4-fold or 38 per cent in 2015 to reach 39 million in MEA. Cisco expects the number of M2M modules in the region to increase 4.8-fold over the next four years to

reach 186 million in 2020. The VNI forecasts M2M traffic in MEA to grow 25-fold from 2015 to 2020, a CAGR of 90 per cent. M2M traffic will reach 104.9PB per month by 2020 by which time it will account for two per cent of total mobile data traffic, compared to one per cent at the end of 2015. The average M2M module in the region will generate 563Mb of mobile data traffic per month by 2020, an increase from 110Mb per month in 2015.

Tower sharing

According to the GSMA, tower sharing is now a "major feature" of SSA's mobile industry. In *The Mobile Economy, Sub-Saharan Africa 2015* report, it said this is driven by license obligations and the MNOs' need to cut opex and capex.

Citing documented examples from Asia and Europe, the association said tower sharing could lead to capex savings of around 40-50 per cent and opex savings of 20-30 per cent. Despite revenue and margin pressures, the GSMA noted that operators across SSA continue to invest heavily in order to expand coverage and implement mobile broadband networks. It said capital investment in 2014 came in at USD9 billion and is likely to hit USD13.6 billion or 24 per cent of total operator revenues by 2020.
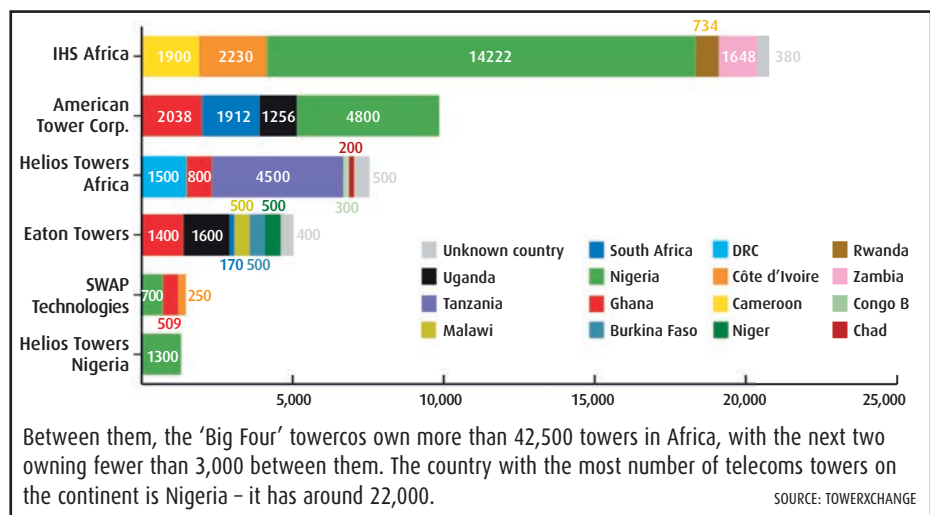
"Funds realised from the sale of tower assets are usually deployed in other priority areas that can improve service quality and operational efficiency, such as investing in next-generation technology and deleveraging through debt reduction," said the report.

A definitive figure for the number of telecoms towers in Africa is difficult to find. The two most authoritative sources differ somewhat. Industry forum TowerXchange estimates there are approximately 165,000 towers on the whole continent. Meanwhile, the GSMA said there are 240,000 towers in SSA and estimated 70,000 in MENA.

Last year, TowerXchange reported that between 2010 and 2014, tower companies in sub-Saharan Africa spent more than USD4bn to buy around 47,500 towers from MNOs. It pointed out that this is equivalent to 33 per cent of the total number of towers in the region.

Some of the towercos with a significant number of estates on the continent include: American Tower Corporation (approximately 10,000); Eaton Towers (about 5,000); Helios Towers Africa (1,300); IHS Africa (more than 20,000); and SWAP Technologies (more than 1,500).

Among MNOs, the company that has certainly been the most active in recent years is Airtel. By the end of 2014, it had sold almost 12,000 of the 15,000 towers it owned

Between them, the 'Big Four' towercos own more than 42,500 towers in Africa, with the next two owning fewer than 3,000 between them. The country with the most number of telecoms towers on the continent is Nigeria – it has around 22,000.
SOURCE: TOWERXCHANGE

across 17 countries in Africa. Three large deals accounted for the bulk of the sales: 3,100 went to Helios Towers; 3,500 to Eaton Towers; and 4,800 to American Tower Corporation (ATC). Airtel's plan was to sell all of its remaining towers and exit the infrastructure business altogether.

At the end of 2014, ATC paid more than a billion dollars to Airtel for its towers in Nigeria, and has now leased them back to the operator for 10 years. Also in Nigeria, MTN entered into a joint ownership agreement with IHS Towers on 9,151 of its towers in the country. IHS paid around USD2 billion for the assets in what was believed at the time to be the largest tower deal to date in Africa. Etisalat has also offloaded 2,136 of its towers in Nigeria to IHS.

Meanwhile at the end of 2014, fixed-line operator Telecom Egypt signed a USD2bn contract with MNOs Mobinil (now Orange) and Vodafone. Under the terms of the agreement, the MNOs will utilise Telecom Egypt's infrastructure instead of constructing their own.

In May 2015, Egypt also saw its first independent tower deal when Eaton Towers used some of the USD350 million it had raised in new finance for the purchase, leaseback and management of Mobinil's towers. Eaton said the agreement consisted of the purchase of around 2,000 towers with a 15-year leaseback contract for the operation and maintenance, and additional build-out of new sites.

All these deals resulted in the size of Africa's tower industry doubling in two quarters to the end of 2014, according to TowerXchange. It said that following the completion of the Airtel and Mobinil deals, independent towercos now own and share 30 per cent of Africa's towers, up from just 4.7 per cent five years ago. It went on to predict that towerco penetration will rise above 45 per cent in 2015.

The 'Big Four' towercos include IHS Africa, ATC, Helios Towers Africa and Eaton Towers. While they concentrate on achieving

economies of scale, colocation sales, greater efficiency and more profitability, smaller and more nimble new companies have now entered the market and can perhaps win in deals considered too small or too risky for the big players. It is estimated these smaller firms owned or operated a total of around 2,000 towers at the end of 2014, with most of the money for their ventures provided by private equity investors.

These relative newcomers include: Atlas Towers (South Africa); BCTEK (Nigeria); Communications Towers Nigeria; Frontier Tower Solutions (targeting Burundi); Hotspot Network (Nigeria); Infratel (South Africa); Pro High Site Communication (South Africa); Shared Networks Tanzania (active infrastructure sharing); Square1 Infrastructure (Nigeria and South Africa); TASC (targeting MENA); TowerCo of Madagascar; and Tower Share (targeting MENA).

According to TowerXchange, another opportunity for newcomers is Africa's urgent need for a viable proposition to build single-tenant towers. It believes this is possible even in markets where the 'Big Four' are active, particularly in low ARPU, off-grid areas. It said these represent "a tough combination of economics which attracts a unique breed of telecoms entrepreneur".

TowerXchange predicted that 50 per cent of towers in Africa will be owned by independents by the end of 2015, which is a year-on-year increase of nearly 100 per cent. It could therefore be argued that within two years, the number of towers remaining in the hands of MNOs will be statistically insignificant.

A more conservative forecast comes from researchers at Statplan Energy. In its *Global Market for Telecoms Towers 2014-2020* report, the energy analyst forecasts that 30 per cent of all towers in Africa could be independently operated by the end of the decade.

Satcoms

In *Prospects for Satellite Communications and Broadcasting in Africa 2015* published in April 2015, Euroconsult reported that usage for satellite capacity in SSA increased at an 11 per cent CAGR over 2009-2014. This was despite the spread of terrestrial fibre networks and the decrease of international trunking.

The company said it anticipated a further 11 per cent CAGR for capacity leased over the next decade, resulting in a total of close to 200Gbps of traffic flowing over satellite. It believes the region's satcoms services market is being driven by multiple factors:

❖ Digital TV growth is still only in its early phase and the transition process to DTT has only started in many countries. In parallel, despite the signing of more than 10 million subscribers in the last ten years, satellite pay-TV is only beginning to penetrate the market.

❖ Mobile penetration continues to increase along with universal access requirements, while 3G and potentially 4G expansion will create new connectivity requirements.

❖ A variety of segments, such as oil and gas, banking, mining, and government networks will require more connectivity as operations either diversify or expand geographically.

❖ A number of new enterprise hotspot markets are evolving, particularly in East and West Africa, in addition to historically strong VSAT markets such as South Africa, Nigeria, Angola, Kenya and Tanzania. This should contribute to overall market growth across SSA.

Euroconsult added that the ability for operators to create new differentiators will be vital against the backdrop of large capacity supply. It also expects the introduction of "more sophisticated" solutions and a potential consolidation of service providers to contribute to market growth.

In the Q1 2016 edition of its Satellite Capacity Pricing Index (SCPI) published in February 2016, Northern Sky Research (NSR) revealed

that satellite bandwidth costs have been declining in Africa and the Middle East. The analyst said there has been region-wide competition from GEO-HTS offerings that have brought down average data pricing to just over USD2,000 per MHz per month for Ku-band, and just under USD2,500 per MHz per month for C-band.

"These figures have been brought down over the previous years by new entrants, and to some extent an oversupply in sub-Saharan Africa that has come about due to relatively slow-to-develop demand over the previous decade," said NSR.

The firm said that overall, its figure of around USD2,200 per MHz for Ku-band data in SSA, for example, corresponds to just under USD1m per transponder equivalent per year. This is still comparatively far from what NSR believes to be the "breaking point" for fixed satellite services operators, but also considerably lower than previous years.

NSR believes the satcoms industry is going through a rapid change as GEO-HTS and eventually non-GEO-HTS continue to pour "unfathomable amounts of capacity" into regions that often do not have sufficient demand to soak up the supply.

It said this has so far resulted in generally slow and stable downward pressure on pricing up to 2016, but warned that the trend will continue to gather momentum. "While this outcome will certainly accelerate the creation of winners and losers in the industry, the alternative is for satellite to remain relatively costly and see its addressable market continue to shrink in an age of bandwidth commoditisation," said NSR.

Broadband, backhaul and broadcast

In a separate study, NSR predicts that VSAT, consumer broadband, and trunking/backhaul will generate USD13.6 billion in global revenue by 2024. In the 14th edition of its *VSAT and Broadband Satellite Markets* report released last October, it said the entire broadband satellite market will add 8.4 million new sites during this period. Despite "congested beams" in developed markets and CPE costs in developing ones, NSR said broadband access via satellite added more than 300,000 net new subscribers globally in 2014. "Capacity expansion through next generation HTS will not only grow mature markets, but will also improve reach in Africa, Asia, and Latin America, with impact for the latter coming in the 2016 to 2018 time frame," said NSR senior analyst and report co-author Prashant Butani.

While satellite trunking sites are predicted to decline between 2014 and 2024, NSR said backhaul will show steady growth for in-service units. "More importantly, revenues will increase even faster given the new markets, HTS supply growth and technology shifts towards bandwidth hungry 3G and 4G sites," added Jose del Rosario, research director and report co-author.

The analysts forecast more than 1.4Tbps of demand for non-GEO constellations across all broadband markets, but only if the various technical, regulatory, and business challenges are overcome.

Broadcast continues to be a lucrative application for the major global satellite operators. For example, Eutelsat has been targeting Africa's DTH markets, and launched a new satellite last year for coverage in a video neighbourhood which it described as the "most dynamic in the global satellite TV market". Launched to 8°W in August 2015, *EUTELSAT 8 West B* joined others from Eutelsat and Egyptian operator Nilesat that are already orbiting at the adjacent 7°W position.

The 7/8°W video neighbourhood comprises three Eutelsat satellites plus two from Nilesat which broadcast more than 1,000

Middle East & Africa traditional FSS spot pricing per MHz per month for Q1 2016. SOURCE: NSR
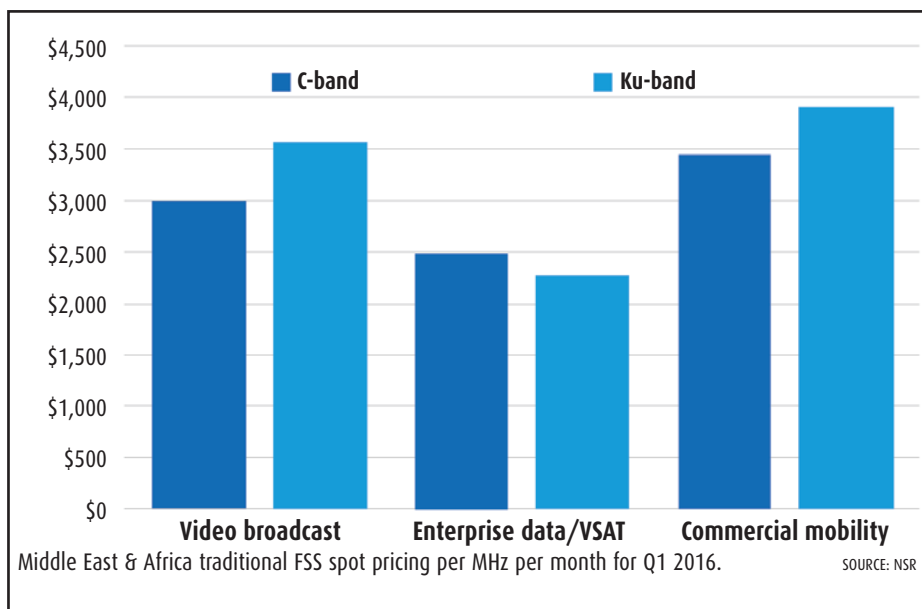
TV channels to households from Morocco to the Gulf.

Eutelsat regularly carries out market research to monitor the number of homes receiving TV channels broadcast by eight of its flagship video neighbourhoods serving North Africa, the Middle East and Europe. As part of its *TV Observatory* report published at the start of 2015, it said all eight continue to experience audience growth, including the 7/8°W neighbourhood shared with Nilesat whose DTH base in MENA grew from 27 million homes in 2010 to 52 million in 2014.

In earlier research carried out in 2014, Eutelsat found that out of a population base of 77.1 million TV homes across 14 countries (which included Algeria, Egypt, Libya, Morocco and Tunisia, amongst others), 92 per cent favour satellite reception for pay-TV or free-to-air viewing.

In 2010, satellite reception accounted for 67 per cent of TV homes in the region, and by 2013 penetration had increased by 25 percentage points. During the same period, Eutelsat found that the number of homes receiving analogue terrestrial TV slumped from 18.2 million in 2010 to 4.1 million in 2013.

Other satellite markets

Machine-to-machine is usually seen as an application in cellular networks but satellite technology also has a vital role to play when it comes to connecting remote devices.

MarketsandMarkets expects the M2M satellite communication market to grow from USD3.36 billion in 2015 to USD5.91 billion by 2020, a CAGR of 11.9 per cent.

The research firm said this will be driven by an increasing need for enriched data communication and expansive applications of M2M.

It added that there are also various factors, such as the conjunction of satellite and terrestrial mobile technology, and the emergence of cloud-based platform providers in the market, that are creating opportunities for vendors such as Orbcomm, Kore Telematics (which announced the acquisition of Wyless Group Holdings in March 2016), Hughes Network Systems, Orange, ViaSat, amongst others.

In a separate study published in January 2016, MarketsandMarkets forecast that the global maritime satellite communication market will grow from USD2.01 billion in 2015 to USD3.10 billion by 2020. It believes the market is growing because of rising demand for enriched data communication to improve operation efficiency, on-board security and surveillance, as well as employee/passenger welfare. MarketsandMarkets also said more end users are being attracted by less expensive satcoms technology being introduced by major vendors and service providers.

Video communication services are expected to reflect higher growth owing to increasing use of video-conferencing, HDTV and entertainment applications. MarketsandMarkets said the passenger ship end-user segment will show the highest growth among all other end users due to an increase in demand from business travellers for advanced communication systems at sea and their expectations for high-speed data equipment.

According to the firm, the maritime satcoms market has seen rapid technology shift from MSS to VSAT. It said the latter will continue to dominate the market over the next four years.

"This shift is attributed to the bandwidth and cost advantages that VSAT offers to marine users," said MarketsandMarkets. "The penetration of VSAT technology is maximum in Ka-band. On the other hand, penetration

across Ku-band will show the highest growth owing to increasing deployment of maritime satellite communication services across Ku-band during the forecast period."

The company said that as the market is becoming more customer-centric, even small vessel owners are now able to subscribe to VSAT communication services. But it also pointed out that various factors, such as lack of awareness among customers and expensive infrastructure to support maritime satellite communication, are hindering growth.

Expansion and stagnation

Over the last decade, the telecoms industry has been a key sector for foreign direct investments into most African countries. The region has been the fastest growing telecoms market in the world, hence it was seen as the next frontier for growth and expansion by global telcos and investors.

Oluwole Babatope, Senior regional analyst West Africa, IDC

However, a number of telecom markets in Africa have started to stagnate as they approach maturity for voice services; consequently, there has been decline in investment in legacy technologies (i.e. 2G).

Key areas of growth that are still attracting investment in Africa include rolling out or optimising 3G networks, LTE, expansion of metro fibre networks, and laying undersea fibre cables. Additionally, in a bid to expand and increase footprint across the continent, global and pan-African telcos have been strategically acquiring local telcos and ISPs.

Although Africa presents opportunities for growth and expansion, the challenges faced by the region's telcos to generate revenue and sustain profitability cannot be over-emphasised. One major obstacle is the lack of reliable and consistent power supply. A constant dependence on diesel generators for power increases opex for telcos, thereby affecting profitability.

Physical security remains another challenge. There have been widespread cases of persistent acts of vandalism of telecoms infrastructure, theft of diesel generators from cell sites, and incidences of fibre cables cuts during road construction. All this has a direct impact on overall profitability as these incidences significantly affect continuity of services and therefore disrupt revenue generation and raise network operating costs.

Telecom Namibia is just one example of an African operator that has suffered

here, and the media section on its website catalogues a long list of thefts and criminal damage to its infrastructure.

Other costs include the acquisition of land for sites, government taxes, and informal taxes from various 'community organisations' that all cumulate into higher operating costs. In addition, the downward pressure on tariffs driven in part by competitive forces have led to decreases in top-line growth year on year. This pressure, coupled with the ever-rising cost of operations due to the factors mentioned above as well as foreign exchange fluctuations, have seen telcos that are no longer willing to weather the storm exit the African market.

For example, readers will recall that in 2005 Zain established operations in Africa after it acquired the subsidiaries of Celtel International's 13 countries for about USD3.4bn. The operator acquired licenses in two more markets and invested in network expansion and upgrades. But after only five years of operation, the group changed strategy and quit 15 of its 17 markets in Africa (Morocco and Sudan were retained).

As well as building networks in its home country, Indian telco Bharti Airtel had already been increasing its international operations with businesses in the Seychelles, Bangladesh, Sri Lanka and other Asian markets. In 2010, it expanded its footprint into Africa after buying Zain's African operations for USD10.7bn. It later acquired two more markets on the continent and now operates in Burkina Faso, Chad, Congo Brazzaville, DRC, Gabon, Ghana, Kenya, Malawi, Madagascar, Niger, Nigeria, Rwanda, Seychelles, Sierra Leone, Tanzania, Uganda and Zambia.

However, Bharti Airtel is now contemplating exiting some of its operations in Burkina Faso, Chad, Congo Brazzaville, and Sierra Leone in order to consolidate resources in its home country and select key markets in Africa.

The fact that this decision comes after just five years of operating in Africa points to the continent's challenging business environment and concerns about long term sustainability and profitability.

Further proof of this came in 2014 when Etisalat Group agreed to sell its West African subsidiaries under the Moov brand to Maroc Telecom. Etisalat had steadily experienced declining revenues from its international subsidiaries, with all of its West African businesses (including Nigeria) only contributing about seven per cent to its revenues in 2014.

The deal included Benin, Central African Republic, Côte d'Ivoire, Gabon, Niger and

Togo. The sale of Prestige Telecom, an IT services specialist based in Côte d'Ivoire that had been providing support to Etisalat in these countries, was also included in the deal.

In contrast to Zain, Airtel and Etisalat, operators like Vodacom which operates in nine markets, as well as MTN and Orange who each operate in 16 markets, are adopting a different strategy in Africa.

For example, Orange recently initiated its Essentials 2020 plan that focuses efforts on providing converged services. It has therefore strategically exited the Kenya market whilst also planning to enter markets like Burkina Faso, Chad, Congo Brazzaville and Sierra Leone that align with its agenda.

The French telco is optimistic about the potential that exists in Africa, and has consequently reshuffled its management structure to create a single holding company for its subsidiaries in the Middle East and Africa. This new structure replaces the multiple holding company model, and the reshuffle is expected to facilitate simplicity and clarity in management.

Orange is expecting a 20 per cent revenue increase by 2018. It has already increased its stake in Moroccan subsidiary Medi Telecom from 40 to 49 per cent, and has initiated plans to sell between 10 and 15 per cent of its 99 per cent stake in Egyptian subsidiary Mobinil (which has now been branded as Orange).

Despite the challenging operating environment, IDC believes telcos can still maintain financially sustainable operations in Africa by implementing the following strategies:
❖ Collaborate with network infrastructure providers to transfer the burden of managing networks and risk thereof to third-party providers. This will enable the operator to focus on core businesses which includes providing innovative services and improving customer experience.
❖ Telcos entering Africa should adapt strategies that have succeeded in other regions to the specific operating environments in Africa. For example, while price competition was a successful strategy for Airtel in India, the same strategy in Africa negatively affected its profitability due to low ARPUs in all the fragmented markets on the continent.
❖ Telcos need to focus on building and growing their enterprise product and service portfolios to appeal to customers in the business sector (especially SMBs).

The latter could prove to be key. As profit margins in the consumer sector continue to fall as mobile penetration across Africa continues to rise, there is a sustained decline in ARPU. The business segment therefore presents a viable next frontier of growth for telcos.

chapter
Cellular
networks

2

LTE connections pass one billion

**Alan Hadden,
Vice president,
GSA**

The global LTE success story continued in 2015, a year in which 104 operators commercially launched 4G/LTE service. The *Evolution to LTE* report published by the Global mobile Suppliers Association (GSA) in January 2016 confirmed that 480 operators have commercially launched LTE networks in 157 countries, and predicts that this will rise to 550 operators by year end.

Most LTE deployments globally use paired spectrum (FDD). The TDD mode is complementary and the best choice for providing high-speed mobile broadband access in unpaired frequencies. Both FDD and TDD networks are deployed in Africa, matching spectrum assets and the different regulatory environments that prevail in the region.

Of the 480 LTE networks that have now been commercially launched: 409 operators deployed LTE using FDD mode only; 50 deployed LTE using TDD mode only; and 21 deployed using both FDD and TDD.

LTE is growing faster than any other mobile communications system technology and supports one in seven connections worldwide today, having passed the one billion milestone in Q4 2015 and ending the year at 1.068bn.

The world saw 552.2 million LTE subscriptions added in 2015, representing 107 per cent annual growth. Almost 1.7 million were being signed up daily in the last quarter alone. With 156 million connections in Q4, LTE achieved 75 per cent more users than 3G/HSPA. The number of LTE and LTE-A subscriptions will pass the 3G/WCDMA-HSPA global total in 2020. GSM subscriptions fell by 141 million in Q4 2015.

The APAC region has the largest share of LTE subscriptions with 54.3 per cent, followed by North America (22.8 per cent) and Europe (14.8 per cent).

In Africa, 4G/LTE mobile broadband connectivity arrived in several countries for the first time during 2015 in Benin, Botswana, Cameroon, Ethiopia, Gambia, Malawi, Morocco, and Somalia; several new players also entered the various markets.

Africa had 6.073 million LTE subscriptions by the end of 2015, up from 2.71 million 12 months earlier – an impressive 124 per cent annual growth. In terms of subscriber numbers, the top 10 LTE markets are (highest first): South Africa, Morocco, Nigeria, Angola, Uganda, Kenya, Ethiopia, Namibia, Zimbabwe and Gabon.

Spectrum

The most widely used spectrum for LTE network deployments worldwide continues to be 1800MHz (3GPP band 3). This is in commercial service in 100 countries on 213 LTE networks, i.e. 44.4 per cent of all LTE networks globally.

The 1800MHz band also has the most developed user devices ecosystem: 2,381 have so far been announced, and 54 per cent of all LTE devices can operate in this band.

The next most popular contiguous band for LTE deployments is 2.6GHz (3GPP band 7). This is used in 108 networks (22.5 per cent), typically as a capacity band.

800MHz (band 20) is by far the most popular sub-1GHz choice for LTE coverage and continued to gain share in 2015 with 100 operators – more than one in five globally have deployed LTE networks using this spectrum. The next most popular contiguous band is AWS (band 4) and is used by 45 LTE operators.

Being part of ITU Region 1 (which also includes Europe and Russia), Africa can directly leverage and benefit from the fact that the three most popular bands for LTE deployments not only have the largest user device ecosystems, but are also widely allocated and in use for FDD deployments in the region's markets. This also greatly assists LTE roaming for customers of African operators.

The pace of TDD deployments has been relatively modest in Europe, with most using 2.6GHz spectrum. There are extensive TDD network deployments elsewhere, particularly in China where there is soaring TDD growth, and also in Africa, the Americas and Asia.

In Africa, 2.3GHz (band 40) and 2.6GHz (bands 38 and 41) are the most common for TDD. Band 41 is the band with most subscribers globally since it has been deployed in major markets such as China, US and Japan.

Prospects for TDD deployments using 3.5GHz spectrum (bands 42 and 43) are also excellent at the global level, and 17 networks use this spectrum for commercial service, including two operators in Nigeria.

LTE-Advanced

Investment in LTE-A technology worldwide is strong. 163 LTE operators (around a third) are investing in LTE-A deployments, studies or trials in 72 countries and 116 operators have commercially launched systems in 57 countries, including in Gabon and Kenya. LTE-A technology trials are progressing in Angola and South Africa.

18 LTE-A networks support Category 4 user devices (101-150Mbps theoretical peak downlink) but the vast majority (around 75 per cent or 86 networks) support Category 6 devices which are capable of a theoretical peak downlink data speed of 151-300Mbps and 50Mbps on the uplink. More than

half of Category 6 networks support the maximum 300Mbps theoretical peak rate.

Evolution of LTE doesn't stop there. Eleven Category 9 systems (301-450Mbps downlink) have already been commercially launched, and the first Category 11 system (451-600Mbps) has gone live in Australia.

Several LTE-A Pro networks with even higher capabilities and performance levels are scheduled for deployment in 2016-2017, using features that have been standardised by 3GPP in Release 13 (and more will follow in Release 14).

Another big trend is the rapid shift to transporting voice over LTE networks. 118 operators in 56 countries are investing in VoLTE deployments, studies or trials of which 46 operators have commercially launched VoLTE-HD voice service in 29 countries, including South Africa and Uganda.

The *Status of the LTE Ecosystem* report published by GSA in February 2016 confirmed the rapid expansion of the LTE ecosystem and a boom in the availability and performance of LTE devices. 1,770 devices were added to GSA's LTE devices database (GAMBoD) during the year, confirming 67 per cent annual growth, and the number of manufacturers grew 34 per cent in the same period.

The smartphone is the largest LTE device category. 2,706 smartphones including operator and frequency variants have been announced, giving an improved 61.2 per cent share of all LTE device types. Ninety-eight per cent of LTE smartphones are multimode, capable of operating on at least one 3G technology in addition to LTE. Almost 50 per cent can operate on 42Mbps DC-HSPA+ networks.

Digital dividend

Last November's World Radiocommunication Conference (WRC-15) acted to confirm the use of 700MHz spectrum (band 28) for mobile broadband globally, including in ITU Region 1. This spectrum is very much favoured for coverage and arises as a digital dividend from the transition by TV broadcasters from analogue to digital transmission (in Europe this is effectively a second digital dividend as 800MHz band 20 was the first).

International support for the APT700 band plan, specifically the FDD arrangement (3GPP band 28 pairing 703-748MHz with 758-803MHz) continues to strengthen and positions APT700 as a near global band which should lead to vast economies of scale benefits for Africa. It's worth noting that Europe's 700MHz band plan is compatible with the APT700 arrangement (lower duplexer).

While harmonising the use of global and regional spectrum removes uncertainty and encourages growth, new frequencies need to be identified for 4G and to meet the anticipated mobile broadband capacity demands for future 5G services and use cases.

The GSA Spectrum Group (GSG) has been formed to contribute to the international and national spectrum work, and intends to actively participate in the ITU World Radiocommunication Conferences. The GSG will operate in all regions around the world mirroring closely the ITU-R organisation structure, and will do vital work leading up to WRC-19.

The group comprises around 45 spectrum and regulatory experts from GSA executive and member companies, and is applying for ITU sector membership.

The GSA has launched a new website which continues to provide a wealth of unique market data, statistics and industry insights. Readers should register at www.gsacom.com.

Africa embraces the future

With 4G rollouts still continuing at a pace, 2015 saw the ITU finalise the main goals, process and timeline for 5G, and established the overall roadmap for the development of systems under the name "IMT-2020".

IMT-2020 is an extension of the ITU's existing family of global standards for International Mobile Telecommunication systems. The organisation reported that work on IMT-2020 was now well under way in close collaboration with governments and the global mobile industry. The next step taken was to begin work on establishing detailed technical performance requirements for the radio systems to support 5G, taking into account the needs of a wide portfolio of future scenarios and use cases, and then to specify the evaluation criteria for assessment of candidate radio interface technologies to join the IMT-2020 family.

Over 2016-2017, Working Party 5D will define in detail the performance requirements, evaluation criteria and methodology for the assessment of the new IMT radio interface. Evaluations by independent external groups and a definition of the new radio interfaces to be included in IMT-2020 will then take place during 2018-2020. The whole process is planned to be completed in 2020 when a draft new ITU-R Recommendation with detailed specifications for the new radio interfaces will be submitted for approval within ITU-R.

The union said the new systems will "usher in new paradigms" in connectivity in mobile broadband wireless systems. For example, it said they will support extremely high definition video services, real-time low latency applications, and the expanding IoT.

With a timeline now established, Etisalat Group announced it had plans to be the region's first operator to launch 5G.

JANUARY 2015

Ooredoo said its 3G network in Algeria has been ranked as the fastest in North Africa in 2014 by the official Network Quality Benchmark. It added that it has also become one of the first operators in the world to achieve network throughput of 63Mbps, and is the first in Africa to deploy a 400G ultra-broadband mobile access network. The operator claimed 3.5 million customers have now signed up for its 3G service since it was launched in December 2013.

FEBRUARY

CommProve is working with an African telecoms regulator to monitor the QoS of multiple mobile network operators. The Ireland-based firm, which specialises in end-to-end network management, said it is unable to name the regulator or the country where it's from. The regulator has deployed CommProve's *GSP* monitoring solution at sites run by each of the operators. It provides KPIs for every cellco, based on the experiences of every subscriber across each network and round the clock. The information gathered is fed back to a centralised reporting system, and is based on the actual calls or data sessions that subscribers make, or try to make in the case of service failures.

MARCH

ZTE has signed a deal to build Algeria Telecom's LTE Phase II project. This is the second time the vendor has worked with the telco following its LTE Phase I project, with the first purchase order for Phase II covering 14 provinces in the north east region. Algeria is the second country in this part of Africa to offer commercial LTE services, having launched its Phase I project in April 2014 with the added help of Nokia Networks. 4G services based on LTE are also available in the region from Smile Communications in Nigeria.

APRIL

Nexmo, which specialises in providing application program interfaces (APIs) for cloud communication, has signed a deal with Mobilis, Algeria's first independent mobile operator and a subsidiary of Algeria Telecom.

Etisalat and Ericsson revealed that they would exchange knowledge and share their solutions to develop 5G. Rollouts could happen in any of Etisalat's African operations, including Sudan (Canar), Egypt, Nigeria, amongst others.

The plan for the future of mobile communications in Africa and the move to 5G was put into perspective by a study by the GSMA. In its *Mobile Economy – Sub-Saharan Africa 2015* report, the association said the mobile industry contributed USD102 billion to the region's economy in the previous year. This was equivalent to 5.7 per cent of sub-Saharan Africa's GDP, with mobile operators directly contributing 1.7 per cent or USD31bn. The GSMA forecasts the industry to contribute USD166bn in value to the region by 2020 which will be equivalent to eight per cent of expected GDP.

The technological march forward was punctuated in March with Telecom Namibia (TN) discontinuing both its *Switch* voice and 3G-EvDO data services on its legacy CDMA network. It said all CDMA sites were shut down on 31 March 2015 as it has transitioned most customers off the technology and onto TN Mobile's faster HSPA+/LTE networks.

"The entire CDMA footprint is already covered with GSM which we began building in 2013," said an announcement on the operator's website. "Customers who are still using their CDMA services are kindly advised to swap their CDMA numbers with a GSM SIM card of TN Mobile."

TN said the main reasons for the shutdown were to avoid operating two mobile networks and offer services over a single GSM platform. The move also enabled the firm to re-use the spectrum as needed. The operator added that CDMA was no longer able to "favourably compete" with GSM-based 3G and 4G LTE technologies. "CDMA is fast becoming obsolete around the world and the maintenance of the same will not be a simple affair for any telco in the mid and long term," stated the company.

4G spreads and diversifies

As detailed in this chapter's introduction, 2015 was notable for the continued spread of LTE. There were numerous new deployments and expansion projects.

For instance, Telkom expanded its LTE-A network to an additional 22 suburbs across South Africa, adding to what it claimed was "already the largest LTE-A network in the country". The expansion covered areas in greater Johannesburg, the Western Cape, KwaZulu-Natal and Tshwane. The firm claimed its LTE-A speeds were comparable to those available over a fibre network, offering a "compelling" alternative to fixed line broadband with the configuration supporting downlink rates of up to 150Mbps.

The longer-term goal is for much higher speeds than that. Back in late September 2014, the operator said it was upgrading its network to offer customers peak speeds of more than 200Mbps, with a view to developing its network to ultimately deliver LTE-A peak speeds of 3Gbps.

Another country to enjoy its first LTE-A network was Kenya. Safaricom rolled out 4G services in Nairobi and Mombasa.

The launch was described as part of the firm's push to "democratise data", according to CEO Bob Collymore. "The direct impact of data on our economy has already been noted through the increasing number of businesses and services offered online," he said. "With 4G, we can deliver revolutionary services like telemedicine, virtualisation, or real-time video that have immediate and transformational impact on our society." The operator added that it planned to launch "affordable" 4G-enabled devices, including phones, routers and modems. To date, the promise to expand coverage to other towns has so far not been delivered on.

The difficulties in moving to 4G have not just been experienced by Safaricom. Airtel was given the go-ahead by the Communications Authority of Kenya (CAK) to launch its 4G network back in May 2015. Preparations had already been made with upgrades to its 3G network in Nairobi, Mombasa and Kitali as part of a USD26m plan to prepare for LTE. The latest update is that Airtel Kenya hope to launch 4G services by the end of 2016.

Also playing catch-up with Safaricom is Orange Kenya, which was also given permission to launch 4G trials on its networks, which almost certainly means it will be allowed to launch the technology on a commercial basis.

African countries could look to Malawi for helpful hints on furthering their LTE dreams. Access Communications not only implemented the country's first LTE network but also claimed to have completed it in record time with the help of Italy-based Athonet.

Huawei created a bespoke end-to-end *eLTE* system for the Addis Ababa City Light Rail Transit project.

The agreement will see Nexmo provide Mobilis with, among other things, online security solutions. Sid Ahmed Zaidi, business development and international roaming deputy director for Mobilis, said Nexmo will bring "advanced" communication tools to a growing network of 15m subscribers.

MAY
Egyptian cellco Mobinil and Huawei have now successfully completed the implementation of a Single RAN project. Mobinil began implementing the system in 2011 in an effort to pave the way for better coverage and services, and facilitate 3G technologies which it first launched in 2008. The operator said its move to Single RAN has resulted in a better customer experience mainly through improved voice quality and reductions in dropped and blocked call rates. It added that the new technology is also more energy efficient.

JUNE
Botswana Telecommunications Corporation Ltd (BTCL) is planning to trial 4G this year. CEO Paul Taylor told local reporters that a commercial rollout would begin towards the end of 2015 following trials that were expected to start during Q1. While BTCL has yet to issue any official statements about its 4G plans, the *Botswana Guardian* said the firm is currently deploying LTE trial sites across the country and is also investing BWP110m (USD11m) in a network upgrade programme. Mascom Wireless and Orange have already demonstrated their 4G capabilities in the country.

JULY
Truphone has added South Africa as one of five new emerging market business hubs. The UK-based firm – which describes itself as "the mobile network operator without country borders" – offers in-bundle plans across 66 countries. It said these provide multiple international numbers on a single SIM, enabling businesses to make international calls that are treated as local ones, and giving contacts a direct way to get in touch on a local number.

AUGUST
South Africa's Cell C said some rival MNOs

Access' network offered initial services aimed at clients who require high speed internet access and voice services in Blantyre's business district.

Athonet said it was able to implement LTE for the operator in a matter of weeks using *PriMo*, its software-based mobile network infrastructure solution. The firm said this virtualises and increases performance of the mobile core, and can run on standard IT servers or in the cloud. It integrated this distributed virtual EPC with Access' existing infrastructure, including its CDMA network.

Athonet said the fully virtualised software approach has created an ultra-broadband LTE service with guaranteed low latency and high reliability. Speaking at the time, the company's head of operations Massimiliano Gianesin said: "Our software approach to infrastructure means that mobile networks in developing countries can be deployed very rapidly and cost-effectively both in terms of capex and opex, avoiding the complexity of legacy products and simplifying operations."

LTE has also branched out in what's claimed to be the first use of the technology in an African metro railway system. The Addis Ababa City Light Rail Transit (AACLRT) project had its telecommunications systems provided by Huawei, including an end-to-end eLTE trunking solution and related comms systems. These have been used to support vehicle-mounted devices and dispatching systems which were provided by another project partner, Shenzhen Communication Technology.

Huawei said that just one of its *eLTE* cells can provide a wireless network that covers 1,200m, and requires just four baseband units and nine radio remote units. The vendor

Vodacom's mobile data centre carries complete power backup with on-board generators, network equipment, and more.

added that *eLTE*'s ultra-wideband technology would enable wireless dispatching and various other services, including voice trunking and single-network ticketing data management, thereby reducing the need for trackside devices and lowering maintenance costs.

In order to avoid duplicating network capacity and minimise the investment required for each device, Huawei said it based the AACLRT's system on a single backbone network that can support multiple services, including communication, signalling, SCADA and fare collection.

Cellular innovation

In what was claimed to be an African first, Vodacom developed a mobile recovery system to ensure its network would be even more resilient in the case of an unforeseen, catastrophic incident. The *RAN Mobile Recovery Solution* is essentially two mobile data centres housed on board a lorry.

The operator said the solution would give it the ability to restore functionality at any of its South African mobile telephone exchange (MTX) sites which link its RAN to the core network "These mobile data centres effectively allow us to recover our site

within 48 hours instead of the two years it typically takes to build a new MTX site," said Vodacom network engineering officer Beverly Ngwenya: "We call this a 'hole-in-the-ground' recovery solution because it's used in the very unlikely event that our entire facility's functionality completely disappears."

The new solution was tested by simulating the recovery of an entire MTX site, choosing Midrand which provides connectivity to hundreds of thousands of customers in the southern and central parts of Gauteng. Vodacom reported that the tests ran smoothly and that no loss of service was reported.

Separately, Vodafone Egypt has built a unique, prefab MTX in the Nile Delta region in a bid to respond to the increased demand for mobile data in the region. "The business needed to quickly and cost effectively increase the number of MTX units in its network, particularly in highly populated regions, without losing any of the resiliency," explained Ahmed Abdelwahab, Vodafone Egypt's MTX planning and optimisation expert.

Vodafone said its engineers created a three-storey, 400m^2 building that was ready to ship in 12 weeks and operational in six months. All the components for the facility were manufactured and tested in advance before being sent in containers to the site, ready for assembly.

More innovation was demonstrated by South African mobile operator Cell C. Following months of testing, the company launched *Wi-Fi Calling* to its entire customer base on 1 October 2015.

According to the operator, the service effectively turns any Wi-Fi hotspot into a Cell C base station. This promises to give subscribers extended coverage, wherever they are, enabling them to make calls and send texts "seamlessly"

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are deliberately preventing subscribers from cancelling contracts early by charging them "excessive and unreasonable" penalties. While it doesn't name names, the firm said it's aware of certain instances where customers are being asked to pay full subscription fees for the remainder of their contracts, plus an additional termination charge. Cell C pointed out that the Consumer Protection Act clearly specifies that penalty charges cannot be an amount which would have the effect of "negating the consumers' right to cancel".

SEPTEMBER

Ooredoo is working with Nokia on what it said are the first 4G technology tests in Tunisia. They began at the start of September with Ooredoo deploying pilot networks in

two major cities. While the initial results have shown a download speed equal to 69Mbps, the operator claimed its 4G technology may exceed 100Mb speed when it's launched in the first half of 2016. Ooredoo's operation in Tunisia was previously known as Tunisiana, but changed following a global rebrand.

OCTOBER

Paratus Telecom is using Infinera's *TM-Series* WDM system for its metro network in Windhoek. It's claimed the upgrade provides the operator with an optimised 10Gbps transport solution upgradeable to 100Gbps. With its acquisition of local voice company VOX in 2014, Paratus said it has experienced "immense growth" in converged data traffic requiring next-generation network technology

built on an advanced fibre-optic infrastructure. "The *TM-Series* packet-optical network solution effectively addresses our bandwidth requirements to keep up with the rapid growth in converged network services," said Samantha Geyser, the operator's executive of planning.

NOVEMBER

MTN will use Ericsson's *Order to Cash* BSS platform to standardise the customer experience of its products and services in all 22 countries where it is operational. As part of the deal, Ericsson will be responsible for the replacement of all legacy infrastructure with its new *Charging System*, along with its *Multi Activation* and *Multi Mediation* software. According to the vendor, *Multi Mediation* supports the retrieval and

Following its own investigations, Gemalto said there are "reasonable grounds" to believe a joint surveillance operation by the NSA and GCHQ (pictured) "probably happened" during 2010-11.

over the Wi-Fi network. When using the service outside South Africa, customers can use any Wi-Fi hotspot to make any call to any network at their local Cell C tariff plan rates.

Operator woes: hacking, failing, and cancelling

Africa saw its fair share of problems in 2015. A hacking scandal erupted following revelations published on the *Intercept* website in mid-February that UK intelligence agencies had the potential to hack SIM cards manufactured by digital security specialist Gemalto.

According to the report, during 2010 and 2011 operatives from the US National Security Agency (NSA) and the UK's Government Communications Headquarters (GCHQ) hacked SIM card encryption keys engraved in Gemalto's and possibly other vendors' SIM cards.

Citing former NSA IT contractor and whistleblower Edward Snowden as its source, *Intercept* said the intelligence agencies had "the potential to secretly monitor a large portion of the world's cellular communications, including both voice and data". KuppingerCole senior analyst Alexei Balaganski claimed the intelligence agencies did not just resort to hacking, but also ran a global surveillance operation on Gemalto's employees and partners. Despite all the revelations, Gemalto maintained that its SIM cards were secure.

Beyond worrying about whether calls are secure is whether a call can be made at all. The QoS tests carried out by the Independent Communications Authority of South Africa (ICASA) back in October 2015 showed Cell C, MTN and Vodacom all failed to meet call retention targets.

Using Ascom's TEMS investigation tool, ICASA's drive-test focused on network

performance measured in terms of call setup success rates (CSSR) and retention of voice calls (drop call rates). The results showed that the three operators did not meet the target in terms of call retention, whilst Vodacom met the CSSR target.

In Nigeria, however, operators were under considerably more pressure to deliver high-quality services. The country has become the latest to threaten mobile operators with imprisonment if they fail to deliver quality services to customers.

Dupe Atoki, director general of Nigeria's Consumer Protection Council (CPC), said mobile users are having to deal with dropped calls, unsolicited texts and calls, and the disappearance of their credit. She said such poor quality of service has left the government with no choice but to impose harsh measures.

"In order to enforce consumer rights and ensure compliance with CPC's enabling law, CPC has adopted a strategy of criminal prosecution of recalcitrant businesses or litigations to achieve satisfactory redress," warned Atoki.

In Zimbabwe, Telecel paid the ultimate price for allegedly not paying its fees and its flouting of the country's back ownership laws by having its license cancelled by the government. Foreign ownership of Zimbabwean companies is limited to 49 per cent by law, but Telecel's local operation was estimated to have only 40 per cent local ownership.

Talks continued after the cancellation of the license and by July Telecel was making initial payments for a new license. The operator promised it would take all possible steps to maintain the full range of its services throughout this process, and said the welfare of its customers and partners was of the "utmost importance and priority".

processing of user data from all network nodes. The data can then be made available to the relevant IT back-end systems and billed in real-time.

DECEMBER

The Zambia Information and Communication Technology Authority (ZICTA) has discovered illegal SIM cards being sold in Masala townships in Ndola, the country's third-largest city and commercial centre for its copper mining region. Working with local police, ZICTA's compliance officers confiscated an unknown number of pre-registered MTN and Airtel SIMs. The authority said they were being sold to the public contrary to Zambian legal regulations which state that purchasers submit a completed SIM card registration form to the seller.

Rahiel Nasir, Editorial director, African Wireless Communications Yearbook

The year ahead: If there's one nut the continent's mobile network operators have found it hard to crack, it's the enterprise market. In the conversations I have had with major operators such as MTN and Orange, this is the sector that comes up repeatedly when I ask them where their pain points are.

But that now looks set to change. Operators have been boosting their international connectivity capabilities by forging alliances with other service providers. For example, MTN has now teamed up with Telefónica, Liquid Telecom, amongst others, and has also enhanced its

own MPLS network as part of efforts to offer enterprise class services and attract more business customers on the continent.

However, if you take the enterprise IT services offered in developed markets as a model, what's really needed in Africa is an ecosystem of data centres, cloud entities and network availability that guarantees uptime for all mission critical applications.

The continent's MNOs are, by their very nature, already cloud service providers. And by investing in fibre, satellite as well as their own cellular networks, they can offer the availability enterprise users demand. Some, like Vodacom for example, have even built their own data centres. Factor in M2M and the IoT, and 2016 could be the year that African MNOs finally crack that nut.

Hesham El Nahhas, GM for Africa, Middle East & Turkey, RFS

Radio Frequency Systems (RFS) has been involved in developing unique telecoms infrastructure solutions for more than a century. Today, the US-headquartered firm has six factories around the world, as well as five R&D centres in Australia, China, France, Germany and the US.

So what about Africa? Here, RFS says its business is expanding on a continent where the wireless infrastructure market grew by at least 10 per cent in 2015, as Hesham El Nahhas explains.

"In Africa and all over the world, the need for mobile broadband is increasing in all environments. Last year, RFS participated in wireless network deployments in many African countries including Nigeria, Uganda, Tanzania, Algeria, and several others. Some were new installations while others were upgrades as part of network optimisation.

"Many operators know they need premium technology for active components, but may not realise that compromising on the quality of passive components – such as the antenna – can cripple network performance. RFS works closely with operators to provide infrastructure solutions that can help future-proof their networks, which is essential to long-term success."

El Nahhas says one project the company is currently working on is the deployment of a wireless network for the metro system in Algiers. He says that because RFS has more than 40 years experience in providing communications technology for railways, metro systems, road tunnels and underground mines, it is "uniquely" qualified to take on such projects, and can deliver "trusted, best-in-class products even for the most demanding environments".

So how has he seen the continent's wireless communications market adapt and evolve in 2015? "A great deal of modernisation is taking place, and high-speed network capacity has become essential. Many networks in Africa are changing from 2G to 3G and 4G. With so much improvement going on, it's important that the upgrades are done well and are future-proof to accommodate new technologies."

As is well documented, El Nahhas says fixed lines are scarce in many African countries so users are heavily dependent on mobile communications, and this intensifies the need for high-quality infrastructure. He adds that the region presents interesting opportunities for RFS, as operators stand to benefit from technologies that have already been proven elsewhere. "With network improvement and expansions coming online later than in some other parts of the world, prime opportunities exist for deployment of the most innovative infrastructure solutions.

"For example, instead of adding visual clutter with more antennas to enable LTE, they can skip ahead to using new multi-band antennas handling 3G at 900MHz, LTE at 1800MHz, etc., on the same band, as well as lower or higher bands such as LTE 800MHz or LTE 2.6GHz."

El Nahhas says multi-band antennas are a big part of the solutions RFS brings to these markets. He adds that two new ultra-broadband models in the company's *RF X-TREME* family are facilitating triple-band site upgrades for reduced cell interference in high-traffic areas.

"In Uganda, LTE Band 20 interference with CDMA850 prompted the government to mandate a fast fix. RFS provided its *Interference Mitigation Filter* to solve the problem, and has so far supplied over 500 filters that are being used at 200 sites in the country."

"Additionally, parts of Africa have environmental conditions that present unique challenges. In desert conditions, towers and pylons need extreme wind resistance. RFS' innovative radome design dramatically reduces wind load and tower loading. The wind load resistance on RFS' antennas is a key advantage in these challenging environments."

He goes on to say that accelerating LTE deployments and a growing need for hybrid solutions will continue to drive Africa's market expansion.

"RFS' hybrid solutions bundle DC cables and fibre cables together into a single cable, offering the flexibility to expand or deploy new RRHs when needed. Deployments of our *HYBRIFLEX* hybrid solutions in Tunisia and Algeria, and in the greenfield operation in Myanmar, have been very successful.

"Small cell backhaul is another significant focus for developing microwave technology. In Africa, operators use microwave backhaul to roll out and control the overall end-to-end quality of network service. RFS' *Invisiline* transparent antennas minimise visual impact, and in 2015 we added the industry's smallest E-band (80GHz) microwave antenna to the *Invisiline* family. The antenna's 122mm reflector and 166mm radome diameter make it visually unobtrusive in any landscape."

So looking ahead, what challenges does El Nahhas envisage for RFS in Africa during 2016? He says modernisation and expansion of network infrastructure will continue unabated on the continent throughout this year and beyond.

"To fulfil the ever-growing demand for network capacity, operators will need to carefully weigh the balance between quality and cost of components, such as antennas, and beware of low-cost, inferior offerings. In the long run, operators making an investment in future-proof solutions will face fewer problems as the infrastructure continues to evolve.

"The most competitive networks will incorporate some of the industry's latest technologies that are suited to all kinds of challenging environments, and to meeting ever-increasing capacity requirements, so they can keep up with the changes ahead.

"RFS will continue expanding its business in Africa in 2016, completing deployments currently under way, and providing its highest-quality solutions where they are needed.

"The company is also planning to increase its presence in Africa by building up its team in key markets – namely North Africa, Central and East Africa and also South Africa."

Igor Biasetti, Sales manager MEA, Coiler Corporation

Last year was "very fruitful" for repeater supplier Coiler in Africa. According to regional sales manager Igor Biasetti, the company significantly strengthened its position in several territories.

"They include Namibia, where Coiler repeaters have been extending coverage for almost a decade now, and Mauritius, Cape Verde and the Seychelles, where our high-power *CR* and *AX* models will soon be deployed on the UMTS network. Our *VB* mid-power indoor repeaters have been tested and approved by Maroc Telecom Networks, while our SOHO plug-and-play series will soon be deployed by Vodacom in Mozambique.

"Globacom Nigeria is also testing some of our equipment, and their feedback so far is extremely positive. MTN Global invited us to participate in a large tender, in which we offered our entire portfolio – quite a big step forward for Coiler in the region."

Biasetti says the biggest trend his company witnessed on the continent in 2015 was the continued rise of LTE as well as an increasing focus on quality.

"In more countries, 4G is becoming a top priority for operators who want to provide added-value services to their customers. There has been a significant increase in demand for LTE solutions, especially in countries that are taking the lead in Africa in terms of technology.

"Although price still is one of the most important factors driving operators, a growing trend for quality products can also

be seen. Operators are increasingly realising that the value of equipment is not only in its price but also in the quality of the hardware and in the additional services available on top of the equipment.

"By offering African operators innovative products and tools to accompany repeaters – such as remote network analysis devices and highly advanced management software solutions – Coiler's portfolio is well aligned with this movement.

"There is also a trend towards multi-technology solutions in one box that are able to address several coverage issues simultaneously – flexibility and adaptability are the keywords for operators here. Our *VB* series, which can be connected to create dual or triple band repeaters, can be a very interesting solution for operators who anticipate future expansions of their networks.

"Simple-to-install, intelligent, auto adjustable solutions also seem to gain space on the continent, following a global trend. Our *AT* and *PS* series repeaters, for example, have received a lot of attention recently thanks to their embedded antennas and plug-and-play installation.

"Rolling out 4G technology fast enough to meet demand is definitely one of the main challenges for African operators in the coming year. A lot of infrastructure still needs to be put in place to address indoor and outdoor coverage issues, both in Africa's growing megacities and in remote villages.

"By extending coverage without having to deploy more costly base stations, repeaters and signal boosters are an excellent solution to improve access to networks throughout the continent; I am convinced their place in hetnets in Africa will continue to grow steadily in the coming years.

"The big challenge for Coiler is providing the continent with the high-quality products and services we are globally renowned for, but at prices more in line with the budgets of the region. With a portfolio as wide as ours we believe we are in a unique position to offer the most flexible solutions to operators throughout the continent. In the coming year, we expect to expand our business to even more countries and establish new strategic cooperation with operators throughout the region.

"Earlier this year, we launched the *ST* series, a brand new line of 4G intelligent single band repeaters, and *NMS* Infinity, a cloud-based management system for remote repeater control and network monitoring.

"These new products – which allow operators to remotely control and troubleshoot repeaters while gathering valuable real-time and historical network Big Data – should give us even more of an edge over competitors.

We hope to see this integrated repeater system deployed in several of the more mature African markets in the coming year."

Joseph Habib, Leader of wireless, CommScope, MEA

Joseph Habib says the big theme at this year's Mobile World Congress was 'Mobile is Everything'. "CommScope witnessed tons of information about the evolution of networks and the underlying technology that enables our mobile world. We also heard a lot about the emergence of the IoT, and plenty of organisations talked about 5G defined.

"Nowadays, expectations for network connectivity in the workplace are very high. Almost all of us expect access to high-performance, desktop PCs and/or laptops, which are networked through wired connections or unlicensed wireless spectrum via Wi-Fi. Mobile devices such as cellular phones have become another reliable and compelling option when connecting indoors.

"People are obsessed with their mobiles and see indoor wireless coverage as important as having access to water and electricity. There are about two billion smartphone users globally and about 80 per cent of cellular data sessions originate or terminate inside a building. But 98 per cent of commercial buildings do not have dedicated systems to guarantee reliable indoor cellular coverage. Why is that? To find out, CommScope recently commissioned research firm Coleman Parkes to carry out a study.

"We surveyed the professionals who design and manage buildings to explore their attitudes and insights about enterprise mobility. The results show that whilst the driving force for reliable cellular connectivity in a building is clear, the reality on the ground is that stakeholders are not invested enough in dedicated indoor systems.

"This is especially surprising considering that survey respondents estimated that the value of a property could increase by an average of 28 per cent with the implementation of a dedicated in-building wireless system. The commercial imperative for investing in dedicated in-building wireless systems is becoming clearer as challenges associated with system costs and technical complexity are confronted and overcome.

"Cellular connectivity in the building is now as important as making available any basic utility for a building. Would you refuse to invest in water supply within your building because it was deemed too expensive or complicated to do? The workplace of the future will have

a plethora of choices for connecting, and dedicated indoor cellular systems will become the norm in buildings of all sizes."

Luke Taylor, Deputy CEO and CCO, Neural Technologies

Neural Technologies says its risk management solutions analyse billions of transactions daily, providing protection for one in seven of the world's mobile phone users. The UK-based firm has been in the industry for more than 25 years, and in Africa it has worked with Safaricom, Kenya, MTN, Telkom in South Africa, Meditel in Morocco and Zain Sudan.

According to deputy CEO Luke Taylor, 2015 saw an evolution in the continent's market, and he reckons proof of this came via Neural's risk management global survey data.

"The wireless communications market in Africa has come a long way over the past couple of years and is starting to enter a new phase of its evolution: market maturity.

"Whilst Africa is large, and its individual countries all have very different political, geographic and infrastructural challenges, some nations are heading towards market maturity.

"Although there are still some African countries and rural areas with lower mobile penetration rates due to lack of infrastructure, countries such as Botswana, Mali, Mauritius and South Africa have reached over 70 per cent penetration. In South Africa in particular, many reports cite over 100 per cent penetration, as people are carrying more than one mobile phone, however, the percentage of smartphone penetration is still below 50 per cent in sub-Saharan Africa overall.

"In countries where the penetration rates are highest, operators are beginning to focus more on customer retention than new acquisition, because it costs more to win a new customer than to retain an existing one, and our survey data reflects the start of this attitude shift."

More than 100 telecoms fraud experts completed the Neural Technologies Risk Management Global Survey which asked questions about key aspects of the communications market, from company losses to the emergence of Big Data, OTT and IoT.

Taylor says 42 per cent of respondents globally considered OTT (including video, audio and other media) more of a threat than an opportunity, citing the increasing trend of OTT bypass fraud and customer distrust of over-the-top services as reasons.

Fifty per cent saw opportunities to increase ARPU through OTT by offering OTT apps, on-demand services (including TV, movies

and sports add-ons), and broadening product offerings. The remaining eight per cent saw OTT as both a threat and an opportunity.

Globally however, Taylor points out that the regions had very different perspectives: "Only 17 per cent of North American respondents saw OTT as an overall opportunity, compared to 61 per cent of African respondents. And Africa showed an above average recognition of the opportunities delivered by the IoT (including home appliance monitoring, healthcare monitoring and smart metering) at 78 per cent, compared to the global average of 74 per cent."

He continues by saying 2015 saw changes in consumer demand across the continent, with more calls for new technology and data services such as IoT, OTT and app availability like *Facebook*.

"As the available market is starting to reach maturity, there is a drive towards customer retention, with pricing reductions and lower margins coming into play. Termination rates are decreasing and voice calls are becoming more competitively priced, so the need to maximise revenue is key.

"Consequently, I was not surprised to see that African operators are keen to offer additional services and subscriptions, adding competitiveness and increasing ARPU through selling M2M and similar services via IoT and OTT channels."

Neural's survey also questioned operators about mobile money and asked if they had implemented services such as branchless banking and money transfers. Here, Taylor says Africa and South East Asia showed the highest rates of offering e-wallets/contactless payment services at 61 and 75 per cent respectively.

"We have seen the increase in mobile money across these areas, as the drive to reach the world's unbanked population continues. At this year's Mobile World Congress in Barcelona, the GSMA announced that mobile money services exceeded one billion transactions in December 2015 with 100 million new registered accounts becoming active in 2015.

"Mobile money services are becoming an increasingly important part of the global telecoms and banking industries, and we will only see it grow further in years to come.

"Fraud continues to be perceived as the biggest threat from offering mobile money services. Over 80 per cent of our respondents cited it as their primary concern.

"However, it was encouraging to see 45 per cent of global respondents recognising mobile money as a channel for new services and revenues. In Africa, this rose to over 50 per cent, which gives us an indication on where the market will be heading in the next 12 months and beyond."

According to Neural's study, revenue loss varies widely by region, with Africa seeing 17 per cent losses compared to the lowest level of eight per cent in Western Europe.

"African respondents reported the highest level of internal fraud globally, and our clients continue to tell us that fraud, collusion and bribery continue to feature heavily in some parts of Africa. Of course, internal fraud occurs everywhere – each region surveyed attributed a percentage of loss to it, but it is exacerbated in emerging countries due to the diversity of wealth typical in these areas."

Over the next 12 months, Taylor reckons African operators will continue to address the big revenue threats: bypass fraud, internal fraud, etc. In addition, he believes the owners of the international gateways (which in Africa's case is the government) will begin to impose more regulations in an attempt to prevent revenue losses and increase licensing income from telecom authorities. This will add another layer of pressure.

"Furthermore, whilst the market begins to get to grips with understanding more of the data it is processing, the region still has issues with quality and consistency, and I think there will be greater focus than ever on quality improvement, both to avoid penalties and to aid customer retention."

Richard Schumann, VP of Africa sales, AdaptiveMobile

Founded in 2004, AdaptiveMobile claims to be the only mobile security company offering products designed to protect all services on both fixed and mobile networks through in-network and cloud solutions. The Ireland-based specialist says it solutions provide operators with advanced threat detection and actionable intelligence, helping them to protect more than one billion subscribers worldwide.

AdaptiveMobile has several regional offices around the world including one in Johannesburg from where it currently works with 22 MNOs across 18 countries in Africa.

In 2015, the company says it was busy building relationships with the continent's large operator groups, looking at how to best assist them in delivering protection to their subscribers. Traditionally, AdaptiveMobile had a focus on the "larger theatres" but this is now shifting toward the group operations which, according to Richard Schumann, has set up the firm for an "interesting and profitable" 2016.

"Africa has always been on the cutting edge of technology, and culturally, Africans tend to consider new technologies as a way

of eliminating redundancies and costs in the networks. Traditionally, [the] operators have focused on subscriber acquisition as a growth strategy. However, over the past year new technologies and innovation within the operators seem to have shifted toward customer retention by driving solutions that enhance the user experience."

Schumann says this may have been driven by the larger markets reaching maximum subscriber penetration, and the bigger groups looking for ways to maximise customer satisfaction and retain users while looking at ways of maximising their spend.

So what does he see as the upcoming challenges for African telecoms during the year?

"The ability to make the transition away from traditional voice and text services and educate the subscribers in the Internet of Things will allow the operators to focus their attention on driving the subscriber into next-generation OTT services and, as such, drive the usage of data to a significant level. This should drive the cost of data services down, and as mobile is the only viable data service in most of Africa it is expected that this would drive revenues over the next 12 months."

Schumann continues by saying Adaptive-Mobile's plans for the region over the next 12 months will be to drive revenue generation for the MNOs by eliminating the illegal use of both the SS7 and traditional transmission networks. "This focus will allow for an increase in revenue and lower interconnect costs for the operator, as well as increased subscriber protection for the end user."

In 2015, the company says it increased its presence in Africa by 16 countries following the MTN Group's deployment of its *Grey Route Controls* platform. AdaptiveMobile claims it's seeing a strong demand for this service and says this is being driven by its "leading edge" work in identifying, mitigating and protecting against the latest mobile security threats and shielding operators worldwide from financial exploitation. It says the region's MNOs are using the solution to identify and shut down grey route traffic and recapture millions of dollars in revenue each month.

MTN said *Grey Route Controls* was enabling it to successfully block unwanted messages terminating to its subscribers via unauthorised routes. Speaking last November, Mohammed Buari, senior manager of alliance operations for the MTN Group's enterprise business unit, said: "Since deploying its network protection platform, MTN Nigeria now records significant new revenues monthly and has stopped the primary streams of grey route messages."

In a study[1] published late last year, AdaptiveMobile's threat intelligence unit

described grey route traffic as extremely resilient: "It's pervasive nature and ability to continuously find new ways to enter networks makes it harder for operators to detect and gain control of these routes."

The study revealed that mobile operators worldwide are missing out on millions of dollars per annum due to application-to-person (A2P) SMS bypass fraud.

Through analyses of network data collected across five continents, the company verified that A2P SMS bypass fraud is significantly affecting operator revenue opportunities and will continue to grow until a security solution is put in place. A CAGR of 127 per cent is predicted for the enterprise A2P messaging market by 2020, making it worth USD7.5bn and a considerable challenge for operators around the globe.

According to the report, one unnamed African operator was able to recapture more than USD44 million per annum through using the *Grey Route Controls* service. AdaptiveMobile adds that other benefits of its platform for the operator include a significant decrease in the volume of customer complaints and billable time-handling concerns. Furthermore, the insights obtained via the software enables them to identify new revenue streams in vertical markets as well as gain market share over competitors.

[1] Turning Grey into Gold – AdaptiveMobile Threat Intelligence Unit Analysis on Recapturing A2P Messaging Revenue
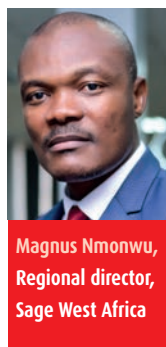
Magnus Nmonwu, Regional director, Sage West Africa

Mobility is the growth engine of Nigeria's economy and the mobile internet is rapidly transforming the way the country does business, according to Magnus Nmonwu, West Africa director for business software specialist Sage. As a result, he says employees and managers are increasingly able to access information on the road to serve customers, speed up decision-making, and save time.

"With sub-USD50 smartphones on the way, rapid improvements to telecom infrastructure, and the availability of affordable cloud applications, the mobile internet is empowering enterprises to be more flexible, responsive and efficient than ever before.

"Nigeria is adopting the mobile internet as quickly and enthusiastically as it did mobile voice services some years ago. It is helping people to enhance their lives and to improve their standard of living, while enabling enterprises to transform how they operate."

Citing statistics from Ericsson's *Mobility Report (also see Chapter 1, State of the Markets, pp8-19)*, Nmonwu says total mobile subscription penetration in sub-Saharan Africa is about 80 per cent but will grow to 100 per cent and a billion mobile subscriptions by 2021. "As one of the largest mobile markets in Africa, Nigeria is leading the trend based on these results. As one example of mobile's impact on the country's economy, consider the fact that the Ministry of Science and Technology forecasts that the mobile market will be worth USD166bn in 2020 and directly employ about 2.7m people.

"Many of our customers and employees today walk around with smart devices that give them access to apps and information wherever they are. For example, *Facebook*'s statistics show that 7.1 million Nigerians access its platform every day, and 100 per cent of its monthly users access it on a smartphone."

Nmonwu believes that tapping into this behaviour gives organisations new ways to interact with employees, suppliers, customers and other stakeholders. He says this ranges from mobile marketing, advertising and e-commerce for consumers, to mobilising business applications such as ERP solutions.

"A salesperson can now easily check from a tablet or smartphone whether a product is in stock while on-site with a customer, and place the order without going to the office. And managers can now use their time between meetings and at airports more productively.

"Mobile technology is also helping HR departments to become more efficient and to build better relationships with employees. For example, companies can offer employee self-service (ESS) across mobile devices to streamline HR processes, and engage with personnel more effectively.

"With mobile ESS, companies can enable employees to file leave applications, submit doctor's notes when they're ill, and make expense claims – all from their devices. They can look up their payslips, change their personal details, and more, all without needing to do paperwork, visit, or call the HR department."

In addition to the productivity boom, Nmonwu says organisations need to adopt mobile business processes and apps to meet the expectations of employees and customers.

"Today's consumers and employees want to interact with companies using accessible, easy to use mobile services and apps. The future is mobile for Sage. We are giving our customers the power to control their businesses from the palm of their hand, connecting them to accountants and partners with real time and intuitive information about their businesses.

"Enterprises thus need to start mobile security and device management, so that they can support mobile employees. Today's consumer wants service on demand from a handset and today's employee wants to be productive wherever he or she is, at anytime or in any location. With this, we expect to see a great deal of investment into mobile technology in West Africa over the next year or two."

In focus:
Value-added services

Cross border remittances – the new frontier in mobile money

Leonard Kore, Senior regional analyst for East Africa, IDC

In 2015, IDC predicted the revitalisation of mobile money services in Africa buoyed by greater investments, increased partnerships, and focus on niche mobile money segments. From 2016, we expect cross border remittances to become the new frontier in the evolution of the mobile money ecosystems.

Cross border remittances are driven by growing interoperability between operators in the region (which increases cross border trade), expensive traditional remittance platforms (such as Western Union or MoneyGram, for example), and the need to expand geographically while tapping into new customer segments. Mobile money players are also seeing demand for these services by migrant workers/expatriates and African diaspora sending money back home.

Cross border trade agreements, regional trade blocs and partnerships are also driving the development of cross border ecosystems such as the One Area Network Agreement in East Africa. These agreements, although previously designed for traditional telco services such as voice and data, can also transcend to include mobile financial services with key benefits being affordability, convenience and avoiding potential regulatory hurdles and challenges that operators are already accustomed to.

MNOs are using several models to deploy their cross border remittance strategies. These include: intra-operator remittances (for example, remittances between Orange Group subsidiaries in Africa or MTN Group subsidiaries); inter-operator remittances between different operators; or using international mobile transfer services such as Western Union.

They are also using mobile money hubs with an established network of specialist partners on the continent, such as TransferTo and Mahindra Comviva's *Terra* platform for example. These offer mobile money players a network of partners (i.e. regulators, bank-led and operator-led providers) across multiple countries while enabling them to avoid regulatory hurdles.

Global or regional operators such as Airtel, MTN and Orange that have a high number of subsidiaries will be looking forward to introducing these cross border offerings at affordable pricing so as to overcome geographical and regulatory hurdles while growing their mobile money footprints and revenues along the way.

Cross border remittances are not a new practice in the mobile money space; Safaricom signed its first international mobile money transfer deal with Western Union in 2011. Partnership agreements between mobile money operators offer more benefits to users especially with regard to convenience and affordability of the service.

For example, the fee for international remittances would typically cost between 15 and 30 per cent of the transaction value, whereas mobile money charges around one per cent of the value of transaction with an exchange rate fee.

MTN (in Uganda and Rwanda) and Safaricom recently signed a cross border agreement allowing their subscribers to send money to and from resident countries. Safaricom also has a similar arrangement with Vodacom in Tanzania. Tigo has also deployed the service between its Tanzania, DRC and Rwanda offices and is planning to launch the same across its other subsidiaries in Ghana, Chad and Senegal. Airtel has also launched a similar initiative in Rwanda, Zambia, Malawi and DRC with the rest of its subsidiaries in the pipeline. In South Africa, Econet has partnered with the South African Reserve Bank to allow remittances to Zimbabwe while the same company has cross border partnerships in Lesotho.

According to the World Bank, Africa has a growing immigrant population of more than 30 million people as of 2013, the key migrant destinations being Côte d'Ivoire, South Africa and Burkina Faso. Outside the continent, the US, UK and France are the key migrant destinations with more than 3.3 million migrants. Mobile money players in these regions can target this population with cross border remittances. Currently, existing remittance platforms that are available for some of these countries are costly, giving rise to opportunities for mobile money.

However, for cross border money remittances to grow in some African countries, existing mobile money ecosystems, i.e. the agency networks, should be improved. Customer education and awareness should be increased, and there should be more regulatory assistance in helping operators to have a greater role. The latter is particularly important in bank-led mobile money ecosystems such as in Nigeria.

In other countries such as South Africa, cross border mobile money systems can be a niche solution for the sizeable migrant and expat community sending money to and from neighbouring countries such as Zimbabwe, Lesotho, Zambia and Mozambique. This can have interesting effects in helping to grow each nation's respective mobile money ecosystems.

IDC believes mobile money players with expansive regional presence in a number

of African countries stand to gain the most from these developments. Operators who will be quick in negotiating commercial agreements between mobile money players and regulatory bodies, while circumventing regulatory hurdles such as acquiring licenses and approvals from central banks across different countries, will acquire crucial first mover advantage.

Although mobile money for the enterprise is still a nascent market, cross border remittances can also be used by businesses to facilitate payments, especially in the FMCG industry. With sizeable cross border trade across many regions such as COMESA, SADC, EAC, etc., they could provide for secure and efficient payments for goods and services across regions.

Regional retail chains such as Shoprite, Pick n Pay and Spar could also benefit from such services allowing for expats and migrant communities in South Africa to pay for groceries and food purchases for relatives in respective countries. These purchases could then be credited to a recipient's mobile wallet and redeemable at the retail chain's local branch.

This could be applied to other areas such as building and construction sectors for efficient and transparent payments across borders. In this way, cross border remittance can go beyond traditional services to play a critical part in the channelling of diaspora investment to recipients for development of the region in a secure and efficient manner.

Additionally, since mobile money is a primary payment method in regions such as East Africa, it can also facilitate e-commerce when buying goods through online platforms across different countries as opposed to less favoured card solutions.

A healthier Africa

2015 saw the power of mobile technology to help with even the toughest of situations. As case in point was Vodafone Ghana Foundation launching the *Ebola Public Health Project* using a platform from emerging markets voice and social media solutions specialist Kirusa.

The project was used to disseminate content on the Ebola outbreak to Vodafone subscribers for free. Kirusa's platform also supported incoming calls from outside the operator's network as well as international sources to retrieve the same content, which was refreshed weekly.

Nana Yaa Afriyie Ofori-Koree, head of Vodafone Ghana Foundation and Sustainability, said: "The Ebola epidemic has taken a huge toll in West Africa. This is our endeavour to spread awareness amongst our countrymen and make Ghana an Ebola-free country."

The *Ebola Public Health Project* was developed as part of the foundation's *Mobile for Good* initiative which set out with the aim of empowering Ghanaians to deploy mobile technology in a way that impacts the lives of ordinary people, socially and economically.

More mHealth innovations will be on the way across Africa thanks to an alliance formed by the U.S. Agency for International Development (USAID) and Orange.

The agency claimed that using mobile phone technology to accelerate access to health information and services is a "game changer". It added that partnerships with private companies such as Orange will enable it to have a larger impact in a cost-effective manner.

Under the first phase of their programme, the two organisations leveraged their
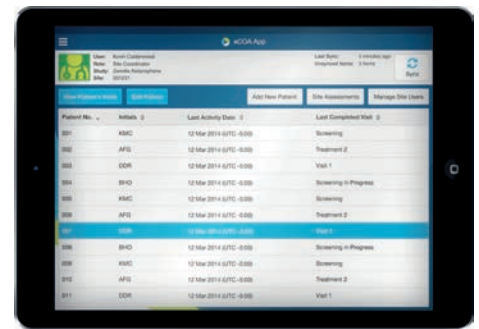
Clinical trial participants can record data about their symptoms and experiences using ERT's *SitePad* tablet.

combined expertise, technologies and local resources to improve quality of care and ensure that health services are readily accessible to the public. Niger was one of the countries under exploration.

Future services will use integrated mHealth platforms and Orange's networks in 20 countries across MEA to communicate alerts and share resources. Orange said healthcare workers will be able to use the technology to share medical expertise, collaborate with specialists regardless of location, and improve patient care.

The public will also be able to access health information via the platforms. For instance in West Africa, USAID and Orange had already started to develop a regional platform with a menu of mobile apps that health ministries, donors and NGOs could use for consumer education, healthworker tools, mobile money, and data collection. The aim of the alliance would be to create a framework for easily replicating these mobile services in a number of African countries.

M2M technology also played its part in 2015 with ERT (formerly PHT Corporation) using Vodafone's global M2M network for its *electronic Clinical Outcome Assessment*

JANUARY 2015

Following the launch of *Internet.org* in Zambia and more recently in Kenya, Facebook is expanding its partnership with Airtel to bring the app to Ghana. Subscribers will have access to a set of online services, such as health, education, news and sports, location information, and more, all for free. Facebook VP of *Internet.org* Chris Daniels said it is important to make "internet access available to the two-thirds of the world not yet connected".

FEBRUARY

MTN Group is aiming to become the first African cellco to offer Amazon Web Services (AWS) Direct Connect to business customers across the continent. The new service will leverage the extensive footprint of MTN's

Global MPLS network to provide customers with connectivity between their data centres or businesses and the AWS EU Ireland region. MTN said this will give users across Africa a dedicated link with which they can access the "scalable and reliable" AWS cloud.

MARCH

MTN has set up a mobile TV service in Côte d'Ivoire. Subscribers can use their smartphones or tablets to download the *MTN TV* app and access a set of live TV channels as well as on-demand content. They have the option to subscribe for a day, a week or a month. The first five international channels accessible on *MTN TV* include FRANCE 24, Al Jazeera, TRACE AFRICA, BBLACK and TIJI. MTN's service is built on a platform developed by SUMMVIEW.

APRIL

South African mobile operator Cell C will use Tecnotree's *Reachability Express* to expand its call completion and interactive voice response platform. The vendor claims the new system will reduce Cell C's opex by 30 per cent when compared to legacy systems, mainly through simpler configuration and provisioning of segmented services. In addition to standard notification channels such as SMS and email, *Reachability Express* also incorporates a social media API that is pre-integrated with *WhatsApp*.

MAY

Safaricom is now using Huawei's *Mobile Money Platform*. In early May, the Kenyan operator announced that all 12.8 million active *M-PESA* subscribers had been migrated to the new

(eCOA) system which collects data for clinical research from patients.

Clinical trial participants record information about their symptoms and experiences using ERT's *SitePad* tablet which stores all data collected securely. Between 2015-2018, ERT is due to deliver thousands of tablets embedded with M2M SIMs to clinical research sites across Africa, Asia, Europe and the Americas.

ERT will manage the connections via Vodafone's global M2M platform to help ensure ease of use and satisfaction for patients and sites. The devices will connect to *StudyWorks*, ERT's study management and patient data portal, over Vodafone's secure M2M network where all patient-agreed trial data will then be available for review, reporting and comparison. By using its network, Vodafone said ERT would give pharmaceutical trial sponsors real-time access to patient information, enabling them to collect higher quality data and make faster research decisions with confidence.

The next-level for money?

Mobile money is always a hot topic in Africa and 2015 was no exception. At the beginning of the year, Mahindra Comviva announced that it had taken mobile money to the "next level" with the launch of its *connectMoney Service Manager* in partnership with Econet Wireless in Zimbabwe.

As part of the agreement, Econet issued MasterCard debit cards linked to its *EcoCash* mobile money system, and said it was the largest rollout of secure chip and PIN payment cards in the country. It was also the first time that MasterCard debit cards are available to consumers using mobile money services in Africa.

The *connectMoney Service Manager* service links financial systems powered by MasterCard and other card networks. *EcoCash* account holders received debit cards allowing them to make purchases at POS terminals and also to withdraw cash via ATMs accepting MasterCard, locally and internationally.

The service also enabled Econet to offer virtual cards that are directly linked to the user's mobile money account. The virtual card number is delivered via SMS and is accepted for e-commerce payments. EcoCash COO Japhet Aritho said: "This will further accelerate adoption of electronic payments in the country thus promoting the national agenda of a cashless society."

In a separate development, Mahindra Comviva created what was claimed to be the world's first domestic interoperable mobile financial service between *Airtel Money* and *Tigo Pesa* in Tanzania. The service enables customers to send and receive money directly between the rival cellcos' mobile money accounts.

Towards the end of the year, Chase Bank Kenya partnered with Safaricom to launch a service that aimed to boost the efficiency of businesses by aggregating all their banking services and making them accessible through a mobile phone.

Mobile2Bank, which was claimed to be the first of its kind in Kenya, enables businesses to make payments and collections directly to their bank accounts. It also enables access to micro-credit and fund transfers from one *Lipa Na M-PESA* till to another in real-time. *Lipa Na M-PESA* is the Safaricom service used by retailers to accept payment of goods and services from their customers.

"[*Mobile2Bank*] demonstrates how innovation in the mobile space can be

harnessed to address some of the common pain points in business," said Chase Bank CEO Paul Njaga. "With *Mobile2Bank*, businesses [both] small and large will no longer need to carry out physical withdrawals of cash from bank accounts, thereby enhancing their efficiency."

Njaga added that the service will also help boost credit scoring once users start accessing credit via the mobile app available on the *Android* and *iOS* smartphone platforms.

Safaricom said *M-PESA* agents are among those who will benefit from *Mobile2Bank*, as they could now move floats between tills and bank accounts in real-time. They could also send floats directly to another agent's account without having to visit the bank.

Replacing cash and more

Airtel claimed a first with the rollout of a contactless payment system in Ghana. It utilises NFC (near field communications) technology and enables *Airtel Money*
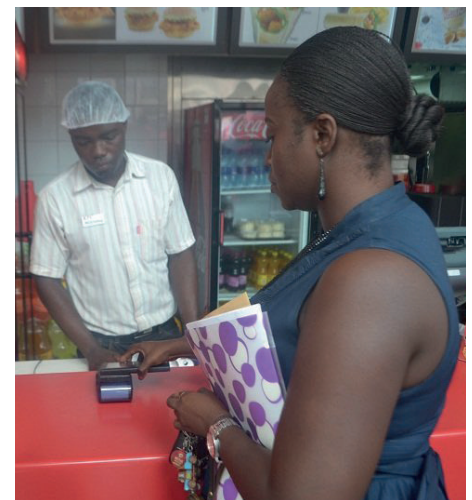
NFC at KFC: a customer uses Airtel Money's contactless service at one of the restaurant's branches in Ghana.

system overnight. Huawei said its platform will help Safaricom to rapidly enhance functionality for *M-PESA* users. Among the benefits it offers are: improved availability for subscribers and agents to execute transactions; faster query resolution time through a Kenya-based support team; faster transaction processing for subscribers; and enhanced call centre integration, ensuring customer experience is of a consistently high quality.

JUNE
The Government of Malawi is trying to accelerate the progress of digital finance in the country with the help of a number of organisations. The Better Than Cash Alliance (BCA) and Mobile Money for the Poor (MM4P) – both formed by the United Nations Capital

Development Fund's – are the main backers of the government initiative. At a recent conference organised by the government, a detailed report into the country's readiness to move to digital money was presented. One of its main findings was that fewer than one in 25 adults in Malawi currently use digital finance money of any kind.

JULY
SimbaPay has launched what it said is the first product in the world that allows Kenyans living abroad to make *M-PESA PayBill* payments. Separately, the UK-based digital money transfer provider also added a service for mobile money remittances to Nigeria. *PayBill* allows payments to be made to vendors via *M-PESA*, but until now it has

only been available to Safaricom's subscribers in Kenya. With the addition of *PayBill* to its platform, SimbaPay said Kenyans abroad can now also pay hundreds of merchants and utility companies back home.

AUGUST
MTN Swaziland aims to quickly introduce relevant, new and differentiated mobile financial services with the help of *Ericsson Converged Wallet*. It's claimed more than 275,000 MTN Swaziland mobile wallet users and 3,000 agents will benefit from the new platform which serves as a mobile money hub connecting the cellco's operations in several countries. Ericsson said the reusability of products and services across regions improves time-to-market and operational

subscribers to make payments at retail outlets by simply tapping their mobiles on a terminal. Airtel Ghana integrated the new service with VeriFone Mobile Money's flexible services platform.

June saw the operator showcasing the new service at events held simultaneously at the Koala Supermarket in the Airport residential area and at the Osu branch of KFC. It said customers were able to experience faster, more convenient, secure and instant payments using their mobiles. Those without NFC-enabled devices were given special stickers which they could attach to their phones for contactless payments.

Airtel Ghana marketing director Manu Rajan reckoned the introduction of NFC technology means *Airtel Money* now offers the "smartest" way to pay in the country.

Other mobile money debuts last year included Kenyan plans to float the first-ever government bond to be offered exclusively via mobiles. *M-Akiba* was to be delivered in partnership with Safaricom's *M-PESA*. The aim would be to broaden access to the retail bond market which was previously subject to lengthy and bureaucratic processes, and only accessible to banks and commercial traders. Using *M-Kiba*, deals can reach an upper limit of KES140,000 (USD1,370) per day until the bond offer period closes.

However in October, the plan was delayed indefinitely because of prevailing economic conditions. 2016 brought some good news as in March the government said the plan was back on. At the time of writing, a rollout was expected by the end of that month.

The Rwandan government was also keen to harness the power and convenience of mobile money. May saw the announcement that the *MTN Mobile Money* platform was to be used for tax collection by the Rwandan

Revenue Authority (RRA). MTN claimed its m-money service had been hugely successful as a banking platform, enabling people to make transfers, pay bills and other conventional banking transaction on their mobile phones. A deal between the RRA and MTN Rwanda saw the new function being added, "making tax payment easy", according to the RRA. Ebenezer Asante, CEO of MTN Rwanda, said: "This move is aimed at further easing up the process and cost of doing business. It will also rank Rwanda as the first of its kind in Africa in doing business, hence a boost for Rwanda in terms of ICT development."

In another announcement, South Africa's Telkom launched a carrier billing service for the *Google Play* app store, claiming it to be a first for the continent. The operator used the *Bango Payment Platform* to give its *Android* customers access to a universal payment method. UK-based Bango said *Android* currently dominates Africa's smartphone market. It added that Telkom subscribers using devices with Google's OS could now purchase their apps and other digital content using one-click carrier billing. The costs would be charged to their bills or deducted from airtime, without the need for a credit card or to register personal details.

According to Bango, wherever the service is introduced to fast-growing emerging markets such as Africa, it routinely sees increases in digital content sales of 300 to 400 per cent.

'School in a box'

The Vodafone Foundation launched a digital 'school in a box' with the aim of bringing tablet-based teaching to refugee camps.

Instant Classroom is shipped in a robust 52kg case containing a laptop, 25 tablets pre-

loaded with educational software, a projector, a speaker and a hotspot modem with 3G connectivity. The Vodafone Foundation said the system takes 20 minutes to set up and has been specifically designed for areas where electricity and internet connectivity are unreliable or non-existent.

All the components can be charged simultaneously from a single power source while the case is locked. After 6-8 hours of charging time, Vodafone said the *Instant Classroom* can be used for a full day.

The tablets connect to the laptop locally, enabling teachers to deliver content and applications to students without the need to access the internet.

The system was deployed in partnership with the UNHCR to 12 schools in refugee settlements at Kakuma in Kenya, Nyarungusu in Tanzania, and in DRC's Equatorial Region It provides up to 15,000 children and young adults aged from seven to 20 with advanced teaching aids that are currently only available in a minority of schools in developed nations.

In Senegal, the Ministry of Education and Samsung Electronics Africa unveiled a mobile education solution to provide an advanced and interactive classroom experience for learners. Installed at the Plan Jaxaay Secondary School in Dakar, the *Smart School* integrated platform enables teachers to monitor, control and keep track of educational content on their pupils' screens, a screen-sharing feature, and a real-time question-and-answer feature.

Samba Guisse, IT advisor at the Ministry of National Education's HR department, said: "The future of education is about accessing information and collaborating locally and globally. Teaching and learning has become social; this has become possible

efficiencies. As well as enabling the fast launch of new services, the vendor said *Converged Wallet* will also provide cross-promotion capabilities for improved adoption.

SEPTEMBER
Beyonic reckons it will become Africa's largest mobile money aggregator following a partnership with Mobile Accord. Kampala-based Beyonic aims to eliminate what it describes as the "rampant" use of cash in emerging markets. It has developed an online platform that enables businesses to quickly deploy, track and manage two-way mobile money payments over multiple mobile carriers using a single, easy-to-use system. As a result, Beyonic said firms

making mobile payments no longer need to connect individually to every carrier they want to send money through, thus saving time particularly if they are operating in multiple countries.

OCTOBER
PCCW Global launches a new internet-based video on demand (VoD) entertainment service for South Africa. *ONTAPtv.com* offers a variety of international TV series, movies, local dramas and lifestyle programmes, and also enables subscribers to rent Hollywood blockbusters. Content can be streamed to PCs and Macs, using what PCCW claims is "advanced" adaptive bit rate technology. Content can also be streamed or downloaded to *Android-*

or *iOS*-based devices. Although accessible through any data provider, cost-effective data bundles are on offer for exclusive *ONTAPtv. com* use in AlwaysOn *Super Wi-Fi* locations nationwide including shopping malls, hotels, hospitals and transport locations.

NOVEMBER
Kenyan MVNO Equitel is working with Effortel to provide what's claimed to be Africa's first fully integrated banking system using a mobile network. Equitel has a partnership with Equity Bank as part of a project that aims to bring a more mobile and truly integrated banking experience to East Africa. The MVNO claimed that 450,000 users had so far signed up for the mobile money service

According to Vodafone, *Instant Classroom* is easy to transport (left) and only takes around 20 minutes to be ready for use in classrooms (right).

with the emergence of initiatives such as the Samsung *Smart School*."

Launched in the country in partnership with Millennium Connect Africa, Samsung said its *Smart Schools* are part of its "far reaching" African citizenship programme which was designed to positively impact the lives of Africans. *Smart Schools* have also already been installed in other countries on the continent, such as the DRC, Kenya, Mali, Rwanda, South Africa and Sudan.

Africa also saw the launch of a new education service from satellite operator Avanti Communications. *Avanti Connected Education* promises to deliver internet-enabled learning to children in Africa for less than USD0.15 per child per day.

This was the latest in a series of e-learning initiatives from Avanti which describes itself as a wholesale "carriers' carrier" but is better known as the operator of the *HYLAS* satellites.

Supporting farmers

Vodacom continued to support farmers in Africa with yet another new mobile-based service. The operator's subsidiary in Tanzania launched *Kilimo Klub*, an exclusive service targeting smallholder farmers. Vodacom said the initiative aims to assist users by giving them vital information services such as credit and market prices, as well as linking them to the wider agricultural community in the country via their phones. By using Kilimo Klub, farmers can also access *M-PESA* services such as *M-Pawa* which enables them to save money, earn interest and apply for micro-loans.

Vodacom Tanzania MD Rene Meza said: "We believe it will allow a lot more farmers to be visible in the economic arena through the gradual elimination of, in some instances, middlemen who do not have the interests of the farmers at heart." The Tanzanian government commended Vodafone for this latest initiative, saying smallholder farms need more support. Kilimo Klub was the result of a partnership between Vodacom Tanzania, Olam International, the Connected Farmers Alliance, and Technoserve.

Using mobile technology to help farmers was also the goal of a real-time survey platform, launched by Control Union. The aim of the project was to help educate farmers.

The company, which specialises in agricultural certifications, food safety and sustainability, deployed GeoPoll's multimodal mobile platform and database of 200 million users. It said this will give it access to what's claimed to be the fastest and most cost-effective data collection method available in emerging markets.

Together, GeoPoll and Control Union will use mobile surveys to engage and educate smallholder farmers in emerging economies, with the goal of reaching a million farmers by 2020 via SMS and voice messaging. The partnership will allow commercial organisations such as global brands, exporters and suppliers, as well as governments and non-profit firms, to ensure social compliance in key value chains.

Control Union said it would also give farmers greater access to markets, ultimately adding value for both them and consumers. The partners aim to initially focus on Ghana, Kenya, Nigeria, Ethiopia, Tanzania, and Uganda, expanding to key markets in Asia later. Target value chains include coffee, cocoa, cotton, palm oil, rice, tea, tobacco, and fresh fruits and vegetables.

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which is activated on its platform. Belgium-based Effortel is responsible for the day-to-day technical operations and administrative management of the Equitel-Equity service.

DECEMBER

Airtel Tanzania has distributed more than TZS5bn (USD2.3m) from its *Airtel Money* trust account to active mobile money customers and agents across the country. The amounts paid were based on the subscriber's end-of-day balances available for the period from March 2014 to April 2015. The operator said that by sharing the interest accumulated on its trust fund, it is boosting the use of mobile money services in Tanzania where the unbanked population is about 85 per cent.

Windsor Holden, Head of forecasting, Juniper Research

The year ahead: In our *Digital Payment Strategies: Online, Mobile & Contactless 2016-2020* research study published in March 2016, we forecast that mobile wallet adoption will continue to accelerate in developing markets.

Nearly 20 countries across Asia and sub-Saharan Africa now have more mobile money accounts than bank accounts. As wallet users are reaching a critical mass in these markets, service providers are introducing more sophisticated payment services such as loans and micro-insurance, thereby hastening the drive towards financial inclusivity for the unbanked.

Our research study also highlighted the growing presence of social media companies in the eRetail space. Several leading companies, including Facebook, Pinterest and Instagram, have already introduced 'buy' buttons, allowing users to make purchases directly from the companies' mobile apps in a seamless couple-of-clicks transaction.

Furthermore, Juniper Research believes digital eCommerce on social media activity will increasingly extend into the P2P payments space. Facebook has already rolled out a P2P service linked to its *Messenger* service in the US, and we would expect additional deployments in other core markets over the next year or so.

Kirusa specialises in voice messaging and social media apps which are offered in partnership with more than 35 mobile carriers in Africa, the Middle East, India and Latin America, as well as via app stores. Its solutions are built on patented technology and scalable multimodal cloud platforms which, according to the company, process more than one billion events a month.

Dr. Inderpal Singh, Mumick, Founder & CEO, Kirusa

Headquartered in the US, Kirusa was founded by Dr. Inderpal Singh Mumick who says Africa offers the firm its biggest markets. "Today, we are present in 16 countries, from Senegal in the west to Tanzania and Madagascar in the east, and as far south as Zambia and Zimbabwe. We cover some of the largest population areas, like Nigeria in the English-speaking world as well as the DRC which is the largest French-speaking country in Africa.

"We provide a range of mobile services that help give people their voice – sometimes quite literally – and be a part of the telecoms revolution. The services could be what some people in the west consider basic ones for communication and entertainment, or they could be enterprise services used by corporations to communicate with customers.

"The term 'value-added services' is used to include a lot of services, and in some sense it's almost like a business paradigm where the operator uses a revenue share model to work with a partner like us or other players We take a broader view. VAS are not just entertainment; they can also include services that are linked to voice and SMS, and fall into the category of call completion services. These allow greater network utilisation and encourage more people to complete calls.

"Let me give you an example. We have a service called *InstaVoice* where we have more than 1.8 billion calls coming into our network. Over 90 per cent of these are in Africa. *InstaVoice* is most closely related to what people in the west experience as voicemail. But what we have developed is a unique combination of missed calls, voicemail and voice SMS. This is presented to users with several of the operators that we work with.

"With *InstaVoice* we have changed the business model of voicemail. For example, in the US or in the UK, if you make a call to somebody and it goes to voicemail, you start paying the second the system picks it up. We decided to create a system that doesn't charge just because a call is picked up by the voicemail system.

"So even after a call is picked up by our *InstaVoice* voicemail system, the sender can choose to not leave a message and not pay. They can simply give the recipient a missed call, which is something users in Africa often like to do. Or they can opt to leave a message and it is then that they pay the charges for the call."

Mumick continues by saying *InstaVoice* is the first app that has been built that actually gives users information about the missed calls they are receiving, and even works when a subscriber has multiple SIM cards.

"In emerging markets, most people have two or sometimes even three SIMs. That is true of almost everybody in Nigeria, Congo or Ghana. But they only carry one phone with them and usually do not have all their SIMs in that device. However, *InstaVoice* is able to deliver all missed calls coming to any of the user's SIM cards as if it were a single card on a single phone."

For the service to work in Africa, Mumick says working closely with operators is essential. "In many countries, all the operators have partnered with us because we have created an ecosystem. Here, not only have we changed the business model of the service, we have also changed the technology model where the service works from the cloud and provides seamless interconnectivity between the operators."

In terms of the challenges of working on the continent, he believes the VAS market is presently in a "state of transition" with smartphone penetration still very small but growing. Mumick also has high hopes for LTE which is starting to be deployed in some countries. But apart from all that, he describes Africa as a "tough" continent to work in.

"There is also the political risk in some countries which requires careful management within the company. A few years ago it was in Ivory Coast; last year and today it is in Burundi. We had a lot of interest from Burundi and even signed contracts, but we cannot really execute on them due to the political situation that is prevailing there."

Business in Nigeria – Africa's most populous country and biggest oil producer – has also become difficult. With the global collapse of oil prices, in February 2015 the Central Bank of Nigeria tried to stem the naira's record drop in value by extending trading curbs and introducing bans on purchases of dollars by certain importers. The country's government continues to resist calls for the currency to be devalued further.

Mumick says all this has had a huge impact on companies doing business in Nigeria. He adds that the NCC's billion dollar fine imposed on MTN has also "unnerved" a lot of people.

Despite all the challenges, Mumick says Kirusa continued to build very strong business in Africa. "In 2015 we crossed 60 billion calls on our network. We have entered 16 countries in Africa, had 90 million monthly customers using our services by the end of 2015, and since then it has surpassed 100 million monthly active users on our networks.

"Our revenues have grown very handsomely in Africa as traffic and usage is growing. We signed more than a dozen operator partnerships last year – MTN in Zambia and Ivory Coast, Vodacom in DRC, Airtel in Congo and Madagascar, and more. Some of them have been launched while others are still in the pipeline and will be announced once they have launched.

"As well as growing relationships with some of the operators, we have also launched new products. "For example, *myGenie* is an advertising platform and a way for users to get free airtime by discovering and downloading apps. *myGenie* was launched in India and we had a very good response there and so we are now taking it into Africa. Right now we have people working out the logistics to launch it in Nigeria."

Earlier this year, Kirusa also unveiled *InstaVoice Ring* which offers subscribers an opportunity to give a free missed call to a person at any time, even when they do not have enough balance to make a call. The company says this encourages the recipient to get in touch with the caller, also helps mobile carriers convert a missed opportunity into a completed call, along with generating a new revenue stream. It claims *InstaVoice Ring* is a world first as it addresses the challenges of pre-paid callers when they are out of balance. With such products, the company is therefore able to deliver VAS in markets dominated by pre-paid users and a low smartphone penetration.

"The market is changing and I think the pace of change depends on who you talk to and which country you talk about. But everybody agrees that feature phone and non-smartphone users continue to be the majority of mobile customers in Africa, ranging anywhere from 60 to 85 per cent."

He also points out that many users on the continent who currently have smartphones are not actually using data, so this also continues to be a challenge for the operators. As well as the expenses of data connections, Mumick says more education is needed here, and that the operators are working hard to get data services and relevant apps in front of people.

"We have been very successful in Africa in coming up with services that work with feature phones. But we have now changed that approach in two ways. Firstly, we have developed services that interoperate with

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apps and feature phones in a seamless fashion. *InstaVoice* is a perfect example of that. We find that there is a far better experience and greater utilisation when customers use the app to access the service rather than via SMS on a feature phone; you can get almost double the amount of usage with the smartphone app. We see this as very positive and are continuing to invest in the app and develop it further.

"Secondly, we are going to introduce services that leverage the smartphone and the app ecosystem and aim to be one of the early movers in that. The *myGenie* service is a perfect example of how we can help grow the ecosystem in a pre-paid environment. It provides an advertising-based platform to help developers get their apps into the hands of users. So even if those users are moving to smartphones, pre-paid continues to be the dominant factor. Smartphone users continue to be much more on pre-paid rather than post-paid plans. And that will continue in Africa."

According to Herman Singh, ICT is often compared to oxygen – you can't really live without it. He believes this is especially true in the digital era where the way we work, live, learn, interact and advance within our respective societies depends on the digital revolution that is powered by sophisticated telecommunications networks.

Herman Singh, Chief digital officer, MTN Group

"The future of any brand is determined in the moment in the digital world, where customers are moving *en masse* to digital channels, forcing businesses to find relevant and creative ways to deliver a great digital customer experience.

"The trend of declining voice revenues and changing telecommunications landscape has forced operators to hunt for new revenue streams. With all the changes to compete and create competitive advantage in this new digital world, operators have to deliver an exceptional digital customer experience."

Singh says MTN has pioneered a concept in which its businesses in 22 countries across Africa and the Middle East are focused purely on delivering a distinct customer experience. In essence, he says the company is driven by an ambition to provide digital services and moving to adjacent industries, such as financial services, e-commerce, digital media such as music gaming and video, and enterprise services such as M2M.

All this has also been encouraged by a burgeoning demand for data in Africa, says Singh. "While the transition to data and digital services in Africa is less advanced, MTN has been aggressively positioning itself to take advantage of expanding data and digital services on the continent.

"The opportunity is too big to ignore. We are leveraging on our core competencies of a strong brand, knowledge of and access to customers, scale and distribution to take advantage of the digital services opportunities in Africa. This strategy has enabled us to focus on being at the forefront of the unfolding digital world by investing in increasing capacity and skills that are vital to partnering with digital content providers.

"As a result, it is no surprise that many do not know that MTN is now the largest distributor of digital music in Africa and has more than 800 companies providing 5,500 content services under their lifestyle offering."

To fast-track its move into providing a distinct digital experience for subscribers, MTN invested into Africa Internet Holdings (AIH) – a leading internet firm on the continent that has a presence in 23 countries. The investment in AIH gives MTN and its customers distinctive access to unique benefits with Jumia, Africa's number one shopping mall that is in 12 markets. Through AIH, MTN also offers subscribers access to Lamudi, Africa's leading real estate classified service available in 21 countries.

"With AIH partnership, MTN is able to deliver to its millions of African subscribers a range of internet services, including e-commerce retailing, as well as marketplace, taxi, travel, classified and food delivery services.

"This has empowered us to offer our subscribers in Africa a distinct customer experience through various digital platforms, such as Zando (a shoe and online fashion platform), HelloFood (a digital platform to order food from popular restaurants), and Vendito (a general classified ads platform)."

Furthermore, MTN has been delivering digital banking services to help transform people's lives by offering simple access to financial services such as mobile money. In 2015, the operator focused on what it describes as a "healthy provision" of mobile money services to the unbanked and underserved users by migrating its mobile money platform to a more agile one, enabling converged campaigns and incentives. This resulted in *MTN Mobile Money* customers rising by 56.3 per cent to 34.7 million across 15 countries in 2015.

One of MTN's success stories is in Nigeria, where the company's mobile money offering *Diamond Yellow* is gaining greater traction. The service currently has 6.2 million users,

and in 2016 MTN is planning to partner with banks and expand its agent network to be able to help the unbanked and underserved to do their banking on the go with ease.

MTN's Ghana operation also saw increasing demand for mobile money services, with uses increasing 23.8 per cent to two million in 2015. In the same period, Uganda experienced a 30.2 per cent increase in mobile money users to 9.5 million.

"We are proud that we are catalysts in the design of pragmatic digital solutions such as *MTN Mobile Money* that directly address the socio-economic needs prevalent in our markets. It is for this reason that we continue to position ourselves as a leading digital player through organic growth and partnerships, across our markets."

To continue to deliver a distinct customer experience, Singh says MTN is planning to offer more digital services across its African markets. "We have recently launched a cashless payment solution in Uganda and are aiming to rollout this to other markets in 2016. We are also in a process of launching a partnership with Uber Nigeria and MTN subscribers will get discounts on their first two rides in Lagos, Nigeria.

"All of this is being enabled by our investments in improving network quality and coverage in our markets, allowing us to focus on creating sustainable economic value through digital inclusion."

During a career with IDT that has so far spanned 17 years, Nicholas Ford has managed the company's expansion of its commercial buying operation into 10 countries, broadening his role to include Asia and Africa. Out of all the regions covered by the company,

Nicholas Ford, President of carrier services, IDT Europe

he says Africa is certainly the one that has the key focus from a growth perspective – so much so that it still has the company's largest business development team working on it.

"Globally, we have more than 500 direct routes and Africa is still one of those continents where there are more direct routes that we are keen to establish. One of the reasons for that is because we have about 30 billion minutes of traffic per year that we terminate over our network. Just over half of that comes from our retail customer base."

Ford points out that IDT is not your typical network operator as its retail customer base was historically generated in

the pre-paid calling card business which has now evolved as an apps business.

The company's retail flagship service, *BOSS Revolution*, is a collection of communication and financial products designed to help immigrant populations and the under-banked to affordably communicate and share resources around the world. The app is available in a number of countries in North America, Europe and Asia, and Ford says that it is the immigrant population calling home through the app that makes up the lion's share of IDT's traffic volume.

With its apps, IDT seems to be moving more into the over-the-top space. But the company also has a wholesale division and therefore needs to work closer with MNOs who fear OTT services – how does the company reconcile that? Ford says the OTT business is certainly a challenge for all operators, and is a constant discussion point with his peers.

"The reality is our *BOSS Revolution* customers also use OTT apps. So we've taken the view that either we let somebody else and eat our lunch or we kind of share that lunch. There is a place for OTT in our global marketplace and we recognise that, so with *BOSS* we give our immigrant customers the option to use it.

"Many mobile operators take a very different view and choose to block the OTT business coming into their networks. That's part and parcel of the world that we live in today. But from the point of view of *BOSS Revolution*, we also generate hundreds of millions of dollars into mobile network operators. So we continue to work very closely with them and in some instances we even promote their networks within the app."

BOSS Revolution has a number of features which, as well as messaging, also includes messaging peer-to-peer calling via a smartphone app and also allows users to share balances to make off-net calls as well.

"When you give people overseas the ability to share a balance with someone in a more developed market then there is the ability to actually increase the volumes of traffic out of those home mobile networks. That is certainly our business plan, and we hope it can grow total traffic volumes, including total paid-for volume."

As is well documented, smartphone penetration in Africa is slowly rising but is still currently generally very low. Therefore, how important are smartphone apps such as *BOSS Revolution* in markets where basic and feature phone users prevail?

"It's vital. If you look at the statistics, African immigrant populations across North America are significant. We can certainly see continued growth. I wouldn't

go so far as saying that this will be in every single African country, but certainly in the top 15 African countries for us – Nigeria, Ghana, Somalia, Kenya, Uganda, Zimbabwe, Tanzania, for example – we see growth of minutes from North America and Europe into those nations."

Ford says IDT's business in Africa was traditionally focused on voice and that continues to be the 'cash cow'. It then evolved into international mobile top-up which is now worth in excess of 100 million dollars a year in global revenues.

"Using their *BOSS Revolution* accounts, people can actually send balances overseas into someone else's phone, and we promote that outbound calling into countries in Africa. And on the back of that, certainly as part of the future evolution of the business over those corridors, is money transfers. IDT has gone to great lengths to have money transfer licenses within all US states, and now the money transfer business is evolving and Africa is on the map."

With consolidation in mobile markets and ongoing issues in certain countries with mobile termination rates, does Ford believe telecoms business is getting tougher in Africa?

"Yes, in a nutshell. Africa has always been challenging. But IDT is in a very fortunate position in that we provide a net outflow of minutes into Africa because of the retail side of our business.

"Having the direct relationship with operating companies is all important, and it is all about relationships, not just about rates. It is about flying out, having your people on the ground in country, and really building those long-term relationships with the operators. And they are reciprocal. As much as our desire is to deliver our minute directly into their networks and onto their customers' handsets, their desire is also to increase their outflow of international minutes and international traffic to those very same customers. So I think IDT has a really good story to tell, and that story sits well with the operator companies."

In its quest to get closer to the region's operators, there was talk last year of IDT opening its own POP in Africa and the Middle East. Did that happen?

"It didn't. There was a long and lengthy business case into the pros and cons of us doing that and in the end we couldn't actually see any advantage. Unlike, say London or New York that you might call switching hubs, Africa doesn't have the intra-country networks that we could see for building a hub in the region. Of course if that changes in the future, then we'd be very keen to explore that again."

Some companies on the continent, such as local data centre operators, believe African

traffic should be routed on African soil. They say having traffic for the region going via Europe, for instance, adds unnecessary costs. So would IDT agree that regional IXPs and POPs are therefore vital and will help keep transit costs down.

"That wasn't our finding. When we looked at the cost of bandwidth, it was cheaper in and out of major centres within Europe, rather than being carried from Kenya to South Africa or from Nigeria to South Africa, for example. There are obviously more cable systems now populating Africa so it will be interesting to see if any of that changes. But for now, we couldn't see a cost advantage to it."

On the subject of cable, there was a time when operators were wary of IP. But now that there is more fibre connectivity enabling more IP-based services in Africa, is Ford finding that service providers are more comfortable with the technology?

"IDT was an early adopter of IP and we probably have one of the earliest IP switched networks – we were one of the first to move to a Sonus IP switch.

"Years ago, we would've run TDM circuits to IP circuits in order to prove the quality was comparable; we sent engineers into many African countries to help them evolve their IP and to do end-to-end testing. So we are absolute believers in IP.

"Subsequently, we have built our own proprietary IP switches. In today's wholesale world you need the most efficient network you can possibly attain, and also for moving services into the cloud.

"The adoption of IP is definitely not complete and has some way to go. But it has come a long way and people are now more comfortable with it."

When it comes to other hurdles to overcome in Africa, Ford says there are certainly challenges around pricing. "Towards the end of 2014 and certainly during 2015 we saw many markets that increased their prices which is obviously somewhat against the global trend. That's fine with me from a wholesale perspective because it increases revenue, and so if a country wants to increase its rates because it wants more foreign currency that is up to them.

"But from the retail side, it makes marketing in a country very difficult if rates go up by two- or three-fold. The customer on the ground doesn't necessarily appreciate the fact the country has put up its international termination rate, so that's something that we have to manage from a sales and marketing perspective and it's a challenge.

"Also, a couple of countries are still looking at the possibility of having a central switch which controls the networks'

international traffic in and out. I don't know if that's going to be easy to negotiate."

On the subject of more competition coming into Africa, Ford says it has always been a "crazy industry" characterised by very aggressive competition that is part of daily business life.

"The interesting thing in the voice business is that your competitors are also your partners. One company's interconnects will all have relationships with those from another as well as with the local mobile operators. So we all kind of come to the table together, if you like. It's a strange industry in that you have very good relationships with your closest competitors.

"But IDT has a distinct advantage over many out there in that we own the retail minutes. So say there is a Nigerian customer who uses *BOSS Revolution* in Europe, the US, or wherever they may be – that represents an IDT minute into our network. We don't have to buy that minute on the open market; we have the stability of that traffic which we can then trade.

"And it is not just a tradable minute – it is a tradable dollar to the African operator. So if we have 15 billion minutes of retail traffic globally going into operating companies, that is dollars into their networks. That really means something to them as a tradable asset."

Christophe Erny,
Head of Africa
region,
Mahindra Comviva

With offices around the world, Mahindra Comviva is a subsidiary of India-based Tech Mahindra and is an acclaimed provider of value-added services and mobility solutions. In Africa, the company claims to be the leader in the mobile financial and recharge markets, and 2015 saw the company strengthen its position on the continent, as regional head Christophe Erny explains.

"We have crossed 100 deployments with leading operators in more than 40 countries across Africa. Our proven platform, *mobiquity Money*, powers approximately 30 per cent of mobile money services in Africa, transforming the lives of over 48 million people by providing easy access to cost-effective mobile money services to those who are marginalised. We now have 45 highly successful *mobiquity Money* deployments in 32 African countries.

"Our vision is to leverage mobile technology to bring the financially underserved into the formal financial mainstream and create cashless economies in Africa and across the globe. 9.6 per cent of Africa's adult population use mobile money services powered by our award-winning platform."

As well as mobile money, Erny says Mahindra Comviva also serves a vast community of pre-paid subscribers across the continent with its *PreTUPS* recharge solution which provides easy access to talk-time.

"It is our expansive reach, proven experience and innovative offerings that have enabled us to lead the pre-paid recharge market in the continent.

"The company has also become one of the largest music aggregators in Africa, the Middle East and Asia, and has more than 300,000 tracks and over 200 content providers on board. In Africa alone, we have collaborated with more than 150 content partners including local and international content providers, copyright bodies, local artists and production houses in the region. Over the past two years, we have helped grow local content consumption by more than eight times. We are actively working with those in the music ecosystem to usher in a positive change in digital distribution, royalty management and copyright management."

Last year, Mahindra Comviva launched two new apps: *Zoto*, which Erny claims is now the fastest mobile recharge platform in Nigeria, and *Mooditt*. "In a very short time *Mooditt* has become Nigeria's number one favourite music streaming app with a rich suite of local catalogue based digital music content. The app has recorded more than 500,000 music downloads and was ranked the number one music app in Google's *Play* store for eight months in a row."

When asked how Mahindra Comviva has seen the wireless communications market adapt and evolve in Africa, Erny says there has been an "explosive growth" in the continent's mobile market as governments have liberalised the telecoms sector.

"This has allowed for a market ripe with competition, resulting in affordable services for subscribers. With competition intensifying across markets, operators are increasingly focusing on offering innovative services and promotions to retain subscribers by introducing customer experience management, loyalty management and customer retention solutions. Operators are looking for services that bring greater convenience and deliver timely and contextual promotions.

"Also, mobile data traffic has grown manifold in the recent past, due to the proliferation of smartphones. As many more devices are connected to the internet, there is a distinct need for innovative and flexible data solutions. Continuous innovations in access technologies are urging service providers – such as fixed line, mobile, Wi-Fi and WiMAX operators – to quickly adapt to offer exciting and

competitive internet broadband solutions to cater to the ever-changing needs of the different market segments."

Over the next few years, Erny believes richer music content over video services will become more prominent and personalisation of content will be very important. As a result, an integrated approach to music distribution will gain significance.

Mobile banking services will also evolve, and he says the next stage will be dominated by the concept of digital wallets where the mobile phone will store all the user's credentials such as payments and identification. "With digital wallets, consumers can not only carry out remote transactions like booking a movie or train ticket, but can pay for proximity transactions. Integrated technologies like NFC or QR codes will make transactions easy."

Like all other markets, Erny says the challenges of deploying services in Africa are similar to most emerging markets. These include a mix of regulatory issues, a country's individual legal environment, under-developed telecoms infrastructure, along with high taxation.

He adds" "Over the years, different value-added services have emerged in markets across Africa. Voice revenues have gone down and mobile VAS is beginning to contribute more to the revenue for operators. Over the next 2-3 years, the VAS market in Africa is expected to grow at a strong CAGR.

"The environment is becoming increasingly complex and competition is becoming tougher. However, Mahindra Comviva has gained extensive market expertise and knowhow which it now exploits to provide a differentiated portfolio of offerings across the globe, and to ensure timely delivery against commitments.

"Going forward, Mahindra Comviva will continue to bring new innovative solutions around mobile payments, data, infotainment, and a VAS platform for business aggregation. Additionally, we will focus on data analytics. We will develop new range of apps that will engage and deliver greater convenience to end users, enhancing customer satisfaction and supporting operators' goals.

"I think the next phase of growth will also come from mobile financial, broadband, customer value management and digital services, and hence our focus will revolve around these solutions. While among the youth, entertainment-related services will be popular, others will look for utility services, location-based services, m-commerce and local content rich services. We will witness a lot of changes and development in this space, and will work together to bring in more revenues for the telecoms industry."

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IDT is one of the largest global carriers of voice traffic, generating over 30 billion international minutes annually.

With our global reach of direct interconnects and billions of international retail minutes generated under our Boss Revolution brand, we represent a compelling proposition to help grow your business. With an extensive portfolio of voice termination, messaging and payment services, we help people stay in touch with home and business, wherever they are located in the world.

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chapter
Fixed wireless
access
3

Towards a vision of the future of fixed wireless

Shrikant Shenwai, CEO, Wireless Broadband Alliance

In our 2015 annual report published last October (entitled *2016 to 5G*) we stated that the transition from best effort to carrier-grade Wi-Fi networks was very visibly under way, and that the ecosystem is starting to plan for the next five years.

In the near term, wider-scale, carrier-grade deployments are enabling new business models such as smart cities and enterprise services. Looking ahead, in our *Towards 2020 Vision* statement we consider how Wi-Fi can evolve around four critical business opportunities: smart cities, 'Big Data' analytics, the IoT and converged services. All that will be enabled by the availability of a truly carrier-grade platform.

Most of the elements of a carrier platform – security, QoS, high availability, strong coverage and data rates, integration with operator OSS/BSS platforms and their other networks – are now in place. That makes Wi-Fi a strong platform in a wider range of business scenarios, and that in turn is driving investment, both by traditional players like pure-play and mobile operators, and by new service providers from the OTT or IoT communities.

The pace of change is accelerating across the public Wi-Fi ecosystem. Last year's report detailed some quite significant shifts, but the contrasts which can be seen this year are even more dramatic. These are driven by several overall trends:

❖ The increasing shift from best effort Wi-Fi to full carrier-grade Wi-Fi, enabling many new business models.
❖ The use of Wi-Fi as a strategic platform by an increasing variety of service providers including pure-plays, aggregators, mobile operators, multiple-system operators (MSO), and vertical market operators.
❖ Wider applicability of Wi-Fi technologies as standards evolve and the needs of service providers change, e.g. the move of Wi-Fi into the IoT.
❖ Development of new technologies to support those carrier-grade and integrated models, from extensions to the 802.11 family, to evolutions of next-generation hotspot (NGH) and Passpoint.
❖ The start of the process of defining 5G standards and the role of Wi-Fi and other unlicensed technologies in the next generation multi-technology wireless platform.

These big shifts mean that the three themes identified in the *Towards 2020 Vision* statement are equally applicable to all Wi-Fi stakeholders. Technology providers, service providers, regulators and industry alliances need to:

Accelerate – develop their technologies, business models and rules to keep pace with the changing ways that consumers and enterprises use wireless networks, and so encourage the deployment of carrier-grade Wi-Fi networks.

Diversify – apply the expanding Wi-Fi platform to a wider range of target applications and businesses, with significant opportunities in the IoT, Big Data, converged services, smart cities and many more.

Increase – invest as much resource as possible in developing, testing and deploying systems and services, and in pushing the technology to the limits, even towards 5G.

That will present challenges as well as opportunities for the WBA and its members. In particular, at a time of significant change, there is a difficult balance to strike between continuity – building on what has already been achieved and consolidating successful platforms and services – and looking ahead to new horizons like the IoT and 5G.

Growing confidence

Carrier-grade hotspots will outnumber best effort in the installed base by the end of 2017, when 57 per cent will support the more advanced capabilities, and will account for 90 per cent by 2020. And two-thirds of respondents to our annual ecosystem survey said that they felt more confident about deploying carrier-grade Wi-Fi than they had 12 months ago – a figure which is up from 56 per cent in the 2014 study.

The dominant business driver for this investment is improving the overall customer experience, which in turn translates into new revenue streams like TV everywhere or enterprise services. Improving customer experience in order to reduce churn and boost ARPU was selected by 28 per cent of the respondents as the primary driver, followed by seamless access across different Wi-Fi/Wi-Fi or Wi-Fi/cellular connections.

In terms of specific monetisation options, those which will be deployed most commonly between now and 2020 are location-based services (69 per cent), roaming (68 per cent) and Wi-Fi analytics (66 per cent). Compared to last year's study, there is far less emphasis on Wi-Fi offload, and more on 'Wi-Fi First', Wi-Fi Calling and TV/video.

Looking further ahead to the elements outlined in *Towards 2020 Vision*, 80 per cent of respondents have deployments or plans between now and 2020 in the area of IoT/M2M, and more than half already plan for converged services (56 per cent) or smart cities (53 per cent).

Such findings indicate how rapidly the Wi-Fi services landscape is changing, driven by the new business imperatives such as multiplay and IoT, and enabled by Carrier Wi-Fi and the advances it brings in quality of experience, availability and integration.

White spaces

Having had what was claimed to be the world's biggest TV white spaces (TVWS) project in 2014 (in Namibia), Africa saw further developments in the area in 2015.

In January. Spectra Wireless and Microsoft launched what was claimed to be the region's first commercial service pilot network utilising TVWS. *djungleEd* was initially made available at the Koforidua Polytechnic in Ghana's Eastern region, and covered the campus and surrounding student hostels.

Spectra used 6Harmonics' *GWS* TVWS radios to connect the buildings, and a total of 17 links were deployed to support the poly-technic's sites. The operator also used Meraki's cloud-based Wi-Fi APs for the client access.

"We have over 5,800 unique client devices registered on our network, out of a student population in Koforidua of 8,500, so the interest level already has been high," said Spectra Wireless country leader Sam Darko.

As part of the *djungleEd* service students can now purchase high-speed internet bundles from GHD2 (USD0.61) per day, and use apps such as Microsoft's *Virtual Academy* and *Office 365*. They can also apply for zero-interest loans in partnership with UT Bank to purchase selected internet-enabled devices from Dell, HP, Lenovo and Microsoft.

April saw the Botswana Innovation Hub (BIH) launching a pilot telemedicine project using TVWS. *Project Kgolagano* provided internet connectivity and services to hospitals and clinics, enabling access to specialised medicine in Gaborone and other locations around the world. BIH worked in collaboration with a number of organisations on the deployment, including the Botswana-UPenn Partnership (BUP) between the Government of Botswana, the University of Botswana, and the University of Pennsylvania.

Using Spectra Wireless' djungleEd service, university students can apply for zero-interest financing to buy internet-enabled devices.

Dr Geoffrey Seleka, BIH director of marketing, ICT and registration, said: "Through *Project Kgolagano*, we will be using TVWS technology to provide access to specialised telemedicine applications, where hospitals can send high-resolution patient photographs back to Gaborone and Philadelphia for a more accurate diagnosis and care." At the time, Seleka said there was a lack of specialised care in remote hospitals and clinics in Botswana.

Project Kgolagano, which means 'connection' in Tswana, had a specific focus on providing access to specialised maternal medicine in order to improve the livelihoods of women located in small towns and rural areas. Telemedicine experts and doctors providing medical advice for referred patients were provided by BUP. The project initially ran in three locations: Francistown, Maunwas and Lobatse where it was officially launched in March at the Tsopeng clinic.

Wi-Fi free for all

Liquid Telecom Kenya partnered with the Nakuru County Government to launch an outdoor Wi-Fi network which the public can access for free. The company designed and launched the network which covers a 10km radius from the central business district. It was initially connected to a

200Mbps pool but can be upgradable to 1Gbps depending on demand. Fifty-one nodes were installed around strategic points in the town's busiest areas.

The first phase of the project covered Kenyatta Street, Marikiti Market, the central bus terminal, Afraha Stadium, academic institutions, the county headquarters and the Westside Mall. The second phase moved on to cover Naivasha and Gilgil towns, more streets using poles and other public infrastructure, as well as Egerton University in Njoro.

Liquid said its main consideration when designing the network had been to ensure adequate capacity and seamless connectivity. Its outdoor Wi-Fi nodes use built-in meshing technology, and also have the ability to withstand harsh climatic conditions to guarantee maximum and uninterrupted speeds.

By the end of phase one, Liquid Telecom Kenya had invested USD400,000 in the Nakuru project. Figures clarifying how much was spent in phase two and also during network optimisation exercises during 2015 are currently still unavailable.

More free Wi-Fi was made available in the South African city of Tshwane in June 2015. A free "basic service" Wi-Fi was offered to everyone within walking distance of a free hotspot although maximum coverage of the city isn't promised until the end of 2016.

To that end, part of *Project Isizwe* will see an additional 1,848 free Wi-Fi zones rolling out across the city to add to the 575 sites that are currently active.

In his State of the Capital Address in May, Tshwane mayor Kgosiento Ramokgopa said: "By the end of 2016, every citizen of Tshwane is within walking distance of free Wi-Fi. The vision is to eventually provide free Wi-Fi in every street and household in the city." Ramokgopa said the new sites will be deployed in

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JANUARY – JUNE 2015

Pan-African operator Gondwana International Networks – better known as iWayAfrica – will upgrade its 4G network from fixed WiMAX to TD-LTE. It will use Telrad's *Dual Mode* solutions in an effort to improve connectivity for its business subscribers in Nairobi before rolling out across its other sub-Saharan networks. The solutions include the *BreezeCOMPACT 1000* base stations combined with dual mode CPEs. iWay will also use the vendor's software defined radio system for migration from WiMAX to LTE.

Integrated access services provider Q-KON has been selected by agricultural machinery

manufacturer John Deere to provide VSAT connectivity in Ghana. Q-KON has agreed to provide its C-band *Satellite Access* service for voice, internet connectivity and VPN to the John Deere branch in Ghana. Q-KON claims it can provide its new client with the "perfect solution" between the high-capacity advantages of fibre access services and the "exceptional" reliability offered by satellite access services.

XLink Communications will distribute Cyan's M2M solutions in South Africa. The Johannesburg-based firm will offer Cyan's smart energy communication technology which enables the measurement and control of energy consumption for the metering and lighting

markets. The deal also includes an initial order for *CyLec*, Cyan's smart metering hardware and software. A hundred units will be used as part of a proof of concept project for an unnamed "leading" provider of energy management systems in South Africa. In addition, XLink will provide field-based system integration and technical support for the deployment of Cyan's technology across South Africa.

Safaricom launches *BigBox*, a DVB-2 set top box that will enable subscribers to leverage the operator's 3G and growing 4G data network to access content. It will offer several TV channels in high-definition format, as well as allow users to watch content on demand

communities including Bronkhorstspruit, Hammanskraal, Soshanguve, Centurion and the greater Tshwane area.

Project Isizwe co-founder and CIIO James Devine added: "In an urban environment, there will be a Wi-Fi hotspot within one kilometre of every single person in the city. In the rural context, this would mean placing a free internet zone within five kilometres of every person. The City of Tshwane is now taking the stance that free Wi-Fi is a basic service."

The free Wi-Fi project was launched in November 2013, and by May 2015 it was claimed it had more than 570,000 unique users on the network. Since then, Isizwe has also deployed networks in Thohoyandeu, Robertson, Atlantis and Lusikisiki.

In Tshwane, the project has enabled a number of value-added services. These include: free Wi-Fi on board local buses; the *WiFi TV* video on-demand service, a community initiative produced by young citizen journalists; and free on-net phone calls that are integrated with municipal call centres. The latter enables residents to report, for example, broken traffic lights whenever they are in a free Wi-Fi zone.

Upgrading to carrier-class
July saw Inwi begin to carry out a major upgrade to *Wifi7dak*, its public Wi-Fi service in Morocco. The operator was planning to increase bandwidth, support network expansion, and add new payment functionalities to the platform.

WiFi7dak was originally launched in July 2013 and made Inwi the country's first cellco to deploy outdoor Wi-Fi technology. The company wanted the upgrade to mean it would be able to offer a "true carrier-class Wi-Fi network", using Aptilo's *Service Management Platform (SMP)*.

The vendor describes *SMP* as providing highly scalable Wi-Fi services to increase Inwi's bandwidth capacity and support the growth of its Wi-Fi network. Aptilo said it will also allow the operator to easily integrate trusted 3GPP Wi-Fi access with SIM authentication, and backhauling to the mobile core via GTP tunnels as part of the next phase of deployment.

Wifi7dak is available to pre- and post-paid subscribers who can purchase the service through vouchers and credit cards. Roaming customers can also use the network, thus creating opportunities for Inwi to acquire new users and expand its services.

Mobile users can log on to the service using an app developed by France-based mobile software specialist Smartcom. This is available from Inwi's online marketplace and offers the same functionality as a branded web portal. It also provides the operator with valuable analytics and more granular control over its Wi-Fi service.

Another upgrading project saw Elitecore Technologies' service management platform being used to support Wi-Fi networks across 10 countries in Africa.

According to the India-based vendor, its platform would enable the unnamed telcos to extend their data services via a network of Wi-Fi hotspots that integrate with existing 3G mobile infrastructure. It is being used by one "large telecom group" in Burkina Faso, Congo, DRC, Gabon, Ghana, Niger, Nigeria, Tanzania and Zambia, as well as another operator in Morocco.

Akshat Joshi, Elitecore's VP of Wi-Fi product management, said: "Elitecore's pre-integrated and modular platform seamlessly integrates with the operator's existing IT and network infrastructure resulting in a quick time to market, faster rollout of services, and hence better capex savings."

Inwi became Morocco's first mobile operator to deploy outdoor Wi-Fi technology when it launched *WiFi7dak* in 2013.

The Wi-Fi network enabled the launch of bundled 3G and Wi-Fi plans, allowing all 3G subscribers to access higher throughput via Wi-Fi using their existing 3G balances. Those without smartphones could also access Wi-Fi via OTP-based authentication.

Wireless powering learning
In October two South African schools were given wireless connectivity services for 18 months thanks to network integrator Broadlink.

While the Mpheti Mahlatsi Secondary School in Orange Farm and Southview High School in Lenasia had access to computers and some tablets, a lack of sufficient funding remained a stumbling block in providing a stable internet connection in order to make use of online education programmes. The schools now have an uncapped 5Mbps wireless DSL service worth around ZAR198,000 (USD14,878) as part of a joint partnership with 3P Learning, an Australia-based international organisation that facilitates online learning platforms specialising in maths and literacy.

Broadlink also donated ZAR100,000 towards the license fees for *Mathletics*, 3P Learning's maths content programme. Nicole van Niekerk, Broadlink's marketing

via online video services such as *YouTube*. Safaricom said the device can also serve as a Wi-Fi hotspot for up to ten users.

JULY – DECEMBER
YooMee Africa has launched an unlimited internet service in Côte d'Ivoire. *YooMee Night* is available from 11pm until early morning, and the operator says its aim is to enable users with limited financial means to enjoy all types of downloading and surfing without limitation. According to YooMee Africa, Abidjan is home to some 200,000 university students and half of the city's population is under 20 years old. It believes *YooMee Night* will allow them to use e-learning and regular search functions to complete their

curricula as well as to enjoy entertainment and online gaming. The company said its unlimited offer costs less than USD2 per night or less than USD9 for a whole week.

Hughes Network Systems is expanding the MPLS services it provides to the African Development Bank (AfDB). AfDB has used Hughes' managed services since 2008, including MPLS circuits connecting four AfDB sites to its group headquarters in Abidjan via a teleport in Germany. As part of this contract, Hughes will now further expand MPLS connectivity to an additional seven sites including regional resource centres and key field offices. The network will be used for

major applications such as SAP, VoIP, video-conferencing and high-speed internet access.

Empresa Nacional de Telecomunicações de Moçambique (ENTM) will deliver broadband connectivity to enterprises and provide cellular backhaul to support residents in remote areas of Mozambique with the help of Intelsat. Under a multi-year deal, ENTM will use C-band capacity on *Intelsat 902* to provide dual band connectivity for local mobile operators as well as for its own transport network. According to Intelsat, for countries susceptible to heavy rainfall and flooding, C-band spectrum is particularly useful given its known performance and durability in adverse weather conditions.

head, says: "Without the internet it was difficult to run online education programmes such as these, which are meant to help bridge the gap between the requirements for more connected and paperless education and the materials that can make that a reality."

Broadlink added that it fast-tracked the installations at both schools in less than a month so that 3P Learning could begin orientating teachers on the platform and pupils were able to start using it as soon as possible. The organisation's spokesperson Penny Andrew said Broadlink's investment will help promote quality education and better prepare pupils for life after school.

Another school which gained high-speed internet services was the Federal Science and Technical College, Yaba, in Nigeria thanks to Vodacom Business.

The college is well-known for producing some of the country's best students in the science and technical fields at secondary education level. To help improve the results of the school even further, Vodacom Business Nigeria delivered Wi-Fi for students and teachers in classrooms, laboratories, workshops and staff offices. The company also sponsored a 220KVA-powered generator to help keep Yaba connected during power outages.

Vodacom Business Nigeria carried out the deployment as part of its *Power to You Project*. This supports public and private schools in the country by ensuring that students and teachers have access to ICT and new telecoms technologies. "Internet penetration in Nigeria is still low, especially in public schools," said Vodacom Business Nigeria MD Guy Clarke. "With the *Power to You Project*, we aim to bridge the digital divide that exists in communities and schools without access to ICT."

Towards the end of the year a wide-scale project saw Balton CP deploying a high-speed Wi-Fi solution from Alvarion in

Teachers are shown 3P Learning's Mathletics online learning platform at the Southview High School.

more than 15 higher learning institutions throughout Rwanda.

The project, funded through the Rwanda Board of Development, meant that tens of thousands of students and teachers gained ubiquitous access to high-speed internet and intranet services via any connected device.

The network featured Alvarion's latest version of its complete Wi-Fi package, and is mesh-enabled for what the vendor claims is "superior" coverage, both indoors and outdoor. It said the network provides secure connectivity throughout each institution's campus, and in some cases across multiple sites.

Safe and secure

Wireless access networks can offer multiple ways to improve the welfare of citizens across Africa.

In Cape Town, for instance, some of the busiest roads are now secured with an automated license plate recognition system installed by LPR Solutions. At its heart is a network of 42 *DS- 2CD4012F-A Smart IPC* day/night box cameras from China-based Hikvision.

The LPR team also installed wireless links as well as cabling to feed the video streams from the cameras to a dedicated central control room located within Sea Point. Each camera supports 802.11b/g/n Wi-Fi, and has a range of 50 metres depending on the environment, according to Hikvision.

The video streams are recorded on a dedicated server via *iVMS* monitoring software and fed from there to LPR's *itrack* license plate recognition software.

"With an average of over 300,000 vehicle movements per hour being expected for the network, the sheer intensity of traffic movement represented a considerable technical hurdle for the system designers," said LPR Solutions' Chris Hobbis. "The main challenges we faced on this project were the changes in lighting conditions as we passed from day to the dark of night, the speed of the passing traffic, and ensuring the utmost in reliability."

Another example comes courtesy of the 'e-welfare' services being delivered in Mali by Globecomm and Gannexion, providing communications and morale support for personnel at remote sites. Each site features a satellite dish, Wi-Fi and GSM antennas for local delivery of radio, television, voice and data services. They are also equipped with video-conferencing facilities to allow users to interact with family and friends.

The e-welfare services are provided via satellite using Globecomm's UK and Netherlands teleports, and Gannexion's customised wireless communications solutions. Working together, the two partners are providing network services, round-the-clock monitoring, and onsite staff at each camp to support operations and provide maintenance.

The Mali installation expands on a network of facilities served by the two companies in Afghanistan, Turkey and other EMEA nations. "Together with Globecomm, we plan to continue the provisioning of innovative and custom-made services especially for governmental organisations where security and reliability is imperative," said Gannexion director Joost de Jong.

The Foundation for African Business and Consumer Services (FABCOS), and its new business incubator programme *Microtelco e-ncubator*, will use satellite capacity from Avanti to deliver broadband connectivity to enterprises in South Africa. Supported by funding from the country's Department of Trade and Industry, the partners will provide high-speed broadband using Ka-band capacity from Avanti's *HYLAS 2* satellite to more than 1,000 SMEs. Avanti said the programme will be deployed extensively to businesses setting up in some of the remotest parts of South Africa, reaching a number of key sectors including retail, finance and agriculture.

Edgar Figueroa,
CEO,
Wi-Fi Alliance

The year ahead: With an installed base of more than 6.8bn devices, Wi-Fi has become one of the most prolific technologies around the world. At the start of 2016, we announced that Wi-Fi shipments had reached 12bn units, and are expected to surpass 15bn by year end.

Our 2016 technology roadmap includes programmes that will increase Wi-Fi's performance and network capacity, and will provide unique capabilities to meet diverse connectivity demands across a variety of applications and markets.

For instance, by the end of 2019 there will be more than 10bn devices capable of connecting to a home router. The second wave of Wi-Fi CERTIFIED ac features, such as wider channels and Multi-user MIMO, will deliver a better experience not only at home but also in enterprise and service provider networks.

WiGig CERTIFIED will soon complement Wi-Fi CERTIFIED ac by bringing multi-gigabit performance to in-room connectivity. The WiGig market will see significant growth in 2016, and enable streaming multiple, simultaneous UHD or 4K videos. Tri-band devices supporting 2.4GHz, 5GHz, and 60GHz will offer the best of Wi-Fi and WiGig to meet the needs of a growing number of demanding use cases.

Kamal Mokrani,
Global VP
of sales &
marketing,
InfiNet Wireless

nfiNet Wireless claims it has a unique position as one of the largest privately owned broadband wireless access development and manufacturing companies in the world. Headquartered in Malta and with global offices, the company has a a history that spans more than 22 years and claims its "innovative approach in research and development has resulted in a range of advanced fixed wireless connectivity solutions that are a perfect fit for many requirements".

InfiNet Wireless says it has more than 500,000 deployments from the "plains of Siberia to the deserts of the Sahara" and, as global VP of sales and marketing Kamal Mokrani explains, its involvement with Africa goes back a long time.

"Our key activities initially centred around the southern and northern tips of the continent. During this time, we worked with various end users to deploy wireless infrastructures in the oil and gas sector, the WISP marketplace and homeland security in various countries.

"Over the past year alone, we have completed major projects in Egypt, one of which was to provide the Cairo authorities with a complete 'Intelligent Traffic Solution' based on our wireless platforms.

"Working closely with a number of other suppliers as part of a consortium, we ultimately deployed a brand new infrastructure to help ease congestion around the city, reduce pollution levels and significantly increase productivity by minimising the time people spent travelling in their cars.

"This infrastructure is now fully operational and, over the next year or so, similar solutions will be deployed in other parts of Cairo itself and other big cities in the country.

"Another recent project delivered very recently was with Icosnet, a major WISP in Algeria. This service provider is mainly focused on providing internet connectivity to the enterprise market, with an even greater focus on foreign entities operating in the country, such as financial institutions, energy companies, manufacturing, etc. Our solution offered this service provider a future-proof platform upon which to build its commercial strategy."

When asked how InfiNet Wireless has seen Africa's wireless communications market evolve in 2015, Mokrani says the continent is so diverse that it is impossible to apply a blanket statement or generalisation about the region, especially as each country and its economy is now at a different stage of growth.

"We have to constantly adapt our approach and overall strategy on a country-by-country basis as each one presents us with its own challenges. Wireless solutions like ours are often classified as sensitive by most local governments, and importing into the country is often hampered by regulatory barriers, making it difficult for service providers of all types to deploy the latest wireless technologies and compete with the incumbent (usually state-owned) service providers.

"Lack of funds for local entrepreneurs to provide internet access, among other services, is also another slowing-down factor in the adoption of new technologies across most of Africa.

"On a positive note, the changes that occurred in recent years with the introduction of 3G technology, now being followed by mobile broadband based on 4G/LTE, have been substantial. The aggressive consumer adoption of mobile devices due to the lack of adequate fixed infrastructures has leveraged wireless technologies, and we are now becoming a key player in relieving the backhauling pressure experienced by mobile operators.

"We are also seeing a huge demand in homeland security. To respond to such a need, we have further enhanced our existing solutions to carry even more data within the same available spectrum, and provide high definition video streams to allow all the usual analytics (e.g. face recognition, ANPR, etc.) to be undertaken by the local and regional law enforcement agencies."

As he continues to talk about the hurdles that need to be overcome, Mokrani believes that the two biggest challenges in Africa remain the regulatory barriers and a serious lack of adequate funding.

"Everybody agrees that technology in general is a key driver to improve people's lives and the local economies in general. But without a good telecoms infrastructure, it is going to be difficult to achieve any major step forward.

"Nobody will invest in a particular country if their investment is not protected by a strong regulator. Such regulation – and ultimately a fair and more efficient use of the available radio spectrum – is what we see as a real challenge in Africa."

"There are other challenges as well, mainly linked to political situations in various countries. For example, a market such as Libya – which was very good for everyone in the past – has reached a 'no-go' stage, and it is practically impossible to even ship anything to the country.

"Other challenges expected to happen elsewhere are to do with previously approved budgets for telecoms infrastructures which are now being reallocated by some governments to homeland security. This is ultimately good news for us anyway since we are also active in this area, but it does create a certain level of uncertainty going forward and planning from the business point of view."

Mokrani says like any other vendor, Infinet Wireless' goal over this year is to establish an even bigger footprint in Africa, adding that the company's wireless solutions are "ideal" for the terrain and are often the "best" available alternative due to a serious lack of wired infrastructures.

"In some of the more developed markets in Africa, we are aware of various initiatives supported by the governments who want to bridge the digital gap between the cities and the urban areas. There are big plans in place in a handful of countries, some of which even have approved funding.

"Our biggest activities for the next 12 months will be focused on significantly increasing market awareness in the region, not just about InfiNet Wireless, but also about the possible applications of fixed broadband wireless access."

Mteto Nyati,
Chief enterprise
officer,
MTN Group

Cisco, Ericsson, and others have made some big predictions about the growth of the global market for machine-to-machine communications and the Internet of Things during the coming years. But does any of it apply to Africa? As part of a feature first published in the May-June 2015 issue of *Southern African Wireless Communications* magazine, MTN's Mteto Nyati explained that the IoT/M2M opportunity on the continent is very real.

"It is no longer a matter of if or when IoT/M2M will take off, as we have seen developments in this area from as far back as six to 10 years ago. Reflecting on SCADA (supervisory control and data acquisition) and the inception of machine-related data communications, it is clear that we have the building blocks and now need to enhance and facilitate greater efficiencies with our own solutions.

"How IoT is used and what that means for customers are the questions that need to be asked. At MTN we have looked in depth at what IoT could mean for our markets. We believe that Africa and the Middle East are primed for high levels of penetration, as these are the markets where efficiencies and M2M services are required the most."

If there is a real market appetite for such solutions in the region, what's driving it? In

answer to this, Nyati said Africa has a unique set of problems that cannot be compared to other territories.

"The continent faces issues largely related to health, environmental sustainability, public safety and agriculture. Underpinning these are the constraints faced in relation to connectivity and data costs. Therefore, there is certainly an 'appetite' for solutions to address the aforementioned problems. By addressing these we create a viable ecosystem to drive solutions and adoption thereof.

"A key focus for MTN in this respect is providing solutions to address the need for basic necessities like clean and drinkable water, driving energy efficiencies, economic inclusion and citizen engagement."

But as Nyati points out, developing and deploying solutions are dependent on expertise, platforms and connectivity, which in turn are all affected by the infrastructure or lack of infrastructure in place. So how does MTN expect to overcome these challenges and what exactly has it done in developing Africa's IoT/M2M market?

In May 2015, MTN's Business division unveiled what it described as the first "truly" pan-African IoT platform to provide enterprises with "greater control and advanced management features" for their connected devices and SIMs. At the time of the announcement, the platform had already gone live in South Africa and other MTN operating countries were expected to follow throughout the year.

"We believe that MTN's IoT environment has eased the above mentioned dependencies by providing a dedicated IoT management platform which runs on a dedicated IoT network." said Nyati. "This allows us to provide a consistent service experience across our footprint and manage costs accordingly. With the addition of an open architecture SDK and API, we have opened our toolsets to allow the developer community in Africa to build African solutions to address our uniquely African problems."

In terms of wireless technologies, we asked him what should be used to deliver these solutions effectively. With cellular, satellite, Carrier Wi-Fi as well as fibre now all available, Nyati believes the choices for connectivity are evolving almost as quickly as the IoT landscape itself.

"What may work today may not be the best solution in five or ten years from now. As noted, the challenges we face in terms of connectivity on the continent limits how intensive some solutions should be.

"However, this also provides an opportunity to optimise how we deliver solutions. We have seen that the bulk of solutions to address the immediate requirements can work on 2G networks and innovators have found brilliant ways of making this work at levels expected from higher bandwidth services against our unique challenges. As an evolving ICT provider, we believe all technologies have a role to play in delivering solutions effectively."

In terms of the future for the IoT/M2M in Africa, Nyati said that as service availability, processors, sensors and development workbenches become increasingly cheaper, spurring innovation to problems encountered on a daily basis, we will ultimately see the emergence of smarter societies and efficient management of utilities and resources. He added that the knock-on effects of this relate to increased economic activity and growth.

"Focus will ultimately span beyond immediate issue resolution to forecasted solutions on yet undefined problems, allowing for further innovation along all verticals of service.

"We envision wide scale adoption of M2M services. There will be solutions to help governments work more efficiently and further improve their engagements with citizens; and businesses, both large and small, will be able to save time, increase productivity, reduce costs and take full control of their businesses, among other benefits.

"The future for Africa through IoT is bright, and MTN aims to assist and drive this activity as part of our key strategic objectives."

Lux Maharaj, Strategic account manager Intracom Telecom

Intracom Telecom is a global telecommunication systems and solutions vendor operating for more than 35 years in the market. Headquartered in Greece, the company specialises in innovative products for self-organising network (SON) small cell backhaul, ultra high capacity wireless transmission, broadband wireless access, and smart software communication platforms.

According to strategic account manager Lux Maharaj, Intracom Telecom has brought solutions to demanding telecom markets which have been deployed worldwide. "Our products use the most advanced, field proven technologies, achieving and exceeding the level of performance required by modern applications for wireless access and backhaul."

In Africa, Maharaj says the company has enhanced its presence on the continent with the establishment of INTRATELECOM SA in South Africa, as well as a subsidiary under the same name based in Rabat, Morocco.

Intracom Telecom has been active in South Africa since 2010 and is now, says Maharaj, the "supplier of choice" for large WISPs and telcos in the country, especially with the deployment of the *WiBAS* point-to-multipoint (PMP) radio product line. So how has the company seen the wireless communications market adapt and evolve in Africa in 2015?

"An important trend is that of high speed broadband access, via wireless, aiming to provide broadband connectivity to as many as possible subscribers who presently are impacted by the digital divide," says Maharaj. "The African market seeks a way to improve competitiveness and access to information for its inhabitants.

"The unlicensed band has become congested with many operators realising that it is an unreliable service, despite the

attractively lower cost of customer terminals. Despite the preference for fibre, its costs, installation times, issues with rights of way, as well as fibre cuts and long repair times, have all resulted in PMP becoming the preferred alternative for deploying a service – typically within 48 hours of a customer request."

Maharaj says Intracom Telecom has also seen the enterprise market begin to demand higher capacities, SLAs and guaranteed services. As a result, operators have started evolving their unlicensed band enterprise services to licensed band PMP.

So what does the company see as the challenges for the continent in 2016 and beyond?

"The need to provide broadband coverage, either due to regulation and international agreements (e.g. UN charter of human rights), or because of the need to create infrastructures for economic growth, mean increased outdoor coverage is required to reach out to citizens away from major city hubs. The quickest way to do this is to deploy inexpensive technologies – Wi-Fi hotspots in suburban and rural areas, and the roll out of rapid data services under centralised control with SDN.

ISPs are looking for alternatives to migrate their WiMAX networks and regulators are receiving a barrage of applications for spectrum in the 10.5GHz and 26GHz bands. Ownership of channels in 10.5GHz has become a critical requirement for operators particularly in West and Central Africa – mainly due to the distance limitation of higher frequencies in their high rain rate regions."

So what are the company's plans over the next year or so?

"With the establishment of the new subsidiaries, the Intracom Telecom group expects to boost business significantly in the South African market as well as in the sub-Saharan African region, targeting ISPs and mobile operators. From the Rabat office, we aim to come closer to better serve clients in North West Africa."

Maharaj goes on to say that the company also expects to assist regulators and operators in formulating strategies to provide high capacity, SLA-based and guaranteed services to the residential and enterprise markets. To support

[1] www.ustda.gov/news/pressreleases/2013/US/SGT_ZakSmartGridOpps_111913.pdf
[2] http://electronicsmaker.com/sub-ghz-wireless-design-choices-for-smart-metering
[3] http://africanbusinessmagazine.com/sector-reports/infrastructure/will-africa-take-lead-internet-things/#sthash.2zr0HASE.dpuf
[4] As above
[5] Small Cell Deployment Strategies and Real-Time Analytics - www.gartner.com/doc/2712418/market-trends-small-cell-infrastructure

this, the firm has recently introduced the new *WiBAS Connect* PMP terminal radio, which operates in the 10.5, 26 and 28GHz bands, for residential and SMB subscriber access.

"With this radio, the company aims to provide broadband connectivity to as many subscribers as possible who presently are impacted by the digital divide. We will therefore improve competitiveness and access to information for the region and other underserved areas offering high capacity QoS.

"Furthermore, Intracom Telecom expects to assist governments and municipalities in implementing street-level solutions for civil, security and traffic monitoring applications. The company can address this need with its truly groundbreaking StreetNode products that are specifically designed to meet the multiple challenges of deployment at street level on lamp posts, bus stops and on walls."

Maharaj claims *StreetNode* "revolutionises" the architecture of small cell wireless backhaul because of its software defined radio operation, switching between PTP and PMP mode without HW and SW changes, to accelerate chain or hub and spoke deployments. He adds that it is controlled by an intelligent SON manager which simplifies provisioning, ensures service availability, automates optimisation, and can be connected to the network within a few minutes.

Nick Ehrke,
Sales director,
Southern Africa,
RADWIN

Established in 1997, RADWIN provides a full suite of wireless point-to-point, point-to-multipoint and broadband mobility solutions, powering applications such as backhaul, broadband access, private network connectivity, video surveillance transmission as well as wireless broadband in motion for trains, vehicles and vessels.

Southern Africa sales director Nick Ehrke says the company has enjoyed "enormous success" over the last 12 months, and has seen an "incredible increase" in its key market of enterprise broadband.

He adds that the firm's carrier business has also grown particularly well due to the success of its *JET* portfolio, which he describes as a "real disruptor" in the marketplace.

"We have seen uptake across the board from both existing and new customers, as the advantages of *JET* are readily apparent," says Ehrke. "The demand for data on the continent continues to grow exponentially. Networks are expanding rapidly, but just not rapidly enough to satisfy the demand for data by both business and consumers.

"Right now, we are seeing fibre being rolled out extensively, and this is having a negative impact on microwave as backhaul and trunk links are being replaced by fibre. However, it has not had any impact on the broadband services.

"Currently, it is common for an operator to say that they have fibre running past 50,000 or 150,000 homes. But the operative word here is 'past'. Operators are still struggling with the 'last mile'. What we are seeing is a move to rapid deployment, where wireless is a catalyst to growth due to the lower cost, particularly when compared to traditional fibre trenching or replacing expensive copper networks that are still being targeted by thieves.

"An LTE network is expensive, and typically networks do not have enough spectrum to meet the capacity and throughput demanded by users. Plus of course, it is designed for the residential market and not for the enterprise.

"LMDS (or microwave point-to-multipoint systems) are still prohibitively expensive – both in terms of spectrum as well as equipment costs – and has currently priced itself out of the market. So at RADWIN we find ourselves in the enviable position of being the leading solution for the 'last mile' among operators due to the numerous advantages of our JET platform in both licensed and license-exempt applications."

Ehrke goes on to claim that almost every operator, carrier, ISP and WISP in sub-Saharan Africa is presently considering deploying the platform on their network due to the benefits that it delivers.

So while RADWIN can help service providers overcome some of the technical challenges, deploying a network is still very capital intensive, especially in Africa where, as Ehrke points out, local currencies have depreciated against the US dollar (for various political and economic reasons), putting further strain on operators and ISP budgets.

"Operators are trying to do a lot more with less, and with less buying power in an ever increasing demand environment. While networks are costing more, capacity requirements have increased exponentially; we have seen a network that was designed to deliver between 2Mbps and 8Mbps, but the actual demand is for 20Mbps and 40Mbps services – a 'fibre type' service. So the challenge for networks is to not only meet the new demand for these speeds, but to look and invest for the future.

"RADWIN research predicted such demand, and we are the first to market with 100Mbps and and 250Mbps CPE in a point to multi-point environment. With our new *JET* platform we can deliver 3Gbps with a four sector high site. That's unparalleled in the industry"

Ehrke says the company's continued aim is to continue to develop innovative products with leading edge technology. "We are at the cusp of the wireless technology market, bringing unique solutions to our customers so that they stay at the forefront of their market.

"Today, RADWIN leads the enterprise market, with virtually every major operator in Africa having deployed and relying on [our solutions] in their networks. We plan to leverage this leadership in the enterprise sector and help our operators reach an even wider market. We will expand on the current benefits of our Jet multi-service platform and offer increasing operational simplicity, further our customers service sales cycle, reduce installation times, reduce network complexity, and automate as much as possible, ensuring we return even more value to our customers.

"It is imperative for customers, whether a consumer, small business or large enterprise, to be able to access data that is reliable and sufficient for their needs.

"From RADWIN's inception, we have really only had one conversation with our customers: if downtime results in loss of revenue, loss of reputation, or in extreme cases, loss of life (consider a hospital, or emergency services network), then RADWIN is the right network for you. And the good news is that most operators, carriers and ISPs agree."

Robin Kent, Director of European operations, Adax

Adax specialises in network infrastructure such as LTE-EPC to replace WiMAX and fixed broadband, high-density signalling solutions to meet the needs of today's smartphone users, interfaces to work between legacy networks and protocols, and much more. The US-based company covers Africa from its European headquarters in the UK, and lists Comviva, Ericsson and Nokia among the many customers who have used its signalling solutions over the last 35 years.

The company's Robin Kent points out that part of the customer service coffee shops now offer is free Wi-Fi. He reckons that what may once have been considered a relative luxury is now an expected service, with many customers using their local coffee shop to work, study or simply just to browse the internet.

But he warns that free Wi-Fi is a "potential money pit" if the business providing this service isn't utilising the vast possibilities that Wi-Fi access offers in terms of business gain.

"Businesses have the opportunity to turn the cost of an expected convenience into a revenue stream, at the same time as enhancing customer experience and brand loyalty.

"Wi-Fi is a guaranteed route to internet access – at least it is when you compare it with the standard mobile networks (3G/4G), which are not always 100 per cent reliable, but it's not always perceived in that way. The process for accessing retailers' Wi-Fi is not always a smooth one, with some requesting users to sign up using quite lengthy online sign-up forms.

"With so many users 'on the move', it's unrealistic to expect adherence to a sign-up process that can take five minutes. Yes, that may not seem that arduous, but when you only want internet access to check the price of a specific product or the location of a store in a shopping mall – the five minutes it takes to sign-up to the Wi-Fi, doesn't seem worth the time spent. The user will just choose to rely on patchy 3G or 4G coverage to access the internet.

"This is a problem for both the retailer as well as the mobile operator. Bearing in mind the retailer, in most cases, is also the Wi-Fi service provider, if the user is in the store's Wi-Fi coverage radius, the retailer will lose out when it comes to user engagement.

"Retailers rely on consumer information and interaction to [improve] the service they offer and to provide a more targeted marketing strategy. If the consumer is relying on their 3G or 4G network, it's harder for retailers to manage consumer interactions.

"From the operator's perspective, the problem of data overload is potentially significant. If you imagine, hypothetically, that in a big shopping mall every retailer that provides a managed Wi-Fi service is suffering from downtime, consumers will resort to their standard mobile networks. If everyone in the mall is doing this then there are obvious concerns for operators who are trying to manage the data flow through the Wi-Fi.

"Retailers and operators can have a mutually-beneficial relationship when it comes to network provision. For instance, retailers who own their own networks can offer access to operators for a fee which will help operators manage the data overload, and similarly operators can offer managed Wi-Fi services to retailers for a fee. Hence, there is an obvious cost-saving implication for retailers that are anxious about investing capital and operational expenditure in Wi-Fi.

"Wi-Fi is growing. According to market trends analysis from Gartner, carrier-grade Wi-Fi hot spot locations are increasing and small cells, which are vital to effective 3G data offload, are expected to capture 26 per cent of smart device traffic by 2018. This gives some indication as to how significant Wi-Fi is in reducing the data pressure on the 3G and 4G networks.

"The importance of small cell technology is best seen in the retail space. There is a clear benefit when it comes to alleviating pressure on other licensed spectrums, but the added benefit to retailers is that real-time analytics can be performed far more accurately using small cell Wi-Fi nodes, as opposed to macrocells, which typically serve a larger radius. Small cells just have greater precision when it comes to data analytics.

"In terms of customer engagement, small cell deployments give retailers access to real-time analytics, which in turn allow them to offer a more targeted and personal marketing approach, based on a customer's location or previous purchasing patterns.

"Managed Wi-Fi networks give retailers critical and hugely valuable information that can help determine everything from the most effective store layout to the consumer's experience while in-store.

"It's not just conceptual either; the data that retailers can use from their Wi-Fi managed network gives very specific information that can be used to directly improve sales by appealing to shoppers' preferences and tendencies."

In focus:
Broadband

Broadband: the most powerful weapon governments have to support national development

International
Telecommunication
Union

As well as marking the ITU's 150th anniversary, 2015 was the year when the UN's Millennium Development Goals (MDGs) were due to have been met.

The MDGs were adopted at the turn of the century, and among the targets they were expected to hit was increasing internet access around the world. While the proportion of households in the developing world with access was more than 34.1 per cent by the end of 2015, it fell short of the goal of 40 per cent. In sub-Saharan Africa only one in nine households was connected.

UN members have now adopted 17 Sustainable Development Goals (SDGs) which cover a variety of issues, and the targets they aim to hit by 2030 include building resilient infrastructure, the promotion of inclusive and sustainable industrialisation, and the fostering of innovation.

At a meeting held in Dubai in March 2016, the UN's Broadband Commission agreed that broadband networks, services and applications have enormous potential to deliver dramatic results in education, health and socio-economic growth. It believes high-speed networks will be a key factor in achieving all 17 goals.

The organisation also discussed the importance of adding new targets to measure the utilisation of selected broadband-enabled public services, the choice of statistical indicators to accurately gauge broadband access at the country and community levels, as well as the choice of data sources and methodologies for generating accurate, reliable measurement.

It agreed that 'National Digital Scorecards' should be developed to measure a country's progress towards achieving broadband targets.

The Broadband Commission's 60+ leaders and experts from government, UN agencies, civil society and a broad spectrum of business sectors will now work to formulate concrete, measurable broadband connectivity goals that could be agreed by the next full meeting to be held later this year in New York.

ITU secretary-general Houlin Zhao said agreement on new targets in September will serve as the next stepping stone to the commission's vision of 'broadband for all'.

Zhao also serves as co-vice chair of the Broadband Commission alongside UNESCO director-general Irina Bokova. She believes the world is going through a "staggering confluence" of emerging technological breakthroughs that can open vast new horizons for growth and development.

"There remain 1.3 billion people without electricity today, and over four billion people without access to the internet. Access and connectivity are absolutely crucial for societies across the world. This is why the message of the Broadband Commission for sustainable development is so important," said Bokova.

Established in 2010 as a top-level advocacy body promoting broadband as an accelerator of global development, the Broadband Commission is chaired by Rwandan president Paul Kagame and Mexican telecoms tycoon Carlos Slim Helú.

Time for an 'information revolution'

According to the ITU's *State of Broadband* report published in September 2015, broadband internet is failing to reach those who could benefit most, with 57 per cent of the world's people still offline.

In a document entitled *Transforming our world: The 2030 Agenda for Sustainable Development*, the UN says "the spread of ICT and global interconnectedness has great potential to accelerate human progress and to develop knowledge societies". The document sets out ambitious ICT development targets in the goals agreed for education, gender and infrastructure, with ICTs recognised as a 'means of implementation' for all SDGs.

The document says there is now a great deal of evidence that states affordable and effective broadband connectivity is an essential enabler of economic growth, social inclusion and environmental protection.

The ITU points out that although figures for global mobile penetration seem to suggest that most of the world is now connected, in reality the digital divide is proving "stubbornly persistent" with regard to broadband access.

According to the ITU's latest data, while 43 per cent of the world's population is now online with some form of regular access to the internet, around 4.2 billion people still have no regular access.

The situation in the 48 UN-designated Least Developed Countries (LDCs) – which mostly include African nations – is particularly critical, with more than 90 per cent without any kind of internet connectivity. The lowest levels of internet access are mostly found in sub-Saharan Africa, with internet available to less than two per cent of the population in Guinea, Somalia, Burundi, Timor Leste and Eritrea.

One of the hurdles that needs to be overcome is extending last-mile access to infrastructure to remote and rural communities. But there are worrying indications that internet growth globally is slowing as broadband services extend out of

urban areas to these more remote and less densely populated areas.

However, empowering people via broadband needs much more than infrastructure alone. Among the billions who are still offline, many may be unaware of the internet's potential or cannot use it because there is little or no useful content in their native language. Extending access must therefore be accompanied by the development of relevant content in different multimedia forms and new services, such as e-commerce and payments in local languages, for example.

Countries need to adopt effective policies and strategies to make broadband available, affordable and accessible. An 'information revolution' is needed to help inform and improve policy-making. Public and private sectors must work together in close partnership to achieve broadband for all.

It is now more important than ever that developing countries prioritise digital development in order to enhance their national competitiveness and to deliver tangible improvements in their citizens' living standards and welfare, including closing gender gaps in access to ICTs and broadband.

Investments in broadband must be combined with new investments in training and education to ensure that every woman and man has the skills and capabilities, as well as the opportunities, to make the most of ICTs and new technologies for human rights and dignity, for social inclusion, for poverty eradication and for sustainable development.

RANK	ECONOMY	SUBS. PER 100 CAPITA
25	Libya	80.6
59	Cape Verde	51.3
67	Tunisia	47.6
74	Egypt	43.5
105	Sudan	27.2
106	Morocco	26.8
108	Côte d'Ivoire	24.6
110	Senegal	23.7
112	Algeria	20.8
120	Uganda	14.7
122	Mauritania	14.4*
125	Sierra Leone	13.0*
130	Nigeria	11.7
131	Mali	11.3
135	Congo (Rep.)	10.8*
138	São Tomé & Príncipe	9.8*
139	Burkina Faso	9.6
142	Kenya	9.1
143	Gambia	8.0
146	Liberia	7.6
147	Ethiopia	7.5
162	Malawi	4.1
164	Djibouti	3.2*
168	Benin	2.8
169	Guinea	2.2*
171	South Sudan	1.3
173	Somalia	1.0*
175	Niger	0.9*
177	Burundi	0.5*
178	Central African Republic	0.3*

SOURCE: STATE OF BROADBAND REPORT, ITU, SEPTEMBER 2015

Active mobile broadband subscriptions per 100 inhabitants in Northern equatorial African ITU member states, 2014. *ITU estimate.

Africa has a long way to go – but is on its way

Broadband internet is failing to reach those who could benefit most, according to the 2015 edition of the ITU's *State of Broadband* report. It stated that while broadband internet access is reaching near saturation in the world's rich nations, it is not advancing fast in the developing world.

The report revealed that 57 per cent of the world's population remains offline. The situation in the 48 UN-designated 'Least Developed Countries' – which mostly include African nations – is particularly critical, with more than 90 per cent of people without any kind of internet connectivity.

The lowest levels of internet access are mostly found in sub-Saharan Africa, with internet available to less than two per cent of the population in Guinea, Somalia, Burundi, Timor Leste and Eritrea.

In its table of 189 member states with active mobile-broadband subscriptions per 100 inhabitants, the ITU ranks the top three countries as Macao (China) Singapore and Kuwait, respectively. Libya is the first African nation to appear in the table. Cameroon, Chad, Equatorial Guinea, Eritrea, Gabon and Guinea-Bissau all ranked at the bottom with a zero or an estimated zero number of active mobile broadband subscriptions per capita.

The union said among the challenges that need to be overcome to expand web access is to create a truly multilingual, multicultural internet, and make services and devices more affordable. The cost-effective rollout of networks into remote and rural areas is also a key obstacle.

The ITU said one factor contributing to the slowing of internet growth is that the business

JANUARY 2015
MENA Submarine Cable System has deployed Infinera's *DTN-X* platform across its trans-Egypt terrestrial network. Infinera said its *Intelligent Transport System* provides multi-terabit capacity and network services to MENA, and will enable it to differentiate its services and manage costs as it scales. A subsidiary of Orascom Telecom Media and Technology, MENA owns and operates a submarine system that connects Egypt to Greece, Italy, Oman, Saudi Arabia and India. This latest deployment will enable it to provide wholesale carriers with terabit capacity as well as a range of connectivity services from STM-1 to 100Gbps.

FEBRUARY
iWayAfrica has become one of the first ISPs in the region to offer global bandwidth as

a service to enterprise users in Zimbabwe. With its MPLS-like managed solution, iWayAfrica claims business networks gain the advantage of guaranteed international bandwidth, visibility of their global traffic broken down by applications and sources, and the ability to define intricate priorities and policies. The cloud-based service is enabled by DiViNetworks which specialises in software-centric network systems. Unlike other MPLS or DPI solutions, DiViNetworks says its service does not require any CPE or capex investment.

MARCH
CETel has launched services using extended C-band capacity in partnership with Arabsat. The two firms have jointly built an Earth station at CETel's teleport in Germany, and it's claimed their new services will

offer "unprecedented business expansion possibilities". CETel will use *Arabsat-5C* which orbits at 20ºE along with its own teleport facilities and services across Africa, the Middle East, Europe and Central Asia. Arabsat and CETel say extended C-band offers not only trunking and backhauling applications but also corporate network connectivity between regions and continents.

APRIL
Botswana has launched a cybersecurity project that will help it make the most of open access to the internet without the fear of being targeted by hi-tech criminals. Speaking at the CTO's *Commonwealth Cybersecurity Forum* held in London, Botswana's minister of transport and communications Tshenolo Mabeo said the

case for service providers is less compelling for the areas in which the remaining 57 per cent of unconnected people live. It cited the World Bank and its call for the private sector to take the lead in providing internet infrastructure and services, but noted that public investment or intervention is sometimes justified where the private sector is unable to provide affordable access.

The union also recommended levies on operators to finance USFs, mandatory infrastructure-sharing, and government-led national strategies. Africa certainly needs to be ready. According to Cisco's 2015 Visual Networking Index (VNI), annual IP traffic is forecasted to triple over the next four years to reach a record two zettabytes globally in 2019.

Factors expected to drive traffic growth include global increases in internet users, personal devices and M2M connections, faster broadband speeds, and the adoption of advanced video services. Doug Webster, Cisco's VP of service provider products and solutions marketing, said: "It took 32 years – from 1984 to 2016 – to generate the first zettabyte of IP traffic annually. However, as this year's VNI forecasts, it will take only three additional years to reach the next zettabyte milestone with more than two zettabytes of IP traffic annually in 2019." In Middle East and Africa, the index predicts mobile data traffic will grow 15- fold from 2014 to 2019, and will reach three exabytes per month by 2019, up from 199.5 petabytes per month in 2014.

The good news is that companies are already moving to satisfy this increasing demand. April saw Liquid Telecom claim to take the crown for the fastest broadband speeds available in Africa, at the time, with the launch of its new fibre-to-the-home (FTTH) service in Zambia.

Liquid, under a joint venture with power transmission and distribution company, Copperbelt Energy Corporation, launched *Fibroniks*, a new FTTH service that is claimed to deliver superfast speeds of up to 100Mbps. The service was initially launched for around 8,000 homes and businesses in Lusaka including the areas of Rhodes Park, Northmead, Long Acres, Sunningdale and Kabulonga.

Another massive boost to Africa's long-term broadband ambitions comes from TI Sparkle who teamed up with DE-CIX to establish an internet exchange (IX) as a key landing site for online traffic to and from Africa, the Middle East and the Mediterranean region

The new exchange is designed to allow carriers that land their IP backbones in Sicily to directly interconnect with each other and to other providers that have a presence in the hub.

"Our partnership with DE-CIX and their new IX node in our Sicily Hub is the most important milestone in the creation of a massive IP gravitational centre in the middle of the Mediterranean," said TI Sparkle CEO Alessandro Talotta. "We will be able to better serve ISPs in the area, including Africa and the Middle East, by bringing worldwide content directly to their doorsteps."

Increased cable is the key

Ever-increasing demand for broadband means that Africa's global connections will need upgrading or new cables being laid.

Deals to lay two new cables connecting Algeria to Spain and Angola with Brazil were signed in 2015.

Infrastructure company Alcatel-Lucent signed with the Algerian Ministry of Post,

Information Technology and Communications (MPITC) to build a 560km fibre optic undersea cable that will link Oran in Algeria to Valencia in Spain. The cable system has been given the name 'Orval', and is expected to be completed sometime in 2016.

When fully operational, the system will deliver 100Gbps but has an ultimate design capacity of 20Tbps. This projected speed and capacity will enable the delivery of broadband services to an estimated 42 million internet users in Algeria and Spain, claimed Alcatel-Lucent.

Also, Angola Cables signed a contract to build the world's first submarine cable system across the South Atlantic. The international wholesale carrier will work with NEC as the system supplier. Stretching 6,165km, SACS (South Atlantic Cable System) will connect Angola with Brazil, directly linking Africa to Latin America for the first time.

In Angola, it will land at the Sangono cable landing station near Luanda, while the Brazilian landing point will be at a purpose built data centre in Fortaleza. The total amount of investment for SACS is estimated to be around USD160m. It will feature four-fibre pair cable and optical transmission technologies with an initial design capacity of 40Tbps (100Gbps x 100 wavelengths x four fibre pairs). Construction is expected to begin before the end of 2015 and the system is targeted to be ready for service during Q4 2016.

Along with new cables, existing connections have also been upgraded.

The West Africa Cable System (WACS) was upgraded for the first time since it was commissioned in May 2012. Phase 1 of the upgrade was completed in July 2015 and focused on the 'Express Fibre Pair' (Fibre Pair 1) between

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project is important to "guard the safety, security and resilience of cyberspace, so that we can enjoy its socio-economic benefits".

MAY
NAPAfrica warns that without innovative approaches to bridging the digital divide, Africa is unlikely to ever have full access to critical information. It said the continent has yet to fully realise the benefits of peering which is currently under-utilised. NAPAfrica claims to be Africa's largest internet exchange point, and is based at Teraco's carrier- and vendor-neutral data centre facility in Johannesburg. "There is significant proof that peering is not only fundamental, but also an essential part of any network landscape, particularly across borders," said Teraco CEO Lex van Wyk.

JUNE
The Communications Regulators Association of Southern Africa (CRASA) has signed an MoU with Ericsson to support the accelerated development of ICT policies and regulations in the SADC region. Under a three-year deal, the two will facilitate capacity building workshops aimed at the development of national broadband plans. They will focus on specific concerns related to ICT in the 15 member states of the SADC who are planning, developing or revising and amending their broadband policies.

JULY
ZTE has launched its *iRail* railway radio broadband system in Africa. It said the communication solution is based on "cutting edge" LTE technology and provides broadband applications such as passenger information

services, patrol alarm systems, and digital advertisements. ZTE entered the railway industry in 1999, and claims it was the first manufacturer to commercially introduce LTE into the sector. In Africa, the company's rail transport solutions have so far been applied in Ethiopia, Morocco and Nigeria.

AUGUST
Telecom Namibia's infrastructure continues to be a target for thieves and vandals. Since August, the operator said 12 poles have been cut down and stolen from the Erongo fibre optic backbone route which links Swakopmund, Henties Bay, Uis, Omatjete, Khorixas, Kamanjab, Outjo, Omaruru, Karibib, Arandis, Usakos and Walvis Bay. The route is also used to transmit internet data to neighbouring countries. TN has called for increased police patrols in the

South Africa and Portugal. It resulted in the addition of nine 100G wavelengths to the existing 24 10G wavelengths.

Phase 2 then upgraded Fibre Pair 2 (South Africa-Nigeria- Portugal), Fibre Pair 3 (South Africa- Angola-DRC-Côte d'Ivoire-Portugal), and Fibre Pair 4 (all landing stations), adding eight 100G wavelengths to the 32 10G wavelengths that existed across the three Fibre Pairs at the time. At the Swakopmund landing station in Namibia, an additional four 100G wavelengths were added on top of the existing eight 10G wavelengths.

SEACOM also completed an upgrade to its global IP and MPLS network. According to SEACOM, the upgraded backbone gives service providers and operators access to gigabit ports offering up to 100GbE at "affordable" prices, as well as the ability to dynamically turn up bandwidth on demand. In addition, the new network will extend the availability of native IPv6 services to all users, and provide translated IPv6-to-IPv4 services.

Broadband for everyone?

Africa will undergo dramatic change in the next few years as a result of robust growth in the number of people going online, according to the Internet Society.

Speaking at the Africa Internet Summit held in Tunisia in early June 2015, Internet Society president and CEO Kathy Brown described the continent as "the frontier" for the next phase of growth for the internet. "Africa's recent economic growth rates and growing entrepreneurial spirit are combining

Internet Society president Kathy Brown said the mobile internet has transformed Africa's technology landscape.

to create a climate of opportunity," said Brown. "Advances in internet infrastructure and the meteoric rise of the mobile internet have already transformed the African technology landscape."

But she warned that there are still many barriers to overcome, such as the high cost of broadband access, online fraud, lack of local content and fragmented markets. "Africa is now the frontier for the next wave of internet progress. While there is huge potential for Africa to continue building an internet that will best serve its needs, it is critical that true collaboration across Africa's technical community, a culture of innovation and entrepreneurship forms part of this process."

According to a report produced by the society, the vast majority of Africa's 54 countries have between 0-20 per cent internet penetration. Only South Africa, Egypt and Morocco are estimated to have more than 60 per cent penetration.

Operators seem only too keen to help increase that penetration. Openserve, the wholesale division of South Africa's incumbent operator Telkom, had multiple rollouts throughout the year, including Pretoria East, and Bryanston as well as across multiple additional suburbs of Johannesburg, Pretoria, Durban, Cape Town, Bloemfontein, Kimberley and Port Elizabeth.

On top of that, the firm's MD, Alphonzo Samuels, said "Openserve is committed to Telkom's goal of reaching one million homes with fibre access by 2018, and already has the largest fibre network in the country."

Ooredoo Group are tackling another aspect of the problem, quality. The firm now using advanced technologies from Nokia to boost 2G, 3G, 4G and LTE-A networks across its global operations.

According to Nokia, Ooredoo has taken the lead in network performance across

its footprint, offering 4G+ in Qatar and Kuwait, 4G in Oman, Tunisia and the Maldives, in addition to launching the first commercial 3G in Algeria and Myanmar. The aim is to prepare for the huge data demand and to ensure what Nokia's EVP Ashish Chowdhary described as " the ultimate personal gigabyte experience".

Submarine and satellite connecting more nations

July 2015 saw construction of phase II of the ACE (Africa Coast to Europe) submarine cable successfully began, with the aim to extend from São Tomé and Príncipe to South Africa. As part of the second phase, ACE will also add Benin, Nigeria and the Canary Islands to its network.

At the time it was claimed the number of people connected by the system had risen 53 per cent to 200 million. Under phase I, which was launched in the Gambia in December 2010, ACE connected 15 West African countries to Europe. They include landlocked Mali and Niger which are linked via a terrestrial extension.

After the completion of the second phase which is due by the end of 2016, the cable will be extended to Cape Town and will cover 17,000km. Branches will also connect the DRC and Cameroon, as well as Angola and Namibia. Cameroon has also become the newest member of the ACE consortium after signing the construction and maintenance agreement in June.

ACE management committee chairman Yves Ruggeri said the addition of the country will bring more value to the cable system. He also said ACE's development continues to improve direct connectivity within Africa and to the world at large. "It will contribute to the overall objective of ACE to reduce communication costs and drive social and economic growth in Africa."

area, and is also offering cash rewards of up to NAD20,000 for information that leads to the arrests and convictions of the perpetrators.

SEPTEMBER

Kenya Education Network and the County Government of Nairobi have teamed up with the Wananchi Group for the provision of free internet in schools. As part of the USD2m *WazED* project, city authorities will leverage Wananchi's fibre infrastructure to help deliver ICT services to an estimated 2,715 schools in Nairobi County. Initially, the project will be piloted for 15 months in 245 schools. Fibre will be rolled out during the first three

months while the rest of the time will be spent on evaluating progress.

OCTOBER

Alcatel-Lucent Submarine Networks has been commissioned to build the 1,900km Sonangol Offshore Optical Cable system in Angola. The network will connect to landing points at four locations along the coast, and promises to give the country's oil and gas industry "very large" offshore data bandwidth with low latency. A high-speed connection will also be established between Luanda and Cabinda. Construction is scheduled to start during the second half of 2016.

NOVEMBER

A cut on the fibre cable connecting Annaba to Marseilles disrupted internet traffic to Algeria on 22 October. Algeria Telecom (AT) said a break on the SMW4 submarine system 15km off the coast of Annaba caused it to lose 80 per cent of the international bandwidth transiting via the cable. MECMA, the international consortium responsible for maintaining SMW4, initiated repair work but AT warned customers that this could take several days depending on local weather conditions. To mitigate the impact of the cut, AT re-routed traffic to the Algiers-Palermo cable.

ACE management committee chairman Yves Ruggeri (right) said the addition of Cameroon to the consortium "adds value" to the system. Also pictured is Camtel DG David Nkoto Emane.

The cable system supports 100G and has an upgradable design capacity of up to 12.8Tbps. Working in collaboration with its contracted supplier Alcatel Lucent, ACE has also recently tested 300G which it plans to deploy in the near future.

WIOCC claimed a first in May by connecting Somalia to fast internet for the first time. WIOCC said it had "fundamentally changed" the international connectivity landscape in Somalia with the landing of a high capacity fibre cable system that now provided a vital platform for sustainable economic growth.

Somalia had lacked direct fibre optic connectivity. The only way the country's 10 million inhabitants could access the internet was via "expensive, inflexible and capacity-restricted" satellite links, claimed WIOCC. But in 2014, and working in partnership with local partner Dalkom Somalia, WIOCC landed the >10Tbps capacity EASsy (Eastern Africa Submarine cable system) cable in Somalia and linked it to a purpose-built landing station and data centre in Mogadishu. It took six years of work.

One big difference was a reduction in latency of up to 80 per cent. WIOCC said people had been flocking to hotels and internet cafés to experience a fast service for the first time. It added that the improved availability, affordability and reliability of consumer mobile broadband have led to growth in mobile and social media network subscriptions.

Despite being just one of many services supported by broadband, social media has taken an interest in helping people in Africa gain access to fast internet connections. For example, under a multi-year agreement with Spacecom, Eutelsat Communications and Facebook will utilise the entire broadband payload on the future *AMOS-6* satellite. They will build a dedicated system to accelerate data connectivity in sub-Saharan Africa.

Scheduled to start service in the second half of 2016, *AMOS-6*'s high throughput satellite architecture is expected to contribute to additional gains in cost efficiency. Spacecom said the satellite's Ka-band payload is configured with high gain spot beams covering large parts of West, East and Southern Africa, and will be optimised for community and direct-to-user internet access using affordable, off-the-shelf customer equipment.

Under their agreement, Eutelsat and Facebook will share the capacity and will each deploy internet services designed to relieve pent-up demand for connectivity from the many users in Africa beyond the range of fixed and mobile terrestrial networks.

Eutelsat said the capacity will enable it to step up its broadband activity in the region that was initiated using Ku-band satellites to serve professional users.

For Facebook, the initiative will be a continuation of its Internet.org project that aims to address the barriers that are keeping people from getting online. It plans to work with local partners across Africa to utilise satellite and terrestrial capacity to deliver services to rural areas. Facebook added that the partnership with Eutelsat will also enable it to investigate new ways to use satellites to connect people in remote locations.

Shola Taylor, Secretary-general, CTO

Shola Taylor was appointed secretary-general of the Commonwealth Telecommunications Organisation(CTO) in 2015. With a career that has so far spanned more than 30 years in the telecoms industry, he has worked with Nigerian telco NITEL, Intelsat, Inmarsat and with the ITU where he led the RASCOM (Regional African Satellite Communication) study which looked into the telecoms and broadcasting requirements of every African country.

In 1999, Taylor established Kemilinks International, a consultancy firm based in his home country Nigeria. Over the next 15 years he became even more active professionally, not only in Africa but also globally. In 2002, he was elected vice-chairman and then chairman of the ITU's Radio Regulations Board which dealt with, for example, spectrum issues faced by global satellite operators.

"Working in an international organisation gives you a special privilege to see how the various countries have developed their networks," says Taylor. "It shows you how they have faced challenges to create efficient systems and efficient access to orbital spectrum."

During this period, Taylor was also an advisor to ministers in South Africa and Rwanda, and was appointed as a board member to the Nigerian Communications Commission (NCC). That coincided with the time the country adopted its first GSM system, and he was responsible for issues of interconnection and spectrum licensing.

Clearly then, Taylor brings a great deal of private and public sector telecoms experience, both in Africa as well as globally, to the CTO. Which should come

DECEMBER
Liquid Telecom Rwanda's FTTH service is now available to homes and businesses in Kigali. With speeds of up to 100Mbps, it's claimed the service offers the fastest-ever internet access available in the country. Liquid is investing more than USD35m in laying Rwanda's first FTTH network which will continue in Kigali and expand to other cities in the future. It says more than 15,000 homes will be passed by the network by the end of next year. The service will also be available from mobile operators and ISPs in the country using wholesale access from Liquid.

H. Sama Nwana, Executive director, Dynamic Spectrum Alliance

The year ahead: Ensuring the digital switchover across Africa in order to release the digital dividend for mobile broadband will be a good start. But this needs political will, funding and a good TMT strategy.

Inane public officials in control of TMT policy at ministries and regulators must truly realise what a brake they are on African countries. There is usually neither urgency, strategy, funding or competence with these officials. This sort of culture must go and new competences developed.

What Africa needs are visionary ministers, regulators and TMT leaders who have the commitment and management skills to execute on projects of national importance such as DSO, fibre, 3G/4G, and all whilst addressing affordability and accessibility concerns.

The business case is simple: for every 10 per cent growth in broadband subscriber numbers, there is 1.3-1.4 per cent growth in GDP in sub-Saharan markets (World Bank). So it makes simple sense to build these 4G and Wi-Fi networks, and keep doubling the speeds.
The above is an extract from a feature first published in the July-August 2015 issue of Southern African Wireless Communications.

in handy as he says there is "much work" to be done. So during his four-year tenure as the organisation's secretary-general, what will that work entail, particularly in the context of Africa and the mission to deliver ubiquitous broadband?

"First of all there is a need to encourage regulatory certainty. There are many cases where investors are not quite clear of what a regulator might decide on a particular issue, such as spectrum, the timing of allocation, the process that is used, etc. There are also policy issues around broadband. Most of our member countries talk about broadband but unfortunately there is still a lot of work that needs to be done here.

"It is not about the technology – the technology is there. But there are a number of constraints. Why? You have mobile operators who are the main players because the fixed line operators are virtually non-existent. So you need to focus on how the mobile industry can provide the broadband that you need.

"However, mobile operators are business entities. They are there to provide services but ultimately they exist to make a profit. There are certain areas that it would not be profitable for them to go to, and broadband objectives therefore become constraints."

While MNOs find it difficult to make the business case for remote and rural connectivity, aren't initiatives such as so-called universal service obligation fund supposed to help here? Taylor agrees that while universal funding is working in many countries, it is the actual implementation of its real objectives that is proving to be a challenge.

"Let me give you an example. In one particular country (I won't mention the name), one of the things the universal service agency did was to buy computers for politicians because they said they needed laptops. That wasn't the reason why the agency was set up. So there must be a conscious effort for the agency to do what it is actually supposed to be doing. It's not just about setting up an agency."

He continues by saying that some of the agencies were initially somewhat clueless – they had a lot of money coming in but didn't know how to spend it. "And because they didn't think it through very well, money was spent on projects that didn't really solve the problems."

When it comes to the ongoing quest to roll out broadband networks to the unconnected, Taylor does not expect the mobile industry to work in isolation. He says while many of the big name operators carry out CSR activities which should be recognised, what governments must do is capitalise on that by making conscious efforts to do their bit.

"There are issues of right-of-ways. That's a big challenge as operators need to have licenses from federal authorities, local authorities, etc. There are also issues of vandalism and security, and operators need to protect their systems and people in remote areas. So the government has to come in with policies that enable those who want to invest. And they should also find some other ways, such as incentives for companies to invest in those areas."

Taylor recalls that when he was with NCC, one of the incentives used was to award operators a license for, say Lagos, provided that they also deployed networks in other and less attractive locations.

"That was quite difficult. Generally, the operators agreed and said they would go to those areas. But then they faced all kinds of issues. They were being told that they would have to pay license fees for right-of-ways, pay for every antenna installed, then the minister of environment would say there are environmental issues that need to be paid for, and then other politicians would get involved and there would be backhanders, etc.

"Government across Africa must get out of their cosy environments and do much more for the industry and create ease of access and make it easier for operators. There must be the political will to connect with the reality on the ground."

Of course, even if and when operators and governments do manage to get internet and high-speed networks in place, what those networks actually offer becomes the next key challenge. For instance, Taylor says a lot of work needs to be done in terms of e-applications. And then, with more networks and more network users, there is the ever-present and growing threat of cyber attacks.

"One major issue that I find in virtually every country is the ability to respond to cyber threats. I see this as one of my priority objectives in the next four years. I want to see every single country in the commonwealth, including in Africa, to not only have a robust policy and strategy but also to ensure that they have the ability to implement this policy and strategy. Implementation has to involve all stakeholders."

As explained in the introduction to this chapter on p51, the deadline for the UN's Millennium Development Goals (MDG) came and went in 2015 but the objectives were missed. Taylor wasn't surprised as he points out that the process of implementing the goals required much more effort than the countries envisaged.

"From the very beginning it was clear that you needed a lot of awareness building programmes and a lot of tuning in of national

programmes to the MDGs. Many countries talked about it but when you actually saw their economic and industrial blueprints, there were disconnects. Funding was also an issue."

Taylor says the CTO will continue to support its members in achieving the new Sustainable Development Goals, but points out that the challenges need to be acknowledged. For example, he says the culture of democracy is still very new in some African countries, many administrations are bogged down by bureaucracy, there are protocols to follow when trying to engage with high ranking government officials, passing legislation in some countries can take four or five years, etc.

"So we need to deal with those constraints. There needs to be a conscious effort which says that when we go out at an international level and collectively agree to reach certain goals, the mechanism to translate those goals to the domestic environment is a big process."

Another deadline that Africa missed in 2015 was the migration from analogue to digital broadcasting. This switchover creates the so-called digital dividend as spectrum that was previously used for broadcasting can be re-used for mobile communications and broadband connectivity.

Later this year, the CTO will host a digital switchover conference for Africa in Nigeria, and is working towards promoting 2017 as the continent's new deadline for a digital switchover.

In the meantime, Taylor says he was "very disappointed" that African countries couldn't meet last year's June deadline: "Despite all the noise, the work that has been done by ITU, CTO, etc., it was not achieved. This shouldn't have happened. By far the biggest challenge was political awareness."

He cites an example when his former company Kemilinks was appointed as consultants for the digital switchover in Nigeria. "We were advising the committee appointed by the president and delivered our report in 2009. That report never left government offices until 2012. Three years and nothing happened. There may be reasons why that can be justified but for me the result is nothing happened.

"In South Africa, it is more or less the same story – the policy is there, they have a very robust committee that looks at it, and they have a strategy in place. But it's all convoluted. They were more concerned about who buys set-top boxes, who does this, who does that… at the end of the day nothing was happening. And this is in the continent's biggest economy.

"Politicians tend to be very narrow-minded. They do not see the bigger picture. They want to protect what is so small and leave out the bigger picture."

Edward Lawrence, Director of business development, Workonline Communications

South Africa-based Workonline Communications is a privately owned global network service provider, and says it offers high-quality IP transit and connectivity services with QoS guarantees to almost any location in the world. Its customers include some of the world's largest telecommunication companies.

According to the firm's director of business development Edward Lawrence, 2015 brought renewed investment in IT and networking infrastructure with the focus remaining on Africa and its global investors to deliver, regardless of the downturn and recovery process. He believes this is especially relevant to telecoms carriers, with the majority expecting significant returns from this emerging market.

"Considering the investments made in fibre networks, in particular, there has been an increase in solutions from carriers as a means to remain ahead of the fast changing demands of the market.

"With regards to executing and expanding fibre footprints, many carriers are looking to make use of partnerships to effectively deliver what their clients expect. These carrier investments and partnerships are critical, as businesses now require higher bandwidth fibre connectivity for internet access and other related services."

Lawrence says Workonline Communications saw a 100 per cent growth in IPv6 traffic and peers last year. For instance, he says the IPv6 traffic increase on NAPAfrica, the IXP hosted at Teraco's data centre in South Africa, grew from 10 IPv6 peers with a 2Mbps peak in August 2014, to 55 IPv6 peers and a 664Mbps peak in August 2015.

He also says there is a growing trend of collaboration which is essential if Africa is to meet its growth predictions and the worldwide economy is to see returns on its investment.

"The collaborative approach of global players leveraging regional network expertise accelerates the availability of high-quality IP transit and connectivity, and ensures that their go-to-market rates remain relevant.

"Through collaboration, we are able to extend the reach of our fibre-based connectivity to regions in the world where we are not present, while extending the reach of other global networks in sub-Saharan Africa. Our overall goal is to improve the quality of the internet in Africa, while simultaneously driving down costs and increasing market penetration."

Lawrence explains that Workonline Communications' international links connect South Africa to the rest of the world through all available routes, and are "amplified" by its partnerships with many of the world's leading global tier 1 IP transit providers.

"This allows us to provide the lowest latency world-class transit services possible to our clients across sub-Saharan Africa. Through our multiple PoPs, we offer remote peering services to international and local exchange points, such as NAPAfrica, LONAP and LINX. Collaboration of this kind ensures the stability, resilience and high quality of our global network."

The Mobile Economy, Sub-Saharan Africa 2015, GSMA

In its *Mobile Economy, Sub-Saharan Africa 2015* report published in October 2015, the GSM Association (GSMA) said that the transition to mobile broadband is well under way.

"The region is seeing continued migration to higher speed mobile broadband networks. Commercial 3G networks had been launched in 41 countries across Sub-Saharan Africa as of June 2015, while 4G networks had been launched in 23 countries."

According to the report, 20 per cent of mobile connections in sub-Saharan Africa are now based on 3G, up from just five per cent in 2010. 3G The GSMA says adoption in the region will surpass the global average by 2017 and account for more than half of total connections by 2020.

The association says the main factors driving the uptake of 3G are network coverage expansions, declining device prices, and the launch of 4G technology in new markets.

"For example, Airtel Africa added 783 3G sites across its 17 markets in the region during the first quarter of 2015. In Cameroon, Nexttel launched the country's first commercial 3G network in September 2014, while MTN, which launched its 3G network in March 2015, has announced plans to extend coverage to 75 per cent of the population by 2018."

The report also points out that LTE is still at its very early stage in sub-Saharan Africa, accounting for just under one per cent of the connection base compared to a global average of 11per cent. It says factors limiting 4G adoption in the region include a lack of greater network coverage, unavailability of LTE spectrum, and an under-developed device ecosystem which leads to high costs of ownership of mobile data connections.

"Nevertheless, 4G is gaining traction in several early-adopter markets, particularly Angola, Mauritius, Namibia and South Africa. This has been helped by the establishment of enabling regulatory and competitive environments that encourage investment."

As an example, the GSMA cites Vodacom's 4G network which now covers more than 40 per cent of South Africa's population. It adds that the operator also launched the region's first commercial VoLTE service in April 2015 which helped it, in part, to differentiate its service from Telkom which has launched LTE-A earlier in December 2014.

The report continues by stating that 4G adoption for sub-Saharan Africa as a whole will grow to account for six per cent of connections by 2020. "Fifteen new commercial 4G networks were launched in the last year, including for the first time in Ethiopia, Kenya and Rwanda. In the technology-leading markets such as Angola, South Africa and Zimbabwe, 4G will account for around one fifth of total connections by 2020."

Sub-Saharan Africa, Mobility Report 2015, Ericsson

In November 2015, Ericsson published its latest *Mobility Report* for the region. With LTE networks predicted to cover 50 per cent of sub-Saharan Africa by 2020, it says there are two basic ways in which ICT acts as a change agent across industries: efficiency improvements and service disruption.

"The introduction of mobile data services has enabled access to even more services that not only benefit individuals, but change industries as well," states the report.

Ericsson believes m-commerce is one of the great unique success stories of mobile innovation on the continent.

"It has allowed the 70 per cent[1] of unbanked and marginalised segments to start to see the promise of financial inclusion as mobile money services take form across Africa.

"Mobile operators have also been beneficiaries of this revolution. Leading operators in the region are deriving up to 20 per cent of their revenue from mobile commerce services, improving business prospects even as voice revenue growth slows.

"Starting from basic person-to-person money transfers, many platforms now provide savings, insurance and credit applications. This has further progressed to mobile commerce and stock management solutions. Purchasing goods and services is increasingly done via a mobile phone."

[1] Ericsson ConsumerLab, M-Commerce study, 2015

Citing statistics from the World Bank[2], Ericsson sub-Saharan Africa transfers more funds domestically via mobile money than any other region in the world. In 2014, up to 28 per cent of the population had received a domestic remittance. By comparison, only four per cent of the population in South Asia did so in the same period.

The report says the next wave of services within the region's mobile commerce ecosystem will include more mature offerings such as micro-insurance and advanced subscriber to subscriber/subscriber to merchant solutions.

For example at the end of 2015 in Kenya (which Ericsson describes as arguably the "most developed" mobile commerce market in sub-Saharan Africa, Safaricom opened up its platform to application developers, enabling design and integration of third-party solutions.

The report says that an improving regulatory environment is supporting Africa's development of mobile money, as governments increasingly realise that the widespread availability of payment and other financial services is a key pillar in socio-economic modernisation.

As is well documented, sub-Saharan Africa has faced challenges in the provision of basic health services. However, as Ericsson points out, mobile solutions are enabling the delivery of basic health services to underserved populations across the region by successfully addressing important challenges, such as cutting infant mortality rates and helping to fight contagious diseases remotely.

"Mobile technology proved to be extremely useful during the 2014-2015 Ebola crisis that afflicted parts of West Africa. In order to combat the spread of the disease, volunteer doctors collaborated with government agencies to set up helplines and social media accounts which informed and provided response on Ebola risks. This approach was particularly effective in Nigeria, which became Ebola-free within a few months."

Another example of how mobility is having a positive socio-economic impact is in optimising agriculture which, according to Ericsson, is sub-Saharan Africa's "economic backbone".

"Use of mobile solutions is helping farmers in Africa to minimise economic risk by knowing when to plant their crops, as well as reduce the time it takes to get crops to the market.

"Considering that agriculture employs more than half of sub-Saharan Africa's workforce and accounts for a third of its GDP,[3] mobile-based solutions will go a long

way towards improving the socio-economic environment in the region."

As more of the region's people adopt smart and digital devices, Ericsson says new modes of content consumption are increasingly being explored and viewing habits are moving away from conventional devices. It believes local consumers increasingly want to pick and choose payment and subscription methods of digital media.

For instance in Nigeria, the company says 51 per cent prefer to watch TV and video at their convenience, 56 per cent want access to video content across all devices, and 55 per cent would like to select the media channels that they subscribe to.[4]

"Even as mobile broadband networks become increasingly accessible across Africa, satisfaction levels are low, which indicates that consumers in some places are in need of higher speeds and better quality connections."

Ericsson concludes that with low internet penetration, booming consumer spending, and a high unbanked population, sub-Saharan Africa's economic potential remains strong.

"Players in the mobile ecosystem in the region aim to support socio-economic empowerment and inclusion. At the core of this is enabling mobile broadband access to the unconnected population through increased 3G and 4G network deployment.

"This will drive uptake of services such as m-commerce and infotainment, enabling service providers to differentiate their revenue streams and at the same time offer higher value services to their customers.

"With more consumers gaining access to connectivity, and consumer behaviour subsequently changing, ICT will have a far reaching impact. While the past decades of ICT progress have shown significant promise, it has only laid the foundation for what is set to come in Africa."

// Africa is undoubtedly a mobile continent. At the dawn of this century when mobile was taking off in most African countries, fixed infrastructure, later on fixed broadband, was in a poor state where it existed and non-existent in most cases except in a few countries such as South Africa.

"Mobile quickly became the *de facto* connectivity option even for the enterprise. This was a period of intense fixed mobile substitution. But with all the benefits of mobile, it has not lived up to expectations

George Kalebaila, Senior research manager, Telecoms & digital media, Africa, IDC

especially to deliver the bandwidth required to support triple play or better still quad play services in Africa. Fixed broadband, and fibre in particular, provides a better alternative and it is no surprise that fibre has been steadily growing across all regions in Africa.

"Almost every major metro's landscape is punctuated with some sort of trenching for fibre deployment. In some countries, such as Kenya and South Africa, FTTx deployment is reaching a crescendo with small and large operators staking their claim. Others, such as Nigeria, Zambia, Rwanda, Ghana and Tanzania, are not far behind with varying levels of speed of deployment.

"What is common in all these countries is that the FTTx market is very fragmented with smaller players targeting niche consumer segments such as affluent estates as has been the case in South Africa. Some have called it the broadband land grab. It is reminiscent of the early days of mobile deployments in Africa when the first wave of entrants were in a race for wider coverage and subscriber acquisition.

"In 2015, IDC predicted that adoption of fibre will begin to accelerate driven primarily by increasing demand for triple play services in the consumer segment. Consequently, fixed mobile substitution will begin to slow down as fixed mobile convergence takes root especially in the enterprise segment.

"This is important because it means that the growing adoption of fibre will not be at the expense of mobile. Both will co-exist and will be used where most applicable and suited. As adoption of data centre and cloud services continues to grow in Africa, enterprises are seeking better and cost effective connectivity options to deliver the capacity required to efficiently run these services. Fibre is undoubtedly the connectivity option of choice in this regard.

"However, it seems the lessons of the mobile era in terms of infrastructure sharing and open access have not been learnt. Although there are some proponents of open access to reduce the cost of fibre deployments and allow competition based on services, at this stage it seems as if it's everyone to him/herself as operators race for widest network coverage. Once again, and reminiscent of the early era of mobile deployment, the network is a source of competitive advantage in fibre broadband.

"In those initial mobile days, every operator had a coverage map on their webpage showing how extensive their network coverage was compared to the competition. As a young network planning engineer I remember how we prided ourselves on how many sites went live each month, updating our coverage maps as

[2] World Bank Global Findex Database, 2014

[3] World Bank Economic Forecasts, 2015

[4] Ericsson ConsumerLab, TV and media report 2015, Nigeria

bragging rights to rival competitor network teams. At that time, the network was even more important than the services for which operators existed in the first place.

"But over the years, mobile operators have learnt that their core business was actually not the network but providing services and maintaining customer relationships. Many have since outsourced their network infrastructure and it is just a matter of time before the few other operators who are still holding out follow suit.

"Infrastructure sharing is becoming the norm rather than the exception. IDC contends that fibre broadband network providers need not relive this painful history; early on, they need to pool their resources and embrace open access to reduce the cost of network deployment and compete on the services they provide to their customers. That's where the value is, as connectivity is fast becoming a commodity, even in Africa.

"But this may not happen on providers own volition. It may need regulatory frameworks that encourage infrastructure sharing and promote competition on services and customer experience. Regulatory bodies need to step up and for once provide the direction needed to encourage open access and infrastructure sharing business models.

"Without this intervention, we will witness more chaotic application of capital investment that could have been best utilised on developing digital services to make our lives better and more interesting. Metro and country landscapes will continue to be scarred unnecessarily when a better consolidated and environmentally-friendly standard way of network rollout would have saved us the trouble of constant trenching and disruption to urban traffic and routine.

"In the medium to long term, it is common knowledge that there has to be consolidation for long-term sustainability of the industry. Economies of scale due to the low margins of connectivity business will drive this trend. Small niche players will remain important for market development but will eventually have to give way to market consolidation by big players who can exploit economies of scale for survival.

"The pace at which consolidation will take place will differ from country to country depending on maturity and stage of the development. For instance in South Africa, consolidation has already started as big players start to reflex their muscles, although some nimble small players are proving their worth.

"However, competition in these early stages is what will drive the development of the sector and help bring down cost of the service, which is still a premium in most countries save for Kenya and South Africa.

"In the long term, fibre land grab is what will usher Africa into joining the rest of the world in enjoying the benefits of digital economy. With mobile and fixed broadband all existing side by side, we can only hope that operators and regulators alike learn from the mistakes of the past and avoid costly business models that will lead to unnecessary casualties and misapplication of capital."

Afrikanet Oxford Consultech is a telecom company registered in the UK and operates five fully redundant virtual network centres in Europe and the US using iDirect and Comtech's *Vipersat* platforms.

Casimir Fotso Chatue, CEO, Afrikanet Oxford Consultech

Through its partners in more than 20 countries in Africa, Afrikanet provides broadband internet services via VSAT along with any necessary equipment, as well as technical support and on site training if required. With over 15 years experience, the company continues to expand its activities and cover new ground.

"2015 has been a very positive year for Afrikanet, especially regarding our involvement in the banking and microfinance sectors, embassies, regional institutions and airport management," says CEO Casimir Fotso Chatue, referring to some of the Afrikanet's projects conducted last year in Côte d'Ivoire, Congo and Cameroon.

"We have seen a big development of WiMAX technology, allowing us to help ISPs and businesses boost their products and expand their services using technologies such as LTE and 4G. It has proven very successful with our European link which undoubtedly set us apart from the competition by its reliability."

For this engineer-turned-CEO, staying on top of the latest technologies and answering customer needs with the best solutions available is a priority. Chatue believes 2016 will turn out to be an exciting year in this regard.

"The price factor will now be very volatile with the impact of Ka-band. The increase in medium and low Earth orbit satellites is presenting customers with very efficient services for an affordable price. Ka-band will be a game-changer, offering up to 20Mbps download and 2Mbps upload for only about USD100."

Chatue does not intend to miss out on this industry trend as he explains that Afrikanet is currently building plans to be a master distributor, as well as managing deals with high throughput satellite owners to bring Ka-band solutions at a competitive price to West Africa.

"Ground solutions, fibre optics and transatlantic cables will have to take new players like O3b in consideration, and this competition should prove very interesting for both the industry and of course our customer base in Africa, who will benefit from more options and opportunities than ever to access effective, reliable broadband."

Chatue continues by saying that Afrikanet's mission continues to be about bridging the digital divide between north and south, empowering customers and bringing connectivity to the continent. As a result, he has recently announced the launch of Solar Access, a new company under the Afrikanet umbrella that is focused on solar solutions.

"Renewable energy is the future. Not only for Africa but for the world, and we are delighted to be in a position to work towards better environmental understanding, thoughtful living, and to offer our customers the opportunity to make a difference with us.

"In this day and age, businesses cannot sustain growth or answer customer needs appropriately without an effective energy plan. We have realised the need for solar solutions and renewable energy for a while, and are now filling this need, starting in two countries in Central and West Africa, and looking to expand throughout the whole continent soon."

This involvement with solar energy is not the first time Afrikanet has undertaken social and responsible initiatives. "In line with the United Nations Global Goals, we have been pushing to get involved with non-profits in Africa, offering our services and solutions, serving as liaison between the organisations, donors and philanthropists. Being a human-sized company with a dedicated team allows us to tailor each and every project individually, and to do our best to reach out and go the extra mile whenever possible.

"The objectives for this year are to keep building meaningful deals and relationship, being ready for the mass market introduction of Ka-band for customers, and being an active part of the global change towards renewable energy and universal access to the internet."

chapter
Satcoms
4

Africa's satcoms post WRC-15: a 'big four' for 2016

Martin Jarrold, Chief of international programme development, Global VSAT Forum

Much of the focus for the global satellite industry during last year was on ITU WRC-15. Preparations for the conference had been a key programme for the industry for almost three years, expressed through the work of the Satellite Spectrum Initiative (SSI).

This GVF-led consortium of regional and national satellite industry associations was supported by a wide range of many other interests, including many African-based stakeholders. The global effort was underpinned not only by the satellite industry but by a broad array of partners and allies within the user community. Many end-users and end-user organisations supported protection of C-band for satellite because they depend upon it.

For example, the World Broadcasting Unions International Satellite Operations Group (now called the WBU-International Media Connectivity Group), and the United Nations World Food Programme, which deploys communications for disaster response, supported C-band for satellite. Others, such as NetHope, the World Meteorological Association, the International Maritime Organisation, and the International Civil Aviation Organisation, all supported no change.

The SSI variously gathered and presented data, formulated analyses, developed arguments, built stakeholder alliances, and lobbied ITU member administration decision-makers for the protection of current satellite service access to spectrum in the C-band frequencies, and to oppose a global identification of the spectrum for International Mobile Telecommunications (IMT). Whilst this was a global issue, it had particular significance for Africa where the C-band part of the radio spectrum – which was under the most immediate threat – is vitally important to satellite services.

The SSI was successful in its mission, as reflected in the world's governments resoundingly affirming a clear vision for the importance of many vital and irreplaceable services provided today over satellite. They agreed to preserve and create new additional valuable spectrum for fixed and mobile solutions used to support services that include the expansion of access to the internet and the bridging of the digital divide for those in Africa and other 'unserved' people around the world.

Various WRC-related researches had confirmed that VSAT Earth stations/ground segments – particularly satellite services delivered over VSATs operating in the C-band part of the spectrum – were essential for, and integral to, continued socio-economic development across developing nations. It was acknowledged that this development – facilitated by accelerated internet access for enterprises, governments and communities – is only achievable with satellite.

These inter-governmental decisions in support of satellite spectrum reflected a comprehensive strategy in which the unique value proposition of satellite-based connectivity is recognised as an integral part of a portfolio of synergistic technologies, encompassing terrestrial wireless solutions.

A joint statement from the coalition representing the satellite industry noted that: "WRC-15 has been a turning point in the global recognition of the value of satellite services for the future. We commend the national administrations – and the WRC Chairman, Mr. Festus Daudu – for their commitment to connectivity for all. These decisions provide the stability necessary for the entire satellite industry to fully leverage its strengths in support of the vision expressed by the WRC delegates."

1. HTS

Aside from C-band of course, commercial satellite services that bring internet access also use spectrum in Ku- and Ka-band. Combinations of these frequency bands are being used by satellite operators for the latest in high throughput satellite (HTS) technology platforms.

Amongst a range of advances over legacy geostationary (GEO) satellite systems, HTS features lower user terminal total cost of ownership – an important consideration in highly price-sensitive markets such as those of the poorer developing nations. HTS provides at least twice (though usually by a factor of 20 or more) the total throughput of a classic fixed service satellite for the same amount of allocated orbital spectrum. Thus, it significantly reduces cost-per-bit.

HTS platforms are primarily deployed to provide broadband internet access service (point-to-point) to unserved or underserved regions where they can deliver services comparable to terrestrial systems in terms of pricing and bandwidth.

While many current high throughput satellites were designed to serve the consumer broadband market, some are also offering services to the government, enterprise, telecom and maritime sectors, as well as to terrestrial mobile network operators who face growing demand for broadband backhaul to rural sites.

HTS can also support point-to-multipoint applications and even broadcast services such as DTH distribution to relatively small geographic areas served by a single spot beam.

As global data demand grows at C-, Ku- and Ka-bands, HTS has already started providing the ability to significantly accelerate the use of satellite broadband, addressing user requirements for multi-service networks in the internet era, and the environment of applications and services in the cloud.

Of course, not all high throughput satellites are in GEO orbit. O3b Networks' HTS system operating in Ka-band comprises an initial constellation of 12 satellites (scaling up to 20 spacecraft by mid-2018) in medium Earth orbit (MEO) together with groundstations comprising a pair of tracking antennas. This MEO system brings what has been described as 'fibre in the sky'-type internet access speeds, with degrees of latency that match those of long-distance fibre.

However, the future of internet access via broadband satellite is evolving and may not be confined to HTS technologies in GEO and MEO orbits for much longer.

In 2015, OneWeb, SpaceX and LeoSat announced separate plans to build hundreds of new satellites for low Earth orbit (LEO). OneWeb – led by O3b Networks founder Greg Wyler and backed by Airbus, Bharti Enterprises, Qualcomm, the Virgin Group, and others – plans to build a constellation of around 650 micro satellites to bring broadband access to the unconnected/unserved population around the world.

SpaceX, backed by Google, has also revealed plans to build thousands of micro satellites to bring internet connectivity all over the world, too. Additionally, LeoSat and Thales Alenia Space have partnered for a planned constellation of 80-120 Ka-band satellites. They plan to provide high-speed, low-latency, broadband services globally, specifically for large private corporations and government agencies.

2. Sub-Saharan social media

In October 2015, Eutelsat Communications and Facebook announced a partnership on a new initiative to leverage satellite technology to get more people in Africa online. Under a multi-year agreement with Spacecom, and scheduled for start of service in the second half of 2016, the entire broadband payload on the future *AMOS-6* satellite will be used, and a dedicated system comprising gateways and terminals will be deployed. In providing reach to large parts of sub-Saharan Africa, Eutelsat and Facebook will each be equipped to accelerate data connectivity for the many users deprived of the economic and social benefits of the internet.

The Ka-band payload on the *AMOS-6* GEO satellite is to be configured with high gain spot beams covering large parts of West, East and Southern Africa. It will be able to transmit 36 high throughput beams (26.5GHz to 40GHz) to the continent, as well as three 12 to 18GHz (Ku-band) beams to the Middle East and Europe. The companies say capacity will optimised for community and direct-to-user internet access utilising affordable, off-the-shelf customer equipment.

Eutelsat and Facebook each aim to roll out internet services designed to relieve pent-up demand for connectivity from the many users in Africa beyond range of fixed and mobile terrestrial networks. The capacity will enable Eutelsat to step up its broadband activity in sub-Saharan Africa that was initiated using Ku-band satellites to serve professional users.

3. Wireless synergies and backhaul

Satellite has always worked synergistically with other (i.e. terrestrial) technologies, including mobile wireless. Backhaul for mobile networks is critical to ensure speed and capacity as it relates to the transport of data (as well as voice, of course) from distributed network sites to the network core. In turn, for backhaul, satellite has become ever-more essential.

One of the most significant challenges in the mobile services market is achieving scalable, flexible backhaul, particularly as markets move to 4G which are forecast to need to support 1,000 times more data traffic by 2020. The backhaul optimisation technologies used to reduce bandwidth which have been introduced cannot solve all backhaul challenges, especially as the rollout of LTE continues.

As a result, there is a need for cost-effective mobile backhaul over satellite for global 3G/4G rural expansion to relieve congestion, and to help mobile network operators overcome several key hurdles:

Reducing cost: Operators must deliver their services at the lowest possible TCO. The cost of backhaul is one of the most important factors. Traditionally, satellite backhaul was an expensive option but with HTS this is no longer the case – even in areas supported by terrestrial access. Within the next few years, it is predicted that the cost of Mbps over satellite will drop by a factor of six.

Mitigating latency: GEO satellite link latency potentially results in a round-trip delay of 500 to 600 milliseconds. This affects the response time of 3G/4G data applications when sent over satellite, resulting in wasted space capacity, link under-utilisation and poor performance.

Latency is a matter of physical law, but the application side can help mitigate its effects. Caching also helps as a way of reducing latency, as does TCP acceleration/backhaul optimisation and reducing satellite bandwidth needs. All this will enhance network performance and the mobile users' experience, increase throughput, and improve network response times and reliability.

Link availability: Some HTS systems are susceptible to rain attenuation/fade during bad weather conditions, resulting in service disruption. The solution is a secondary communication path added at base stations. This enables voice and signalling to be routed over high availability terrestrial or C-/Ku-band links while the packet service runs over HTS. It maintains the use of the existing infrastructure, ensuring voice and signalling stay on low latency and highly available communication paths while providing an alternative backhaul approach for service providers. This therefore eliminates the need to upgrade expensive terrestrial communication paths.

Next generation backhaul for LTE and small cells: MNOs want innovative backhaul architectures that are robust and flexible to accommodate shifting traffic loads on network sites without massive bandwidth over-provisioning. Importantly, they are looking at segmenting macrocells into smaller (femto-, pico-) cells, a trend presenting new challenges for satellite backhaul vendors.

4. HTS and communications on the move

Increasingly, airlines are providing passengers with in-flight connectivity. Internet access and the ability to make calls using mobile phones, via the combination of on-board small cell and VSAT technologies, is becoming a customer expectation on long-haul and even some domestic routes in many parts of the world.

With African nations representing many long-haul destinations and points-of-origin to/from Europe, North America and Asia, in-flight connectivity will become an increasingly evident service provided by airline carriers on trans-oceanic routes to and from Africa, as well as on routes traversing the continent.

Satellite as cheap as fibre?

Satellite communications has traditionally been the ultimate in flexible but expensive connectivity. That is about to change.

Fibersat is to use a hosted Ka-band payload on Arabsat's forthcoming high-throughput satellites (HTS) to provide extensive coverage over Africa using an innovative system.

Luxembourg-based Fibersat is a new operator and its HTS payload, *Fibersat-1*, is planned for launch in 2018. The company promised its optimised design will enable satellite services to be delivered at the cost of fibre throughout the continent.

Fibersat-1 will use beams that are smaller than conventional geo satellites, but it's claimed they can deliver up to 100 times more bandwidth. "Traditional geostationary communication satellites typically use one large beam to illuminate a large area," stated the firm. "This single beam usually has a capacity of 1Gbps. Fibersat has smaller beams – so much smaller that we cover the same area with almost 100 beams. Each one of these beams has as much bandwidth as a traditional satellite beam."

As a result, Fibersat reckons broadband delivered via its system will cost a "tiny fraction" of what it costs today. The company's CEO Christof Kern said: "By combining the benefits of a power-optimised HTS design and leveraging a hybrid satellite architecture, Fibersat will be able to offer customers unprecedented price levels for satellite services which is key in price-sensitive markets like Africa. This is the only way to meet the exploding demand for internet in Africa, the fastest-growing market in the world."

Fibersat said that at launch it will be able to provide affordable internet access services to remote areas across the continent using low-cost commercially available VSAT terminals. The firm added that it has already signed

In late October 2015, Arianespace began preparations for the launch of *Arabsat-6B,* which is seen here receiving its propellant.

up "significant" pre-launch orders with key African operators but does not name them. It said the agreement with Arabsat represents a major step forward in its mission.

Keeping up with demand

As prices drop, the demand for satellite connectivity is likely to rise and there are no shortage of launches and projects aiming to satisfy that need.

Globalstar, for example, said in June 2015 that it could now deliver its satellite-based simplex services across the entire continent, following the opening of its new regional gateway in Botswana.

The firm began working on the construction of the new gateway in Gaborone in partnership with Broadband Botswana Internet the previous year. In the announcement, the

firm said the facility was now live, enabling it to deliver what it claimed was "affordable" simplex coverage across Africa, including its *SPOT* portfolio of personal tracking devices.

"We see this region as a significant growth opportunity for our low-cost satellite solutions," said Globalstar CEO Jay Monroe. "For the first time, people and industries in this burgeoning region will have access to affordable satellite solutions for personal and asset tracking."

The company said it now operated the only complete next-generation satellite constellation in orbit, enabling professional, corporate and government users to take advantage of the capabilities of M2M and the emerging Internet of Things.

According to the firm, Africa-based enterprise, government and consumer users could now take advantage of its new simplex services. These include remote workers who could use its M2M-based *SmartOne* products to monitor machines, or the *SPOT* personal GPS devices for personal safety. It added that farmers could now monitor their livestock with Globalstar-enabled tracking collars including *FindMyAnimal*. This enables animals to be tracked wherever they roam, helping to protect against theft and mitigating the risks of natural predators. The collars can also help farmers understand the grazing locations of far-flung herds.

Another example is CETel which launched services using extended C-band capacity in partnership with Arabsat. The two firms jointly built an Earth station at CETel's teleport in Germany, and claimed their new services will offer "unprecedented business expansion possibilities".

CETel is using *Arabsat-5C* which orbits at 20ºE together with its own teleport facilities and services across Africa, the Middle East, Europe and Central Asia. At the launch,

JANUARY 2015

Gilat Satcom has established a new POP in the US to provide a direct satellite route for traffic to and from the DRC. This latest investment from the company in its fibre and satellite infrastructure comes after it won a variety of new deals from operators and enterprises across Africa last year. "We are investing to ensure that we provide our customers with reliable high-quality competitively priced broadband services with excellent QoS," said CEO Dan Zjicek.

FEBRUARY

Luxembourg's government has ordered a new satellite as part of a joint venture with SES.

SES-16/GovSat will be built by Orbital ATK and orbit at 21.5ºE when it is launched in Q2 2017 by SpaceX. SES said the multi-mission satellite will use dedicated military frequencies (X-band and military Ka-band) to provide high-powered and fully steerable spot beams covering the EMEA region. The Luxembourg government has pre-committed to significant capacity in support of its NATO obligations, but the remainder will be available to governmental and institutional users.

MARCH

Intelsat and Azercosmos will build a new satellite that will orbit at 45ºE when it launches in 2017. *Azerspace-2/Intelsat*

38 will cover Africa, Asia and Central and Eastern Europe. For Intelsat, it will also provide continuity of service for *IS-12* while Azercosmos, which is the national satellite operator of Azerbaijan, will use it for enhanced capacity and coverage to support the growing demands in the region for DTH, government and network services currently offered by *Azerspace-1.*

APRIL

The Russian Satellite Communications Company's *Express-AM6* is now ready for service. On 22 April, the firm said it had commissioned its new heavy-class communications and broadcasting satellite

Arabsat and CETel said extended C-band offers not only trunking and backhauling applications but also corporate network connectivity between regions and continents. They added that their strategic plan to expand into these frequencies is driven by the need for cost-effective communications solutions in rural areas.

Arabsat president and CEO Khalid Balkheyour said: "Service providers' ever increasing demand for capacity is satisfied by development of the extended C-band which gives wider room for expansion, not available anymore on congested normal bands."

While C-band frequencies generally operate at around 4.2GHz to 6.6GHz, extended C-band on *Arabsat 5C* is about 6,425MHz to 6,675MHz (uplink), and 3,404MHz to 3,636MHz (downlink).

Other projects still in the pipeline include a low Earth orbit solution being explored by LeoSat with the help of Thales Alenia Space (TAS). The goal is to offer high-speed, low-latency, cost-effective broadband

Working in partnership with Broadband Botswana Internet, Globalstar began working on the construction of its gateway in Gaborone last year.

services worldwide. The two companies started working on the project together in 2014 and by July 2015 they had already come up with a preliminary system design for the LeoSat constellation.

After assessing the architecture and performance of the overall system, including both the ground and space segments, LeoSat expects to be ready to contract for its satellite constellation development sometime in 2016, with the first launch taking place in 2019 or 2020.

The firm's fleet is initially planned to include 80 to 120 high-powered Ka-band satellites that will fly in polar orbits at an altitude of around 1,400km. Each one will be fitted with a dozen steerable spot beams and it's claimed this will provide aggregate throughput rates greater than 10Gbps. The constellation will form a private data network via high-speed inter-satellite links.

LeoSat said the aim is to provide global coverage specifically for large corporations and government agencies. It added that its system is designed to deliver point-to-point data connections to and from anywhere on Earth without the need for any interstitial terrestrial landings or transport. The company also claimed its network is "strongly-secured" as data will be able to travel in its native form but is encrypted and secured from end to end.

In the best of health

The potential good that can be achieved with satcoms comes in many forms and there are few areas that improve lives more readily than the health sector.

For example, hospitals in Benin are using the SATMED platform to help improve childbirth healthcare, as well as to enhance and disseminate medical knowledge via remote consultation and monitoring

facilities. Conceived by SES TechCom Services, SATMED uses satellite technology to improve public health in emerging countries, especially in isolated areas with poor connectivity.

In Benin, the platform is operating as a remote consultation and monitoring tool to provide communications between the Maternité Hospital in Ahozonnoude, the hospital in Cotonou, and a third unit in Allada. SES explained that the system provides the only effective communication link between the three sites, since overland routes are often inaccessible due to flooding during the rainy season.

At each hospital, SES trained staff to use and maintain the SATMED equipment, while support for healthcare workers in the field is ongoing. Additional remote training is being delivered online, enabling midwives and health workers in training to have their performances monitored and evaluated by an assigned physician.

SES TechCom Services MD Gerhard Bethscheider said SATMED is overcoming the barriers often faced in the deployment of health services across Africa, where terrestrial infrastructures may be lacking or even non-existent. "Thanks to satellite technology, we are now in a position to assist in improving both the speed and quality of healthcare services in rural and remote regions, contributing to change on a much wider scale," he claimed.

A change of technology, from Ku-band to C-band, has helped Save the Children International (SCI) improve its service whilst reducing costs.

The charity is now acting as a virtual operator to provide services to its C-band VSATs across 35 sites in Africa. The network was supplied by SpeedCast France

to provide coverage over Russia, Europe, the Middle East, Africa, and Asia. It was launched to 53ºE last October, and has a payload of 72 transponders in C-, Ku-, Ka- and L-bands. RSCC now has 11 satellites in its fleet, and also planned to launch two more later in 2015.

MAY
UAE-based fixed-satellite and ICT solutions and services provider iSAT Africa has taken space on MEASAT's *AFRICASAT-1a*. The company said it will use the capacity for the new managed services platform it launched in March. The platform utilises the latest DVBS2x broadcasting standard. When combined with *AFRICASAT-1a*'s beams, iSAT said it delivers "a higher spectral efficiency". iSAT Africa MD

Rakesh Kukreja added that his company was attracted by *AFRICASAT-1a*'s "high bandwidth efficiency across the continent".

JUNE
On 17 June, the agreed deadline for countries in ITU Region-1 (which includes Africa) switching over from analogue to digital TV broadcasting expired. According to ITU online data showing the status of DTT deployments on the continent, only Malawi, Mauritius, Mozambique, Rwanda and Tanzania have completed their switchovers. Deployments are still ongoing in many other African countries, but Central African Republic, Namibia and South Africa are among some of the nations that have yet to start.

JULY
Inmarsat's *I-5 F3* satellite is still delayed after arriving at the Baikonur Cosmodrome in Kazakhstan and originally planned for launch in May. This will be Inmarsat's third satellite that will support its much anticipated *Global Xpress (GX)* service. The firm is investing USD1.6bn in the development and delivery of *GX*, which it describes as the world's first globally available mobile broadband service. It has been designed to deliver broadband speeds up to 100 times faster than the firm's *I-4* constellation. *I-5 F3* finally launched in August.

AUGUST
iWayAfrica is now offering free equipment with its Ka-band VSAT service in Zimbabwe. The

(formerly Geolink Satellite Services). It said the rollout of the new service was particularly complex as the migration to its platform required work across multiple countries, and had to be completed to a tight deadline before the previous provider switched off SCI's existing service. The deployment to all 35 sites – which are situated in some of Africa's most remote areas – was successfully implemented ahead of the deadline in five weeks.

SpeedCast trained members of SCI staff as VSAT installers at its teleport in Germany. This approach proved to be particularly successful as one of SCI's team members was able to quickly apply the training and completed the installation of a number of VSAT units in Sierra Leone during the Ebola crisis.

"During the recent Ebola emergency, I spent two months connected to the SpeedCast service, and the connection quality was better than some places in Europe," said Mark Hawkins, global field technology manager at SCI.

SpeedCast also supported the NGO in Somalia which it said can be a "challenging place" when it comes to finding satellite engineers. With the company's help, SCI staff in the country were able to re-point all of the VSAT systems to the new network.

Since the initial migration of its core C-band network, SCI has now worked with SpeedCast to expand the network to 51 sites. "By replacing Ku-band equipment with C-band systems, we have been able to provide our field sites with a better service for a lower monthly cost," said Hawkins.

The health of the planet is also being monitored using satellite. An international research team has used space technology to map the continent south of the Sahara, and discovered that many areas receive drastically different amounts of rainfall today compared to just ten years ago.

The new concept developed by the team interprets satellite observations of rainfall and vegetation greenness at the same time. Satellites have the ability to fill in the gaps in weather observations in Africa where meteorological stations are far and between.

The researchers used a rain dataset that was produced by the US National Oceanic and Atmospheric Administration's Climate Prediction Centre, and combined the best qualities of local rain gauge stations with 10 years of satellite data.

Their study suggested that areas such as the Congo, Nigeria and Madagascar now receive far less rainfall than they did a decade ago, while other locations such as the Sahel zone have become far greener through increased rainfall.

The findings have highlighted areas where climatic changes are the likely cause of greener or browner vegetation. More rain can lead to a 'greening up' of large regions, as was the case in the West African Sahel zone. If rains become scarcer, in dry areas the plants cannot green as much. This effect is large enough to be observed from satellite.

Navigation is being told where to go

For consumers, GPS is traditionally the first thing that would be associated with satcoms (apart from TV which is covered below)

Last year saw Avanti Communications announcing that it will support a satellite-based augmentation system (SBAS) as part of a crucial air navigation project in Africa. SBAS-AFRICA will be used for GNSS (global navigation satellite system) operations serving significant parts of the continent. It is being developed in partnership with a number of local stakeholders such as the South African Air Traffic and Navigation Services Company, South African Space Agency, Ghana Council for Scientific and Industrial Research, the Agency for Aerial Navigation Safety in Africa and Madagascar, amongst others.

The project will use the L1 transponder on Avanti's *Artemis* satellite to provide a navigation data broadcast service. *Artemis* was previously owned by the European Space Agency before it was taken over by Avanti early in 2014. It orbits at 21.5°E covering Europe, Africa and the Middle East with a payload of Ka-, S- and L-band transponders.

According to the Flight Safety Foundation, although around 67 million people fly each year on 762,000 flights that connect to Africa's 371 commercial airports, the continent

Avanti's *Artemis* orbits at 21.5°E and features Ka-, S- and L-band transponders.

ISP claimed it is removing the "huge barrier" to entry for customers who require VSAT services by offering 12- or 24-month contracts with free kit subject to a nominal standard installation charge of USD155. iWayAfrica said the setup fee factors-in the newly approved USD20 annual Ka-band license fee which came into effect in August. Monthly service charges for home users start at USD80 for 1Mbps with a 15GB data cap. All plans include free browsing from 11pm to 6am.

SEPTEMBER
ABS' "revolutionary" new *ABS-3A* satellite is now in full commercial use. Services covering Africa, the Middle East, Europe and the Americas began at the end of August following the satellite's launch in March 2015 and the successful completion of all in-orbit tests. Built by Boeing, *ABS-3A* is one of the world's first satellites to use an all-electric propulsion system which makes it more cost effective to launch and operate. It features 48 C and Ku-band active transponders, and is equipped with high-performance beams to support regional markets.

OCTOBER
BICS has developed an automated optimisation solution to help improve connectivity in Africa. *RouteFlex* aims to provide intelligent and cost-efficient backup via IP over satellite, and is supported by an SDN. BICS claimed it enables operators to handle high volumes of IP traffic across satellite by applying end-to-end differential treatment to different types of aggregated data flows during peaks or outages. It also enables dynamic switching between fibre and satellite facilities. The firm said optimisation can be performed across regions, with operators able to move capacity between markets.

NOVEMBER
In what was described as a "pioneering" service provision model, Yahsat will use Newtec's platforms and operating systems for its third satellite. *Al Yah 3* is due for launch in late 2016 and will extend Yahsat's commercial Ka-band coverage to an additional 19 countries and 600 million users across Africa, as well as in Brazil where it will cover more than 95 per cent of the population. Yahsat will use Newtec's multi-

has just three per cent of global air traffic. However, air accidents in Africa account for roughly 20 per cent of the global total.

By demonstrating potential improvements in flight safety via SBAS technologies, the project is also expected to provide long-term socio-economic benefits According to one EU-backed study, the potential economic benefit to African aviation from the deployment of SBAS services amounted to EUR1.7bn.

Satellite location was also used in what organisers described as "the world's most extreme running race" – the Marathon Des Sables 2015. Globalstar Europe Satellite Services was selected to track and protect all participants in the 11-day, 250km foot race from Morocco to France.

Globalstar, a provider of satellite messaging and emergency notification technologies, said its *Spot Gen3* safety device had been chosen for the 30th edition of the multi-stage endurance test, in which 1,450 runners took part. The pocket-sized personal GPS messenger helps users stay connected via satellite even where there is poor or no GSM signal. The event organisers and emergency support services used *Gen3* to precisely track each runner's location on a "user-friendly" display which showed GPS positions in real-time via geolocation platform *Dreamap*.

The sun always shines on TV

Africa has long suffered with the issue of how to reach out to inhabitants in remote locations, and satellite television has been a key technology to not only entertain but also bring education to those who wouldn't otherwise have the opportunity.

Last year saw Eutelsat Communications and Spacecom teaming up to expand digital

Intelsat 20 will enable Sentech to leverage a single, multiplexed transmission platform.
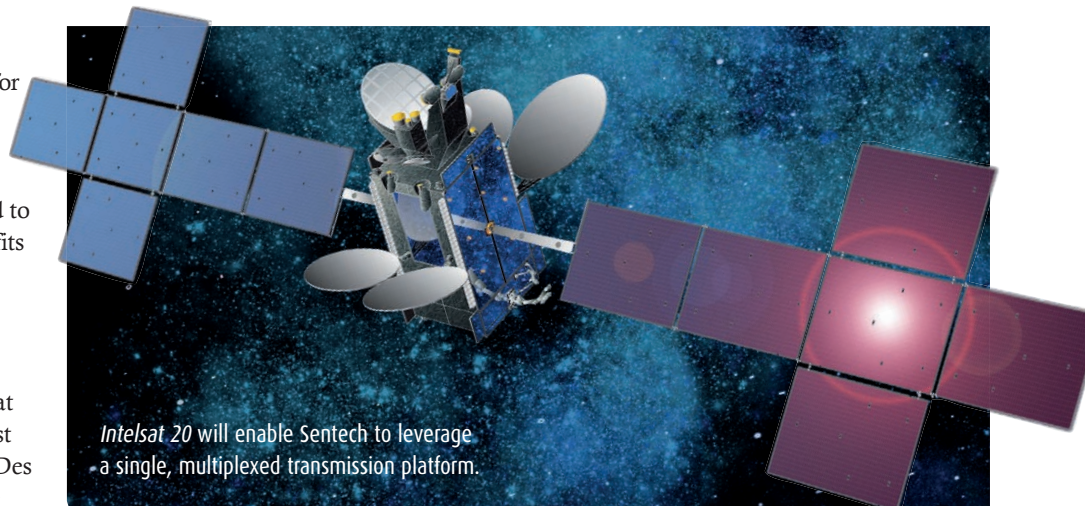
broadcast services at what they described as Africa's "leading" video neighbourhood. The two firms established a framework for cross-commercialisation of Ku-band capacity connected to the high-power African service areas of *EUTELSAT 16A* and Spacecom's *AMOS-5* (until disaster struck – see below).

At the beginning of 2015, Eutelsat and Spacecom said the 16º-17ºE slot was one of the fastest-growing broadcast markets, with a strong DTH and free-to-air video neighbourhood in West Africa.

They claimed that more than 100 free-to-air local and international television channels were being transmitted by their two satellites, across a footprint covering approximately 30 million TV homes, mainly in Francophone Africa but extending to Ghana and Nigeria.

EUTELSAT 16A and *AMOS-5* were launched in 2011 and their Ku-band African payloads offer identical footprints over Africa. The two firms pledged to improve the quality and effectiveness of broadcasting services, and expand the channel lineup from what they dubbed as their one virtual position.

Another project saw broadcasting signal distributor Sentech continue to leverage Ku-band capacity on *Intelsat 20* to cost-effectively expand and enhance its DTH and DTT services in Africa. Under a renewed multi-year contract, the company said *IS-20* would enable it to leverage a single, multiplexed transmission platform that would maximise its efficiency to distribute DTH as well as national DTT programming to viewers in South Africa. The satellite orbits at 68.5ºE and provides Sentech with a selection of nearly 500 channels, 31 of which are HD.

Intelsat said its "proven" DTT solutions in Africa are backed by ACM techniques that enable efficient use of bandwidth and improved reception quality.

Speaking at the time, Rhys Morgan, the company's interim regional sales manager, said: "*Intelsat 20* reaches more viewers in Africa than any other DTH platform, making it an ideal video neighbourhood to support Sentech's growing business need. Our ability to support and deploy both DTH and DTT transmissions will enable Sentech to continue its customers' seamless migration to DTT."

DECEMBER

By December, it became clear that Spacecom's *AMOS-5* was now a "total loss". All contact with the spacecraft had been lost during the previous month. After carrying out its investigations, the satellite's manufacturer ISS-Reshetnev said: "The most likely cause is the total failure of its onboard electric supply system or the 100V cable network bus. Or it is also possible that the satellite failed due to the external exposure of a critical element of the power supply system or the onboard 100V cable network bus to high-energy cosmic ray particles. Among other possible causes are the problems in the satellite's tracking, telemetry and command system or its payload." *AMOS-5* was launched in 2011 and covered Africa from 17ºE.

Rahiel Nasir, Editorial director, African Wireless Communications Yearbook

The year ahead: 2016 will not only prove to be a milestone year for Intelsat but also for African satcoms in general. In January, the company launched its first satellite to use its *EpicNG* platform for HTS. While *IS-29e* is aimed at the Americas and the North Atlantic region, its will be followed later this year by *IS-33e* and *IS-36*, as well as *IS-35e* in 2017. All three will cover Africa, giving the continent its first opportunity to experience the potential of HTS systems.

HTS offer a number of unique advantages which have been well-documented, and some of which have been highlighted in the introduction to this chapter. For Africa, the advent of the HTS era will be a gamechanger: as well as facilitating wider broadband connectivity across the region, there are also other applications the platform will boost, such as backhaul, enterprise networking, e-government, and more.

But the future for satcoms isn't all about HTS platforms from the likes of Intelsat. As the year progresses, also look out for the continued ramping up of other missions, such as OneWeb's LEO fleet of satellites, the first of which is expected to go into orbit next year. Then there's O3b – it has now secured new investments worth USD358m to purchase another eight satellites and launch four of them to add to its current constellation of 12 MEO spacecraft.

This time next year, there will be much to talk about in the African satcoms market.

Jean-Philippe Gillet,
VP Europe, Middle East and Africa sales, Intelsat

After working for broadcast services provider and Orange subsidiary GlobeCast for 13 years, Jean-Philipe Gillet joined Intelsat as VP of media sales in 2003. So in terms of its approach to Africa, is Intelsat very different from his previous experience with GlobeCast? Gillet explains that that was a very different business, and he can't really compare what he was doing before with what he has done with Intelsat.

"Before Intelsat I was working for a value-added reseller. We were packaging satellite, the ground infrastructure, the terrestrial infrastructure, and on the other side, we were selling services. I was looking at the US, Europe, Africa, anywhere."

"Africa is a great opportunity in terms of satellite communication. And right now, what is exciting in the market, is that the economies in a number of countries have developed so much that this is creating additional communication needs. And what we are doing is coming at the right time to meet those communication needs."

But Gillet goes on to point out that the communication needs are also different, and that you can't provide the "same old stuff" to meet the new needs.

"Today, there is a requirement for data communication and voice traffic but e-government applications, for instance, require a new type of technology in order to meet the economics. The overall economics in Africa have evolved which is creating needs. So this is what we want to do and what we need to do."

Evolving needs

Looking at the challenge of meeting those needs, was 2015 a tough year in Africa because of, for example, global recessionary impacts?

"Is it a tough market? I think any market is tough especially in an environment where you have an economical situation and, sometimes, a political situation in certain countries which is not always easy. So yes, this is a challenging market. Is it a market that has grown and evolved? Yes, there is no doubt about that.

"But it is very difficult to look at it as just one market. Today, if you are operating in oil and gas in Africa or in mining, it's very different from, say, a backhaul operator that is deploying networks in countries where the economy is still growing.

"So there are value markets and there are markets that are more challenging. And the markets that are challenging are challenging all over the world, not just in Africa.

"Then there are markets that are growing. And there are certain ones in Africa – connectivity and backhaul in particular – where there is growth today that is not in other regions."

In the 13 years that he has so far been with Intelsat, how has Gillet seen satellite usage evolve on the continent? For instance, is the company's business now primarily driven by broadcast and broadband rather than backhaul?

"We try to do all of the above. Broadcast is very exciting right now in Africa because of the digital terrestrial deployments and there is a lot of development in the market. It's linked to digital terrestrial TV and also to the fact that there is also a middle class that is growing which is interested in consuming more content. For example, MultiChoice in Africa is still growing and it now has more than five million DStv subscribers.

"So you still have growth on the DTH services that we provide from MultiChoice, and at the same time you still have DTT deployments that are expanding. There are DTT projects in a number of countries today. Migrating from analogue to digital is something most countries have to do and is creating challenges but it is being done.

"So that's on the media side. At the same time, look at all of the GSM operator deployments today – they are going in areas where it is more difficult to reach. What is the best way to go into rural areas? What gives you more 3G in areas that already covered? You use satellite as a way to relay and as a way to expand. It's quicker and more flexible."

So what about backhaul? Are African MNOs less reliant on satellite as a backhaul technology now that there is more fibre and microwave still remains an option?

"Backhaul is still a big part of Intelsat's business. I was talking to one of our customers who is an operator in the DRC which is a country that is two thirds the size of Europe. It has 70 million people and the operator has 1,000 active towers."

Gillet compares that to South Africa which has a population of more than 53 million people (according to ITU figures) and where Vodacom, for example, has 12,000 active towers.

"So the need to deploy in the DCR is very significant. And then behind that you look at power penetration. Power is important because it gives mobile operators the ability to deploy in an easy way in being connected to the grid and having their network connected to power. Right now in Nigeria, the World Bank would say power penetration is 44 per cent. In Kenya it is 23 per cent.

"So how do you expand the reach of a cellular operator in a way that is easy to deploy, but where there is very limited road infrastructure and very limited power? The solution is satellite. And this is where the next-generation satellites with *EpicNG* come in, together with small kit and solar panels that are easier and cheaper to deploy. That is where we see the market."

But he reiterates that it is important to change the economics in order to take advantage of all the growth potential – users who are still waiting to pay USD10 for 1Mb today won't pay USD20 for the same capacity tomorrow.

The last option?

Would Gillet agree with some of his peers who say satellite technology is only used when there is no other connectivity option because fibre, if available, will always be the first choice for service providers?

"There is room for all of the technologies. For me satellite, fibre, microwave, or any other means, will always be there. At the end of the day you need to have the most cost-effective way.

"We provide services to certain customers in rural areas who want to do 2TRX mainly for voice traffic. They deploy a small site, solar panel and use our network. Then they find demand is growing and need to deploy 3G, and because the population is big enough they realise they need to put more equipment in. At that point it's all about the economics. Do they have better economics to lay down fibre? Do they have better economics to go for different type of towers? It's all about the economics.

"Can I really say satellite is going to be *the* primary choice? I don't think this is realistic. If you put yourself into the shoes of a GSM operator you need to have various options to deploy and you will look for the most cost-effective."

Looking back over 2015, some of the key moments for Intelsat in Africa during the year included the various capacity deals it did with broadcasters. These include Sentech in South Africa as well as MultiChoice which will use capacity on *IS-36*, Intelsat's first satellite for Africa that will use the *EpicNG* high-throughput satellite (HTS) platform and is due for launch later in 2016.

Gillet also says there were backhaul deployments in several countries last year, as well as an agreement with Teledata which specialises in corporate telecoms and is part of Mozambique Telecommunications. He says that deal was about providing satellite connectivity as part of a network deployment

Russian Satellite Communications Company

Best Regional Operator of the Year

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for a single operator, and describes it as a good example of what Intelsat is doing and replicating in other countries.

"The enterprise market is one that is still very much growing. We do that either with customers that are in Africa or customers in Europe that provide services to multinationals. It has really been a challenging market at times but also an exciting one when you look at all of the potential."

The future

As he looks forward to the future, Gillet says 2016 will be an exciting year for Intelsat.

"We have been working on *EpicNG* for five years, defining the market, the technology, the next step, and really looking at how we're going to change the size of the market we are addressing.

"The whole strategy behind all this is not just to provide more of the same to existing customers. It's to provide something different, expand the range of customers that we can target, and for customers not to see satellite as the last resort but use it more as a single tool in their toolkit."

Several years ago there was talk about a satellite 'capacity crunch' in Africa. But with so many launches now coming up for the region, there has been talk of a possible oversupply, especially in Ka-band which seems to be a focus for many new payloads. Does that worry Intelsat?

"This is not the way we are approaching it. It is not about the supply to meet the existing requirements. It is how to position satellite to meet new demands and expand with our existing customers.

"If what we do is provide the same old thing to meet the same old requirements, it will always be about balancing supply and demand all the time. We need to change the way we look at it. In order to do that you need new technology on satellite and you also need new innovation on the ground."

Here, Gillet refers to Intelsat's investment in Kymeta, the US-based company that claims to have developed a unique satellite antenna that can connect anything that moves. He says these new, mass-produced dishes are easy to install and present a different type of economics. As a result, he believes new markets can be targeted that were previously unattainable.

"You could do a connected car with this, you could do a bunch of other applications that will be triggered not by what you can do on the satellite, but by the accessibility on the ground. So this is really very important from our standpoint."

Gillet is quick to point out that satellite innovation is also important for Intelsat so

it's not just about the ground systems.

"We do innovate on satellite because that is what will deliver the throughput at different economics. That's also going to have equipment that uses less power and it's going to be smaller, meaning it is easier to deploy.

"So this is really the way we look at the market on our side. High throughput is really all about positioning ourselves in order to help our customers reach new markets and expand in their existing markets. If you are in the DRC with 1,000 sites and you want to move to 10,000 sites you need to have different economics in order to mass deploy."

So with all this talk of innovation and economics, will Intelsat help to address that age-old question of satellite being 'too expensive'? Gillet has a favourite example that he often cites here.

"I think you need to understand the customer in order to be able to deploy the right technology. So if you look at Airtel's 2014 financial report, you'll see, for example, its revenue in Nigeria: voice traffic was down two per cent, data traffic was up 18 per cent, and total revenue was minus one per cent. So there you have the whole thing. Customers are using more but in a different way.

"Look at it from Airtel's standpoint. In terms of voice, let's say traffic is 62-64 kilobits. That's small. But data traffic is going up. It's big. So if Intelsat sells megabits at the same price, customers will come back and say this is great, I need more. But by the way, my revenue is not going up. So if you don't provide me more at an attractive rate, I'm going to find other ways.

"So this is where you need to remain relevant in order to meet their demand. You also need to understand what their challenges are. We may think that we have a lot of challenges, but I can guarantee you that Airtel Nigeria has a lot more challenges about how to deploy its network and all of the things it needs to do in order to have a functioning network, grab customers, etc. It's a very competitive market. All of our customers are in very competitive markets."

Flavien Bachabi, MD, Africa, ABS

ABS has experienced significant growth in Africa's data and video markets, according to the company's MD for the continent, Flavien Bachabi.

"ABS has always been a strong player in the data domain with its previous satellite *ABS-3*, and now it continues its growth with the new *ABS-3A* at 3ºW. ABS has created two new products targeted at mobile network

operators and internet service providers who are looking for reliable internet services as primary or secondary links.

"Firstly, there is *OCB (On C-Band)*. This is a full-time internet trunk service on C-band and deployed from ABS' state-of-the art teleport in Germany. The service includes bandwidth and provides a complete hardware solution to meet multiple STM bandwidth requirements of customers at affordable prices from USD400/Mbps.

"Secondly, we have *BOD (Bandwidth-on-Demand)*, a backup service over satellite. The customer gains the advantage of getting reliable backup connectivity by paying a small monthly premium to be always connected. ABS has received tremendous response from MNOs who are always looking at backup services without paying for full-time satellite bandwidth cost."

ABS says it came up with *BOD* after recently winning a contract from Ethio Telecom to supply bandwidth capacity of 400Mbps as backup over satellite. This made it realise that there is a latent demand for cost-effective backup solutions over satellite. As a result, it developed *BOD* which it describes as a new and unique service for a satellite operator to offer in the African market today.

ABS has reserved several transponders and internet backbone capacity for clients to accommodate the need for very high bandwidth whenever required – usually when their primary links fail. The company says mobile operators and ISPs are the focused sectors looking for this type of service as they need 100 per cent availability.

To take advantage of *BOD*, clients typically pay a reservation fee which is said to be "very nominal" in addition to the data usage fee paid for the time they use the backup link. According to ABS, this is a "win-win" situation as the nominal reservation fee is similar to an insurance premium which one would pay in order to be risk free and 'always connected'.

With regard to video, Bachabi explains that ABS has begun to penetrate the region's market. "With the advent of digitisation of TV networks and technologies in Africa, ABS has positioned itself very well with two satellites, *ABS-2* and *ABS-3A*, for both DTH and contribution links.

"Each of these satellites has its unique advantages. *ABS-2* has a strong video neighbourhood at 75ºE, which will soon be complemented by *ABS-2A* launching this year. *ABS-2* is positioned for video operators broadcasting in East and Central Africa, while *ABS-3A* is well-suited for pan-African coverage at 3ºW."

When asked how Africa's wireless com-munications adapted and evolved in 2015,

Bachabi says ABS has seen "revolutionary developments" in the satellite market at both the space and ground levels.

"ABS was the first operator to successfully launch an electric-propulsion satellite that minimises the spacecraft's mass and maximises available payload. With its innovative design and capability, ABS is able to provide its customers with flexible service offerings to meet their growing demands. Other satellite companies have started following this trend.

"ABS is seeing the advancement of high throughput satellites (HTS) which are delivering massive amounts of capacity to the enterprise market. Greater supply, combined with higher data throughput, is lowering the cost of satellite bandwidth. Advanced technologies and network infrastructure enable higher performance capabilities and more efficient platforms."

That's all on the positive side. But what about the negatives – what does ABS see as the challenges for Africa in 2016?

"Poor infrastructure and power issues are continual challenges in Africa which makes the deployment of VSAT services difficult (logistically) causing delays in installation.

"The political and economic situations have also been problematic recently. Major oil-based economies like Nigeria and Angola have suddenly gone dark. Forex control changes in these countries have further added difficulties to doing business.

Bachabi adds that ABS has also seen big players such as Google and Facebook take an active interest in satellites. He reckons this could be an "inflection point" for the industry.

"Facebook has begun deployment of free internet services in Africa while Google is adding local servers in every African country as well as pouring investments into the building of satellites."

But while the challenges are high, he says equally the market is growing with an increasing appetite for band-

width at low cost. "With most of the MNOs and DTH operators wanting to deploy 4G networks and 4K networks respectively, ABS would like to deliver high throughput bandwidth to serve these markets cost effectively. We have increased our resources to penetrate the entire continent by adding a sales team in West Africa for Francophone countries.

"ABS-2A is planned for launch in 1H 2016 followed by ABS-8. With a wide array of satellite capacity designs and frequencies at its disposal, ABS is able to deliver the best solution to meet customer needs, at the right price."

**Andrey Kirillovich,
Director of
integration &
projects,
RSCC**

Andrey Kirillovich says 2015 was a pivotal year for the Russian Satellite Communications Company (RSCC). It met all requirements of its domestic customers in Russia and started focusing on foreign markets, raising international sales revenue share up to 35 per cent. In fact, for the second consecutive year, the company demonstrated two digits growth:
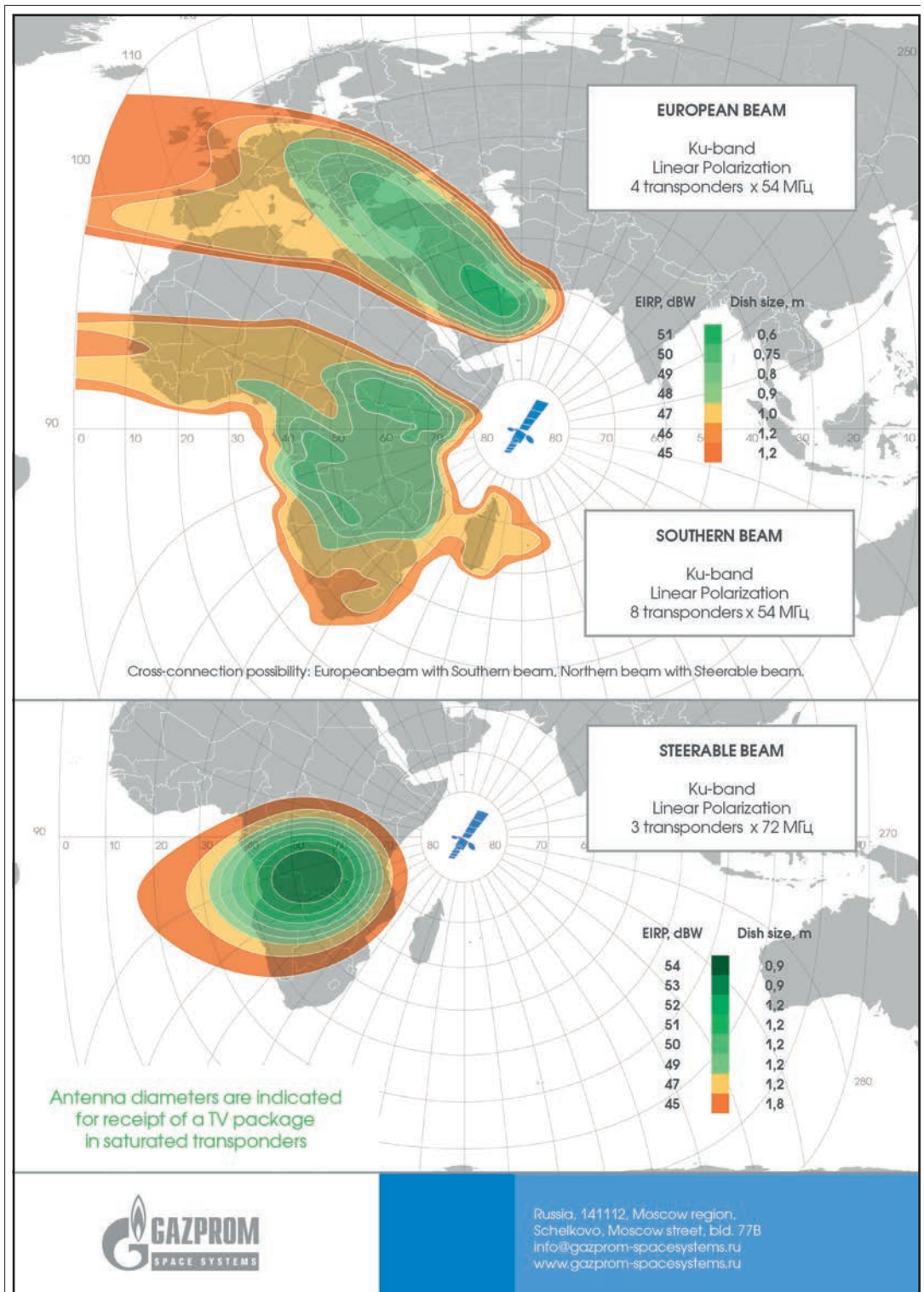
sales revenues increased 30 per cent in 2014 and 21 per cent in 2015.

Last year also saw four successful launches and six new satellites enter commercial service, as Kirillovich explains. "Three of the recently launched satellites provide coverage of sub-Saharan Africa in C- and Ku-bands. *Express-AM8* (14ºW), *Express-AM7* (40ºE) and *Express-AM6* (53ºE) are in orbit and provide service to African customers in wide and tailored regional high power spot beams.

"Today RSCC provides services to more than 10 countries in the sub-Sahara African region. Africa is one of the top priorities for RSCC, and despite many challenges it hides a lot of great opportunities.

"RSCC has been a new player in this market, so we started a sales and marketing campaign well in advance of the launches. As a result, the satellites started filling with customers immediately after the launch. Several big deals with customers in different parts of Africa helped RSCC to become an active player in the SSA satellite market.

"What we have learned during the first year of operation as a full scale African satellite provider is that a tailored approach and full support throughout the entire sales and even post-sale process is required. Customers in Africa are very sceptical about new entrants, but once trust and confidence are gained, they are eager to change satellite provider or run a new network with antennas pointed at a new orbital position."

Kirillovich says that despite improved connectivity in the coastal countries, where numerous submarine fibres have brought large pipes to big cities, satellite plays a pivotal role in many sub-Sahara African countries.

"Unsatisfied demand in remote regions and landlocked countries, together with unbeaten satellite advantages in covering large areas and quick network deployment, had an impact on the market development in Africa in 2015.

"RSCC also used its new orbital assets to improve connectivity in the region. Our focus on applications is different for C-band and Ku-band capacity. In C-band, this is predominantly regional trunking and cellular backhaul applications for the sub-tropical region of central Africa – DRC, Angola, South Sudan, Zambia, Cameroon, Gabon and Congo.

"Rain fade and geographical location with many remote communities make satellite the only cost-effective solution here, so our spot beam on *Express-AM7* is the best option for this region in terms of power and price. It allows to use smaller BUC sizes and maximum MODCODs to save on bandwidth costs.

"Our other focus is on broadcasting and corporate VSAT customers who tend to work in Ku-band. RSCC has got a very

powerful spot beam covering West Africa coastal countries from Senegal to Cameroon, including Nigeria, Ghana and Côte d'Ivoire. Tailored coverage with 55-52dBW EIRP is ideal for enterprise, TV distribution and even DTH networks providing full coverage over French-speaking countries and Nigeria."

As with some of the other satellite operators featured here, Kirillovich believes oversupply is becoming an issue in the region and driving satellite capacity prices down. On the other hand, he also says it makes satcom applications more affordable and service providers can benefit from this.

"Nevertheless, if you want to stay in business for a long time, you cannot sell below break-even for a long period. You should also be smart when designing new satellites. Our strategy is that we do not just add bulk capacity in the region. RSCC satellite footprints are unique with best coverage for certain countries from orbital slots providing best look angles for sub-Saharan Africa.

"Throughout 2016, RSCC plans to continue using its expertise and satellite assets for promoting connectivity in the region, and assisting governments and businesses in bridging the digital divide.

"We are very positive about the future as our tailored footprints, new satellites in prime orbital positions, and solid customer base give us a great potential for business proliferation. The company's focus will be on expanding the service portfolio and meeting customer needs all across Africa."

David Murphy, Chief commercial officer, Yahsat

With two satellites already in space and a third due later this year, UAE-based Yahsat reckons it is in the vanguard when it comes to meeting the high demand and need for satellite communications across Africa.

"We were pretty much at the forefront of that with Ka-band," says the company's CCO David Murphy. "I think there was quite a bit of scepticism prior to our launch but we've shown that you can successfully do that. We've got quite a few thousand customers in Africa, and are number one on the continent in terms of satellite broadband to the extent that we are investing it further with *Al Yah 3* going up in 2016."

That all sounds like bold claims, but what is Murphy basing that "number one" status on? He says it is due to the sheer number of broadband satellite connections Yahsat has in Africa, and while he knows the total figure he says he can't share any break downs because Yahsat is

not a public company. But clearly the operator is going from strength to strength as Murphy says business was good in Africa last year.

"We have seen that demand has absolutely outstripped our ability to supply in a number of markets. Our beams are starting to fill up. That's part of the reason why we invested in a third satellite. We're also putting additional coverage in our core markets in Africa – South Africa, Angola, Nigeria. We're topping up the capacity, and are in 18 additional markets across the continent. Naturally, we are quite bullish about it all.

"It's a typical demand and supply situation. We have actually increased prices and in some markets we have doubled them. We've managed to keep our base, and obviously our revenues and profitability has increased.

"That's contrary to C-band. It has seen price decreasing because there is a reliance from the oil and gas industry, and as oil and gas prices went down you could see that C-band was under pressure."

Murphy says that plummeting oil prices have created strong headwinds in Africa, particularly in Angola, Nigeria and the Middle Eastern markets which are very much tied to the energy markets.

"That's had a very negative impact on some of the economies. The South African rand has been hit; in Nigeria we can see the currency is down by 35 per cent in the last 12 months; in Angola it has gone down by 40 per cent in the last 12 months. The forex issues have hit everybody, and we bill in dollars. Despite that, our revenues are increasing."

While it appears that Yahsat can't get the capacity out there quick enough, does Murphy think there is any danger of Ka-band capacity oversupply on the continent?

"I would say that is always a sign of your success. We were first into this market with Ka, we've had very little or no significant competition. When you start to show success then obviously it starts to bring competitors into the market. So I absolutely see increased competition as we go forward.

"Putting a satellite up and getting the technology right in Africa is maybe 10-15 per cent of the work. The challenge is building a reliable channel and getting a partner that you can trust and get paid from in Africa. That's the biggest challenge. And you also need to ensure that they have technical competence and the customer care focus to be able to interact with and support your customers. That's also the challenge.

"So when I hear about a new satellite going up I say okay that's fine. That's the relatively easy part. The challenge is really setting up the channel. We've taken tier one service partners to take our product out to the market, and

it's taken us four years to get to a stage where we still have a lot of work to do in terms of establishing and developing the channel further.

"For a newcomer entering the market, it will take years to develop that. So competition will come, absolutely, and I see that there will be advertised pricing pressure. But the ability on the ground to supply, that's the key challenge in Africa. That's the priceless part of the equation and it only comes with time.

"Furthermore, in the Middle East and Africa, all that is very much based on your personal relationship and trust with your service provider, and it works both ways. You can only start when you have history together."

That seems to suggest there may be not enough support for newer satellite missions such as those based on low Earth orbit (LEO) constellations or even current medium orbit programmes. Does Yahsat have any interest in these?

"As a company we look at everything. And as a management team we look at every potential challenge, every new technology that's coming through. I certainly don't see [LEO] on our roadmap going forward in the discussions that we are having with regulators, mobile operators or any of our service providers. We are competing with

LEO offers on the market. There is an initial interest, but when it comes down to the nitty-gritty – the number of antennas and price, [etc.] – then the discussion tends to finish and they continue with our product."

On the subject of price, this has always been a sticking point with satellite connectivity, but here's Yahsat putting up its prices – so does Murphy believe that this is no longer an issue?

"Price is always an issue from the advertised pricing perspective. We are targeting a consumer base across Africa, not only enterprise, so you have to have a consumer offering.

Consumers, particularly in East Africa, are seeing mobile operators offering perhaps a dollar per gig. It's really cutthroat competition there. So when consumers are getting exposed to all the advertising and promotions on a daily basis, they come to the market where that is the perceived price point.

"In the consumer market there is an expectation that you're going to get 'all you can eat' data offers, with a USB dongle thrown in, or a discount on the 12-month period that you pay for a mobile phone. Our consumer customers come with that in mind and it takes them some time to transition out of it.

"From the satellite perspective, we are never going to do prices like that. Once

the satellite goes up, we can't just send up another rocket and bolt on a component that gives us additional capacity on it. We have to launch another satellite. So our objective is to maximise the yield on that particular satellite. We keep prices with supply and demand, and the demand is there with customers prepared to pay these prices.

"Our intention is not compete in the centre of Cape Town, Johannesburg or Lagos. We are a complementary service in areas where the mobile operators are not rolling out their networks or it's not feasible to pull fibre."

Murphy continues by saying that as the middle class is growing across Africa and the Middle East, the internet is becoming core and everything now revolves around data access which is the main focus for Yahsat's offerings. But the operator also offers satellite applications such as backhaul.

"Mobile operators are really being squeezed out with regard to capex. From a regulatory perspective, they have commitments to cover certain areas but it's not financially viable for them to do so. We therefore have regular discussions to support operators with backhaul and how we effectively do it.

"We can conclusively prove that it is a lot cheaper to roll out our service – we have the

coverage, the spot beams. All they need is our 74cm dish, a modem, and they are all setup in an hour. They don't have to roll out the base station, don't have to worry about how they are going to power it, and don't have to worry about the connectivity to backhaul over microwave or fibre."

Like many of his colleagues in the industry, Murphy agrees that fibre will always be the first choice for service providers if it's available. But he adds that satellite technology is particularly complementary to fibre in Africa.

"Fibre is not as reliable as it is in other countries – you have a number of fibre cuts and outages for whatever reason – so a lot of our customers are taking us for redundancy services. Also, in Africa you've got power outages and a number of brownouts. So we are a complementary service.

"From the outset, our intention was not to advertise our services in urban areas but to go into underserved areas. That's our whole business model. "If you look at Lagos and certainly the centre, Victoria, you've got fibre coverage. Outside a certain number of housing or industrial estates, there's no fibre coverage. So we found ourselves in a situation where we were providing critical services to a number of these businesses that are outside of those estates.

So when fibre is good, and when it is there covering an entire city, I see us as redundancy or backup. But in Africa, it is just not there; 95 per cent of the time it's just not there."

Yahsat certainly has some busy times ahead of it, particularly with the prospect of its third satellite going into orbit. So is the company on track to launch *Al Yah 3* later this year?

"I am not personally responsible for the satellite build but I believe from a technology perspective these things always work. So I am optimistic that our CTO Marcus [Vilaca] has taken care of putting the satellite up in space.

"The challenge that we have is working with our existing service providers to gear up into new markets. We have 18 traditional markets across Africa, and by European standards some of these countries are the size of a continent. Getting service partners that we have worked with before, signing them up now, getting them ready to provide the service when the satellite is up – that's what we're really busy with.

"We are also in discussions with a number of governments in markets where we have additional coverage. I can see, particularly in Africa, a strong push to have schools and clinics covered, as well as other humanitarian missions and services, etc.

"There are a number of elections coming up across African markets, and a lot of the governments that we are approaching want to go out with the message that they now

have internet coverage across their schools which is going to support education, and lead to jobs, higher technology, etc.

"So a lot of our discussions are on a government level for these projects. And if we've got single capacity over a country that tends to be the government."

But the bottom line for Yahsat at present is to work with its existing service partners, some of whom want to increase their geography to other markets, as well as with new partners.

Murphy concludes: "We are 100 per cent focused on signing up new service partners over the next 12 months. I am optimistic that when we have a discussion at Africa Com 2016, I will be able to give you a list of additional service providers that we have deals in place with."

**Amir Carmelli,
Head of Africa,
Spacecom**

Amir Carmelli describes himself as a telecoms veteran having been in the industry for more than 20 years and attending shows such as Africa Com when it was just a GSM event and many of the operators were only beginning to get their licenses. Today, he says Africa's satcom's industry is characterised by a type of "sinusoid" behaviour in terms of supply and demand.

"From concept until the time it is launched, it takes about three or four years to get a satellite into space. Sometimes it's even more. So when some of the operators are considering how they are going to grow going forward, they are analysing the market. They look at what's happening now and what is expected to happen in the next years.

Five years ago, Africa was heaven for satellites. Why? Because the supply was much less than the demand. There was enormous growth, fibre was still not here, and therefore the pricing was also up. So new companies and operators decided to build new satellites. They looked in South America, Asia, the Middle East, etc., and a lot of them decided to go for Africa.

"Today, and over the last one or two years, those satellites are coming in with big chunks of capacity. At the same time, fibre has already hit most of the shores of Africa and has started to penetrate inland. This has reduced, to some extent, some of the 'traditional' satellite services, namely IP connectivity, voice, and international IP from Europe to Africa.

"So demand reduced somewhat in terms of the fibre penetration and supply increased which created a completely negative situation in terms of competitiveness, pricing, supply and

demand, etc. The current situation with satellite in Africa is that while there is not too much supply it is still fairly high. The demand will continue to grow but at less than the supply which creates a situation where the pricing is down again.

"And perhaps satellite operators are now looking at Africa and other places of the world and saying let's go to South America or Asia; Africa doesn't look like the best place right now. This is why I mentioned a sinusoid behaviour – it's up and down. And it's not ups and downs over months, its ups and downs over a period of years because of the phenomenon I just described."

Does that mean Carmelli goes along with the idea of 'capacity crunch' turning into oversupply? Furthermore, does he believe there is a risk of that also applying to the influx of Ka-band capacity that is coming into Africa?

"This is exactly what is part of it. I think we are already over the down curve and the price reduction is behind us (at least this is the way we see it). Right now it's steady and I believe that in the next couple of years prices will be up again."

But there are caveats here as he goes on to point out that you cannot talk about satellites as a single entity, and any future prices rises will depend on services and applications.

"For example, if you focus on television – because this is one of the more interesting satellite-based services – I would say there is no oversupply. Why? Because just about two years ago, more or less, the African market stopped being dominated by the duopoly of MultiChoice and Canal. Today, you can see that the number of new DTH platforms in Africa are already in double digits. This is just the beginning. It continues and requires satellite capacity, normally Ku-band which is well-designed for this specific type of application.

"I am a great advocate of Ku-band for DTH, but it has to be very high-powered, you have to cover the right region, etc., and there are not that many options. So here, the market today is stable in terms of price, performance, quality, etc.

"In addition there is the migration to DTT. This requires satellite for the contribution to most of the channels into the various remote stations. Obviously, from those remote stations it goes terrestrially using DTT technology. This process is slow in Africa but it has started. And like DTH which started two and a half years ago, it is still not even in the middle of the process. There are already discussions and contracts for the beginning of services in DTT in the next two years or so.

"So this – plus DTH, pay TV and free-to-air platforms that are also booming in Africa, enabling people to watch television without

monthly subscriptions – are all creating a situation in which the services are stable, the prices are stable, and the industry is stable in general. There is no oversupply. And I don't see any oversupply because this is a very specific and professional type of market.

"The new guys that are coming are not necessarily building the beams with their satellites to answer these needs. For example, I would say in general that about half of the Ku-band satellites or beams are like wide beams, meaning they have very low-power and large coverage areas. This is good for data applications, maybe sometimes TV channel contribution, but not distribution to the homes because you need large antennas. So broadcast is healthy. There is no crisis and it is doing well.

"Now there are two other markets. One is data in general, Ku-band and C-band, and the other one is a new technology in satellite, namely Ka-band HTS.

"In terms of data in general (which HTS is part of because it's still broadband data), it is growing. However, because additional capacity is coming into the continent, this market is not as stable as broadcast.

"The prices are lower and the churn is higher because it is fairly simple for a service provider to move from one satellite to another if they get maybe five per cent better pricing, etc. If a service provider only has 20 or 50 sites, it is very simple for them to migrate, unlike television or DTT where you have hundreds of thousands of users.

So the market for data in Africa is different. It is more dynamic, more price sensitive, there is a lot of existing supply, and new supply coming up."

Does Carmelli think the general perception of satellite being too expensive is still true? He reiterates that prices always fluctuate over long cycles. But he also believes that new technologies such as Ka-band multi-beam HTS are, for the first time, allowing operators to offer fairly low prices that are sometimes even competitive with fibre for data connectivity and internet browsing.

"The downside of that is that it requires a fairly high initial investment because there is still no mass market. Once the mass market is there, CPE prices will reduce significantly. But today, the initial investment for end users is still not that low.

"Also, because Ka technology uses very small concentrated beams, it does not cover large areas. So you have to define upfront which areas you plan to cover, and per satellite, this is probably a fraction of a per cent of the continent. Whereas with C-band you can cover the whole of the continent, and offer data, VSAT, etc., to everywhere in Africa.

The Eutelsat-Facebook deal

Last year, the big news for Spacecom, and indeed African satcoms as a whole, was the Eutelsat-Facebook deal for *AMOS-6*, Spacecom's Ka-band HTS *(see Year In Review, p67)*. Its entire broadband payload will be used by those two companies as part of a joint mission to connect more people in Africa Carmelli explains how the deal came about.

"Actually our plan was to run *AMOS-6* ourselves. Like any other satellite operator, we build satellites for our own use. Around three and a half years ago, and like we do with each and every new satellite that we have, we ran a very in-depth analysis about the market, the requirements, where it's heading, etc. And we took what some called a risky decision to build an HTS Ka for Africa. We studied the market, learned, and designed which areas specifically those beams should hit in Africa to maximise the potential business with this payload. So we went ahead, invested, and built it."

[At the time of writing] "*AMOS-6* is going to be launched in the March 2016 timeframe and we started to prepare ourselves in terms of the terrestrial gateways and platforms, infrastructure, etc. And we also talked to some partners about that.

"In parallel, and like other companies, Facebook and Eutelsat looked into the very same topics and tried to determine their own strategy and plan. We were ahead of time in terms of their planning. And because we took the initiative long ago, and because *AMOS-6* is well designed and being launched pretty early in the process, those guys started talking to us about possibly leasing the whole payload for their own purposes.

"Eventually, after some negotiations, we decided to go for it. By the way, it wasn't just Facebook and Eutelsat that we talked to – some other very big organisations also talked to us about the very same thing.

"So what we are bringing to the party is the satellite, the whole payload. What Eutelsat, probably together with Facebook in one scenario, is bringing is the ground infrastructure. In parallel, I read Facebook are building their own satellite, but it will probably take a good few years until it will come up and the market, I guess, will be experimented with in that timeframe. But once we go in with *AMOS-6* and Ka-band, I think all of us will be more smart."

So with *AMOS-6* all sold, what now for Africa from Spacecom? At this point, Carmelli starts talking about growing *AMOS-5*, the company's first satellite for the continent which was launched in 2011. But just days after this interview in November 2015, news emerged

that Spacecom had lost all contact with the spacecraft and since declared it as a write-off *(see Year In Review, p67.)*

AMOS-5 covered Africa from 17°E. So when asked what Spacecom's plans were for Africa, it was perhaps prophetic for Carmelli to say: "We are considering our way forward for Africa. As you know, we also have a cooperation agreement with Eutelsat to promote the 16-17°E position from our free to air neighbourhood and DTH channels, so there is still a lot to do in Africa for us from 17° East.

"But don't forget, within five years, more or less, we will have Ka in Africa and we will start to sell it into the market. And we are also considering plans for *AMOS-7* and *AMOS-8* which are still in the early stage."

SatADSL is a Belgian company specialising in IP connectivity via VSAT. The firm aims to develops innovative solutions for business professionals in need of cost effective and reliable internet solutions in areas with difficult or no web access in Africa and the Middle East, as founder and COO Caroline De Vos explains.

Caroline De Vos, Founder & COO SatADSL

"Since 2010, our dedicated team has been working every day to close the digital gap and enable development, solving the connectivity issue for hundreds of companies in more than 45 African countries. Whether you're a larger corporation or a smaller NGO, SatADSL tailors volume, speed and budget to suit the client's exact needs.

With Newtec supplying the hardware and various satellite operators (SES, Avanti, Eutelsat, etc.) providing the bandwidth, we are able to offer corporate, business and specialised packages to ensure their communication needs are met and surpassed.

"Our offer, recognised as being unique and competitive, combines high quality with affordable equipment and subscriptions. We provide both service quality guaranteed by SLAs and affordability for serving companies and small branch offices performing business critical transactions."

De Vos reckons SatADSL offers unique solutions for the region. She says they can be deployed anywhere where there is a good view of the sky within the footprint of the satellite used. "This allows the solution to be implemented even in extremely remote regions where it is uneconomical to deploy fibre or even copper.

"SatADSL provides turnkey solutions to professionals; our solutions are volume unlimited and continuously monitored to

ensure a very low congestion (much lower than ADSL). Each solution comprises a customisable subscription, hardware, along with additional services such as maintenance, technical support and monitoring tools."

She adds that unlike competitors, the company's platforms do not depend on any local infrastructure such as the power grid. They utilise cutting edge technologies including what's described as "state-of-the-art" ACM (adaptive coding and modulation) which further increases link reliability and ensures that satcoms is maintained even during heavy rain.

"Our technology uses a completely different approach to offer affordable pricing, exploiting optimal bandwidth management and a large subscriber base to allow for very competitive service pricing. We can continuously control the usage of each site to optimise capacity."

SatADSL leverages Newtec's *Sat3Play/Dialog* technology which is based on a large and complex hub but offers simple user terminals thanks to *Point & Play* terminal configuration. De Vos says everything is easy to install while hardware costs are minimised, allowing for temporary installations anywhere from construction sites to humanitarian camps.

"Our tailor-made service plans, hardware and value- added services provide reliable, cost effective internet access, and play a pivotal role in supporting business development across the MENA region.

"In almost all countries across Africa, we now have a number of success stories highlighting our professional suite of satellite IP connectivity to SMEs and corporates.

"For example, one of the largest banks in Africa has chosen SatADSL's solution to rollout its ATM network across Ghana and Cameroon in areas that were not previously accessible and where connectivity is limited or non-existent. We designed a cost effective solution to enable financial institutions to rollout their networks in urban, suburbs or rural areas. The solution provides the secure execution, on a real-time basis, of every transaction from a large and scattered network of ATMs."

In a second example, De Vos describes how an established money transfer company in the DRC took the initiative to launch a lower cost service dedicated to national transactions. Other money transfer services in the country typically cost 10-15 per cent of the amount to be transferred, which was quite expensive when transferring small amounts.

"The company's lower cost service dedicated to national transactions quickly attracted many customers. However, to access their clients' money, the company needed to establish a physical presence in a large number of remote or rural locations. SatADSL designed a cost-effective solution to enable money transfer companies to rollout their networks in suburbs and rural areas."

SatADSL has also been supporting radio broadcasters across the continent. "To cover a large territory, radio and television broadcasters often have to install a large number of local repeaters. The challenge is to send the signal to each repeater reliably and at a low cost.

"To route programmes using these repeaters, thanks to multicasting IP technology, the satellite solution is the simplest to use, fastest to implement, most reliable and least expensive. SatADSL offers services to companies wishing to broadcast their radio and television programs over a wide territory. Currently, almost 100 radio stations have already been equipped with our solution in just a few months."

Sevastiyanov Dmitriy, CEO, Gazprom Space Systems

According to Sevastiyanov Dmitriy, when the global satcoms market undergoes considerable changes, becoming more competitive, volatile and challenging, these 'megatrends' influence the businesses of all satellite operators, both global and regional – without exception. He believes Africa is the region where new market tendencies are the most evident.

"Last year proved that Gazprom Space Systems (GSS) selected the correct vector for its international business growth, making a bid for close cooperation with well-established operators and service providers who have clear vision of their business development and wide experience of operations in local regional markets.

"All our partners, having started with just trial projects, increased the volume of their rented satellite capacity and expanded the geography of their services. We continue to move in the same direction and see the fruits of the efforts: for the last two years our international business has doubled."

GSS' key satellite for the region is *Yamal-402* which was launched to 55ºE in 2012. Dmitriy says more customers are becoming interested in the satellite's capacity, and its most sought after link, Europe to Africa, is almost fully contracted.

"This capacity is used by European providers, having high-speed connections with telecommunication backbones in the Netherlands, Great Britain and Germany, for servicing customers in Africa.

"The capacity of *Yamal-402* is intended for services in the African continent but is also

demanded to solve communication problems in remote regions. Despite the development of fibre optic networks, communication via satellite often remains the only option available.

"Over the last year, all service providers working with the southern beam of our satellite have increased their deployed capacity. [For example] SatSpace Africa, one of our fastest growing partners, has doubled rented resource. This additional capacity has allowed it and its customers to expand the opportunities for providing high-quality internet access services in southern Africa."

Dmitriy adds that as part of its efforts to improve service quality, last year SatSpace established a new teleport in Luanda, Angola from where it uplinks signals to *Yamal-402*.

He continues by saying the satellite is also becoming more popular with the continent's broadcasters: "We have signed contracts with several large TV companies working in Western Africa. *Yamal-402*'s capacity is used for TV distribution in the region, and it is also in demand for SNG services."

As an example, Dmitriy says Telemedia in South Africa has used *Yamal-402* on a constant basis for two years for the distribution of African TV channels and Angolan state television. It is now actively developing SNG services from places of topical events – such as political, elections, sports meetings, etc. – on the continent.

"Telemedia's fleet of motor vehicles and mobile satellite communication stations, together with *Yamal-402*'s features which includes effective coverage of sub-Saharan Africa as well as inter-beam connectivity, allows quick, high-quality and organised TV reporting and content delivery both from within Africa, and from Africa to Europe.

"Another result of our close interaction with partners was the activation of *Yamal-402*'s steerable beam. Now it covers the countries of Central Africa (Angola, DRC, Tanzania, Zambia and their neighbours), and is actively loaded. In our opinion, this beam is pointed very well and may also deliver services to territories which have a sharp deficit of communications capabilities.

"Inter-beam connectivity with the Northern beam allows us to use the same European teleports for signal uplink, and the high power of the beam and flexible sales conditions attract new clients.

"African countries continue to show high thirst for development. It brings optimism, and Gazprom Space Systems together with its partners is eager to expand its activity in this region."
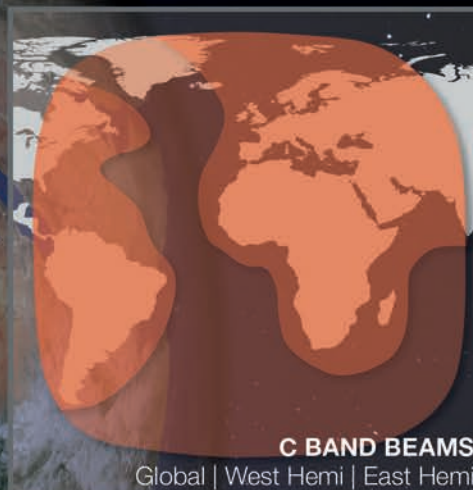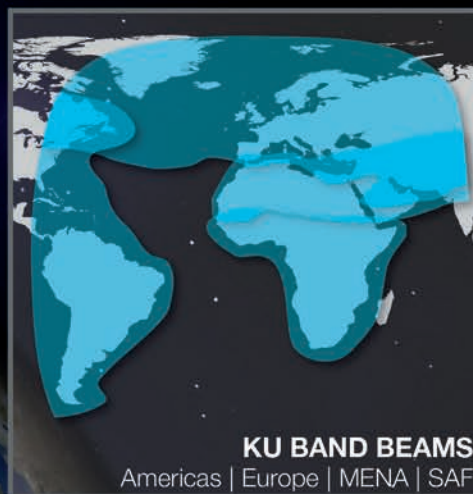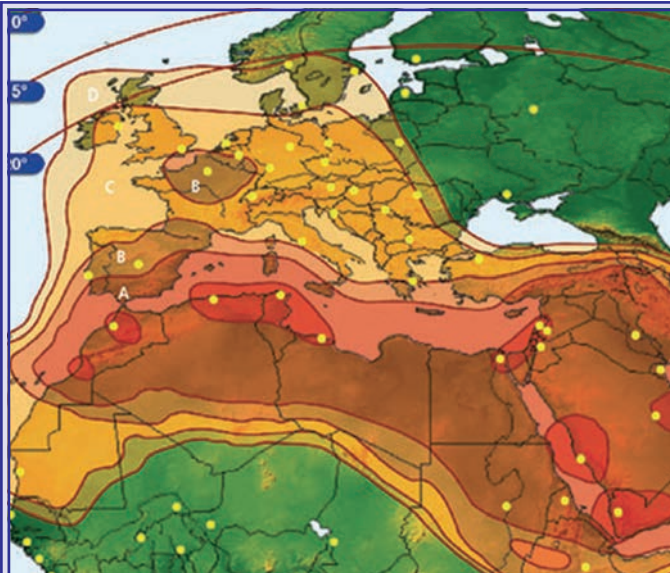
Arabsat BADR-4: 26°E

|	
Launch date:	November 2006
Transponders:	Ku-band/FSS – 16 LTWTAs for 12 active channels
	Ku-band/BSS – 20 TWTAs for 20 (BOL) or 16 (EOL)
Bandwidth:	Ku-band/FSS: 36MHz
	Ku-band/BSS: 34MHz
Frequencies:	Ku/FSS: 13.75 to 14.00GHz (uplink); 12.50 to 12.75GHz (downlink)
	Ku/BSS: 17.30 to 18.10GHz (uplink); 11.70 to 12.50GHz (downlink)
Polarisation:	Linear horizontal/vertical
Typical G/T:	Ku-band/FSS 6.2dBK; Ku-band/BSS 3.2dB/K
Typical EIRP:	Ku-band/FSS 51.8dBW
	Ku-band/BSS 51.8dBW
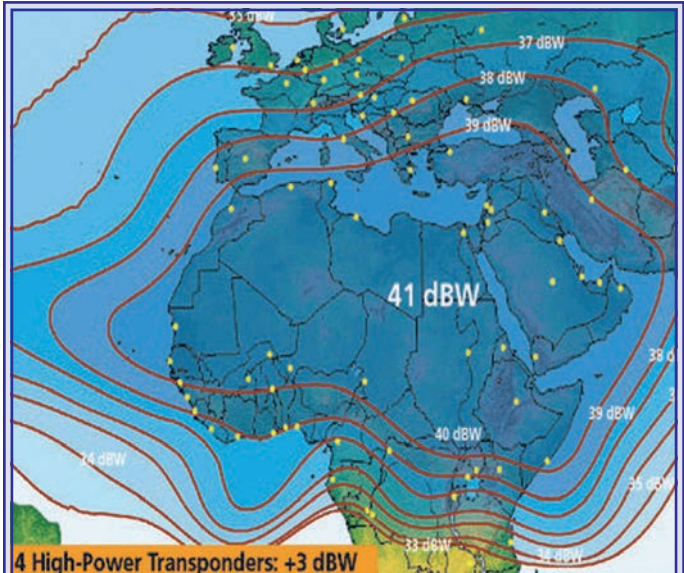
Arabsat BADR-6: 26°E

Launch date:	July 2008
Transponders:	Ku-band/BSS 20 (BOL) or 16 (EOL)
	C-band – 30 TWTAs for 24 active channels
Bandwidth:	Ku-band/BSS: 34MHz; C-band: 36MHz
Frequencies:	Ku/BSS: 17.30 to 18.10GHz (uplink); 11.70 to 12.50GHz (downlink)
	C-band: 5.925 to 6.425GHz (uplink); 3.700 to 4.200GHz (downlink)
Polarisation:	Linear horizontal/vertical
Typical G/T:	Ku-band/BSS 52.1dBK; C-band 1.2dB/K
Typical EIRP:	Ku-band/BSS 52.1dBW
	C-band 41dBW (medium power) & 43.5dBW (high power)
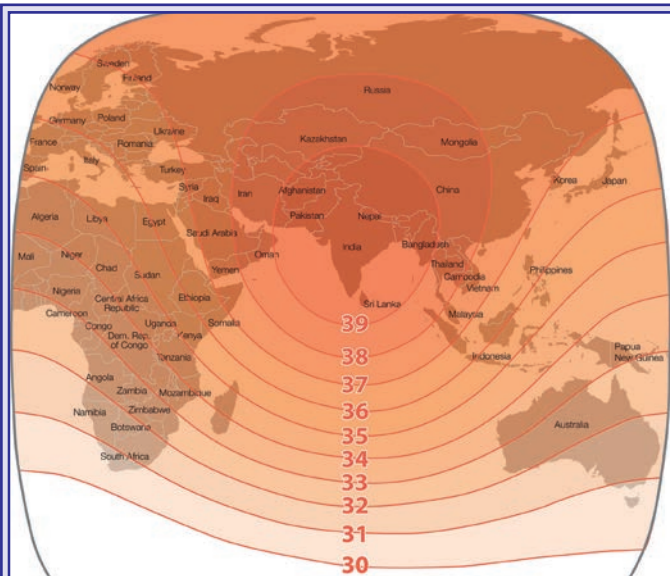
Asia Broadcast Satellite ABS-2: 75°E – Global C-band beam

Launch date:	February 2014
Transponders:	Up to 32
Bandwidth (MHz):	36, 72, 104
Uplink/downlink frequencies (GHz):	Standard & extended
Uplink/downlink signal polarisation:	Linear H & V
Cross-polarisation separation:	Better than 27dB
EIRP (peak):	45dBW
TWTA size:	62W
TWTA redundancy:	34
G/T (peak):	+6dB/K
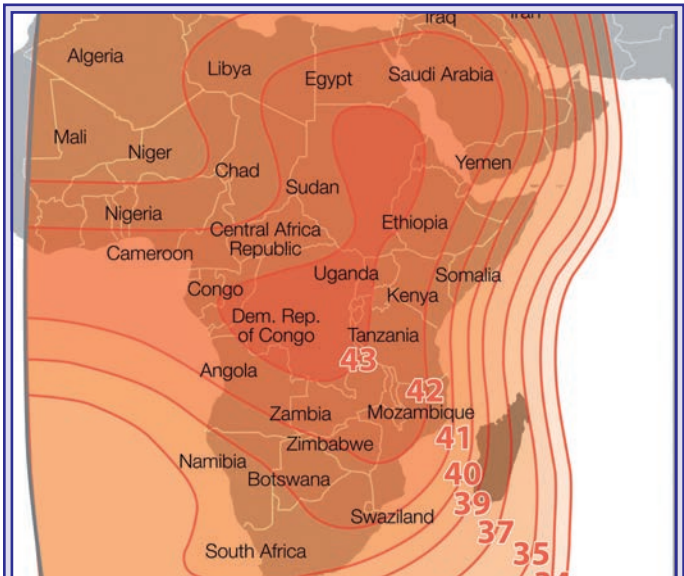
Asia Broadcast Satellite ABS-2: 75°E – West C-band beam

Launch date:	February 2014
Transponders:	Up to 32
Bandwidth (MHz):	36, 72, 104
Uplink/downlink frequencies (GHz):	Standard & extended
Uplink/downlink signal polarisation:	Linear H & V
Cross-polarisation separation:	Better than 27dB
EIRP (peak):	45dBW
TWTA size:	62W
TWTA redundancy:	34
G/T (peak):	+6dB/K
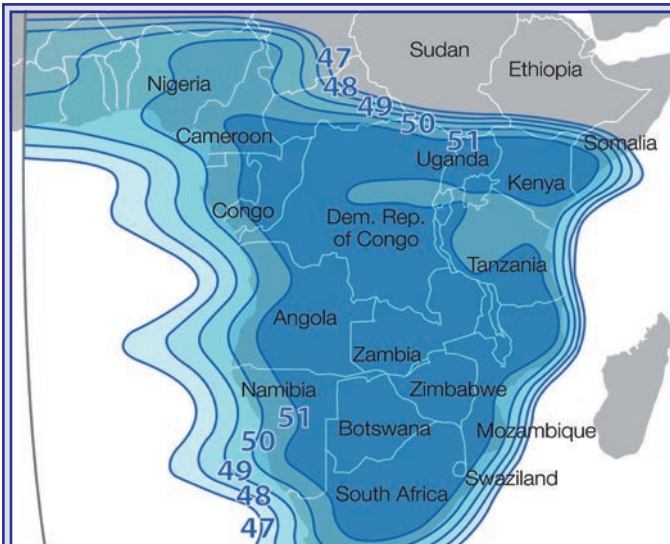
Asia Broadcast Satellite ABS-2: 75°E – South & Central Ku-band beam

Launch date:		February 2014
Transponders:	**Ku-band**	**Ka-band**
	Up to 51	Up to 6 (commercial & military)
Bandwidth (MHz):	54, 108	435 (commercial), 225
(military)		
Uplink/downlink frequencies (GHz):	FSS & BSS	Commercial & military
Uplink/downlink signal polarisation:	LinearH&V	Circular RHCP & LHCP
Cross-polarisation separation:	Better than 27dB	
EIRP (peak):	53dBW	49dBW
TWTA size:	143W	117W
TWTA redundancy:	52	6
G/T (peak):	+7dB/K	+2dB/K
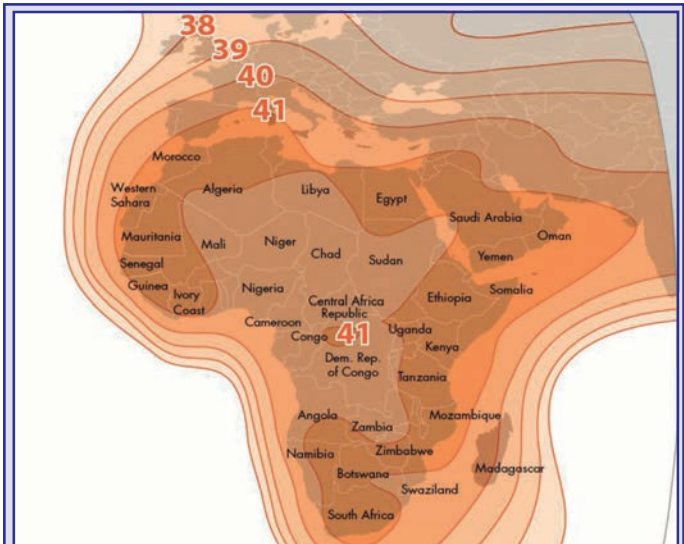
Asia Broadcast Satellite ABS-3A: 3°W – East hemi beam

Launch date: March 2015

Transponders: 24 C-band 72MHz; 24 Ku-band 72MHz

C-band uplink/downlink: 5.850-6.425GHz/3.625-4.200GHz

Ku-band uplink/downlink: 13.750-14.750GHz/10.700-11.200GHz

11.450-11.700GHz, 12.500-12.750GHz

EIRP (Peak Value) (dBW)	**C-band:**	**Ku-band:**
	39 (global)	49 (Europe)
	41 (east hemi)	50 (MENA)
	42 (west hemi)	49 (SAF)
		51 (Americas)
TWTA size:	70W	150W
Polarisation:	Linear (H & V)	
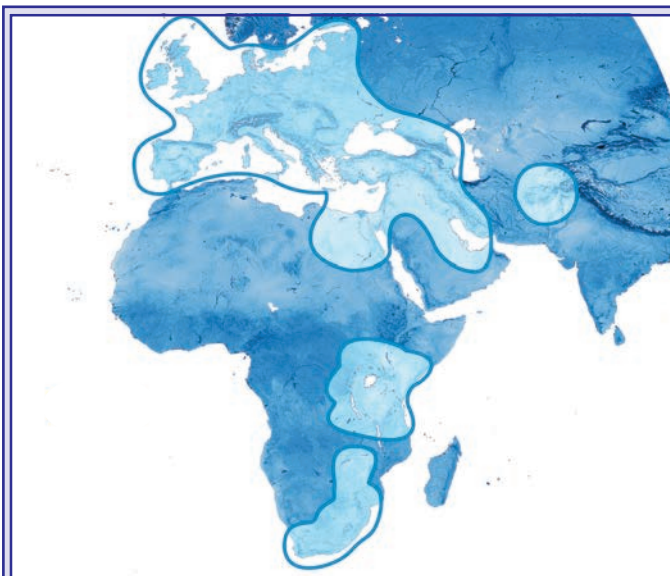
Avanti Communications HYLAS 2: 31°E

Launch date: August 2012

Ka-band uplink: 27.5GHz (forward); 29.5GHz to 30GHz (return)

Active Ka-band forward transponders: 24

Forward channel bandwidth: 230MHz per beam

Ka-band downlink: 19.7GHz to 20.2GHz (forward); 17.7GHz to 19.7GHz (return)

Active Ka-band return transponders: 6

Return channel bandwidth: 220MHz per beam

Typical 'dry beam' EIRP (at edge of coverage): up to 58dBW

G/T (at edge of coverage): up to 11.5dB/K-1

Typical 'wet beam' EIRP (at edge of coverage): up to 61.5dBW

G/T (at edge of coverage): up to 14.0dB/K-1
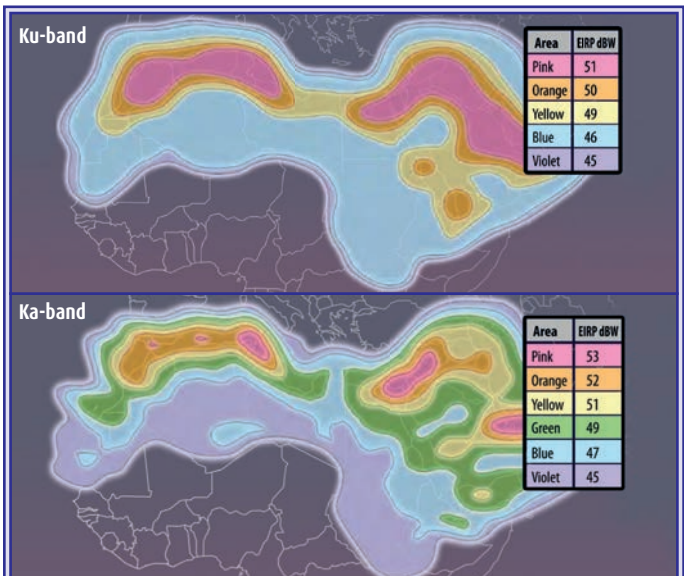
Es'hailSat: 25.5°E

Parameter	Ku-band	Ka-band
Coverage	MENA	MENA
Number of transponders	Up to 8	7
Transponder bandwidth	33MHz and 50MHz	33MHz and 50MHz
Polarisation	Dual linear	Dual linear
Uplink frequencies	Standard 14 GHz band	18.1-18.4GHz
Downlink frequencies	Standard 10/11 GHz band	21.4-21.7GHz
eirp (peak)	51-52dBW	50-51dBW
G/T (peak)	+5dB/K	+5dB/K
Uplink sfd	-95 to -65 dBW/m² (location dependent, 22dB dynamic range)	-95 to -69 dBW/m² (location dependent, 22dB dynamic range)

41 dBW
40 dBW
39 dBW
38 dBW
37 dBW
35 dBW
33 dBW
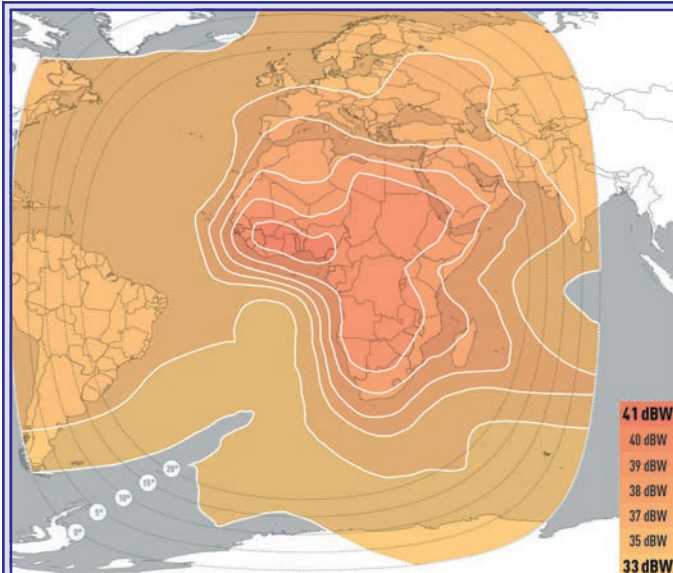
EUTELSAT 3B: 3°E

A tri-band satellite for Europe, Africa, the Middle East, Central Asia and South America, EUTELSAT 3B offers resources in Ku-, C- and Ka-band connected to fixed and steerable antennas for flexibility. It enables users to select the most relevant frequency band. Eutelsat says the Ku- and C-band capacity is optimised for broadcast and data markets, while the high throughput Ka-band beams are ideal for bandwidth-demanding markets.

Launch date: May 2014
Manufacturer: Airbus Defence and Space
Projected lifetime: Over 15 years
Launch craft: Sea Launch AG's Odyssey
Operational transponders: Up to 51
Downlink polarisation: Ku-, Ka- and C-bands

50 dBW
49 dBW
48 dBW
44 dBW
40 dBW
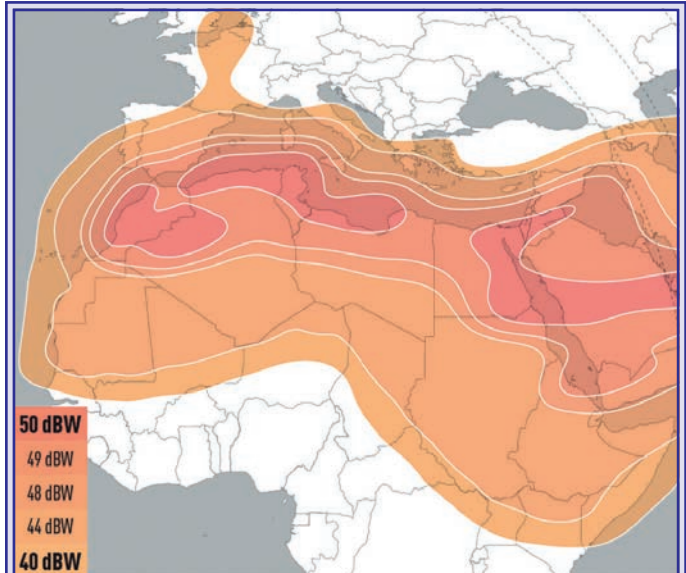
EUTELSAT 8 West B Ku-band: 8°W

EUTELSAT 8 West B is a new high-capacity spacecraft equipped with 40 operational Ku-band transponders designed primarily to serve DTH markets in North Africa and the Middle East.

Launch date: August 2015
Manufacturer: Thales Alenia Space
Projected lifetime: Over 15 years
Launch craft: Ariane 5
Operational transponders: 40 Ku-band, 10 C-band
Frequencies: Ku-band, C-band

41 dBW
39 dBW
38 dBW
37 dBW
36 dBW
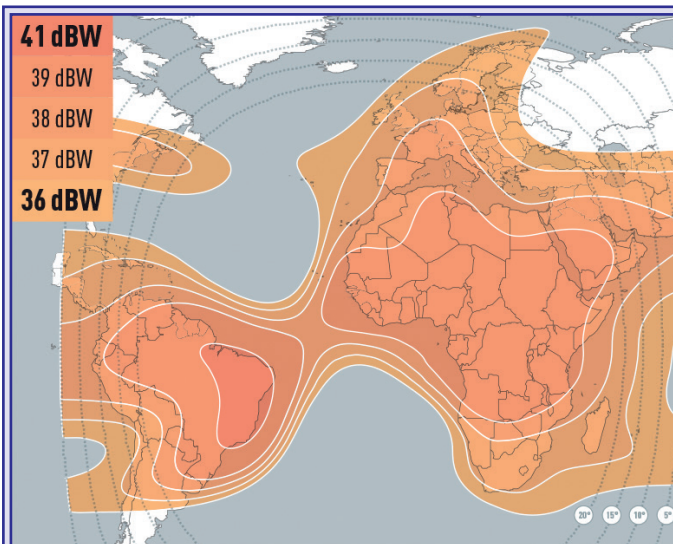
EUTELSAT 8 West B C-band: 8°W

EUTELSAT 8 West B is a new high- capacity spacecraft equipped with 10 C-band transponders connected to footprints covering the African continent and reaching west to South America.

Launch date: August 2015
Manufacturer: Thales Alenia Space
Projected lifetime: Over 15 years
Launch craft: Ariane 5
Operational transponders: 40 Ku-band, 10 C-band
Frequencies: : Ku-band, C-band

52 dB/W
50 dB/W
48 dB/W
46 dB/W
44 dB/W
42 dB/W
40 dB/W
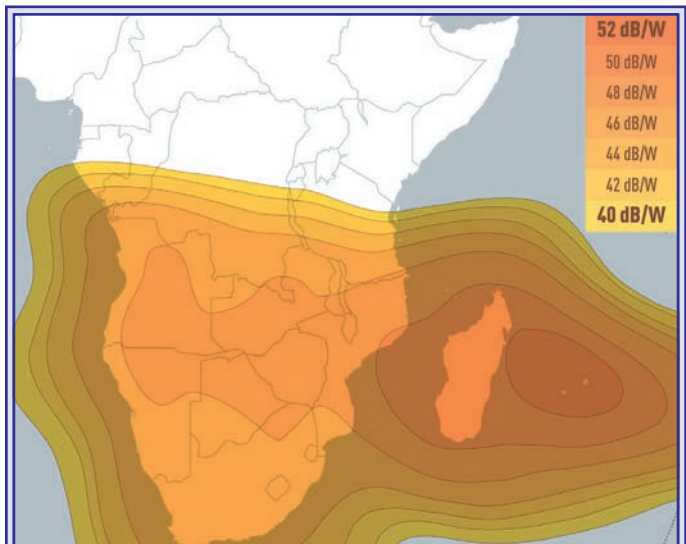
EUTELSAT 10A: 10°E

EUTELSAT 10A carries a powerful payload of Ku-band capacity, while also boosting C-band capacity available through Eutelsat's fleet for services across Africa. The Ku-band payload offers an enhanced widebeam footprint serving Europe, North Africa & the Middle East. A second Ku-band beam serves southern Africa & Indian Ocean islands, & enables connectivity between Africa & Europe. The C-band payload provides pan-African coverage, extending to India, parts of Asia, as well as Latin America, for broadband & telecommunications services.

Launch date: April 2010 **Launch craft:** ILS Proton
Manufacturer: Thales Alenia Space
Operational transponders: up to 46 in Ku-band; up to 10 in C-band
Transponder bandwidth: Ku-band: 36, 72MHz; C-band: 72MHz
Downlink: Ku-band: 10.7 to 11.70GHz, 12.5 to 12.75GHz; C-band: 3.6 to 4.2GHz
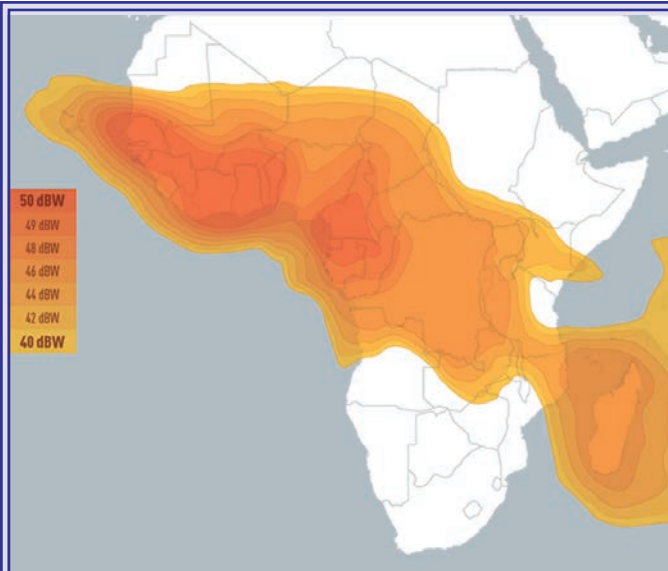
EUTELSAT 16A: 16°E

Through its configuration of Ku- & Ka-band transponders, EUTELSAT 16A's coverage stretches from Senegal to South Africa. A second regional footprint over Madagascar & Indian Ocean islands serves the Canal+ Overseas, Parabole Réunion & Orange platforms, as well as France Télévisions to support digital switchover in Reunion Island and Mayotte.

Launch date: October 2011   **Projected lifetime:** 15 years

Operational transponders: 56   **Bandwidth:** 36, 54, 72, 108MHz

Downlink frequencies: 10.70 to 11.70GHz; 12.50 to 12.75GHz; 21.4 to 22.00GHz

Beacon 1: 11 200.800MHz   **Beacon 2:** 11 699.200MHz

Beacon 3: 12 500.000MHz   **Beacon 4 Ka:** 21 401.000MHz

Polarisation: Horizontal (X)
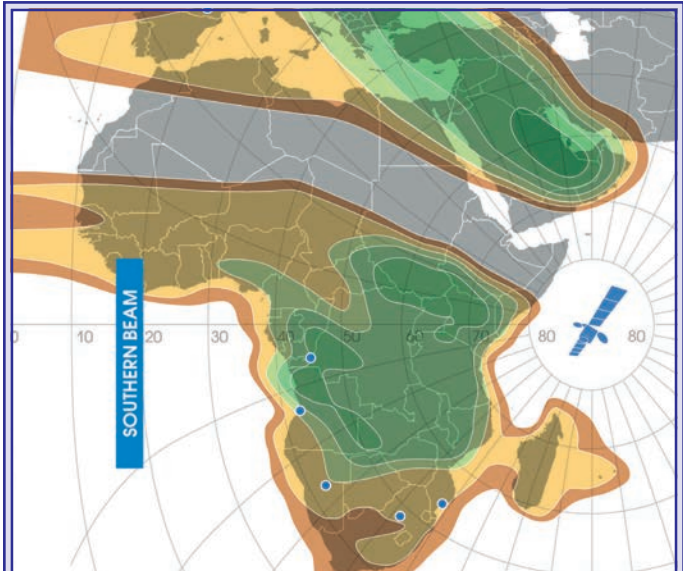
Gazprom Space Systems Yamal-402: 55°E

Launch date:	December 2012
Frequency:	Ku
Transponders:	12 x 72MHz; 18 x 36MKHz; 16 x 54MHz
Transmitter output power:	120 - 150W
Beams:	Four fixed: Russian, Northern, European, Southern, and one steerable. Eight 54MHz transponders are operating in a wide South beam that covers sub-Sahara Africa.
Payload power:	10,800W
Lifetime:	15 years
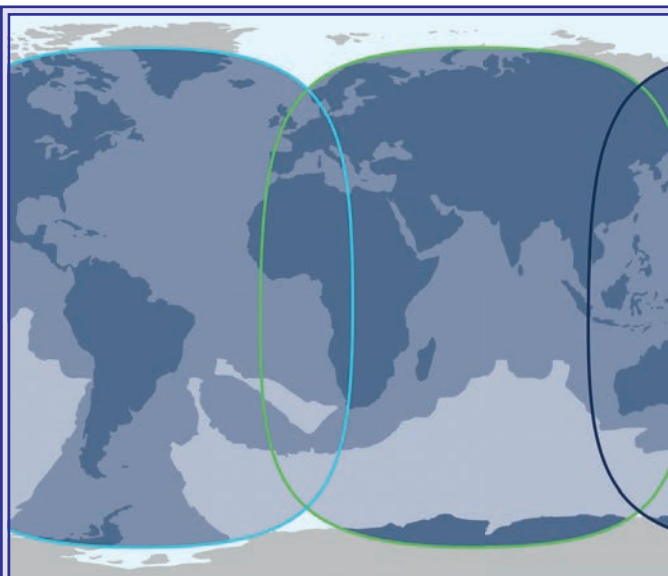
Inmarsat Global Xpress 63°E

Satellite Name: Inmarsat-5F1 (Inmarsat 5F1, I5-IOR)

Status: active

Position: 63° E (63° E)

Launch date: 8 December 2013

Launch site: Baikonur Cosmodrome

Launch vehicle: Proton M

Launch mass (kg): 6070

Manufacturer: Boeing (Hughes)

Model (bus): BSS-702HP

Orbit: GEO

Expected lifetime: 15 years

Intelsat IS-20: 68.5°E

Launch date:	August 2012
C-band total transponders:	8 x 54MHz; 16 x 27MHz; 12 x 36MHz C/Ku cross-strap
Polarisation:	linear – horizontal or vertical
Uplink:	5850 to 6425MHz
Downlink:	3700 to 4200MHz
e.i.r.p. (typical edge of coverage):	> 30.7dBW
G/T range:	> -10.6dB/K
Edge of coverage SFD range:	-97.0 to -68.0dBW/m2 (at G/T = -10.6dB/K)
Ku-band total transponders:	48 x 36MHz, 6 x 72MHz
Ka-band total transponders:	1 x 500MHz
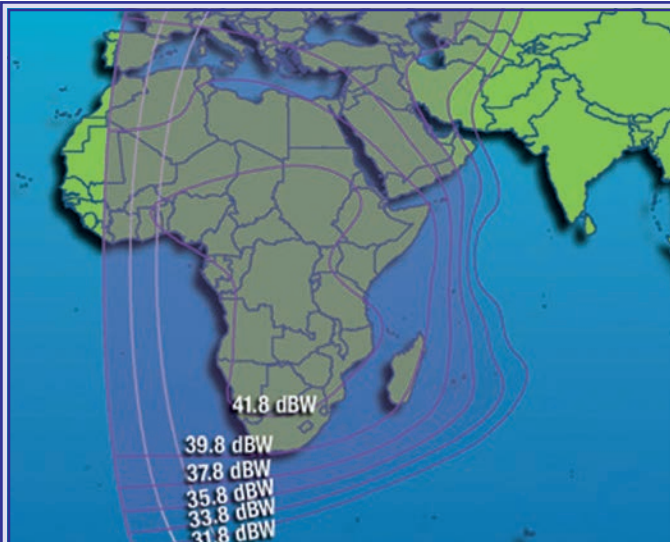
Intelsat IS-22: 72°E

Launch date:	March 2012
Transponders:	C-band: 24 x 72MHz
	Ku-band: 12 x 36MHz, 6 x 72MHz
Polarisation:	circular right/left hand (C-band);
	linear horizontal/linear (Ku-band)
Downlink frequency:	3625 to 4200MHz (C-band)
	11.45 to 11.70GHz (K-band)
C-band G/T range (edge to beam peak):	-3.3 up to 2.6db/K (East Hemi)
	-1.9 up to 3.6dB/K (West Hemi)
Ku-band G/T range (edge to beam peak):	-1.5 up to +4.9db/K (MEA)
	-0.9 up to +2.3dB/K (Mobility)
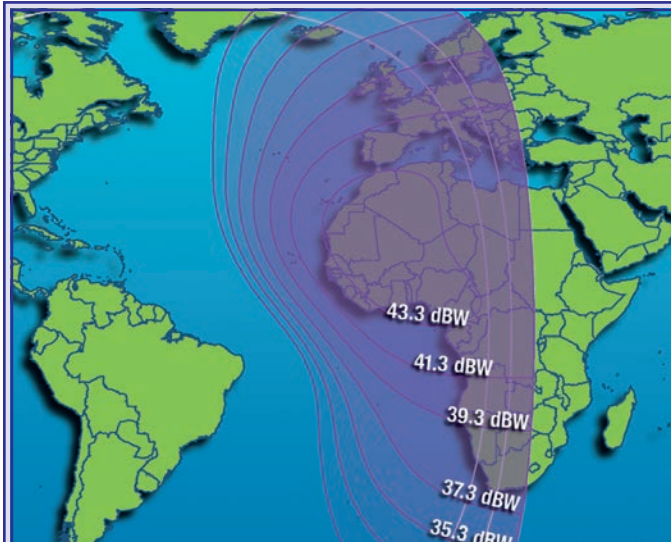
Intelsat IS-23: 307°E

Launch date:	October 2012
C-band total transponders:	24 active in combination of 36, 41, 72MHz
	channels (up to 46 equivalent of 36MHz units)
Polarisation:	circular – right/left hand
Downlink frequency:	3700 to 4200MHz
Edge of coverage e.i.r.p:	West Hemi: > 32.6dBW; East Hemi: > 33.2dBW
	Global: > 31.7dBW
Uplink frequency:	5925 to 6425MHz
Edge of coverage G/T range:	West Hemi: -8.4dB/K
	East Hemi: -7.6dB/K
	Global: -9.6dB/K
Edge of coverage SFD:	-97.0 to -76.0dBW/m
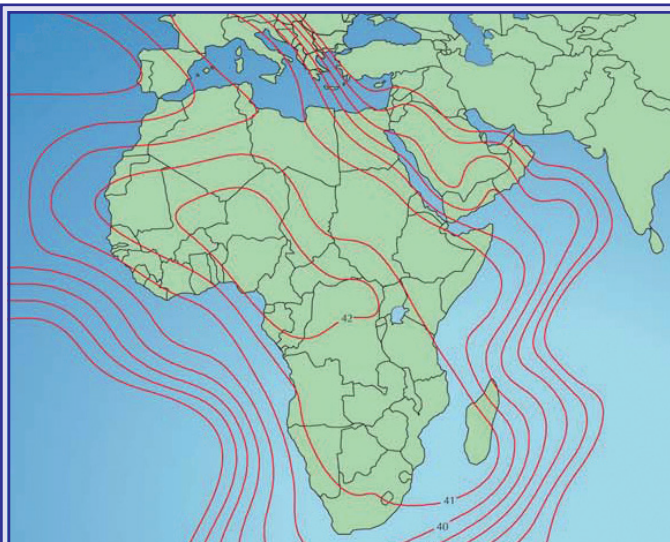
MEASAT AFRICASAT-1A/AZERSPACE-1: 46°E

Africasat 1a/Azerspace-1 is the result of a USD300m, three-year collaboration between Malaysia-based MEASAT Satellite Systems & the Azercosmos Joint Stock Company set up by the Government of the Republic of Azerbaijan. It provides high powered satellite communications services across Africa, central Asia and Europe. As well as C-band capacity across Africa with connectivity to Europe, the Middle East & south-east Asia, Ku-band services are also offered across south-east Asia.

Launch date: February 2013
Manufacturer: Orbital Sciences Corporation
C-band transponders (36MHz equivalent): up to 24
Typical EIRP beam coverage: 42dBW (max)
G/T (dB/oK): −1 (max)
TWTA power: 65W   **Polarisation:** linear
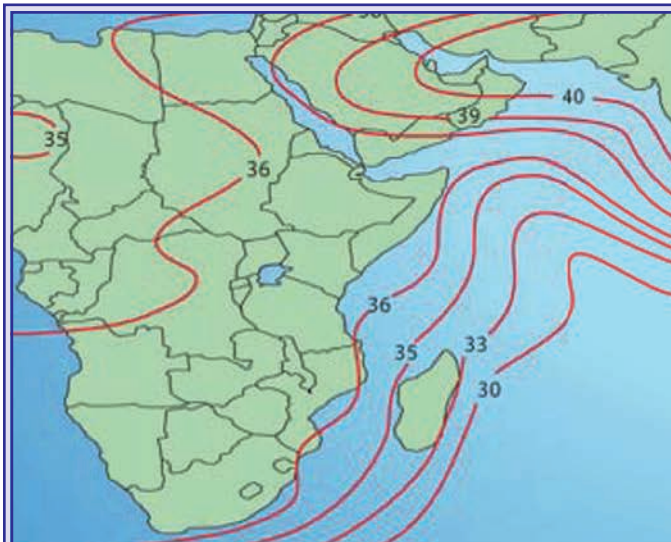
MEASAT 3A: 91.5°E

MEASAT-3a carries 12 Ku- & 12 C-band active transponders along with three antennas. It covers Asia, the Middle East & Africa, serving C-band markets throughout the region with a global beam, & Ku-band beams that support broadcasting markets in southeast Asia. MEASAT-3a generates approximately 3.6kW of payload power.

Launch date: June 2009
Manufacturer: Orbital Sciences Corporation
C-band transponders (36MHz equivalent): 12
Typical EIRP beam coverage (C-band): 42dBW
G/T (dB/oK) (C-band): +1.3 (max)
TWTA power (C-band): 60W
Polarisation: linear
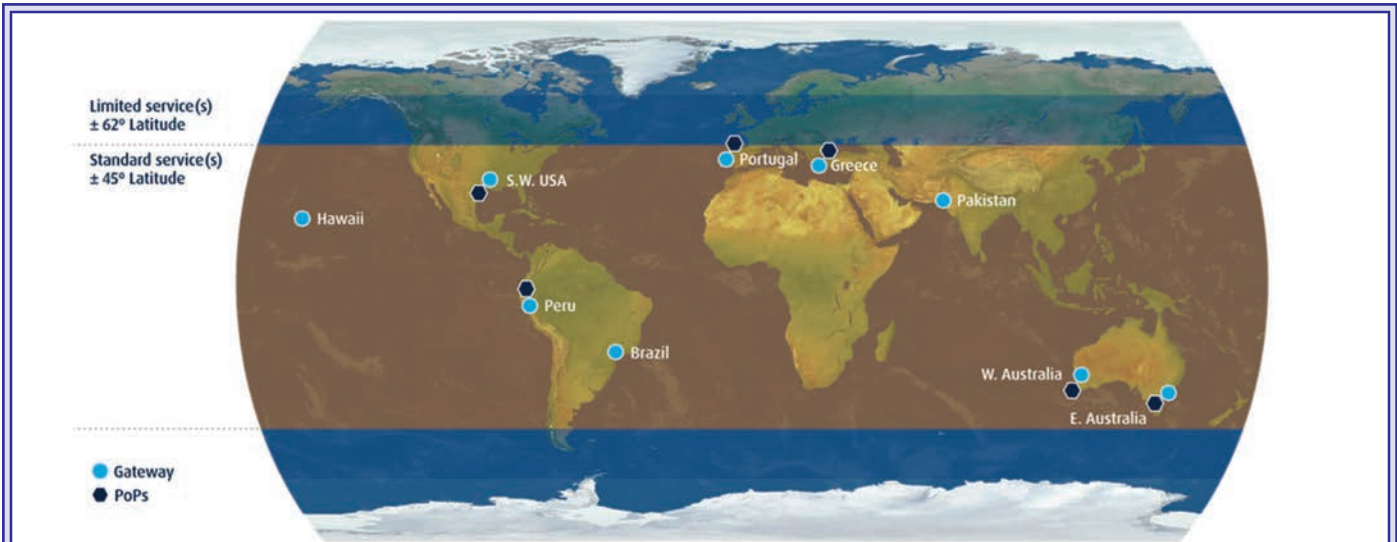
O3b Networks: 45ºN/S

O3b Networks has launched an initial constellation of 12 satellites. These have been placed in Medium Earth Orbit (MEO) and circumnavigate the planet from a height of 8,062km. O3b says its MEO fleet will provide around 70 per cent of the world's population with fibre quality and low latency services such as internet connectivity and trunking. It has established a global network of gateways that have been strategically located on the internet backbone.

Launch dates:	June 2013 (first set of four); July 2014 (second set of four); December 2014 (third set of four)
Manufacturer:	Thales Alenia Space
Orbital inclination:	<0.1°
Ground period:	360 minutes/Four contacts per day
Beams:	Ka-band; 10 beams per region (seven regions) totaling; 70 remote beams per eight satellite constellation
Capacity:	Up to 1.2Gbps per beam (600Mbps x 2); 84 Gbps available per 8 satellite constellation
Beam coverage:	700km diameter
Transponder bandwidth:	216 MHz; 2 x 216 MHz per beam
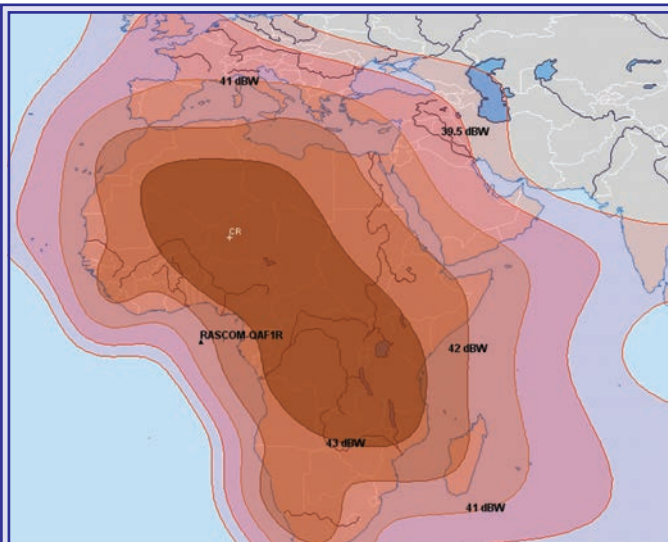
RASCOM-QAF1R: 2.9°E

Launch date: August 2010

Number of equivalent transponders (36MHz): 24.5

Ku-band: 10 transponders within 10.7–10.95GHz & 11.2–11.45GHZ

C-band: 6 transponders within 3.9–4.2GHz & 10 within 4.5–4.8GHZ

G/T (max): Ku-band -2dB/K; C-band -6dB/K

(Global standard C-band CU)

Uplink: 6190 to 6425MHz

Downlink: 3965 to 4200MHz

(Southern Ku-band – KS)

Uplink: 12750 to 13250

MHz Downlink: 10700 to 11450MHz
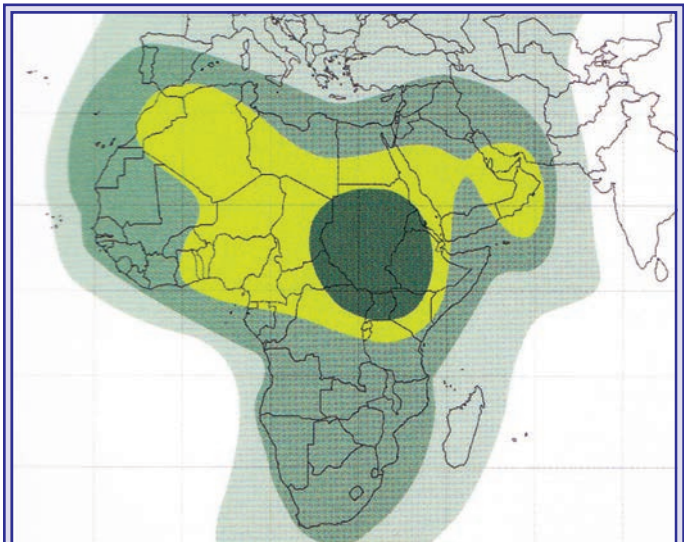
Yahsat Y1A: 52.5°E

C-band key parameters

Yahsat claims to be the first company in Africa and the Middle East to offer hybrid satellite services to the region with the Y1A. Its tri-band coverage connects users to more than 85 countries across Africa, the Middle East, Europe, & South West Asia. It also offers the possibility of inter-beam connectivity. Yahsat launched its second satellite, Y1B, in April 2012.

Launch date:	April 2011
Number of transponders:	C-band 8 x 36MHz plus 6 x 54MHz
	Ku-band BSS 25 x 33MHz
	Ka-band secure Military 21 x 54MHz
Primary power:	10,900W
C-band power:	>37dbW to >43dbW
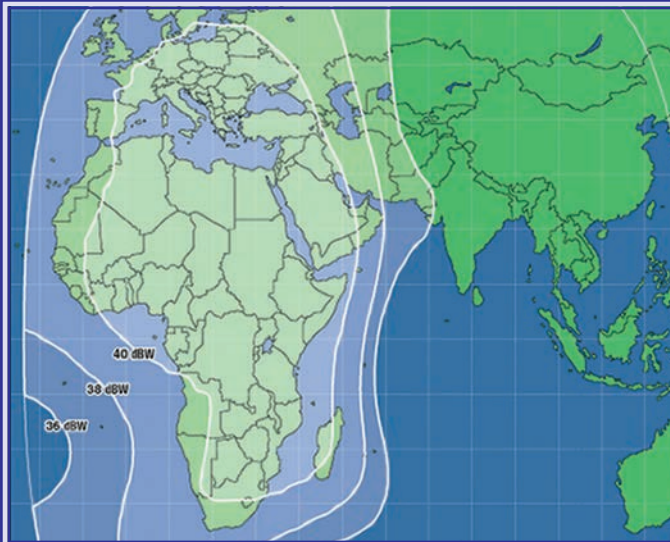
RSCC Express-AM6: 53°E
C-band, fixed beam, EMEA.

Express-AM6 is designed for TV broadcasting, enterprise networks, disaster recovery and business continuity, IP trunking, cellular backhaul, oil & gas and mobility applications.

Launch date: October 2014
Operational lifetime: 15 years

Frequency span:	C-	Ku-	Ka-	L-
Number of transponders:	14	32 (12)	10	2
Transponder bandwidth, MHz:	40	54 (36)	110	0.5
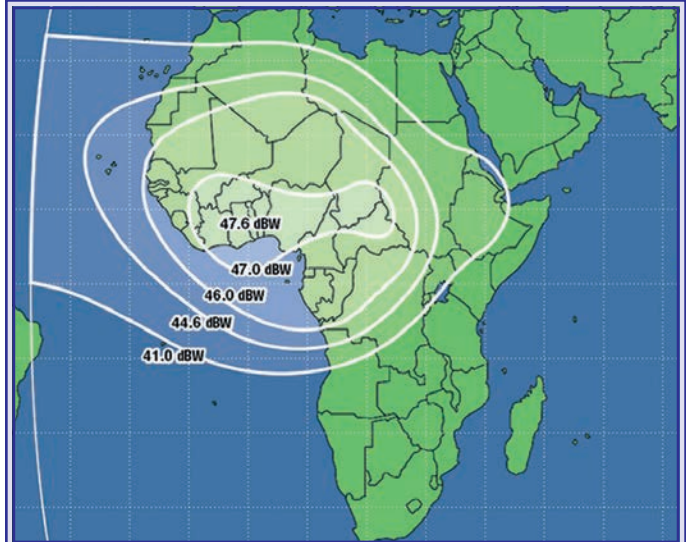
RSCC Express-AM7: 40°E
C-band, steerable spot beam, optional pointing: West Africa.

Express-AM7 is designed for TV broadcasting, enterprise networks, cellular backhaul, oil & gas and government applications.

Launch date: March 2015
Operational lifetime: 15 years

Frequency span:	C-	Ku-	L-
Number of transponders:	30	48	2
Transponder bandwidth, MHz:	40	36	0.5

RSCC Express-AM7: 40°E
Ku-band, steerable spot beam, optional pointing: East Africa.

Express-AM7 is designed for DTH, enterprise networks, broadband internet access, USO, telemedicine and distance learning applications.

Launch date: March 2015
Operational lifetime: 15 years

Frequency span:	C-	Ku-	L-
Number of transponders:	30	48	2
Transponder bandwidth, MHz:	40	36	0.5
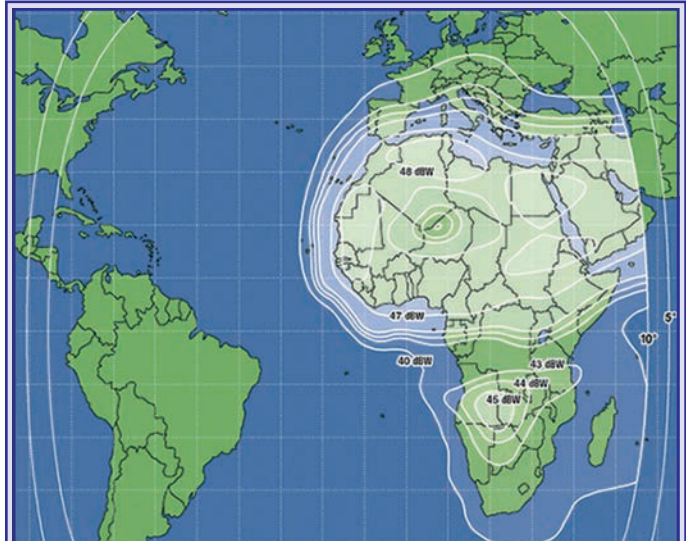
RSCC Express-AM8: 14°W
Ku-band, fixed beam, MENA & West Africa.

Express-AM8 is designed for TV broadcasting, enterprise networks, broadband internet access, USO, telemedicine and distance learning applications.

Launch date: June 2015 (expected)
Operational lifetime: 15 years

Frequency span:	C-	Ku-	L-
Number of transponders:	24	16	2
Transponder bandwidth, MHz:	40	36 (12) 54 (4)	0.5
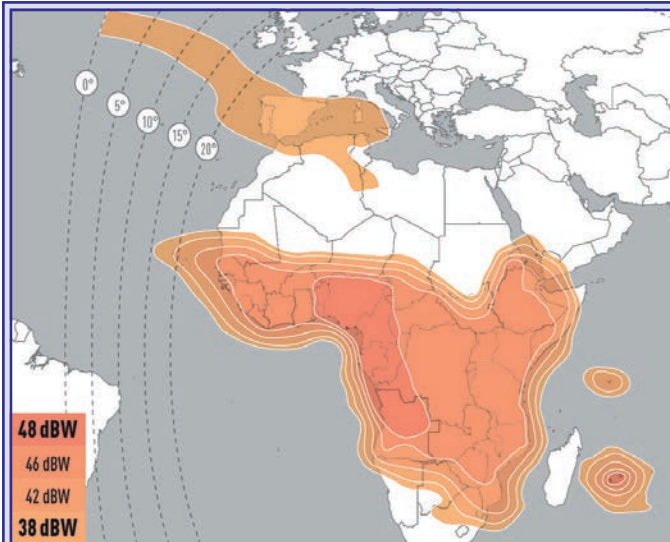
RSCC Ekspress-AMU 1 / Eutelsat 36C: 36°E

Ekspress-AMU1 has up to 70 transponders in Ku- and Ka-band. It provides service to Russia and continuity and growth for broadcast markets developed by Eutelsat in sub-Saharan Africa under the name Eutelsat 36C.

Launch date:	December 2015
Coverage:	Russian, sub-Saharan Africa
Launch vehicle:	Proton-M
Design life:	15 years
Manufacturer:	Airbus Defence and Space
Polarisation:	Ku-band: linear; Ka-band: circular
Total transponders:	70 Ku- and Ka-band
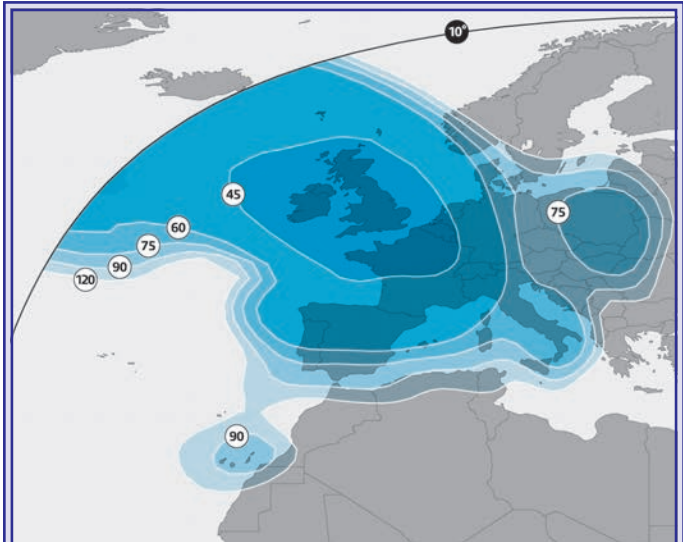
SES ASTRA 2E: 28.2°E / 28.5°E

Delivers broadcast, VSAT and broadband services in Europe, Middle East and Africa, and carries Ku- and Ka-band payloads at a prime dual orbital location. The Middle East beam provides a Ka interconnect feature.

Launch date:	September 2013
Coverage:	Middle East , North Africa, Europe
Launch vehicle:	Proton
Design life:	15 years
Manufacturer:	EADS Astrium
Polarisation:	Ku-band: linear; Ka-band: circular
Total transponders:	Ku-band: 42 (Europe); 12 (Middle East). Ka-band: 4 (250MHz, 500MHz and 600MHz)
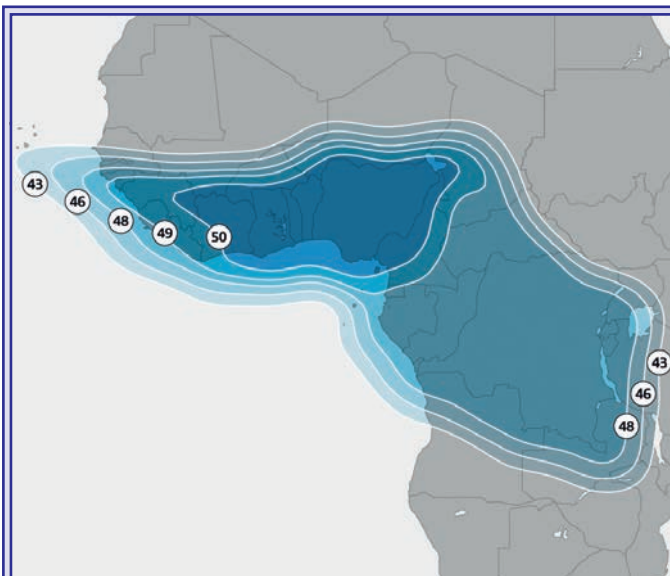
SES ASTRA 2F: Orbital location: 28.2°E/28.5°E

Serves to deliver next-generation broadcast, VSAT and broadband services in Europe, Middle East and West Africa, and carries Ku- and Ka-band payloads.

Launch date:	September 2012
Launch vehicle:	Ariane 5 ECA
Design life:	15 years
Manufacturer:	EADS Astrium
Polarisation:	Ku-band: linear; Ka-band circular
Total transponders:	Ku-band: 40 (Europe); 12 (Africa) Ka-band: 3 (500MHz & 600MHz)
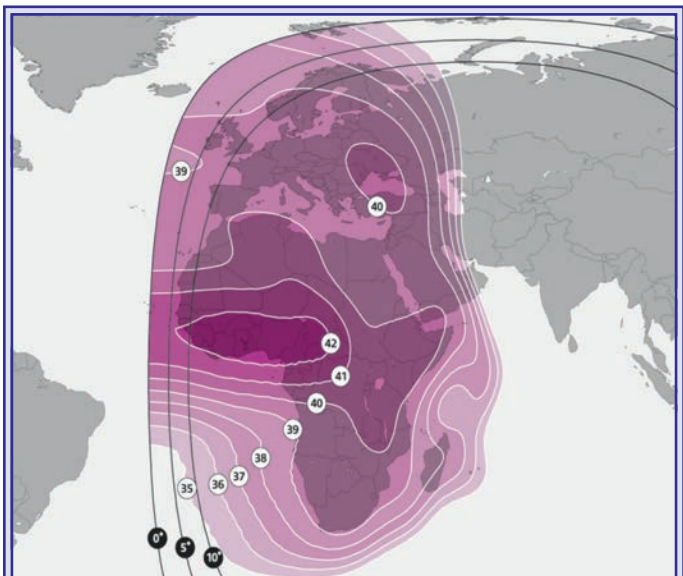
SES NSS-12 West Hemi C-band beam: 57°E

NSS-12 allows customers to directly connect PoPs to the global internet backbone & link teleports in Europe, Africa & Asia. NSS-12 is capable of cross-strapping between C- & Ku-band transponders, & can cross-connect China to Africa.

Launch date: October 2009
Manufacturer: Loral Space Systems 1300
Projected life: 15 years
Number of C-band transponders: 36
Typical EIRP beam coverage: 35 to 42dBW
Polarisation: circular RHCP/LHCP
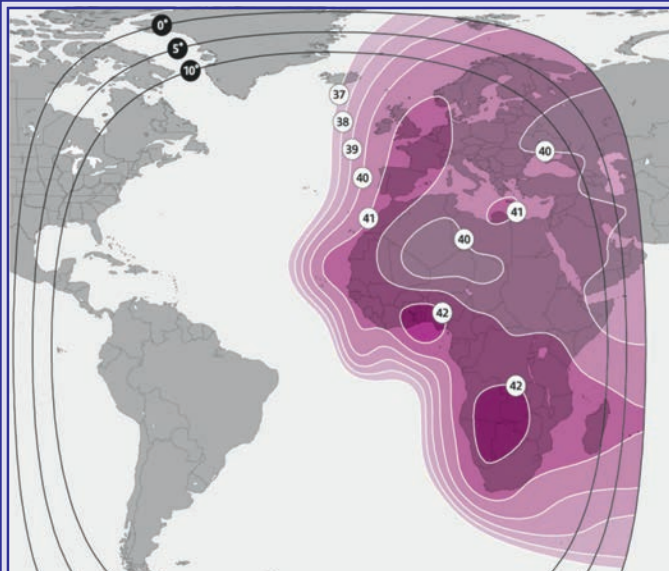
SES-4 East Hemi C-band beam: 338°E

The high-powered East Hemi beam covers all of Africa, including Madagascar, & is capable of cross-strapping to the Ku-band beams. The incremental global capacity can support maritime services, trunking applications, & more.

Launch date: 2011
Manufacturer: Loral Space Systems 1300
Projected life: 15 years
Number of C-band transponders: 36
Typical EIRP beam coverage: 37 to 42dBW
Polarisation: circular RHCP & LHCP
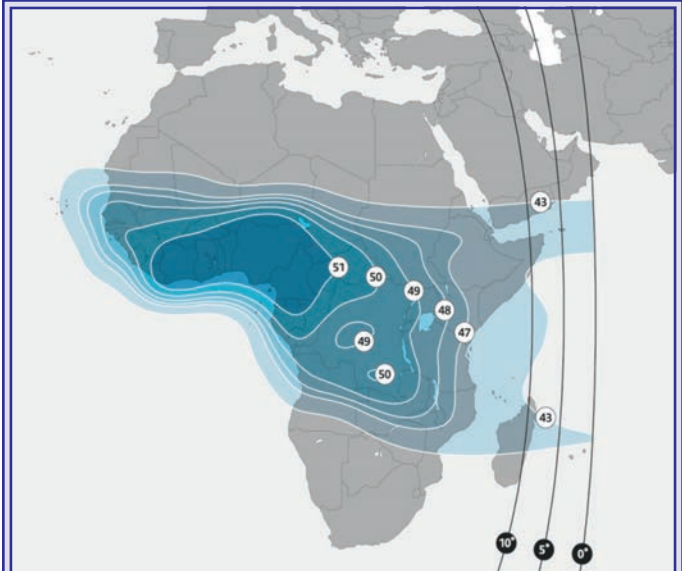
SES-4 West Africa Ku-band beam: 338°E

SES-4 has replaced NSS-7 to provide enhanced coverage over Africa. The high-powered beam is ideal for DTH & VSAT services throughout the region, as well as linking Africa & Europe.

Launch date: 2011
Manufacturer: Loral Space Systems 1300
Projected life: 15 years
Number of Ku-band transponders: 50
Typical EIRP beam coverage: 43 to 51dBW
Polarisation: linear horizontal & vertical
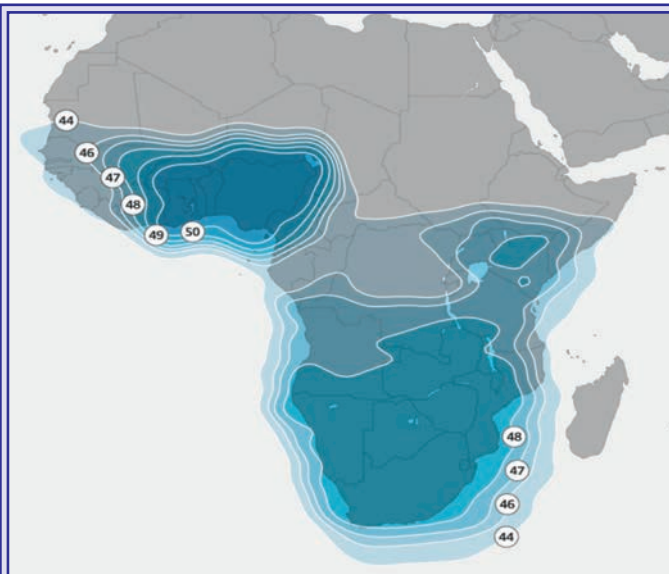
SES ASTRA 4A: 5°E

The high-powered beam provides DTH coverage to multiple African markets with a dedicated Ku-band beam from a single orbital position. SES says that this eliminates the need for dual illumination from separate beams. It adds that customers can uplink & downlink within the African footprint, & also between Africa and Europe.

Launch date: November 2007
Manufacturer: Lockheed Martin A2100
Projected life: 15 years
Number of Ku-band transponders: 61
Typical EIRP beam coverage: 44 to 50dBW
Polarisation: linear horizontal/vertical
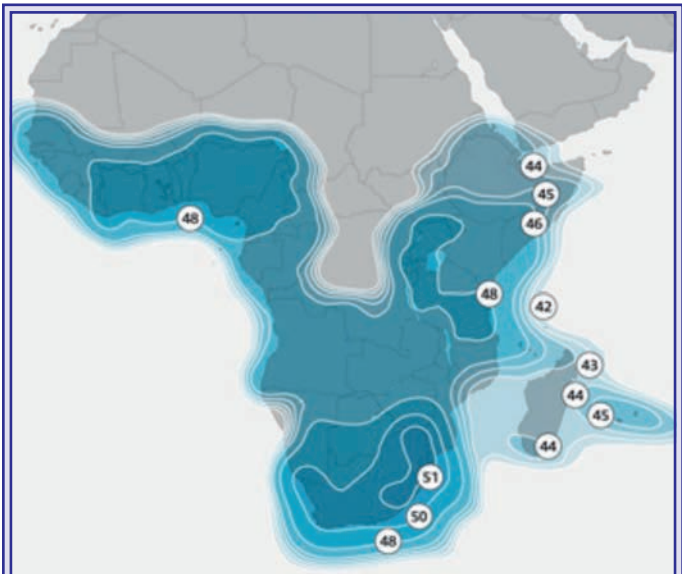
SES-5 sub-Saharan Africa Ku-band beam: 5°E

The high performance Ku-band beam offers powerful & reliable coverage to deliver DTH services across sub-Saharan Africa.

Launch date: July 2012
Manufacturer: Loral Space Systems 1300
Projected life: 15 years
Number of Ku-band transponders: 49
Typical EIRP beam coverage: 42 to 51dBW
Polarisation: linear horizontal/vertical
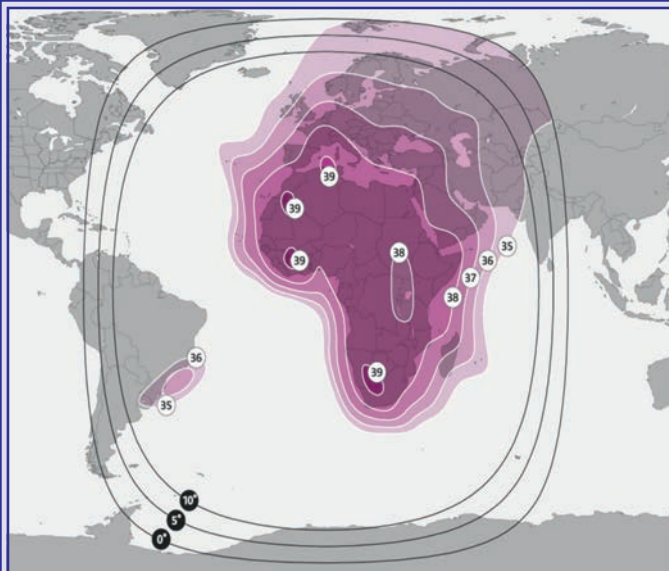
SES-5 Hemi C-band beam: 5°E

SES-5's East Hemi beam provides high-powered & comprehensive C-band coverage of the African continent to support services including wireless backhaul & enterprise VSAT networking. The beam's unique coverage also enables uplinking from teleports in Europe & the Middle East.

Launch date: July 2012
Manufacturer: Loral Space Systems 1300
Projected life: 15 years
Number of C-band transponders: 20
Typical EIRP beam coverage: 35 to 39dBW
Polarisation: circular left/right
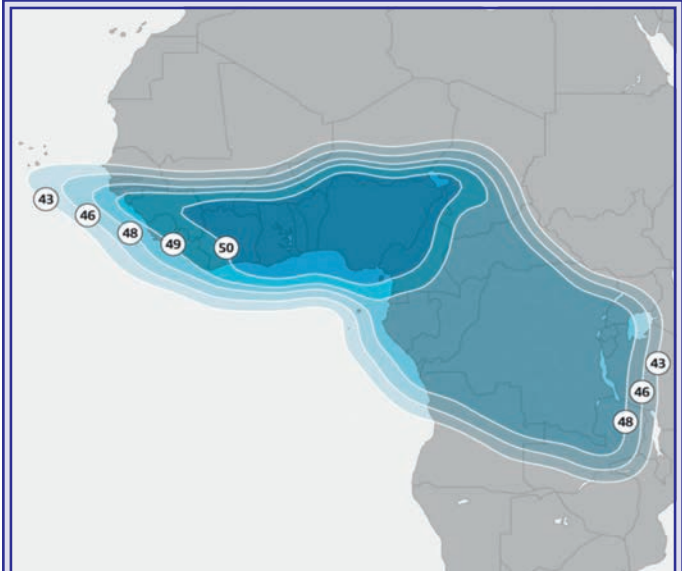
SES ASTRA 2F: 28.2°E

Designed to deliver next-generation broadcast, VSAT and broadband services in Africa as well as the Middle East & Europe. Its payload includes Ku- and Ka-band transponders.

Launch date: September 2012
Manufacturer: EADS Astrium Eurostar E3000 platform
Projected lifetime: 15 years
Number of Ku-band transponders: 64
Polarisation: linear horizontal/vertical
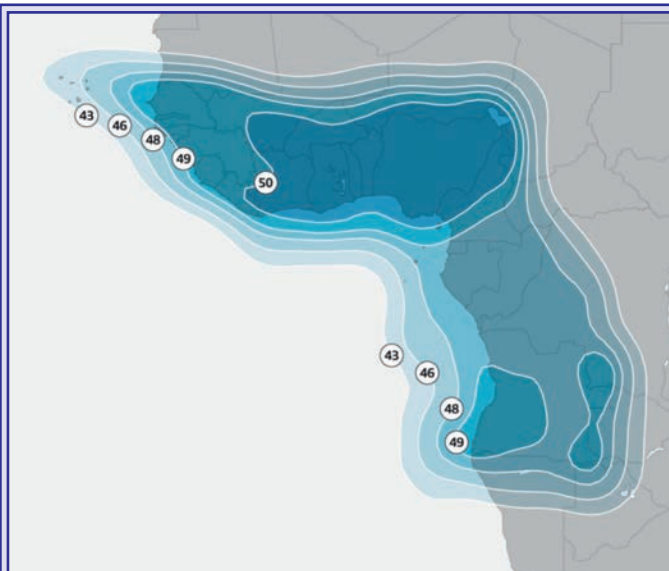
SES ASTRA 2G: 28.2°E

With ASTRA 2G launching in 2014 to join ASTRA 2F, the 28.2oE orbital slot is expanding to become a regional platform for West & Central Africa.

Launch date: expected Q2 2014
Manufacturer: EADS Astrium Eurostar E3000 platform
Projected lifetime: 15 years
Number of Ku-band transponders: 64
Typical EIRP beam coverage: 46 to 51dBW
Polarisation: linear horizontal/vertical
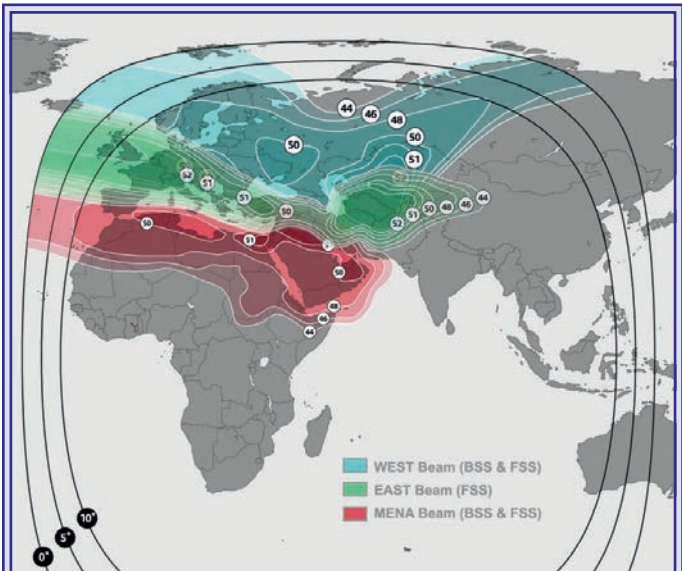
TürkmenÄlem 52E/MonacoSat: 52°E

38 active Ku-band transponders shared over 3 beams. Turkmenistan Minister of Communications owns 26 TPs and the rest 12 TPs with Middle East/North Africa coverage are fully leased to SES.

Launch date: April 2015
Manufacturer: Thales Alenia Space
Projected life: 16+ years
Launch Vehicle: Falcon 9 v1.1
Number of Ku-band transponders: 38
Orbit: GEO
Beacons: 11201, 11449

ACE

The Africa Coast to Europe (ACE): a 17,000 km long broadband optical submarine cable between Africa and Europe

Phase 1 project

3 segments in service:
- France-Senegal,
- Senegal-Cote d'Ivoire,
- Cote d'Ivoire-Sao Tome & Principe.

16 countries connected on the coast, 2 landlock countries.

Phase 2 project

Phase 2, under construction or planned:

- Extension from Sao Tome & Principe to South Africa

- Canary Islands, Benin & Nigeria, Operational May 2015

- Cameroon, Democratic Republic of Congo, Angola, Namibia

ACE,

With its large bandwidth and high quality transmission technology, supports the present and future growth in telecommunication traffic between Africa and the rest of the world, reduces digital divide and drives economic and social growth.

France
Portugal
Canary Islands
Mali
Niger
Mauritania
Senegal
Gambia
Guinea
Ghana
Benin
Nigeria
Liberia
Sierra Leone
Côte d'Ivoire
Sao Tome & Principe
Cameroon
Equatorial Guinea
Gabon
Democratic Republic of Congo
Angola
Namibia
South Africa

— PHASE 1, in service

••• PHASE 2, under construction or planned

www.ace-submarinecable.com

ACE

In focus:
Backhaul

Setting new sights on backhaul

**Rahiel Nasir,
Editorial director,
African Wireless
Communications
Yearbook**

The number of submarine cables that now surround Africa and have been landing on its coastlines over the last few years has certainly been a fillip to broadband connectivity in some parts of the continent. But as well as being used for broadband what about fibre's other great promise – its ability to backhaul mobile networks? Here, operators need more terrestrial cable deployments that reach far deeper inland.

In 2014, a new chapter began in the story of fibre in Africa as Liquid Telecom announced it had created the continent's first fully redundant regional fibre ring (*see p.92*). Although the company uses wireless technologies including satellite to complement its network, it believes that only fibre will be able to provide the speeds and capacity needed by LTE base stations.

However, much of the demand for increased mobile connectivity will come from rural areas, where terrestrial infrastructure is either unable to meet demand or is simply non-existent. Even Liquid admits it is just "too costly and time-consuming" to lay fibre for cell sites covering smaller populations in such areas.

Thus, what could be regarded as fibre's weaknesses is where wireless technologies come into their own. For instance, Intelsat says the introduction of HTS (high throughput satellite) will deliver additional capacity that will enable the expansion of 4G networks. It says this will lead to an increase in MNOs utilising satellite backhaul and satellite-based rural telephony extensions, as it allows them to cost-effectively increase their customer base in areas that were previously inaccessible.

Northern Sky Research (NSR) forecasts that HTS will propel the global market for satellite backhaul in the coming years. In its *Wireless Backhaul via Satellite* report published in April 2016, the firm predicts that current and next-generation solutions will generate revenue streams from USD1.7bn in 2014 to USD5.3bn by 2024.

According to the report, traditional fixed service satellite (FSS) capacity in C- and Ku-bands has so far been the most prevalent solution used for backhaul and trunking in land areas and has begun to address the need for 3G services. But it adds that less expensive and higher throughput capacity is challenging the economics of traditional FSS where erosion of the revenue base is leading to an 'HTS play' by operators that own traditional FSS transponders.

While non-geosynchronous HTS is still in its infancy, NSR believes it promises better latency with the likes of O3b making inroads in backhaul, trunking and mobility platforms. It adds that although few details on LEO (low Earth orbit) HTS programmes have been released, if one or two of these are launched, total capacity will increase manifold leading to price pressure for all offerings.

So where does that leave microwave? Infrastructure specialists such as RFS believe operators in Africa are still highly reliant on the technology for backhaul despite the advent of fibre. It says although some regions elsewhere in the world are reducing the number of microwave links used for long-distance backhaul or for new installations because of the existence of fibre, this is not something it has seen in Africa. According to RFS, given the complexity of doing civil works (especially in the continent's big cities), and fibre being prone to vandalism and theft, microwave is still the dominant choice as a backhaul solution.

Then there are other technologies such as free-space optics (FSO) which uses light propagating in free space to wirelessly transmit telecoms data. Although FSO has been around for some time now, its use in Africa has not been common.

However in April 2015, Nigerian ICT solutions provider WaveTek successfully deployed AOptix's Laser-Radio Technology (LRT) in Nigeria.

Lagos is the largest city in Africa with a population of more than 20 million people. It is the landing point for four major submarine systems that connect Nigeria to Europe: SAT-3/WASC/SAFE; ACE; GLO-1; and Main One.

With the undersea cables largely in place, the challenge was to pull all that network capacity into the continent's population centres and bring connectivity to underserved markets. Speaking at the time, WaveTek said fibre was not viable in most situations across Africa given its costs and the challenges of deployment created by difficult terrain. It added that microwave was unable to provide the bandwidth and range needed, and could not withstand humidity and heavy rains in Nigeria.

In Lagos, a seven kilometre FSO link from AOptix was used to connect capacity from the submarine fibre cables to a distribution point in the city.

According to WaveTek CEO Ken Spann the FSO link survived Nigeria's rainy season and delivered 100 per cent uptime. "The technology has significant potential to bring broadband mobile connectivity to underserved populations in Nigeria and across Africa," he said.

Fibre – the backbone for backhaul

In 2014, Liquid Telecom announced it had created Africa's first fully redundant regional fibre ring. Spanning 20,000km, the East Africa Fibre Ring runs from Kenya to Uganda, Rwanda, Tanzania and back into Kenya, connecting these countries to each other as well as to the rest of the world. Built at a cost of USD20m, it was said to be Africa's largest single fibre network and also linked to the region's five main subsea cable systems: WACS, EASsy, SEACOM, SAT3 and TEAMS.

Liquid Telecom uses wireless technologies and satellite to complement its network but it believes that only fibre will be able to provide the speeds and capacity needed by LTE base stations. Speaking at the time, Ben Roberts, CEO of the company's Kenya operations, said: "In Africa, most people access the internet over their mobiles, and so LTE networks are already commercially deployed with more being built. LTE base stations need mega amounts of bandwidth that can only be provided by fibre. We have already started laying fibre to LTE base station sites that have been built by a variety of operators and independent tower leasing companies. This fibre then interconnects with our pan-African fibre backbone."

The dedication to fibre continued strongly into 2015. The company partnered with CEC to build a new fibre link between Lusaka and Livingstone, and claimed it would offer the "most reliable high-speed" broadband connectivity in southern Zambia.

The 500km fibre connection was built at an estimated cost of USD5m and now provides additional capacity, increased redundancy and route diversity. It starts in Lusaka, transits through eight southern

The record was achieved at Alcatel-Lucent Submarine Networks' test bed facility in Villarceaux, France.

circuit towns including Choma, Kafue, Kalomo, Mazabuka and Monze, before terminating at Victoria Falls in Livingstone. From there, it interconnects with Liquid Telecom's fibre network in Zimbabwe. Onward international access is enabled via the group's pan-African satellite and fibre networks which connect to the subsea systems mentioned above.

The Lusaka-Livingstone link was completed in time for the United Nations World Tourism Organisation General Assembly, part of which was held in Livingstone in August. Fibre was also laid to connect all the major hotels and airports. CEC Liquid Telecom then went on to build out to the border towns of Kazungula and Sesheke to connect with Namibia and Botswana.

Connectivity to Europe will see a boost following the extension of the African Coast to Europe (ACE) submarine cable. This will help transcontinental phone calls as well as provide extra broadband capacity. Phase two of ACE connects Angola, Congo-Brazzaville, the Democratic Republic of Congo, Namibia and South Africa to the fibre backbone. There will also be an extension linking Cameroon. At its most northerly end the system links to Portugal, Spain, and France.

Orange is the main backer in the USD700m ACE system which will cover 17,000km after its second phase is completed by the end of 2016.

The MTN Group became a member of the ACE consortium in August 2015. According to the group's GM for network, IT projects and carrier services, John Unterhorst, the operator acquired an eight per cent stake. He said MTN's involvement, which is reportedly worth USD50 million, will facilitate the extension of the cable to South Africa. "MTN will build and provide the ACE cable landing station and backhaul in South Africa. Until now, MTN's participation in ACE has been through its subsidiaries in Benin, Liberia and Guinea Conakry," said Unterhorst.

July saw an announcement of a breakthrough that promises to further reduce backhaul and other data costs. Alcatel-Lucent Submarine Networks (ASN) claimed to have set a new record for data transmission over a distance of 10,000km using real-time processing prototypes of its 300Gbps modulation technology.

ASN, the undersea cables subsidiary of Alcatel-Lucent (now owned by Nokia), explained that this would help optimise the performance of submarine cable systems that have already seen the costs of internet delivery and other telecom related services "slashed by almost half " in Africa.

The record was achieved during a simulation of a 10,000km network at ASN's lab-based test bed in France. It combined the 300G 8QAM technology of the firm's *1620 SOFTNODE* platform with its second-generation *Coherent Submarine Fibre 2* cable.

According to Alcatel-Lucent, 8QAM technology can optimise both existing and

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KEY BACKHAUL PRODUCT LAUNCHES IN 2015

MIMOtech's *Janus AirDuplex* (below right) is a range of "ultra-high" capacity microwave backhaul radios that use a new patented technique called *Air Division Duplexing (ADD)*. This combines MIMO and full duplex transmission to achieve claimed data rates of up to 1Gbps in a single 28MHz channel, and 2Gbps in 56MHz bandwidth.

The company said the radios are suitable for small cell, microcell and macrocell mobile deployments for a range of technologies including LTE/ºLTE-A and potentially 5G, providing a cost-effective alternative to fibre and millimetre-wave links for enterprise and government applications.

ADD uses spatial multiplexing to double capacity and spectral efficiency. With an antenna separation of typically only 100mm, MIMOtech said it can be considered as a quasi single-aperture antenna from the point of view of licensing, site rental cost and implementation.

The firm said opex/capex are reduced due to lower spectrum and site rental fees, lower maintenance, while software definability offers downstream savings in upgrade costs.

Gilat Satellite Networks' *CellEdge* comprises a small cell that is optimised to provide the ability to deliver cost-effective 2G and 3G cellular services via satellite to unserved areas. Gilat said it has an 80W total average power draw, including both the small cell and VSAT in a typical configuration, and therefore "significantly" lowers capex in the terminal and solar power generation.

The firm claims its technology also minimises satellite space segment overhead by applying efficient voice and data compression combined with satellite bandwidth allocation on demand. Gilat said this can reduce satellite opex by up to 80 per cent compared to traditional solutions.

The company hopes *CellEdge* will enable operators to overcome high rollout costs, lack

new undersea systems, enabling operators to deliver more than 15Tbps per fibre pair on transoceanic systems – that's equivalent to 2.25 million HDTV channels streamed simultaneously.

ASN added that the timing of its technology "seems appropriate" for Africa as most countries are currently migrating their broadcast systems from analogue to digital.

Looking to the skies

There are always likely to be areas in Africa that won't be cost effective to connect using fibre cables. Last year saw more operators and deals struck for satellite as the favoured option for backhaul.

For instance, ISP Presta Bist is now using O3b to provide backhaul from Chad to the internet. The company, which is also a pay TV operator, delivers consumer and business services across Chad via its national network of wireless broadband and VSATs.

Presta Bist CEO Moussa Radjab said: "The broadband services we will now be able to offer are far superior to anything possible using current fibre connections or GEO satellites."

This is another win for O3b which regards the Sahel region as a high priority. The company views Burkina Faso, CAR, Chad, Mali and Niger as key satellite backhaul opportunities because they are all landlocked and suffer from erratic terrestrial fibre connections that are dependent on neighbouring countries.

Satellite is also being used in a two-year deal worth USD7.5m for Gilat Satcom. It will provide satellite backup for a "leading mobile communications company" in the DRC. As part of the agreement, the unnamed operator will use satellite to

CEO Zainadin Dalsuco said Intelsat will help ENTM to quickly scale its network.

backup its cellular, fibre, and backhaul networks in the DRC's four largest cities: Goma, Kinshasa, Kisangani and Lubumbashi.

Gilat Satcom added that it had been providing satellite broadband connectivity to enterprises and ISPs in the DRC since 2008, most recently using O3b's satellites.

Mozambique will also be gaining backhaul capacity thanks to satellite. Empresa Nacional de Telecomunicações de Moçambique (ENTM) is now delivering broadband connectivity to enterprises, and provides cellular backhaul to support residents in remote areas with the help of Intelsat.

Under a multi-year agreement, ENTM is using C-band capacity on *Intelsat 902* at 62.0°E to provide dual band connectivity for local mobile operators as well as for its own transport network. According to Intelsat, for a country such as Mozambique that is susceptible to heavy rainfall and flooding, C-band spectrum is particularly useful given its known performance and durability in adverse weather conditions.

"Our customers expect and deserve fast, reliable and continuous broadband connectivity regardless of location or weather," said ENTM CEO Zainadin Dalsuco. "By partnering with Intelsat, we can quickly scale our existing network to meet the increasing broadband demands in

the remote areas of Mozambique and ensure that our network infrastructure is robust enough to retain and, as needed, quickly restore service to local cellular operators and their customers throughout the country."

Intelsat added that with mobile penetration rates in the country at around 69 per cent, its partnership with ENTM will enable the operator to provide a reliable and always-on broadband service that will enhance customer satisfaction.

On a more continental scale, a new satellite will be aiming to increase backhaul capacity as well as access to broadband for Africa. The end of the year saw Eutelsat Communications revealing the next step in its broadband strategy for the continent with the order of a new-generation HTS from Thales Alenia Space (TAS).

To be launched in 2019, the all-electric spacecraft will be the first to use Thales' new *Spacebus Neo* platform, and Eutelsat claimed it will offer "unprecedented" operational flexibility when operational.

The firm said its baseline mission will be to provide 75Gbps of capacity across a network of 65 spot beams that together provide "quasi-complete" coverage of sub-Saharan Africa. The satellite will address direct-to-user consumer and enterprise broadband services with dishes sized from approximately 75cm. It will also be used for community networks connected to Wi-Fi hotspots, mobile backhauling, and rural connectivity.

During 2016, Eutelsat will have the option to upscale the satellite to significantly increase overall throughput and service areas. The company has decided that its African broadband business, including sales, will be managed by a newly created London-based affiliate.

of backhaul and power infrastructure, as well as low consumer uptake and ARPU.

With *iQ.linkXG v9.5*, **Comsearch** believes it's created the first microwave link design tool tailored for small cell backhaul, where non line-of-sight (NLOS) conditions often apply. The upgraded version is also said to make it much easier to configure microwave links powered by adaptive modulation radios.

According to the company, small cell planning can involve both LOS and NLOS paths, the latter of which presents a special challenge to designing networks where signal loss predictions are
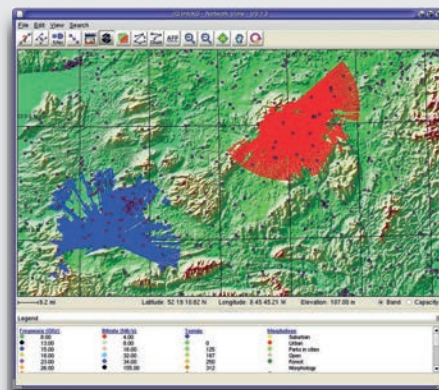
critical. Comsearch said it has developed unique and proprietary models that look at the true obstruction environment along a path to better calculate losses. It said these models have been validated with a major radio vendor using existing network designs

and integrated into the latest version of *iQ.linkXG*.

In addition, Comsearch said the use of adaptive modulation radios has made it difficult for link designers to quickly engineer microwave paths. It added that power, fade margins and predicted performance must be evaluated for all the modulations configured for a path, not just one.

Cambium Networks launched a 900MHz version of its flagship *PMP 450* point-to-multipoint wireless platform. It said the new *PMP 450i* access point allows for deeper frequency propagation to suit the needs of rural broadband deployments, SCADA and sensor data backhaul, and even video surveillance applications.

TAS claims *Neo* offers a fully modular platform with a smart Ka HTS payload for "unrivalled flexibility and maximum throughput". It says the all-electric version of the platform combines high efficiency and light weight, and will also mean Eutelsat will benefit from more cost-effective launch options. The all-electric *Neo* is currently capable of carrying payloads weighing more than 1,400kg, and with power exceeding 16kW. Starting in 2016, TAS promises that the platform will be able to handle payloads up to 2,000kg, with record power of 20kW.

Traffic demands

As operators scramble to find more capacity from various providers or upgrade their own hardware, it's easy to forget the size of the problem that needs to be solved. Annual IP traffic will triple over the next four years and will reach a record two zettabytes globally in 2019, according to Cisco's annual Visual Networking Index (VNI) forecast.

Factors expected to drive traffic growth include global increases in internet users, personal devices and M2M connections, faster broadband speeds, and the adoption of advanced video services.

Doug Webster, Cisco's VP of service provider products and solutions marketing, said: "It took 32 years – from 1984 to 2016 – to generate the first zettabyte of IP traffic annually. However, as this year's VNI forecasts, it will take only three additional years to reach the next zettabyte milestone with more than two zettabytes of IP traffic annually in 2019."

In Middle East and Africa, the index predicts mobile data traffic will grow 15-fold from 2014 to 2019, and will reach three exabytes per month by 2019, up from 199.5 petabytes per month in 2014.

Cisco forecasts that by 2019, 41 per cent of mobile connections in the region will be from smart devices, an 11 per cent increase from 2014. It expects consumer mobile traffic to grow 16-fold from 2014 to 2019, a CAGR of 74 per cent.

According to the VNI, there were 1,200 million mobile-connected devices in MEA in 2014. This will rise to 1,676 by 2019, with 4G connections growing 32-fold from 2014 to 2019, a CAGR of 100 per cent.

3G connections are forecast to be 54.4 per cent of total mobile connections in the region by 2019, compared to 19.4 per cent last year. This means 3G will overtake 2G in the next few years, as second-generation connections will represent 31.6 per cent of total mobile connections by 2019, compared to 80 per cent in 2014.

Extra capacity pops up

The start of 2015 saw two announcements concerning new African PoPs.

Firstly, Telstra said it was aiming to provide greater connectivity and redundancy options for businesses operating across the continent with the launch of a new PoP in Johannesburg. The Australian telco said the facility builds on its existing network-to-network interconnection across 16 African countries which include Kenya, Mozambique, Zimbabwe, amongst others.

It claimed the deployment of a PoP in South Africa represents "another step" in its international expansion, and will act as a gateway for businesses looking to grow their footprint across South Africa and beyond. "South Africa is an emerging power, with one of the fastest-growing internet economies in the world," said Bernadette Noujaim Baldwin, Telstra's head of connectivity and platforms portfolio,

Bernadette Noujaim Baldwin said Telstra was seeing growing demand from foreign firms based in South Africa.

global enterprise and services. "With these economic conditions in mind, we're seeing demand for data connectivity throughout South Africa grow as an increasing number of Asian, European and American headquartered businesses look here for long-term growth opportunities."

She also explained that Telstra needed an expert local provider and therefore launched the new PoP in partnership with Gauteng-based pan-African telecom services provider Internet Solutions (part of Dimension Data).

Telstra has licenses in Asia, Europe and the US, and says it can now offer access to more than 2,000 PoPs in 230 countries and territories across the world.

The second announcement came with East African carrier Wananchi Telecom saying. It has partnered with Epsilon to connect its customers in Africa to more than 170 countries around the world. Wananchi is using Epsilon's *Global Network Exchange* and carrier grade IP network for the delivery of outsourced services to support the growth of its wholesale telecoms business.

Epsilon deployed a 'virtual PoP' in Telehouse's *East London* UK data centre and at *SmartHub Fujairah* in the UAE, enabling Wananchi to access more than 500 carriers and network service providers.

In addition to network infrastructure, Epsilon also provided a remote support service for cabling, installations and PoP management. As part of the deal, Epsilon

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According to **Cambium**, the propagation characteristics of 900MHz frequencies "outperform" many others and are ideal for connecting subscribers and sensors that are difficult to reach.

It said the *PMP 450i* (pictured right) has the same capacity as its other *PMP 450* radios, and provides the infrastructure needed to deploy networks in non-line-of-sight and remote environments.

Cambium said users of its *PMP 100* systems can now upgrade and unlock 900MHz capacity with the *PMP 450* platform. "We expect to achieve three to four times the amount of available bandwidth in the same channel size, even in the same noisy and interference prone environments," claimed the firm.

Proxim Wireless has combined a WLAN access point with a carrier class wireless point-to-point backhaul radio and integrated them into a single ruggedised enclosure for outdoor deployments.

The *ORiNOCO QB-9100* (shown right) features Proxim's *ORiNOCO* 2.4GHz AP and *Tsunami Quickbridge* 5GHz PTP backhaul radio. The company said combining the two functions into a single unit is designed to reduce hardware footprint, capital outlay, and recurring site rental costs.

With its very high throughput 866Mbps data rate, jumbo frame support, and IEEE 1588v2 synchronisation, Proxim said the *QB-9100* products provide all the necessary features and capacity for backhauling small cells. Moreover, the integrated 802.11n AP enables the offload of data to Wi-Fi.

will have access to Wananchi's extensive African network footprint, giving it greater local presence.

Droning on about tower maintenance?

2015 saw the successful completion of site audits using remote drones. The Communications Regulatory Authority of Namibia (CRAN) carried out audits of 25 broadcast transmission sites using remotely piloted aircraft (RPA). The aim of the project was to determine the RF performance characteristics of identified sites and masts, installed antennas per mast, and the operational broadcasting services on every antenna, including an assessment of spectrum usage.

The audits were carried out on behalf of CRAN by German-based specialist LS telcom. Its software and services are designed to address the efficient use of RF spectrum in broadcast, PMR, mobile and microwave networks. The firm conducted the audits using RPAs which were each equipped with an onboard camera as well as measurement and sensor systems.

In contrast to other measurement services, LS telcom said its auditing took place without affecting operational services and without direct involvement of network operators. It added that the detailed measurements, recordings, and visuals of each site and mast infrastructure did not require core site or building entry, or power reduction of services.

"The site audit produced very detailed and informative results," said CRAN COO Jochen Traut. "This is the introduction of an exciting phase of efficient telecommunication regulation in Namibia." The regulator has now incorporated the results of the audits into its central database for future referencing and compliancy assessment.

Dave Rehbehn, VP international division, Hughes Network Systems

As part of a feature first published in the April-May 2015 issue of *Northern African Wireless Communications*, we asked Hughes' Dave Rehbehn how important backhaul was as a satellite application for Africa.

"I am going to answer that from a couple of different directions. Talk to the cellular operators and if they can get fibre that's going to be their number one choice. And if they can get microwave with a reasonable number of hops that's going to be the next choice. The fact is satellite, historically, is the option when you don't have anything else.

"Having said that, mobile operators are keenly interested in expanding their services. And what were starting to see is operators using satellite to go to greenfield service areas because they can get the backhaul connectivity immediately and it's good quality. I think that what will happen is that over time, as terrestrial develops in terms of capacity, the cellular operators will figure out a way to get terrestrial in there."

While Rehbehn was painting a picture about satellite from the mobile operators' perspective, he was quick to point out that when it comes to Hughes' view, cellular backhaul is seen as a very important application.

"The reason is that, number one, it is a very high value service offering on the part of satellite service providers. And number two, it is an area where there is very good potential as we see more high throughput satellite [HTS] systems deployed because what these systems enable is a lower cost per bandwidth capacity. That cost of the capacity

has always been one of the key issues with satellite backhaul for cellular networks.

"So we have a new generation of satellites coming up – Intelsat has *Epic*, Yahsat is already in service over Africa and the Middle East, Avanti is in service [etc.], and these satellites have a lot of capacity that enables lower cost for the service. So we think we can change the equation of satellite backhaul for cellular systems with these new generation of HTS. That will make it more cost-effective for cellular backhaul satellite applications.

"In addition, from the infrastructure side of it, we see more so-called small cells from the likes of Huawei, Ericsson, Nokia, etc. Instead of having a macro site that costs hundreds of thousands of dollars and requires a tremendous amount of power, infrastructure providers are able to provide a small cell which, maybe doesn't have a huge amount of capacity, but is very cost-effective and can be powered by solar.

"So from the infrastructure side we see small cells enabling more cost-effective rural deployments. And from the satellite side we see HTS enabling a lower cost of bandwidth. Together, we think this really does create some significant opportunities for satellite backhaul and cellular traffic."

When it comes to small cells, satellite can also play a more direct role here. For example last year, Gilat Satellite Networks announced *CellEdge*, a small-cell-over-satellite solution to provide MNOs with a cellular infrastructure solution to connect remote areas (*see p93*). Gilat worked with Intelsat and deployed its system for Canadian operator RuralCom. So from a purely technological perspective, does satellite have the edge over fibre and microwave?

"You mentioned Gilat and they have an integrated small cell that they resell. As I said before, Ericsson, Huawei, Nokia – all of those guys have very good small cell

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Metro Ethernet Forum

The year ahead: In its *Backhaul for rural and remote small cells* white paper published in June 2015, the Metro Ethernet Forum (MEF) said small cell technologies are "coming of age" thanks to scaling of deployments in residential, enterprise and now urban markets.

The forum believes these maturing technologies can now be applied to a range of rural and remote use cases that may not otherwise be viable using traditional deployment approaches.

"Small cells are well suited to deployment in rural villages, remote industrial sites, on

transportation, and for temporary networks," stated the paper.

In summarising the key aspects that must be considered when designing and deploying the transport network, the MEF said remote deployments by definition are far from existing network infrastructure and thus are potentially expensive to backhaul with terrestrial links.

However, it also pointed out that rural deployments are not necessarily remote and may be 'in the next valley' from a larger town with connectivity. As a result, shorter range backhaul and copper connectivity can be used here.

The paper also highlighted the fact that backhaul to remote areas is likely to have

limited performance. For instance, it said as little as 50kbps capacity is sufficient to provide a basic 2G voice and SMS service. Data service bandwidth is also likely to be limited by the willingness to pay for backhaul bandwidth, and while latency of around 300ms one way is tolerable for voice, it can limit TCP connection bandwidth if acceleration technologies are not implemented.

According to the MEF, Ethernet adoption has been accepted by the vast majority of operators and service providers across the global industry. The forum believes its Carrier Ethernet 2.0 for Mobile Backhaul standard brings answers to the challenges associated with managing rapid backhaul data growth while scaling costs to new revenues.

products with an IP interface and they have done a bunch of optimisation. Our view has been to integrate effectively with those products as opposed to trying to force fit our solution onto a operator. That's just our approach to the market.

"Unequivocally, if you've got fibre, people are going to use fibre. In that context we have seen projects where satellites will be used as a backup mechanism (and they are very effective for that). We can dynamically allocate capacity based on a fibre link going down."

However with microwave, Rehbehn believes the argument is not so cut and dried. "You start to deal with microwave hops; and to go out and build a bunch of microwave hops you have to start worrying about things like the power generators, and it may or may not make sense.

"If microwave is already there, that's fine, you are not going to use satellite. But would it be more cost effective building a microwave link versus a fibre link versus a satellite link? Hands down, it's probably always going to be more cost-effective with satellite, at least initially."

When asked if these competing technologies have had an impact on Hughes' backhaul business in Africa, Rehbehn acknowledged it had. What the company has seen is a number of deployments where operators have used satellites to connect a particular area, increased the subscriber base there, which then justifies an investment into a terrestrial backhaul technology.

"And then they will take that satellite and move it somewhere else. Some do keep it for backup, but we have seen quite a few who then just take that satellite equipment and move it somewhere else and develop another area."

Lionel Chmilewsky,
CEO,
CBNL

Lionel Chmilewsky regards 2015 as a "successful year" for CBNL as it supported a growing customer base across 14 African countries, as well as a further 31 markets across the globe.

"From our offices in Kenya, Nigeria and South Africa, we have served the continent's largest operators with backhaul and enterprise access networks, including MTN, Vodacom and Airtel.

"CBNL's growth has been driven by the uplift in capacity we can offer with our latest *VectaStar 600* point-to-multipoint (PMP) microwave platform that has strengthened our position as the largest supplier of PMP microwave solutions in Africa and the world.

"By offering up to 1.2Gbps per sector and 14.4Gbps per hub site, we have grown our

business into markets that were typically served by point-to-point (PTP), enabling us to offer the same high-capacity with a dramatically improved business case. This was recently highlighted by a Real Wireless[1] report that found PMP microwave offers up to 50 per cent TCO savings when compared to PTP.

"The report also found PMP microwave can enable an ISP to connect 67 per cent more customers, and generate 1.8x higher return on investment than PTP for the same upfront investment. The surge in data demand, coupled with slowing operator revenues[2], have brought a sharp focus on more cost effective strategies and opened up the market to more innovative technologies such as this."

According to Chmilewsky, a key trend over the past year has been the maturity of the African enterprise market and the demand this has created for higher capacity fixed broadband.

"Modern organisations now depend on secure, reliable and fast connectivity to enable a wide range of business-critical activities. The rise in cloud applications has also changed the shape of traffic, with demand growing for more symmetrical services.

"Carrier-grade broadband, such as this, often requires both an uplift in capacity and the provision of guaranteed bandwidth 24/7. In many cases, the legacy unlicensed or WiMAX technology used to connect businesses has run out of steam.

"As a result, we have seen an increased uptake of licensed PMP that offers the same cost effective architecture, while boosting capacity and offering dedicated bandwidth with a very high quality of service."

Chmilewsky also says there's a growing adoption of SDN (software defined networking) on the continent. "Throughout 2015 an increasing number of operators have woken up to the potential of utilising SDN to optimise their last-mile. From our own work with Airtel Kenya, we have seen how SDN can enable operators to unlock spare capacity on the backhaul network to roll out additional enterprise access sites.

"This technique is especially effective in locations where capex is limited as it allows operators to maximise their existing network assets and generate valuable new revenue streams. With Strategy Analytics forecasting[3] that utilising SDN in backhaul could save operators in Africa and the Middle East USD368 million by 2017, it looks set to be a vital strategy for years to come."

Chmilewsky says 2015 saw the continued roll out of 4G with 129 operators now investing in projects across 39 African countries[4]. He believes LTE is driving innovation in wireless backhaul.

"This includes some highly innovative use cases where operators are using LTE spectrum to deliver data-only connectivity. With low fixed broadband penetration in many markets, the new services facilitated by LTE give consumers and businesses vast socio-economic opportunities.

"As with all data heavy networks, operators are developing new backhaul strategies to ensure every bit of data is transported in the most cost effective way. This is essential to build an attractive business case in low ARPU markets and the latest wireless backhaul technologies are playing a leading role in facilitating this."

Cisco forecasts that EMEA will have the highest mobile data growth of any region, with traffic expected to increase by 71 per cent in 2016[5]. As most of this is predicted to come from Africa, Chmilewsky points out that the region's operators need to be prepared.

"[Traffic increases] will be driven both by a younger population demanding increased access to mobile content and an increasing number of new businesses accessing online services. This will further enforce the need for operators to innovate in order to increase capacity of their networks and maintain a sustainable business model.

"As in 2015, local economic dynamics will continue to influence network strategies. We have seen last year that fluctuations in commodity prices, such as oil, can significantly impact economies that are reliant on extractive industries.

"When prices decline, local currencies often weaken against the dollar, the major currency for technology purchases. Because end users pay the operator in local currency, the net effect of this is that the 'dollarised' ARPU decreases commensurately and so a given network may no longer show a positive ROI.

"While this can deter investment altogether, it also represents an opportunity for operators who are able to exploit new, more cost effective technology to out-compete others in this difficult environment."

[1] New study finds latest PMP can deliver almost twice the ROI for MNOs and ISPs compared to traditional last-mile infrastructure, January 2016, www.realwireless.biz
[2] Top telecoms companies: Talk is cheap, but data leads the way, March 2016, www.theafricareport.com
[3] Mobile Backhaul Savings from SDN May Be Bigger Than Previously Expected, February 2014, www.nfvzone.com
[4] 4G/LTE network projects and launches in Africa (2016), January 2016, www.balancingact-africa.com
[5] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015-2020 white paper, February 2016, www.cisco.com

Chmilewsky concludes by saying a key aspect of CBNL's new projects in 2016 will be the continued roll out of its *VectaStar 600* solution. "This new platform will enable PMP hub sites to be built that offer a quicker time to market and better ROI. This not only provides the transformation capacity our customers need to launch new services, but also holds the scalability and business case to support long term growth."

I s fibre the answer to backhaul in Africa? As part of a feature first published in the April-May 2015 issue of *Northern African Wireless Communications*, Newtec's Semir Hassanaly told us that the continent's markets are leveraging a wide array of backhaul communication technologies.

Semir Hassanaly, Market director cellular backhaul & trunking, Newtec

"Varying landscapes, population density and capacity needs have driven the need for microwave, fibre and satellite infrastructures. Early deployments were based on microwave and satellite, with the demarcation point based on having line of sight and distances above the number of microwave hops to justify the recourse to satellite.

"The recent advent of undersea cables and fibre has modified the landscape especially for coastal regions which can be accessed more easily. However, needs are still diverse. Many regions have a high mobile penetration rate with 3G and even 4G technologies, while other countries remain satisfied with 2G. A few countries (Nigeria, South Africa, etc.) are booming and demanding huge capacity. In the latter cases, the increasing data traffic can justify the use of fibre in urban regions while more remote areas still rely on traditional means.

"But fibre is not always the answer. It can suffer from reliability issues (cuts, theft,

etc.) and it is expensive. As a result, it is unlikely we will see it in remote and distant regions any time soon.

"Meanwhile, the progress made with other technologies opens up further opportunities. Microwave technology can carry gigabits of traffic today, while high throughput satellite (HTS) and a multiservice platform like Newtec *Dialog* are ideal for newer mobile architectures and optimal for fibre backup. The combination of HTS and *Dialog* also brings the cost of satellite down to the point where it can be very competitive.

"Finally, the choice between fibre, microwave or satellite is pragmatic and driven by three parameters: availability (fibre is most ideal in urban regions); economics (fibre is expensive, which makes microwave, if line of sight allows a limited number of hops, or satellite the most cost-effective solutions); and marketing (satellite provides quick go-to-market).

"Capacity requirements can be very acute and in the end it is these three parameters which operators will consider when making the decision on which backhaul method to choose.

CHAMPIONS RUN CHAMPION'S SYSTEM

As the market leader in **DMR Tier III Trunking** solution, Hytera has so far offered over 25,500 channels to institutions of different sizes and industries, and various departments of governments, who rely on the system for seamless and resilient communications. Hytera empowers professionals and organizations to work more efficiently, and gain edges to stay ahead of the competition.

Hytera DMR Trunking Lite

- Alternative Topology
- Fast Deployment
- Lower Total Cost of Ownership

Iphone   Android

◀◀ DS-6210
Hytera DMR Trunking Pro

⯬ DS-6211
Hytera DMR Trunking Lite

Hytera
Respond & Achieve

DMR
DIGITAL MOBILE RADIO ASSOCIATION

PD79X Ex   PD78X   X1p   MD78X

chapter
Critical
Communications

5

Opportunities, challenges, and huge potential

Africa's adoption of critical communications is following the global trend of migration from analogue to digital narrowband technologies. Demand for data is also increasing, as more users expect more sophisticated high-bandwidth data applications on their networks. This is reflected in the limited but growing amount of broadband introduction in the professional sector as part of a hybrid solution.

Phil Kidner, CEO, TETRA + Critical Communications Association

African countries are not however uniform in their approach, and there are significant differences in budget, reflected in the project choices. Public safety, and oil and gas are the main drivers for professional comms, but it must be remembered implementing new systems has to be balanced in some countries with the challenge of upgrading legacy infrastructure.

This is a critical communications market that is continuously developing, driven by a growing awareness of the need and value of reliable and secure wireless communications in key industries. Many African countries still rely on aged analogue radio systems, and there is a clear drive and intention to migrate these to a digital platform.

Greater government regulations regarding the safety and security of employees and business operations are also having an impact, and overall there is a growing awareness of the value of safe and secure wireless communications.

Economic diversity across African countries will see varied digital technologies being implemented in the drive to migrate from analogue to digital – TCCA members note an increase in the number of TETRA-related enquiries for public safety and business critical environments. Of course, TETRA technology is not new to Africa – commissioned in 2001, the City of Cape Town system was the first public safety TETRA digital trunked radio system on the continent. It has been in successful operation for 15 years, with regular increases in resources and coverage. Dedicated commercial-grade microwave links were deployed in 2008, and last year the master switching office was also upgraded. Further investment is planned as the network has proved highly reliable in meeting users' needs.

TETRA continues to be deployed throughout Africa. During the past year, many new systems and upgrades have been installed, including those in Angola, Botswana, Namibia and South Africa in the mining, safety and security, and oil and gas sectors. Shifts in the economy obviously have an impact, but it seems that for critical communications, capital projects and expansion plans can be scaled down and/or extended over longer time scales rather than being cancelled or postponed.

TCCA members report significant TETRA opportunities in Northern Africa where the characteristics of the technology are particularly appreciated by users in the public safety, and oil and gas sectors. Southern Africa is also showing increasing interest in TETRA, with a tender being issued by the South African Police Service, and the potential use of TETRA in railways applications.

Security issues in the oil and gas industries have catalysed interest in TETRA from a number of countries including Côte d'Ivoire, Gabon, Guinea, Nigeria, and the Republic of Congo. Mozambique and Tanzania are also looking at TETRA to deliver secure communications, which are an important component in oil fields and plants protection.

Southern Africa is expected to experience a relatively good growth for 2016-17 in the trunked radio communications market. Various requests for information for digital wireless communications solutions have been issued since the beginning of 2016, and these cover transport, safety and security, and the mining sectors.

Added to this are growing demands in Southern Africa to include LTE for broadband critical data communication in conjunction with TETRA. But as with so many regions, the continent has a shortage of suitable and sufficient frequency bandwidth allocation for critical mobile broadband.

The TETRA industry remains robust in Africa. It is the premier voice and data technology installed by critical communications users around the world, and is also a mature standard with ongoing development and a clear evolution path. The combination of functionality, quality, spectrum efficiency, and lifetime costs and benefits have proven hard to beat.

Migration to a digital standard is a long term commitment for end-users which needs the full support from manufacturers. There is huge potential in Africa, and it is important that international regulatory bodies and standards-based associations such as the TCCA invest time and effort in the continent to ensure awareness of the available choices in open-standard technologies.

Seychelles Police call in Motorola

In October, the Seychelles Police announced that it had deployed a Motorola Solutions' *MOTOTRBO* system for critical communications and improved dispatch of officers across land and sea for rapid response to criminal activities.

The Indian Ocean region is home to 115 islands in the Seychelles and faces the constant threat of pirates hijacking local fishing boats, and organised crime gangs using the many isolated beaches to traffic illegal drugs. Patrolling the area has been an ongoing challenge for the police where mountainous island terrain severely disrupts analogue radio and cellular coverage.

Designed and installed by UK-based Communication Specialists (Comm Spec), the *MOTOTRBO* radio system connects more than 800 police officers with dispatch at headquarters in Victoria, the Seychelles' capital. Comm Spec extended the reach of the network using *DR 3000* repeaters which provide more than 30,000km² of radio coverage, blanketing the islands and surrounding ocean for the first time.

Officers were equipped with *DP3601* portable two-way radios which Motorola said offer reliable integrated data communications and enhanced voice capability, while police vehicles had *DM4401* mobiles installed.

Comm-Spec also introduced the VHF version of the *MOTOTRBO DP4801* to the force's radio fleet. This integrates GPS and is also claimed to deliver best-in-class audio. According to Motorola, all the radios deliver advanced location-based services including geo-fencing, enabling the control centre to track, monitor and – should an officer's status unexpectedly change – respond quickly throughout the islands.

Hytera delivers nationwide TETRA system in Nigeria

In January, Briscoe Technologies replaced and expanded its TETRA network in Nigeria with the help of PMR specialist Hytera Communications.

Hytera worked with Briscoe Technologies which owns and operates Nigeria's biggest TETRA network and has more than 10,000 users.

Lagos-based Briscoe is the owner and operator of Nigeria's biggest TETRA network. With more than 10,000 users from multiple industries, it covers Lagos, Abuja and Port Harcourt, and is claimed to be the first network in Africa to be based on all-IP TETRA technology.

With the need for broader coverage in areas such as Port Harcourt and Rivers State, plus increasing demands for higher security and stability, Briscoe needed a new exclusive communication system based on a customised design. But the company faced a challenge in replacing its existing systems without causing disruption to customers. It also had to ensure that any new infrastructure offered compatibility and flexible network topology to satisfy different industry requirements.

Hytera's complete TETRA solution for Briscoe included 30 base stations and 2,500 of its *PCS* terminals with system control, dispatch, and PABX service.

As part of the first phase, 15 base stations were delivered in order to replace the existing network and extend coverage to parts of the Niger Delta where the oil and gas industry is located. During phase two, coverage was then extended to most of the Niger Delta region as well as in the Abuja Federal Capital Territory.

Hytera also provided Briscoe professional services including network topology design, site selection, commissioning of network, training, and local technical support.

Emcom delivers DMR at the speed of sound

In February, South African-based PMR specialist Emcom Wireless announced a deployment to the Bloodhound Supersonic Car project.

In October 2016, the Bloodhound team will attempt to break the world land speed record on the Hakskeenpan in South Africa. As he tries to topple the record of 763.035mph, driver Andy Green will be able to communicate instantly with the control centre at the press of a button thanks to a DMR system supplied by Emcom.

Sipho Tony Sibanda, Emcom Wireless' executive director in charge of business development, said: "Our DMR solution will provide real-time voice and data communications and allow the command centre to not only talk to the driver but monitor his vital statistics such as heart and breathing rates, as well as offer capability to transmit real-time vehicle performance criteria throughout the attempt."

The network will use Tait Communications' Tier 3 *TAITNET* DMR platform which will directly link all operations to the control centre on the Hakskeenpan. All support teams, engineers, emergency crews and airborne assets (such as aircraft filming the event) will benefit from having coordinated group radio communications without interfering with each other.

The system was specifically configured at Emcom Durban Radio workshops and even has the capability to integrate with the LTE network supplied by MTN.

At the push of a button, driver Andy Green will be able to instantly talk and relay or receive information from the command centre.

JANUARY – JUNE 2015

Altech Fleetcall is upgrading its analogue radio trunking network in South Africa using DMR systems from Hytera Communications. According to Hytera, it is arguably the largest operational MPT1327 network in the world with more than 170 sites. Using the vendor' ETSI standard DMR Tier 3 trunking solution, Fleetcall said its network will offer higher data speeds, GPS tracking, flexible dispatching, multi-level monitoring, larger subscriber capacity, and "crystal clear" voice quality.

Hermes Datacomms is using O3b satellite capacity to deliver critical comms for a global oil company's operations in West Africa. Under the deal, Hermes is also providing the unnamed firm with a connection back to its regional HQ in Europe. Hermes was acquired by Speedcast earlier this year, and said this latest announcement represents its strategic partnership with O3b in the energy business. The two have been working closely with the satellite operator since 2012, and said they now have a number of fully trained O3b installation engineers.

JULY – DECEMBER

The City of Cape Town has upgraded its TETRA infrastructure using the latest system from Motorola Solutions. The city's TETRA network is said to be the largest in South Africa. It serves 11,000 public safety, security and utility services, and also provides communications for 2,500 external users from surrounding municipalities. Altech Alcom Matomo upgraded the infrastructure's master switching station using *Dimetra IP 8.2*. Motorola says efficiency, safety and incident

**Zheng Yafei,
Deputy sales
director for Africa
& surrounding
China region,
Hytera**

Founded in 1993 in China, Hytera has grown to be a key player in PMR and now has a large customer base in more than 120 countries and regions across the world.

The company claims to be rare in that it specialises in TETRA, DMR and PDT technologies, and produces a wide range of products and solutions using all these mainstream digital protocols. Hytera adds that its acquisition of Rohde and Schwarz's TETRA business in 2011 further strengthened its edge in the TETRA market.

Africa is becoming an increasingly important market for the company, and in 2015 it achieved a lot of breakthroughs on the continent as Zheng Yafei, Hytera's deputy sales director for overseas sales in Africa, explains.

"Hytera was selected to help Ethiopia Police build their nationwide network. The implementation of phase 1, including a command and control centre, and a DMR trunking system to cover the whole of Addis Ababa, was recently finished in March 2016.

"In Uganda, we won the contract to provide the national police with a DMR trunking solution, and the first phase of the project has been completed, providing communication coverage for the capital Kampala."

Other work currently in progress includes a communication system expansion for a South African operator which has chosen DMR trunking, and a TETRA deployment for an operator in Nigeria. In addition, Yafei says Hytera has also offered some "significant" TETRA solutions for public safety clients in Francophone Africa.

So how has the company seen the continent's PMR market adapt and evolve in Africa in 2015? Yafei says analogue products are still widely used in Africa, which presents a great opportunity for future migrations to digital. He also believes that, compared with TETRA, DMR is relatively more suitable for clients in Africa because of the technology's cost effectiveness, abundant functionality, larger coverage, etc.

"Most African countries are resource-based. The price drop of oil and major international commodities affects the continent's economies greatly. As a result, many governments cut their budgets this year, and so the lack of financing capability is the main challenge in 2016. The lack of infrastructure is the other challenge and always exists.

"But while many challenges remain, this continent still has great potential. Market demand is still there, and clients need to solve their problems with mission critical communication equipment. The budget limitation drives them to reconsider their suppliers and make the right choice."

Yafei says Hytera is committed to bringing leading-edge technology but at a "reasonable cost" to its clients.

"Actually, Hytera has put massive resources and investment into this continent to develop the market, and the company is dedicated to bringing the most suitable solution for African clients. In the past five year, Hytera's business in Africa has grown greatly, especially in East and West Africa."

In terms of the future, Yafei says the company is targeting bigger growth this year with the deepening of China-Africa relations. He also believes PMR will play a role in the broadband systems that will be deployed on the continent.

"Mission critical communication systems are going to apply to broadband technology in the future for sure, but we need to identify what the real broadband solution is and what our clients need.

"Since the narrowband is widely deployed, to save their previous investment clients need a merged broadband and narrowband solution which is interoperable with their legacy system.

"Moreover, in view of the capex, a mixed solution is also needed. A nationwide narrowband voice communication system is necessary while a broadband system can be deployed in some specific hotspots only."

"Clients in Africa need to solve their practical challenges with mature, approved technology. And to solve their voice communication challenge is always the higher priority – video transmission is good but remains supplementary."

However in reality, Yafei thinks it will take long time for Africa to enter the broadband era due to undefined standards, high investment and maintenance costs, lack of spectrum and infrastructure, etc.

**Allan Detlefsen,
Sales &
marketing
director,
DAMM**

DAMM is currently developing and expanding its presence in Africa. In the past, the Denmark-based company's focus was on the sub-Saharan region and so it now wants expand into the remaining parts of the continent, as Allan Detlefsen explains.

"DAMM's primary focus is on private market deployment of high-end professional communication in the sectors of mining, transportation (seaports, airports as well as public transportation), oil and gas, and utilities. In the public sector, the main focus is city/regional networks and the radio network operator business. Due to these expansion plans, we are interested in getting in touch with potential partners within the African continent."

Like Hytera above, Detlefsen says Africa still has a large installed base of analogue equipment, and so DAMM is seeing an increasing interest from organisations to migrate to digital trunked solutions.

"Low-cost digital technologies are mainly used in cost-sensitive regions for simple

response time have all now been improved through enhanced network management, security and new location-based capabilities.

The Addis Ababa Police Commission has awarded Hytera a contract to supply an emergency command and dispatch system. While precise details are as yet unavailable, Hytera said the scope of the project also includes establishing a PMR network covering Addis Ababa, Ethiopia's largest city, as well as offering two-way radio terminals to the police force. The value of the deal is around USD7.2m.

**Bryan Raath,
Business
development
manager, Africa
Sepura**

The year ahead: We have seen an increase in the number of TETRA enquiries for public safety and business critical environments in the region. But as user density is rarely an influencing factor, DMR and its coverage capabilities is the forerunner in the race to secure future networks.

From a cost perspective, DMR is most often associated as the best fit-for- purpose technology as it addresses most of the operational requirements whilst offering a slower and easier to consume migration strategy designed on budget availability.

As many African countries still rely on legacy analogue radio systems, there will continue to be a clear drive and intention to migrate these systems to a digital platform.

But switching to a digital standard is a long term commitment for end-users, and they need the support from manufacturers to fully understand their options before making a commitment on any investment.

push-to-talk systems and standalone radio communication systems. For professional and advanced solutions integrating other services for voice and data, [systems] based on TETRA technology remains the preferred choice.

"For instant communication in first-responder emergency and security services (especially for rural areas with limited or non-existent infrastructure) DAMM offers a fully featured TETRA node in a compact format called *Rapid Deployment Tetra (RDT)*. This allows for a full featured TETRA system to be deployed in less than five minutes."

Housed in a tough wheeled suitcase for maximum mobility, Detlefsen says RDT offers a fully functional high powered TETRA communication system that can be instantly deployed in any situation. Its internal battery offers independent power for more than two hours, and can additionally be connected to solar-powered devices. With extremely low power consumption, RDT is described as an "ideal robust, secure and compact solution for the African continent".

Detfelsen says the challenges critical comms users face in Africa are the same as in other regions of the world.

"Users should be able to navigate in the huge pool of information provided by manufacturers of different communication technologies and solutions. They should be able to maximise the benefits of the investment in a critical communication solution.

"It is key to select a cost effective and future proof system that matches current needs, yet stays open to changing demands and requirements. Customers go for the best ROI in critical communication with a future proof and technology independent solution that will help keep costs down."

To meet the challenges in Africa, Detlefsen says DAMM offers a multi-technology platform that features an outdoor system capable of handling multiple technologies – all in a single base station. As a result, the platform is able to meet the user's needs of today as well as their potential needs of tomorrow. "The customer also eliminates the uncertainty of making the wrong choice today, affecting his options tomorrow."

Detlefsen continues by saying DAMM's platform offers the world's first outdoor DMR tier 3 base station optimised for direct outdoor mounting, thus eliminating the need for special housing or additional cooling.

"Other cost saving features include plug and play installation, as well as an extremely low power consumption making it possible to operate on solar power, which is ideal for the continent. A self-sustained solar power supply enables easy and agile infrastructure expansions to meet Africa's challenges."

As he looks forward to the foreseeable future, Detlefsen says the company's mission is to be able to reach new geographies and new market segments on the continent, and to introduce its cross-technology platform to even more customers, partners and system integrators.

"Industry leaders worldwide trust DAMM in critical radio and broadband communication. We are eager to establish a strong presence in Africa, and to bring the benefits of the most flexible and scalable communication solution to customers."

Tony S Sibanda, Director of sales & business development, Emcom Wireless

According to Tony Sibanda, the process of migrating customers to new digital technology is often met with scepticism due to unfamiliarity with not only the new products and vendors, but also the different forms that digital technology comes in.

"The influx of eastern products onto the continent has seen digital radio, though rich in features and functionality, land at prices a fraction of conventional analogue products.

"But in their quest to buy the 'cheapest' and 'save' money, customers have often ended up with elephants in their backyards, having chosen the wrong digital type for their application. Lessons have been learnt through educating the market and using case studies to demonstrate the importance of planning and finding fit-for-purpose technology and products, and not purchasing on price alone.

"We have thus seen a rapid shift from the initially favoured TETRA technology onto the now mature DMR platform. In our experience, the latter is better suited for wide area coverage in sparsely populated regions, allowing some use of existing analogue high-site infrastructure.

"The last 12 months has seen Emcom successfully deploy multi-site DMR Tier 3 systems in six countries, half of which have been national, with the capacity to accommodate multiple agencies on one network. Sectors covered have included wildlife management and anti-poaching, mining, public safety, municipalities and electricity utilities.

"Right from commissioning date, the customers have reported significant operational efficiencies and immediate returns on investment through better fleet management. That's thanks to: tracking and location services on terminals; improved voice quality; cheaper communication costs through integration and linking of sites for long distance radio calls; and improved safety in environments where traditional communication means fail.

"What has been key in the successful deployment of radio technology in Africa has been Emcom's customer centric business development team that has travelled extensively on the continent. The team adopts a culture of empowerment and skills transfer in every interaction with the client and practices a culture of listening before proposing any new technology or product.

"Relationships matter and trust has been built over time through always delivering on promises and seeking opportunities to always improve and exceed expectations. For my part, I keep my finger on the pulse through interactions with technology and product suppliers, as well as with a wide range of customers on the continent.

"I believe Africa's radio market is where the cellular industry was in 2009, with the introduction of smartphones into the market. Digital radio has come as a major game-changer in that it's not so much about voice anymore. Data has introduced a new dynamic in how professional radio is used.
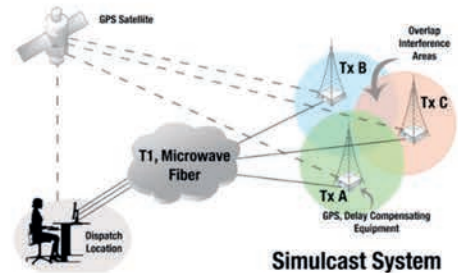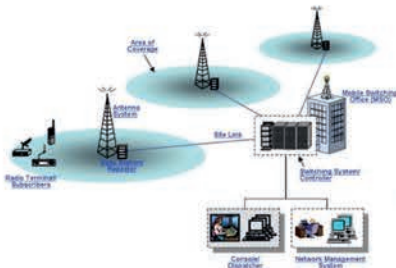
"With the dawn of unified communications, the IoT, and faster data speeds with LTE (and 5G on our doorstep), we see a big shift soon to software defined radios and more demand for customised applications on radio. Already we have integration of radio to Bluetooth, Wi-Fi and GSM on our laps. Soon it will be a question of what the radio can do for the user and not so much what brand of radio one uses.

"With the standardisation of communication protocols over different products through ETSI, interoperability has become key in integrating different brands and bridging devices. In Africa, like the rest of the world where disasters such as flooding, fires and building collapses still occur, command and control centres are a growing priority, making it ever more important to unify the different communication platforms in recovery and rescue operations. This calls for a different skill set in applying the technology and requires a bit more thought in understanding where the digital drive is going and forecasting future needs that we may not be aware of today.

"Finally, I would say the benefits of adopting DMR today cannot be over-emphasised as they talk to the fundamental principles governments are preaching about. These include infrastructure development, improved service delivery, safety and security, skills development, and employment creation, to name a few.

"The growth in connectivity on the continent must not ignore this area of communications which is often the last line of defence in every incident where resources are stretched to the limit, and life and limb are at stake."

In focus:
Green networks

Africa leapfrogging lean and green in the cloud

**Roel Castelein,
EMEA Marketing
Chair
The Green Grid**

Some time ago I did extensive research into the African ICT market. So how does it compare to the rest of the world? Let's focus on Africa's weakness and transform that into a strength.

The lack of basic telco and grid infrastructure across its 55 countries is probably the continent's biggest weakness. Just as roads, airports and harbours stimulate the flow of goods and services, so does the digital infrastructure of cable networks and Data Centres enable growth in ICT services. Summarised, Africa does not have legacy infrastructure on which to grow the digital transformation.

But this 'legacy infrastructure' is now hampering the rest of the world. It is old and expensive to maintain. Worse, it prevents investment in new systems that would be both more environmentally friendly and provide better capacity. Also the old world model of selling boxes and licenses is so ingrained in company habits that a shift to grouping data and applications in a Data Centre (the Cloud) versus each company operating its own Data Centre is still hard to contemplate.

So Africa's weakness suddenly is a strength. Just as Africa leapfrogged expensive landlines towards mobile phones, it now has a similar opportunity to jump expensive servers, licenses, maintenance and energy by thinking smartly about centralising software applications in hyper scale Data Centres and ensuring wireless networks deliver Software-as-a-Service to all market segments. Not only would it be less expensive, but also better for the environment.

These African hyper scale Data Centres could be located near deserts, powered by solar or wind. Humid and warm equatorial climates are tough on hardware, so mini Edge Data Centres could be connected to Hub Data Centres, always taking into account that grouping applications and services will be more efficient in cost and in environmental impact.

Sure, both Data Centres and Mobile Towers need grid power, and in many places across Africa grid power is unreliable or unavailable. But there are small, nimble companies working on solutions to reduce the costly diesel generator, and even replacing it by solar energy. The demand for reduced maintenance cost is there, so the technology to displace diesel will follow. And in the meantime it would be wise to stop acquiring expensive servers and software licenses, and consider African hyper scale Data Centres where multi-tenant applications could serve users efficiently at lower economic and environmental costs.

Site location and climatological impact would need to be thoroughly assessed, as is network connectivity, both from the huge data pipes that land on Africa's coast to the inland spider web of Mobile Towers. This is not for the faint hearted, but since this is Africa the prize will be equally rewarding. Mobile Network Operators should do what they are good at, and build and maintain the cloud infrastructure and application vendors can then provide their services through these networks for a fee. The telco's billing system is equally adapted to ensure the client is charged for services used, so everybody wins.

There is also an economic reality behind Mobile Network Operators driving Africa's green cloud business. I would hate to see the big hyper scale players like Microsoft, Amazon or Google take the lead in Africa, because they siphon value out of Africa instead of back in. Africa needs them to put their services on locally owned and operated Mobile Networks so the African engineers and technicians learn, benefit and pump value back into the local economy. This will also spark local cloud content creation, be it African Health Clouds, – Enforcement Clouds or - Government Clouds, with specific African content run by African Mobile Network Operators.

Intelligent MNO's will run this content on super efficient, lean infrastructure, benefiting from partnerships with infrastructure vendors who wish to test and trial their new servers in low resource conditions. Limited bandwidth, scarce power supply and extreme heat and humidity are perfect conditions for suppliers to test and prove resilient and efficient Data Centres. The Mobile Network Operators bring their knowledge of local regulations, customs and other challenges so the value gets created on both sides.

And last but not least, sharing experience, knowledge and best practices sharing through an objective platform would be fantastic. An example is The Green Grid, but there are others too. The underlying philosophy should be that when Cloud Computing can thrive in the most resource scarce environment, Africa, the whole world can benefit from this experience and learn to do more with less. Africa would lead the way in driving a less destructive and more sustainable future for humanity.

The vision for Africa is thus to leap frog expensive and unsustainable ICT legacy systems, lean and green into the Cloud. Hopefully the rest of the world will follow.

The Green Grid Association is a non-profit, open industry consortium of ICT industry end users, policymakers, technology providers, facility architects and utility companies that works to improve IT and data centre resource efficiency around the world.

Solar power, mobile comms, and fresh water

In a move that possibly illustrates the key needs of people in modern Africa, Ericsson and Coca-Cola worked on a pilot project to bring mobile connectivity to *EKOCENTER*, a social enterprise initiative designed to bring safe water, solar power and mobile communications to underserved communities.

The project was carried out with Tigo Rwanda and German start-up Solarkiosk. Coca-Cola partnered with Solarkiosk to roll out *EKOCENTER* in six countries in Africa and Asia during 2015. The modular kiosks are being run by local women entrepreneurs, and serve as a community centre where people gather and have access to free and fee-based connectivity services.

Ericsson provided a number of its products for the *EKOCENTER* in rural Rwanda. It deployed its *Managed Rural Coverage* solution to provide internet services, and is also offering its *TV Anywhere* service to enable access to education and healthcare content as well as 'infotainment' capabilities.

In addition, the company provided its *M-Commerce* solution so that people at that centre can now make transactions using

Coca-Cola has been testing its solar powered *EKOCENTERs* in Africa with the help of partners that include Qualcomm and IBM.

their mobile wallets. Based on the success of the implementation, Ericsson says it will potentially incorporate its services at additional *EKOCENTER* locations.

On top of all the mobile communications features, each solar powered kiosk is housed in a shipping container and supplies safe drinking water to rural areas using the Slingshot water purification system developed by DEKA R&D. This utilises vapour compression distillation technology to turn nearly any source of dirty water into safe drinking water.

Energy efficiency standard to help optimise RANs

The ITU and European Telecommunications Standards Institute (ETSI) agreed a new standard to measure the energy efficiency of mobile radio access networks.

Energy efficiency measurement and metrics for telecommunication network (ITU-T L.1330 and the technically equivalent ETSI ES 203 228) was said to be the first standard to define energy efficiency metrics and measurement methods for live RANs. It provides a common benchmark to evaluate performance, and its application will build uniformity in the methodologies employed by such evaluations, in parallel with establishing a common basis for the interpretation of the results.

The ITU said the standard accounts for the fact that optimising the energy efficiency of equipment within a network does not guarantee the optimisation of its overall energy efficiency. It had been developed to take a more comprehensive view of a RAN, incorporating impacts on energy efficiency caused by the interactions of interconnected equipment within complex networks.

ITU-T L.1330's scope extends to radio base stations, backhauling systems, radio controllers and other radio site infrastructure equipment. The technologies covered include GSM, UMTS and LTE (including LTE-A).

According to the union, the standard offers a pragmatic measurement approach focusing on the performance of 'partial' networks to extrapolate estimates of the energy efficiency of 'total' networks. It provides for a total network to be defined by topologic, geographic or demographic boundaries, enabling estimations of the energy efficiency of an operator's, country's or continent's networks, or networks distinguished by their coverage of urban or rural areas.

The result of these estimations could then be captured and delivered in an assessment report, the form of which is also detailed by the new standard.

Cutting down on diesel

Whether the primary factor is the environment or just saving cold, hard cash, there are certainly benefits to both when reducing the amount of diesel needed to power base stations or the site and construction fees of a private set of towers to attach antennas to.

For example, MTN Benin is using managed rural coverage (MRC) provided by Ericsson to bring 'mobile as a service' to central and northern parts of the country where connectivity was previously unavailable. The company claims MRC is a "cost-competitive" solution whereby operators provide mobile coverage for a set period according to SLAs and defined KPIs. A key detail is that under the terms of the five-year contract with MTN Benin,

GREEN PRODUCTS IN 2015

Cummins Power Generation's latest mobile generators are around four to five per cent more fuel efficient than previous Tier 3 models. They deliver higher availability and longer running times between service intervals with no increase in overall package size. The units are based on Cummins' *QSB7* and *QSL9* engine platforms which are said to have undergone extensive refinements to meet the US Environmental Protection Agency's (EPA) stringent Tier 4 Final regulations. These limit mobile genset emissions to 0.4g per kWh of nitrogen oxides and 0.02g per kWh of particulate matter. These levels represent a 90 per cent reduction of the two pollutants from its previous Tier 3 models.

ComNet's solar powered systems are designed for applications where a remote camera or wireless repeater is needed but power is either

not available or too expensive. Its *NetWave Solar* range of kits aim to offer a complete system for providing remote power to edge communications equipment. They include: a solar panel; valve-regulated lead-acid battery; solar charge controller; PoE midspan injector; and an outdoor steel enclosure.

The 30A solar charge controller features an LCD for diagnostics and system health monitoring, intelligent PWM charging mode, and battery protection from overcharge/over discharge. ComNet adds that the battery provides "outstanding" deep cycle and cold weather performance.

Emerson Network Power (ENP) claims its *Battery Optimisation Program (BOP)* will help telecom providers optimise the performance and lifespan of DC power system batteries in critical infrastructure environments.

The program uses a tailored combination of traditional discharge testing and what ENP says is state-of-the-art internal resistance tests. It assesses battery health and the impact of various parameters such as battery type, age, discharge cycling and ambient temperature.

Four standard battery management solutions are offered, ranging from a low-cost offering with limited testing, to one that provides a value suitable for the most critical sites (comparable with the IEEE benchmark). Each one targets different type of site demands and can be further customised to meet specific requirements.

CommScope has developed a new antenna to help wireless operators relieve overloaded cell sites and support high concentrations of subscribers in special venues. The *Tri-Beam*

Ericsson will provide access via its low-power BSTs running on solar energy to avoid the expense and emissions associated with diesel generators. There will also be transmission provided via satellite as an alternative to the high costs and civil works associated with building a microwave backhaul network in remote villages.

As a result, MTN Benin said it had been possible to create a business model to provide mobile coverage to parts of Benin where people have to survive on less than USD2 a day.

"With Ericsson's help, we are now able to provide mobile coverage in areas where it previously did not exist," said Stephen Blewett, CEO, MTN Benin. "This connectivity allows people in these areas to communicate with family, friends and acquaintances which they previously could not do. We are also proud to see members of these communities establishing themselves as MTN Mobile Money agents."

Orange and ENGIE aims to boost power in Africa

Orange will work with ENGIE on two projects to expand the rural electricity grid and optimise the energy supplied to its telecoms infrastructure in Africa.

France-based energy specialist ENGIE said it currently supplies 760MW of power across the continent. As part of its aim to become one of Africa's major energy leaders by 2025, it has created a dedicated business unit with around a hundred employees and has a number of projects planned.

Under an initiative announced in late 2015, ENGIE said it will combine its experience in renewable energy production, aggregation and maintenance, with Orange's expertise as a telecoms carrier. Working together, the two companies will

trial a range of domestic power supply solutions for rural populations that could then be marketed by the telecoms operator.

These solutions could include, for example, individual solar kits and small-scale local electricity networks. The service could then be billed via mobile using *Orange Money*.

The partners said trials will allow them to validate the technical solutions, sales and distribution models, and economic feasibility of the service before making it available on a larger scale.

Citing figures from a 2014 BearingPoint study, they say around 90 per cent of the rural population in sub-Saharan Africa has no access to the electricity grid.

Low power networks to support M2M

Another issue that is causing an unnecessary higher power utilisation is the prevalence of cellular networks being used for M2M applications, but the dominant position of traditional cellular networks in the market for M2M connectivity is about to change, according to Beecham Research.

In a report published in October 2015, it said that as well as reduced energy consumption, low power wide area networks (LPWANs) also offer low cost, long range, and enable a far wider variety of M2M and IoT applications currently constrained by budgets and distance from a power source.

From a standing start in 2015, Beecham expects that by 2020 LPWANs will provide 26 per cent of the total IoT connectivity market with 345 million connections, marking an end to the near monopoly of traditional cellular networks for M2M connectivity. It said there's a growing variety of LPWAN technologies, such as Sigfox

as well as those developed by the LoRa Alliance. It also says most of these solutions utilise the ISM bands better known for use by short range wireless technologies such as Zigbee, Wi-Fi and 6LoWPAN.

However, the firm said recent advances have enabled LPWANs to be established using the ISM bands over longer distances, up to 50km in rural areas and 5-10km in urban areas. It added that TV white space (TVWS) technology also promises connectivity over distances of 10km and with "superior" in-building penetration compared to 3G or 4G.

Beecham Research CEO Robin Duke Woolley explained that LPWAN is ideally suited to the African IoT/ M2M market, where long range, low power, and low data rates are typical requirements.

"There are vast areas in Africa where it is not cost effective to install cellular but where LPWAN can be," he said. "For example, LoRa can be installed either as part of a public network available to all, or as a private network available only to one company's remote devices. There is also nothing to prevent a private LoRa network from being used by other companies through agreement with the owning party.

Speaking about the potential for the future across the continent, he went on to say, "We expect all of that to develop in Africa, particularly for smart farming, land security, tracking and possibly smart metering purposes

Beecham Research CEO Robin Duke Woolley believes LPWAN is ideally suited to the African IoT/M2M market.

antenna uses new lens technology that focuses antenna signals like a magnifying glass into three narrow beams, sculpting an overloaded sector into three sectors.

According to CommScope, the result is nearly three times the capacity as the original sector without adding a new cell site. It adds that when deployed in cell clusters, the antenna can achieve up to four times the capacity with the optimised overlap between cells.

With 4dB more gain than a standard single-beam antenna, the *Tri-Beam* is said to optimise sector roll-off. CommScope claims it provides more than double the signal strength inside of the sector, resulting in better building penetration and at least 4dB better signal to noise ratio.

Dr. Nicola Davies, ICT journalist, African Wireless Communications Yearbook

The year ahead: According to industry statistics, there are currently around 145,000 cell sites running off the grid in Africa, and more than 84,000 in areas where grid power is unreliable.

This adds up to emissions amounting to 6,587,000 metric tonnes from diesel generators alone, without taking into account the emissions from grid power supplied by coal burning power stations.

Although Africa is only responsible for a small percentage of the 70 mega-tonnes of CO_2 produced by the global cellular industry, network penetration and the demand for

services is growing rapidly. With some of the continent's countries having only 10 per cent network coverage, meeting this demand will result in a considerable investment in cellular infrastructure accompanied by increased emissions in areas without grid power.

As has been well-documented, Africa offers enormous potential for mobile growth, and network coverage will be an important enabler for its economic development.

With infrastructure in place, companies will be increasingly attracted to investment in Africa, and with electricity utilities offering limited or unreliable coverage in many of the continent's countries, the region will continue to prove to be the ultimate test for the successful implementation of energy-efficient, 'green' cell sites.

IHS Towers was founded in Nigeria in 2001 and is now the largest tower company across MEA. We have operations on the continent in Cameroon, Côte d'Ivoire, Rwanda and Zambia, but Nigeria remains our biggest market where, despite an unpredictable electricity grid, IHS has uptimes of more than 99.9 per cent on its sites.

Issam Darwish,
Executive vice chairman & CEO, IHS Towers

We have invested more than USD70 million to develop and maintain two state-of-the-art NOCs in Lagos and Abuja which save money and add value for network operators. As a result, IHS can offer a range of services, such as turning every base station and tower into a profit centre, and green power management.

For example, IHS Cameroon was launched at the end of 2012. The following year we acquired MTN Cameroon Towers and signed a management with license to lease contract with Orange Cameroon. Despite declining grid availability, the company managed to provide robust network availability in record time. We did this through a large investment in a power system upgrade, strategic team expansion, and a consistent and proactive approach to site maintenance.

IHS Cameroon now operates 180 hybrid solar sites nationwide. We continue to roll out new green energy solution systems, selecting the most efficient source of power according to diesel supply, weather and availability of electricity.

After adding Nexttel in 2014 and Camtel in 2015 to our client portfolio, IHS Cameroon now services all of the major players in the country's telecom sector.

Elsewhere in West Africa, IHS Côte d'Ivoire operates more than 2,300 towers and has a diversified portfolio of customers that include major telcos such as MTN, Orange and Moov, ISPs Yoomee and VIPnet, as well as public and private companies. We currently operate 110 hybrid solar sites throughout the country.

Further east, IHS now owns and operates more than 80 per cent of the tower portfolio

"IHS has reduced its diesel consumption by up to 50 per cent on average across Africa."

in Rwanda after acquiring the tower assets of MTN Rwandacell and the entire shareholding of Rwanda Towers (formerly a subsidiary of Airtel Rwanda).

IHS Zambia was incorporated in December 2013, and has since acquired towers from MTN Zambia and Airtel Zambia. Today, IHS Zambia manages approximately 70 per cent of towers in the country and operates more than 200 hybrid solar sites.

Over the next two years, IHS has resolved to become diesel neutral across its portfolio in the country by using a combination of on- and off-grid solutions. Batteries, charged by the grid and/or solar power throughout the day, will pick up the load when the grid stops.

In fact, IHS has reduced its diesel consumption by up to 50 per cent on average across Africa over the last year. This equates to 72MW of solar energy in Nigeria alone, saving 500L litres of diesel per tower per month.

Since the first quarter of 2013, the company has spent USD500m across the continent on power systems. We now plan to spend up to USD1 billion throughout 2016-2017 to upgrade our power systems across Africa, and will develop alternative sources of power to guarantee 99 per cent network uptime for mobile operators.

**John Anderson,
CEO,
World Panel**

In 2014, World Panel launched its innovative solar panels in Zambia with the claim that they charge mobile phones as fast as a wall plug. Founded by micro-solar technology expert John Anderson, the US-based company developed its technology following years of R&D in sub-Saharan African communities.

While using portable solar panels for charging mobiles has been around for a while, Andersen believes his patented technology is different.

"You have this dominant electrical engineering logic in the industry where you take solar electricity from photocells and then put that through a chipset and condition the energy. But when you put a chipset in between the solar panel and the phone (or what we call 'the host' and 'the client') you have a derating; I've seen losses of up to 50 per cent, so the chipset has to be energised."

Instead, Andersen has developed a unique and patented circuitry process that "streams electricity from the sun" and enables the solar panels to directly charge six to ten phones per day via their USB ports.

"Our technology bypasses chipsets and PC boards and directly connects the sun into the phone. Bypassing those weak components substantially extends the life and substantially lowers the cost. It's the most efficient solar panel in the world, and has a 99 per cent throughput rate.

"And because we're not having to energise internal components or batteries we can reduce the size of the photocells needed. We can have 3W in and 3W out – it's not 5W in and 3W out because we're so efficient."

Over the last few years, World Panel has been refining its technology in order to make it affordable for people living on tight budgets. As a result, it is now able to manufacture a small solar panel charger that can be sold for ZAR199 (USD14).

The next step was finding the right partner. Anderson said the company spent time in discussions with various companies, and in November 2015 it announced Vodacom as a key retail partner to sell its new *SunStream* charger in select stores, starting in Soweto.

So why choose Vodacom when other operators such as MTN can offer a larger footprint across Africa? He reckons that when it comes to using renewable energy, Vodacom is the "greenest" company in the region.

"Vodacom has the largest solar array installed in a commercial building on the whole continent, in their facility in Cape Town. They are extremely minded for sustainability, and creating a sustainable enterprise means having sustainable customers."

Having said, Andersen was quick to point out that MTN is also a company that World Panel has "high regard" for, and the advice was to "stay tuned" for more announcements. Indeed, at the time of writing this in April 2016, MTN South Africa launched a new promotional package for ZAR219 that includes the SunStream charger and free airtime worth ZAR20.

As well as establishing World Panel, Andersen is also business professor at the University of Denver where he teaches "triple bottom line" theory – the measurement of profit not just to the corporate bottom line but also to people and the planet.

"Just like cellular technology overleaped wired phones in Africa, I believe people in the rural areas will leapfrog and have their own energy. I think that everybody in the world is going to generate their own electricity at some point, but the first movers that can adopt the generation of electricity on a micro level are consumers in Africa.

"There's 600 million people right now that live off-grid. Mobile electricity is desperately needed to create a healthy mobile ecosystem – you have networks, handsets, and the content, but all of those stakeholders are limited because of energy poverty. Over 20 per cent of all phones right now on this continent are dead; no energy. Our panel can boost ARPU – if phones have energy then you're selling more airtime, right?"

**Lee Andrew Jones,
Senior manager infrastructure & energy,
Vodafone**

Lee Andrew Jones has around nine years' experience in the energy management industry and is an active member of the Energy Services and Technology Association.

In a blog that was first published by Vodafone in August 2015, he writes that fuel cells have become an alternative source of energy generation to traditional diesel generators in the industry's quest to reduce carbon usage and noise pollution.

"Vodafone now has more than 122 million customers in emerging markets who use mobile data on their smartphones. Data traffic over our networks in those countries nearly doubled over the past year.

"We are expanding our networks to keep our customers connected, but are focused on minimising any increase in energy consumption and carbon emissions.

"Electricity grids remain the most cost-efficient energy source for our radio base stations. However, in some areas within developing countries, utility grids can be unreliable or non-existent, requiring robust on-site power generation.

"Diesel generators are the traditional solution to this problem, but there are many disadvantages, including high carbon emissions, noise, maintenance needs and theft.

"Solar panels can be installed to generate free energy and reduce a diesel generator's runtime, lowering emissions. However, solar is not always suitable for built up urban areas.

"Fuel cells on the other hand, are largely free from harmful emissions because they use alternative fuel sources such as hydrogen and even water. Water-based fuel cells, for example, work on the principle of splitting water into its component elements, hydrogen and oxygen, wherein the hydrogen is used as fuel source. Fuel cells are also less attractive to thieves and are quiet running, making them more suitable for use in some urban areas where noise is a concern.

"[In South Africa], Vodacom started to use pure hydrogen fuel cell systems eight years ago and now has more than 200 fuel cells deployed.

"More recently, we have started to explore other fuel sources for fuel cells, trialling several solutions at our Site Solution Innovation Centre in Johannesburg.

"While we would always like to use renewable energy where possible to power mobile sites, the energy demand is often too large and the capital investment costs too high. Therefore, the optimum solution is typically to combine two energy sources supported by an intelligent on site management controller. There is no single technology which qualifies as an ideal energy source in every location where we operate.

"However, by continuing to test and deploy alternative energy technologies like fuel cells, we can minimise the increases in energy consumption and carbon emissions while providing the benefits of mobile data to an ever increasing number of people in emerging markets."

> "[In South Africa], Vodacom started to use pure hydrogen fuel cell systems eight years ago and now has more than 200 fuel cells deployed."

chapter
Wireless Users

6

Cellular

The MTN Group continues to develop digital solutions and form strategic partnerships as part of its efforts to offer customers and communities pragmatic solutions that directly address their socio-economic needs.

To this end, the operator is investing in the introduction of sustainable mobile health solutions to help improve access to healthcare in Africa. These have been developed in response to the various constraints in the public healthcare sector on the continent, including the impact of increasing populations on limited services, and the lack of easily available and reliable information.

As an African company, MTN says it strives to find locally relevant solutions to strengthen the use of ICT in health development. For example in Cameroon, it is providing health advice related to infant mortality rates and the diseases that are most prevalent in the region. A similar partnership in Ghana ensures access to information on maternal health, reproductive and family planning advice, nutrition health tips and interaction with health professionals in one of six major languages spoken regionally.

In addition, MTN's innovation in making healthcare accessible in Africa through technology includes the use of text-messaging platforms to access healthcare services.

For instance, it has successfully piloted a service in Uganda in partnership with Google and Technology Centre. This offers a free inter-active text-messaging platform which enables mobile users to send questions on reproductive health and to receive answers from a database prepared by reputable healthcare professionals.

Meanwhile in South Africa, customers can access *MTN Care Connect*, a 24-hour nurse advisory helpline service that facilitates access to healthcare information and medical education on mobile devices.

Among its various mHealth initiatives, MTN offers its 24-hour nurse advisory *Care Connect* helpline service in South Africa.
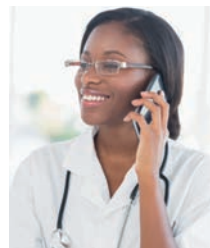
In 2014, MTN launched the *Hello Doctor App* which provides free access to medical information daily, and includes participation in live group chat forums, confidential advice and interactions with a doctor, and the option to receive a call back from a doctor within an hour. The service is now available in South Africa, Swaziland, Zambia, Ghana, Uganda, Cameroon and Rwanda, and was accessed by more than 220,000 people in 2015.

In Nigeria, the *Business Home Healthcare* application enables healthcare professionals to receive a continuous stream of data on their mobiles, allowing them to remote monitor patient health issues such as blood pressure, weight, etc., while they are at home.

By offering affordable and easily accessible digital solutions specifically developed for the needs of its markets, MTN believes it is helping to reduce and mitigate some of the systemic challenges in public health, education, and other sectors which provide social dividends.

Cataleya modernises legacy infrastructure in Liberia

Working with Singapore-based IP networking specialist Catelya, Liberia Telecommunication Corporation (Libtelco) has modernised the national communications infrastructure and ushered in what's claimed to be a new era of IP networking in the country. The operator transformed its network in order to deliver advanced communications services and applications to local service providers, businesses and communities.

Libtelco serves local consumers and businesses with fixed-line services, as well as leasing network capacity to Liberia's four mobile operators – Cellcom (Orange), LoneStar (MTN), Novafone, as well as its own mobile operation which has more than 2.4 million subscribers.

For many years, Libtelco had been reliant on legacy TDM infrastructure. But as business has grown it recognised the need to migrate to IP and modernise its network infrastructure. The company had limited experience in IP services, and its subscribers did not have access to VoIP calling or international dialling from fixed-line phones, so the company knew there was plenty of scope for it to expand its service offering and offer greater choice for customers.

The challenge for Libtelco was to migrate to IP with QoS and QoE that matched or exceeded TDM while building its IP services capabilities. The operator wanted to move quickly to realise the advantages of the tech-nology without needing to manage multiple vendor relationships or go through a long procurement process with different suppliers.

Cataleya was chosen to help make the transition. It was commissioned to create and deliver a fully integrated turnkey solution for IP networking that included interconnection, billing, and session and application management. The vendor took 'best of breed' interconnection and billing solutions and matched them with *Orchid One*, its session and application manager. It claims the result was a seamless roll out of IP infrastructure with Libtelco fully equipped with the tools it takes to monetise IP services.

As the foundation of the solution *Orchid One* has been used to ensure that the telco's customers receive guaranteed QoS and QoE and are able to enjoy IP services with the highest possible performance. Cataleya says

Cataleya says its *Orchid One* appliance provided Libtelco with full end-to-end visibility into network performance. As a result, it can troubleshoot issues as they happen and ensure call quality.

Orchid One gives Libtelco full end-to-end visibility into network performance with near real-time analytics related to session, service, application, MOS/R-factor scores, and end-to-end SLAs. These are used to troubleshoot issues as they happen and ensure call and session quality.

To create a complete solution, Cataleya says it used its experience in integrating multiple components of an overall solution, including switching, media gateways and BSS elements, to bring interconnection and billing together in a bespoke turnkey solution. It was therefore able to create a full IP ecosystem to accelerate Libtelco's adoption of IP.

The first phase of the network modernisation process has enabled the delivery of both domestic and international VoIP services to local enterprises and government, allowing international calling from fixed lines for the first time in Liberia. Libtelco will also use its IP infrastructure to offer triple play services on its fibre network. A second phase will support the delivery of cloud services and Unified Communications as a Service (UCaaS) to the country's growing SMBs.

AdaptiveMobile turns "grey to gold"

An application-to-person (A2P) 'grey route' is a network that sends commercial SMS data in violation of the carrier's terms and conditions regarding commercial messaging. It is SMS traffic that enters mobile networks through unauthorised and unbillable channels, transmitting alerts, notifications and marketing messages.

Globally, mobile operators are losing revenue through such unauthorised grey routes. Despite increasingly generous consumer packages for high volume messages, person-to-person (P2P) SMS is steadily falling. Enterprises are communicating more with their customers via text, and it is here where most major brands have their commercial messages funnelled at the lowest cost. If left unchecked, this will lead to the widespread use of SMS grey routes at the carriers' expense.

In 2012, one of the largest operators in Africa approached AdaptiveMobile seeking assistance in dealing with this

unauthorised traffic. The unnamed operator had three main areas of concern. Firstly, it was worried by in-bound marketing messages sent from one corporation to many subscribers at no additional interconnectivity cost. Traditionally, these are legitimate messages from valid organisations – for example, customer notifications from delivery firms, utility companies, financial services or retail brands. They are often requested by the subscriber and are not spam.

Secondly, there was competitor messaging. This type of message is specifically sent from a competitive network to roamers or subscribers on the operator network to try to entice them to switch to a different network – along with their valuable roaming revenue.

Thirdly, the operator was concerned about access codes – messaging that comes from companies such as banks or social networks that use SMS to send access codes and notifications about a specific account. These are not spam, as often the receiver has requested this method of communication and it's used as a security feature for any service that requires two-factor authentication.

Based on the strength of an existing relationship, the operator worked quickly with AdaptiveMobile to determine a solution. After deploying the vendor's *Grey Route Controls*, the cellco was able to identify and shut down three main classes of grey route traffic and realise in excess of UD3.7 million in revenue each month.

AdaptiveMobile monitors a network using its *Threat Intelligence Unit* and the deployment of *Grey Route Controls* in conjunction with its *Threat Intelligence Service*. The receiving operator then gets intelligence on the routes and sending organisations, ensuring maximum revenue through direct sales to enterprises and brands. While the enterprises and brands may be still paying the same price per message, AdaptiveMobile says grey routes are significantly reduced and the operator can ensure the original message is successfully distributed to its intended end-audience.

The vendor adds that once *Grey Route Controls* are implemented, most messages sent through unauthorised routes will be blocked. As a result, AdaptiveMobile points out that it would be in the best interest of the sending company to set up a direct relationship with the operator.

The company claims it is unique in providing a product that enables multiple business models to manage grey routes. It says the managed service is deployed through a "sophisticated high precision platform", allowing only illegitimate traffic to be blocked, even when coming from rapidly changing sources or compromised legitimate sources.

This means that regardless of where the grey route moves to, the operator is always protected and is able to select appropriate hybrid business models – protecting business relationships with key brands.

Swaziland races ahead using Dynamic Tariffing Engine

The Kingdom of Swaziland is a landlocked country bordered to the north, south and west by South Africa, and to the east by Mozambique. MTN Swaziland is the country's only mobile operator, and out of a population of more than 1.26m people (World Bank figures), the company says around 900,000 currently subscribe to its services.

In 2007, MTN wanted to find a way of making mobile telecoms more accessible to the population, while improving network utilisation and reducing congestion, increasing ARPU, and maintaining revenue. As a result, it decided to pilot Digitata's *Dynamic Tariffing System (DTS)*, which at the time was offered by South African business intelligence specialist Rorotika (Digitata acquired a controlling interest in the company in September 2015).

Two areas representing 13 per cent of MTN Swaziland's mobile network were chosen to pilot *DTS*. Customers in the trial area were offered discounts of up to 90 per cent during periods when network capacity was under-utilised. This resulted in a more evenly distributed network traffic profile in the pilot area across the day.

According to Digitata, the peak traffic on the over-utilised cells in the area was reduced by 14 per cent, while network utilisation increased by 11 per cent. It adds that mobile originated revenues rose by nine per cent in the pilot area, while ARPU from registered customers increased by 4.8 per cent.

Only 1.3 per cent of registered customers decided to leave the *DTS* service during the five-week pilot period, but at the end of the trial, 85 per cent migrated to it. These subscribers generated 81 per cent of all mobile originated traffic. MTN Swaziland went onto launch *DTS* commercially on a partial basis in August 2007, and embarked on a full national launch in June 2008.

Satcoms

With millions of voters heading to the polls to take part in the democratic process, government elections require a high level of logistics, sharp coordination of electoral management staff, and efficient and reliable technical resources.

This is particularly the case in countries with a high proportion of rural areas, where collecting and accurately processing retuned

ballots can be a very difficult task mainly due to the scarcity and obsolescence of terrestrial infrastructures. For example, with an electorate of 5.5 million selecting a new president and parliament, the Commission Électorale Nationale Indépendante of Burkina Faso (CENI) faced the challenge of coordinating polling stations and publishing the results of the 2015 presidential elections on the day following the ballot.

CENI commissioned SES Techcom Services for the installation a high-performance, reliable and secure network infrastructure to ensure the transmission of the results in due time. This had to delivered within eight weeks from contract signature.

Using the *Astra Connect* satellite service and Newtec's *Dialog* platform, SES Techcom installed and integrated a solution connecting 368 polling stations across the country to CENI's collection centre in Ouagadougou. Local ISP Satplay and system integrator Access-sat secured the successful deployment and support of the satellite terminals across the country.

The International Foundation for Electoral Systems supported the training of the 368 technical coordinators in collaboration with local technology partner Unicom and SES Techcom. Together with the coordination of technical teams and experts, this training was key to the project's success.

Each of the 368 sites was equipped with a VSAT station allowing rapid transmission of electoral raw data to the collection server at CENI's central office. These data were then automatically dumped to a specialised server which was developed by Unicom and was capable of showing the results graphically in real-time.

The graphs were not only available on CENI's dedicated election website, but were also disseminated by national broadcaster Radio Télévision du Burkina (RTB) via an *Astra Connect* terminal at its HQ. RTB was then able to show the evolution of the results during its TV broadcasts, making the information widely available to the public in a clear and transparent way.

The training of technical coordinators for the 368 VSAT-equipped polling stations was key to the success of the project in Burkina Faso.

VoIP was also provided at each site to enable constant contact and coordination with CENI's technicians and collaborators sitting in the capital.

On 29 November 2015, 3.3 million people or 60 per cent of the Burkinabé electorate turned out to vote. The e-election was able to reach a vast number of voters across vast areas. SES Techcom's satellite solution ensured that fast and secure transmission of electoral results was provided, with votes displayed to the public in real-time as they were counted.

The following day, it was announced that the country's former prime minister, Roch Marc Kabore, had won the presidential election having received 53 per cent of the votes. SES Techcom says CENI had become Africa's fastest electoral administration to deliver presidential electoral results in a transparent way.

Mercy Ships set sail with mission-critical satcoms

Mercy Ships is a global charity that has operated hospital ships in Africa and other developing regions since 1978. Currently serving needs in Madagascar via the *Africa Mercy*, the organisation brings hope and healing to individuals and communities by mobilising people and resources across the globe.

Mercy Ships' volunteers and staff have performed more than 67,000 life-changing operations that are free to patients. They have treated more than 572,000 patients in village medical and dental clinics, educated around 32,100 local health care professionals and workers (who have in turn trained multiple thousands in primary health care), and completed more than 1,100 community development projects focusing on water, sanitation, education, infrastructure development and agriculture.

Working in some of the world's most distant and isolated locations, the organisation depends on mission-critical satellite communications to keep its ships operating smoothly, and to ensure its teams of volunteers – which include surgeons, dentists, nurses, health care trainers, teachers, engineers, agriculturists and crew – remain connected with headquarters and family members back home.

"Running an organisation like this requires a lot of close collaboration between our staff on our hospital ship, our offices around the world, and our shore teams that are working off the ship," says Chris Gregg, CIO of Mercy Ships. "We are probably more integrated in terms of the involvement of the shore offices with what goes on onboard than you would probably see in a normal

Mercy Ships has operated hospital ships in Africa and other developing regions since 1978. EMC has been its exclusive provider of satellite connectivity for more than 15 years.

merchant vessel. The actual operation onboard is tied very closely with our support office, whether that be supply or hospital programmes, or even IT or finances."

EMC has been the exclusive provider of satellite connectivity for Mercy Ships for more than 15 years. Whether at sea, on land or in the air, the company says it provides "seamless and reliable" connectivity as well as access to some of the most remote locations on the planet.

In 2015, EMC signed a new agreement to expand and upgrade the satcom systems and services it is providing to the *Africa Mercy*. The ship relies heavily on satellite to support surgeries and treatments, as Michelle Bullington, programmes design director at Mercy Ships, explains: "There are two key areas, lab and radiology, that are particularly influenced by a connection with satellite. In our lab we use it to help with diagnoses from a remote location in the US. Also, all of our scans from our radiology department are read remotely. [Satcoms] is important for us to help achieve our mission in terms of treating people."

Mercy Ships is also evaluating new ways to use satellite, especially for training. Bullington says that with satellite-enabled video, the organisation could teach both staff and beneficiaries using lessons delivered from land. "As a future area of growth, we see that using video could be beneficial in terms of sharing curriculum or ideas with other groups and organisations. There are others who are interested in this type of work as well, so we can share ideas and train more people in Africa more effectively."

To support the ship's important medical training mission, EMC is deploying its new global on-demand video service for remote learning access. Based on patented technology, the company claims *HD Connect* provides broadcast-quality video anywhere in the world.

In addition, it is increasing the satellite bandwidth available to *Africa Mercy*, making it easier for the hundreds of volunteers living onboard to communicate with family

and friends during long deployments. The crew and volunteers also have access to live broadcasts from the BBC and Fox News.

EMC says the new agreement with Mercy Ships leverages its extensive VSAT coverage across the continent, as well as its wholly-owned and operated satellite-terrestrial-cellular broadband network with fully meshed MPLS interconnected teleports. The company adds that it has 52 field service offices around the globe, staffed by its own field engineers who are ready to render "prompt and efficient" service to Mercy Ships' vessels wherever they travel.

Bringing Africa closer to London

A mid-sized UK-based independent energy firm listed on London's FTSE 100 stock exchange had existing communications services in Africa, mainly from a local internet service provider. While the services were low-priced, they did not provide an SLA or connection directly to the energy firm's London-based data centre. In addition, the services were largely reliant on local infrastructure, and were delivered through numerous providers with no consistent single point of contact, either for the end users or for the firm's information services (IS) department.

As a result, the energy company (which has not been named due to confidentiality agreements) sought a new connectivity solution and got in touch with SpeedCast. After surveying the client's communications, SpeedCast began with recommendations on how the firm could take more than 20 contracts in a single country down to one with a defined SLA, service support framework, and connection direct to its UK data centre.

Due to the nature of the client's drilling campaign, sites were required at short notice and in remote locations. They needed to be installed before drilling could start, and so the IS team and SpeedCast were placed under pressure to accelerate implementations even before orders were placed. By working in partnership, SpeedCast says it rose to the challenge and delivered on time, each time.

The remote sites connect directly to the client's centralised data centre and it now has one service desk to call for all of its global remote sites. SpeedCast also advised the client on how to cut 30 per cent from its overall network communications budget by moving to a consistent footprint and platform across all of Africa.

As the relationship developed, SpeedCast contributed to and informed the IS strategy, developing standardised remote deployments to give forecasted costs and lead times. It also

contributed to the client's local content strategy by opening local offices to support the services, and contracted local companies alongside its own employees to deliver support.

Broadband

Zambia Research and Education Network (ZAMREN) is a specialised ISP dedicated to supporting research and education communities in the country.

Through the Zambia Information and Communications Technology Authority (ZICTA), the Government has started an initiative to promote low-cost, quality, reliable and affordable ICT goods and services that are universally accessible. Under the programme, ZICTA has supported ZAMREN to provide last-mile connectivity between the University of Zambia, Copperbelt University and Mulungushi University to the fibre optic grid operated by state-owned power company ZESCO.

As well as last-mile connectivity, ZAMREN needed to find a broadband supplier that offered reliable, high-speed cross-border connectivity. Improving education standards is vital to the economic development of many nations, and using broadband connectivity to interlink regional education networks (RENs) is essential for success.

However, cross-border networks are still relatively rare in southern Africa. Most traffic passes onto satellite networks and is then transferred to hubs outside the continent and back again. This impacts on both price and latency.

ZAMREN decided to go with Liquid Telecom for several reasons. As well as having education sector experience and expertise, the company has built the largest single fibre network in Zambia – at more than 1,200km long it is also the country's first fully-redundant network. Liquid adds that it is able to lay new fibre to cover the last mile from its existing network to ZAMREN's establishments, and also claims to supply SLAs that are "unmatched" by any other provider in the country.

After just five weeks of testing, the organisation's network went live in July 2012. Zambia's research and educational community are now linked for the first time, and can communicate with colleagues globally via the UbuntuNet Alliance for Research and Education Networking. The UbuntuNet Alliance is an association of national RENs in Africa. It exists to provide regional and international connectivity and internet services to its members in Eastern and Southern Africa on a non-profit basis.

It also provides specialised and dedicated interconnections with other RENs worldwide.

In 2013, 15 establishments were using the Zambia Research and Education Network, and a further eight were connected soon after. ZAMREN says institutions connected to its network have benefited from a five-fold reduction in the cost of dedicated bandwidth.

According to the organisation's CEO Bonny Khunga, by working with Liquid Telecom ZAMREN has been able to provide efficient, low-cost broadband to research and education institutions: "The result has been a 70 per cent reduction in the cost of internet access for ZAMREN's member institutions and now more dedicated bandwidth capacity for those institutions. This is positively impacting researchers, academic staff and students in their core business of research and education."

Managing bandwidth for corporate broadband customers

Founded in 1995, AccessKenya claims to be the country's leading corporate ISP. It was acquired by Dimension Data in 2013 and later merged with Internet Solutions Kenya, which is also owned by Dimension Data.

AccessKenya provides broadband internet connectivity and services to enterprise and high-end residential customers. Some of these services are sold directly while others are wholesaled to downstream ISPs.

In 2007, the company implemented a bandwidth management solution by installing Allot's *NetEnforcer* devices at critical links in its network. As a result, AccessKenya has been able to monitor and manage bandwidth utilisation per application and per business customer. QoS policies dynamically allocate bandwidth and ensure that SLAs are enforced at all times.

Through the Allot solution, the service provider has also created more than 40 different service plans for its customer base. As a result, its business is said to have grown dramatically both in revenues and in the number of new broadband connections.

However, as AccessKenya's corporate broadband customer-base increased, so did the demand for services within those corporations and ISPs. Enterprise users who experienced network performance problems were sure that the service provider was not meeting agreed-upon SLAs.

But thanks to the granular visibility provided by the Allot bandwidth management solution, the company knew exactly how much bandwidth each corporate customer was using. It discovered that most congestion problems were

originating on the individual corporate networks and did not point to SLA violations on the internet connection. The challenge was to make this transparent to the customer and to provide the tools to correct the situation.

Access Kenya took a two-step approach to achieving its goal. First, it needed to track the actual usage of each corporate account and present this information to the customer. In this way, they would be able to understand how their bandwidth allotment was being used as well as the causes of their congestion or performance problems.

The ISP had been using the *Cacti* open-source network graphing tool for some time to provide basic utilisation statistics to its users at no cost. This was integrated with Allot's *NetXplorer* management system so it could display its usage graphs per customer 'pipe' or 'virtual channel' as defined by the system. In this way, corporate customers can view their own utilisation graphs using a familiar interface. New customers are added automatically to the *Cacti* system and receive a user name and password via email when their pipes/virtual channels are added to the relevant service plan in the *NetXplorer* policy table.

Step two involved solving performance issues. If the problem lay with the service provider, then AccessKenya would take immediate steps to correct it by refining its QoS policies or proposing a bandwidth upgrade to the customer. If the problem was on the customer network, the service provider would offer Allot's *NetPolicy Provisioner (NPP)* to enable customers to monitor and manage their own network traffic. Through *NPP*, AccessKenya's corporate customers can see which specific applications are using the most/least bandwidth. They can assign different priorities to different applications, guarantee bandwidth to business critical apps, and limit the bandwidth available to recreational apps.

Fixed wireless access

Galela was founded as company in 2007 with the purpose of participating in various sectors of the South African economy. As well as working in the mining and energy industries, the firm also has a telecoms division as well as an investment arm for acquisitions and expansions within these sectors.

Galela Telecommunication describes itself as a "trailblazer" in deploying broadband networks, offering internet connection services in under-serviced areas such as townships and rural areas. For example, it has successfully deployed a Wi-Fi hotspot network in Dr. Kenneth Kaunda

Above left: Altai's *C1ns* is used for pico coverage, backhaul and as CPE to extend the Wi-Fi coverage.
Above right: The vendor's *A8-Ein* base station for macro coverage and *A2-Ei* dual band AP have been deployed on the rooftops of various buildings to provide access.

('Dr. KK'), one of four large district municipalities in South Africa's North West province. The company chose to use *Super WiFi* from Hong Kong-based wireless specialist Altai. Galela says network deployments based on Altai's equipment require fewer base stations and access points per square kilometre, and significantly lower total project cost.

Altai claims its technology was designed to overcome Wi-Fi's inherent limitations and give it the ability to cover large outdoor and indoor spaces with high capacity and reliable connectivity. According to the vendor, *Super WiFi* uses proprietary smart antenna technology to give standard Wi-Fi clients much longer ranges, more uniform area coverage, and superior indoor penetration. It says in-house developed 8 x 8 MIMO technology provides five times the average throughput than standard 3 x 3 MIMO in complicated NLOS environments, and *Altai AirFi* improves Wi-Fi cell efficiency with throughput optimisation by a factor of two, even with a large number of concurrent connections.

Launched in February 2016, the Wi-Fi service in Dr. KK provides free internet connectivity to local residents. There are 225 Wi-Fi hotspots in the city of Tlokwe located in the municipality which have been installed mainly in underserved areas such as townships and settlements. Galela says that at peak hours, there are more than a thousand simultaneous users with an average speed of more than 15Mbps per user.

Because of the huge coverage area and high user capacity, Altai's *A8-Ein* base station for macro coverage and *A2-Ei* dual band AP have been deployed on the rooftops of various buildings to provide access, while *C1ns* for pico coverage and backhaul are used as CPE to extend the Wi-Fi coverage. In some areas, such as internet cafés, schools and clinics, *A2*s and *C1ns* are used to provide small area wireless networks.

The network is configured and managed using uses the *AltaiCare* cloud-based solution, which helps to enable local residents to now benefit from round the clock and seamless Wi-Fi services for free.

Galela's rollout in Dr. KK is part of the *South Africa Connect* programme which aims to provide fast, reliable and secure internet to all citizens. Phase two of the initiative will cover all the provinces in the north-western part of the country and, at the time of writing, was targeted to be completed by the second quarter of 2016.

'Digital oilfield' connectivity saves USD1m for Shell Nigeria

Nigeria has become West Africa's biggest producer of petroleum, and approximately two million barrels a day are extracted in from the country's Niger Delta region.

Shell Nigeria needed a solution that could help it automate manual processes, creating an environment that is safer and more secure for its employees and the production facility as a whole. It knew IoT technologies could help its processes become more efficient and its operations more productive, but not only were connectivity options limited, they were also expensive.

Shell Nigeria used many manual processes to monitor its oil operations in the Niger Delta, and sought a solution that not only met its requirements for providing pipeline surveillance and wellhead monitoring capabilities of remote infrastructure, but also could withstand the harsh environmental conditions across a large and remote area.

Furthermore, the company is involved in all segments of oil operations, including exploration and production, upstream and midstream, and needed a system that was scalable for future expansion as well as able to deliver different information over different communication protocols.

Additional requirements included:
❖ A reliable system that enabled near real-time monitoring of different processes
❖ Support for the end devices within the system to be able to run on battery power only, as many locations of interest for remote monitoring have no power supply
❖ Monitoring of operational values both in the local operations centre and at the customer's headquarters in Europe
❖ Two-way communication to not only improve existing monitoring capabilities, but include capabilities for remote intervention.
❖ Data integrity, i.e., system and communication security.

As part of its evaluation process, Shell investigated several IoT connectivity options

and technologies, including satellite, PI to SMS, and GPRS. Each required significant infrastructure investment for towers, radios, data communications equipment, battery banks, logistics and installation. The firm needed to make not only a strong technology case for implementing an IoT solution, but also a strong financial case, and these options were too expensive.

In order to fulfil all system requirements and to ensure reliability and longevity, Shell Nigeria deployed a *Random Phase Multiple Access (RPMA)* machine network from US-based Ingenu. It claims to be a pioneer in delivering connectivity exclusively to machines, and uses end devices from KONČAR, a Croatian producer of industrial electronics and power electronics devices and systems.

Ingenu's machine network is purpose-built to support M2M/IoT applications. It comprises access points that broadcast the *RPMA* wireless signal, end devices that receive the signal from the access points, and the *RPMA* signal itself.

The vendor's technology operates in unlicensed free spectrum at 2.4GHz. It says *RPMA* optimises spectrum/frequency usage, and ensures security via mutual authentication, message integrity and replay protection, message confidentiality, device anonymity, authentic firmware upgrades, and secure multicasts. Ingenu says *RPMA* also ensures the lowest possible battery consumption, yet enables wide-area coverage with almost unlimited capacity.

Upland Consulting Nigeria provided all of the necessary support and conducted all field/installation services for Shell Nigeria. It has deployed KONČAR *Remote Terminal Units* with built-in *RPMA* modules in the flow-stations, manifolds, at wellheads and other customers' facilities. Connections have been provided from the field to the office, ensuring

As part of the IoT network for Shell Nigeria, Upland Consulting provided connections from the field to the office to transmit data about pipeline pressure, temperature and flow.

reliable information flow of field data pertaining to pipeline pressure, temperature and flow. End devices are capable of power consumption control, OTA parameterisation and updates, scheduled and alarm reporting, and encryption of transmitted data.

On top of the *RPMA* system, KONČAR delivered a multiple connection and data export platform with its *MGMS (Modbus Gateway and Management Studio)*, enabling MODBUS TCP/IP and OPC connectivity for Shell.

Ingenu says its low-power, *RPMA*-based WAN solution required minimal infrastructure – just four access points have been used to serve the entire oilfield. This has resulted in total project cost savings of more than USD1m over the technology alternatives Shell Nigeria evaluated.

With the new network in place, the company has been able to:
❖ Reduce manual processes and on-site inspections, thus enabling continuous operations
❖ Quickly identify and resolve issues, resulting in the efficiency and safety enhancement
❖ Monitor equipment status in near real-time, preventing unscheduled downtime and safety risks
❖ Capture critical production data and utilise collected data to further enhance efficiencies
❖ Improve reporting

Upland Consulting Nigeria president and CEO Bola Awobamise adds: "The key criteria for selecting the solution were the technology's ability to cover difficult terrain, power performance and long-range transmission, as well as network scalability, two-way communications, and secure data transmission."

Avanti and Meso power national library digital network

The National Library of South Africa (NLSA) has an important role to play in providing universal access to information for its population. During implementation of its open source Library Information Management System (LIMS), the scale of the country's connectivity issue became apparent. Without broadband access, libraries could not make use of the new system, nor could they access central archives.

NLSA appointed Meso Systems and Avanti Communications to collaborate and deliver internet access to more than 100 South African libraries in close succession.

Phase one of the national rollout delivered the following:
❖ One in ten libraries were provided with services using VSAT access networks
❖ A state-of-the-art modem offering 15Mbps/2.5Mbps download/upload

During the first phase of the deployment, more than 2,000 connections were made at a rate of 11 new connections per day. An average of eight workstations were installed at each library.

❖ A cost-effective 74cm satellite antenna
❖ Bandwidth management using what Avanti describes as its "highly flexible" OSS

The latter enabled the NLSA to record live terminals and new installs at each step. It could monitor terminal performance and data usage, design and create its own bandwidth plans and usage policies, assist with the billing of customers, and communicate with customers.

Over a six month period, more than 2,000 connections were made at a rate of 11 new connections per day. An average of eight workstations were installed at each library.

Phase two of the project brought the total number of connections to more than 3,000. All of the sites were connected using VSAT services in partnership between Meso and Avanti.

Avanti says its satellite technology was favoured for its low cost, high quality, flexibility and rapid deployment. The company adds that not only did the technology extend the reach to rural areas where ADSL was not available, it was also chosen in many locations where ADSL exists.

"We chose Avanti because its services offer unparalleled quality at prices which radically change the economics of high-speed internet access in South Africa," said Thibedi Mogoba, chairman, Meso Group. "Now this access is supporting social transformation, and is helping deliver national objectives around knowledge- and information-sharing."

Commuter train service gets on board with wireless

Three train stations in the Gautrain commuter railway network now have wireless connectivity with the help of South African mobile operators and CommScope.

CommScope has been involved in the Gautrain project since 2007 when it was first being built. The first construction phases were all about building the railway. It wasn't until recently that it was ready for a dedicated wireless connectivity solution. Here, CommScope says it provided a

complete turnkey solution including system design, material supply, installation, project management and commissioning.

The project supports both data and voice services for Vodacom and MTN subscribers in the Gautrain underground stations at Sandton, Rosebank and Park. The solution deployed in the stations is an *ION-M* DAS (distributed antenna system) with a centralised 'base station hotel'. The master unit, which is located at Rosebank, provides the fibre distribution to all three stations which are covered by *ION-M* optical remote units.

CommScope says commuter rail projects are always challenging because work must not interrupt train services. Construction mostly happens at non-operational hours, usually in the middle of night, which makes the logistics more challenging. The company adds that it also takes skill and experience to install and optimise the network at the optimal service levels.

Like in other markets, wireless users in South Africa increasingly expect fast internet speeds and reliable voice service wherever they are. CommScope says the *ION-M* solution is a multi-operator DAS that enables Vodacom and MTN to provide such service to their customers.

The firm will also be involved in the next planned stage of the network, supplying equipment and services. It says this will bring dedicated wireless coverage and capacity to the tunnels via the leaky feeder coaxial cables.

Backhaul

Hughes has helped an MNO overcome the hurdles of jagged mountains and muddy roads to provide uninterrupted cellular overage across the DRC. It has not named the cellco but describes it as a "large African mobile operator which is working to install portable, solar-powered, towers in various parts of the country as part of its rural coverage project. These towers are connected to the mobile network core over satellite and will bring coverage to isolated locations throughout the DRC.

One such location served by this operator will be the conflict-ridden areas high in the mountains of South Kivu where building communications infrastructures can be a Herculean task. Hughes says the operator has been committed to bringing mobile technology to this and other remote areas on the continent.

In addition to boosting economic and social development, the hope is that improved communications will make the South Kivu mountain region safer. Its people will no longer be at the mercy of bandits and robbers because they will be

Clockwise from top left: With the help of Hughes, a mobile operator in DRC has provided cellular services via Ku-band satellites in Numbi; local people gather to watch as workers build the mobile tower; once completed, the 18 metre structure overlooks the town; it marks a day of great significance for local people who were able to place their first calls once the service went live. PHOTOS: SUSAN SCHULMAN

able to connect with the government, law enforcement agencies and the outside world. Hughes is delivering the cellular backhaul services that will support the provider's efforts to enable such communications.

The company claims its field-proven, high-performance VSAT systems are a solution to backhaul for all generations of cellular base station technologies, including 2G, 3G and 4G/LTE. They are cost-justified in areas like Numbi, a town in South Kivu that is impossible to reach using traditional terrestrial means such as fibre, cable or microwave.

Roads do not lead past Kalunga, the small town that sits at the base of the South Kivu Mountains. To reach Numbi, workers must offload the heavy equipment and carry it up and down hillocks and berms (*as pictured below*).

In the rainy season, they must also avoid muddy and slippery dirt roads. On foot, the journey is 27km and the weight of the equipment totals 2,660kg.

The operator established a few sites such as these across DRC, bringing cellular connectivity to the lives of many. Due to low cost, ease of expansion and economies of scale, the operator decided to expand the network.

PHOTO: SUSAN SCHULMAN

The Hughes VSAT system for this network now includes three gateway stations, around 800 remote terminals, and a comprehensive network management system. They enable the operator to provide uninterrupted cellular service over Ku-band satellites. Powered by Hughes Adaptive Coding technology with support for DVB-S2 – one of the most advanced satellite air interfaces – and TDMA for efficient multi-point use, the system delivers more than 45Mbps of IP throughput. The highly scalable gateway architecture allows the operator to cost-effectively expand as needed.

The Hughes gateways are designed for 'lights-out' operation and can be fully managed from the operator's NOC. No personnel are required for daily operations at the gateways which are strategically co-located to provide coverage for the required regions, while experiencing the least amount of bad weather that could interrupt service.

Designed to scale to tens of thousands of users, the Hughes satellite VSAT system is opening new opportunities for mobile operators to extend coverage and improve mobile services for subscribers in target coverage areas with obstacles similar to those in Numbi as well as the DRC's other under-served regions.

Liquid supports nationwide coverage for Econet

Liquid Telecom has provided satellite-based backhaul for mobile base stations in rural Zimbabwe, helping its sister company Econet Wireless move closer to its goal of countrywide coverage and connecting the unconnected.

Econet is Zimbabwe's largest provider of mobile services but large areas of the country are still without cellular coverage.

Building and operating commercially sustainable networks in remote areas throws up problems including transporting kit on poor roads, generating power in areas with no electricity, and equipment maintenance.

Liquid helped Econet improve coverage by implementing a VSAT system which provides backhaul to its rural base stations in Marymount, Masase and Sango Border Post.

The satellite connection includes: a DVB-S2 shared bandwidth downstream carrier, enabling dynamic adjustment of bandwidth to suit demand; dedicated SCPC return links for an always-on connection that uses the latest modulation and coding techniques to maximise efficiency; and guaranteed service levels for specific types of traffic such as voice, SMS and internet traffic, for example.

Every BST is connected to a VSAT which then uses a dedicated IP backhaul link back to what Liquid says is a state-of-the-art VSAT hub in Harare. Both the base station as well as the VSAT run on minimal power so they can be powered by solar.

As a result Econet is now able to provide GPRS and EDGE coverage to even the most remote villages. Francis Mahofa, the operator's GM of network planning and deployment, said: "Liquid Telecom has enabled us to provide cellular services to remote areas where it has always been extremely difficult for operators to make the business model work. Liquid has built a reliable and cost-effective VSAT link and, in the process, has helped change the lives of many people in Zimbabwe for the better."

Point-to-point enables 24/7 visibility for mining company

When South African gold mining company decided to implement a new network at its site, it had very specific requirements in mind. The chosen wireless solution had to be able to:
❖ Transmit video in real time from cameras located at multiple locations in the mine
❖ Enable mining personnel to monitor activity around the clock from a command centre
❖ Support voice, video and data applications that are crucial to safe and effective mine operations
❖ Link surface infrastructure to underground systems (e.g. VoIP switches located 1,200m underground)

The company assessed equipment from different vendors before opting for *RADWIN 2000* point-to-point systems. Radwin specialises in sub-6 GHz wireless point-to-point and multipoint, wireless broadband, and small cell

non-line-of-sight (NLOS) backhaul solutions. According to the vendor, its platform was chosen for a variety of reasons. Firstly, it says wireless was the only relevant option for this type of deployment as fibre optic cable was unfeasible due to reliability and maintainability concerns.

Secondly, Radwin says the mining site is a production shaft and any system placed in this type of harsh environment is subject to extreme abuse. Once again, an armoured fibre cable would have been simply too costly to install and maintain.

It claims the *2000* platform offers the highest throughput of up to 250Mbps. It supports voice, video and data services on single platform, and provides "superior" video quality transmission in challenging conditions. The system has been designed for fast and easy set-up, and also offers NLOS operation and low power consumption. Furthermore, Radwin says the ruggedised, IP67-certified *2000* is built for installation in harsh mining environments.

During the installation phase, the vendor says its system overcame challenges posed by multipath and fresnel zone limitations imposed by the moving skips and cages and the physical dimensions of the mining shaft.

The mining company now has a network that enhances the safety of its site and workers via real-time, high quality video transmission. It benefits from fast detection and response to field mining operations through round the clock visibility into activities.

In addition, the system features support for a range of applications including efficient data communications and remote monitoring, and the firm can connect surface infrastructure to the underground systems. It also has the ability to deploy and re-deploy the equipment where and whenever needed.

Critical communications

Malawi's Ministry of Health and Population extends the public health service through a number of rural clinics and health centres. However, distances from rural hospitals to the more remote health centres can be up to 80km or more, and on dirt roads often impassable in the rainy season. The use of radio communications is therefore literally a vital lifesaving tool.

The UK Department for International Development (DFID) has funded a pilot scheme to provide radiocommunication systems for remote health centres run as part of the *Safe Motherhood* project in three districts in the country's southern region. The initiative aims to improve pre-natal health care in Malawi. Its technical advisor Dr. Esther Ratsma says: "Communication

is critical when dealing with health issues; when a life and death situation occurs the need to call for more professional guidance is paramount and often the life saving force."

Historically, many district hospitals and health centres throughout Malawi have used an assortment of simplex radio systems provided on an ad hoc basis from a wide variety of donor funds. After seeking advice from consultants, the *Safe Motherhood* project decided to go for an integrated and consolidated approach to each network and the needs of each district.

Linked together and sharing resources afford the ability to communicate directly with each other. This has offered a significantly improved network performance.

Team Simoco's locally-based distributor, Pitronic Limited Malawi, entered into an agreement with the Zimbabwe distributor, Vista Communications, to submit a bid for the tender prepared by consulting engineers Scott Wilson. It's claimed Team Simoco's 33 years of expertise combined with Pitronic's local knowledge and Vista's experience (it had previously contracted a similar system in Zimbabwe during the 1990s) ensured the success of the joint venture.

The scheme called for a turnkey solution. This involved the survey, supply, installation, commissioning and maintenance of three VHF radio networks to link groups of rural health centres with district hospitals.

The primary purpose of the network was to minimise response time, both in providing professional help and, if necessary, in dispatching an ambulance to transport an expectant mother to hospital. Most rural clinics are solely dependent on good radio communications as this is frequently the only medium available outside of the major urban developments.

Team Simoco radios comprising *PRF10* repeaters and *SRM9000* transceivers were supplied throughout three of the districts. The majority of the health centres had no electricity supply, and each was therefore equipped with a solar power system as an integral part of the installation.

It's claimed the *SRM9000*'s advanced features enabled sophisticated facilities such as selective calling, ANI, missed calls, phone book, ringtones, etc., to be programmed for easy operation by unskilled staff working under difficult and isolated circumstances.

Careful planning using information gained from an initial survey determined the optimum positioning of the three *PRF10* repeaters. This ensured the best coverage over the extensive areas of operation, with topography being both relatively flat as well as very hilly.

Left: Team Simoco supplied its *SRM9000* transceivers throughout three of the districts. The majority of the health centres had no electricity supply, and each was therefore equipped with a solar power system as an integral part of the installation. **Right:** Careful planning determined the best positioning for the three *PRF10* repeaters to ensure the best coverage over extensive areas which included flat as well as very hilly terrain.

The combined resources of Pitronic and Vista proved to be extremely successful in progressing the project through all phases from initial survey, which demanded some extensive travel, to final commissioning and acceptance. With rough bush tracks providing the only access to many of the remote centres the installation teams has to use 4x4 vehicles fitted with VHF radios and GPS.

Team Simoco says its VHF equipment installed in the three districts initially selected for development is operating very successfully, with good received signal levels being achieved throughout. A few ambulances have also been fitted with *SRM9000* mobile radios, the area coverage of which is being evaluated. Improvements have been realised and the network has been expanded.

Following the success of the pilot scheme the entire team now hope to work on the extension of the project to other areas selected for development under the next phase of the DFID funded programme.

Green networks

New Sun Road (NSR) is a registered California Benefit Corporation committed to implementing solutions to climate change and global energy poverty. Its engineers have teamed-up with Ugandan green energy startup GRS Commodities to deliver reliable and clean power to the Ssese Islands in Lake Victoria. The goal of the pilot system is to provide affordable and reliable solar powered electricity to businesses on Kitobo Island.

Although no small feat, deploying the solar power grids is perhaps the simplest part of the solution. Solar was the obvious choice for the power source because it is economical and relatively simple to deploy.

The primary difficulty lies in managing the energy grid and ensuring proper maintenance without having to be on-site at every location. The capability to remotely monitor the grid will enable NSR to expand its service across the islands in a more efficient manner since each grid can be monitored from one

central location. But in remote areas where communication options are limited, how could the organisation remotely monitor and manage the smart solar power grid? Without a local ISP, this can be a complex challenge, so the team decided to enable remote connectivity over the global cellular network.

In addition to communication challenges, another major difficulty NSR had to overcome was finding a device capable of withstanding the high temperatures within its network hubs. The device would be residing within a NEMA enclosure in direct sunlight, so the capability to function under extremely high temperatures was essential.

It chose Digi's *TransPort WR11 XT* industrial grade router to enable a connection to the available 3G HSPA+ network which would allow for remote monitoring of the grid. NSR says the device provides a reliable connection to the global 3G network while withstanding high operating temperatures of the network utility hub.

By using *Digi Remote Manager* the operations team can easily push out new device configurations, firmware updates, and

remotely diagnose and fix any issues in the network. The cloud management platform also makes it possible to monitor device temperature and alert the team if a device is starting to reach a user-defined temperature threshold, as well as any other changes in device-state that it chooses to actively monitor.

One unique piece to the NSR solution is the custom software application it developed to provide real-time analytics and remote control for both the solar generation system and the end users' electricity usage. The analytics engine allows the team to anticipate problems before they happen, ensure correct maintenance, understand user needs, and continuously optimise the system.

In the summer of 2015, New Sun Road, GRS Commodities, and the University of California Berkeley's CAL-RAE group began providing the first ever round the clock metered electricity service, powered entirely by solar on Kitobo Island. Thirty-four businesses and residential customers are now receiving power and making regular electricity payments, saving on average 50 per cent of their energy costs by switching to the solar micro grid compared to diesel generators.

NSR says the system is generating sufficient revenue to cover maintenance costs as well as ROI, proving its sustainability. It adds that the solution also emphasises the sharing of technical knowledge with local partners and communities. Experts are available to assist young engineers who are on-site to develop skills with solar system designs and communication technology.

Following the successful pilot, New Sun Road is now committed to extending electricity service to each of the inhabited Ssese Islands over the next two years.

New Sun Road chose Digi's *TransPort WR11 XT* to enable a connection to the available 3G HSPA+ network, which would allow for remote monitoring of the grid. The vendor says its cellular router provides a reliable connection to the global 3G network while withstanding high operating temperatures of the network utility hub (pictured here).

Buyer's Guide

Your essential guide to the companies manufacturing, installing, supplying and providing wireless communications products and services in Africa

Company location, country, website	Technology						Infrastructure									Operations						Outsourcing & Ancilliaries						Network Services & Applications					
	Cellular	Wireless Access	Critical Comms (PMR/DMR/TETRA)	Satellite	M2M/Internet of Things	Fibre Networks	Radio Access Networks	Masts, Antennas, Tower Products	Wi-Fi & Access Points	Optical Fibre; Network Cables & Accessories	Power Products & Accessories	Network Cables and Accessories	Test & Monitoring Equipment	Network Security (Hardware & Software)	Backhaul	OSS/BSS – Churn Management & CRM	Fraud Detection & Revenue Assurance	Traffic Analysis & Management	Network Planning & Optimisation	Inventory Management	Energy Efficiency	Network Build	Managed Services	Consultancy & Training	Data Centre Services	SIM Cards	Wireless handsets & End User Devices	Broadband	Broadcast	Enterprise Services	Mobile financial services	Mobile Apps	Other VAS
ABS Suite B01b, First floor Block B Ambridge Office Park, Vrede Road Bryanston, JHB SOUTH AFRICA info@absatellite.com www.absatellite.com +27 10 594 4621				✓											✓													✓	✓	✓			
ACE Consortium c/o France Telecom 61 rue Des Archives Paris, FRANCE lamincamara11@yahoo.com www.ace-submarinecable.com +220 437 8028 or 437 8031 cel: +220 974 0077						✓																											
Advantech Wireless 39 Edison Road St. Ives Cambridgeshire, UK info.uk@advantechwireless.com www.advantechwireless.com +44 1480 357 600 +44 1480 357 601			✓	✓	✓										✓													✓	✓				

ABS

ABS operates a global fleet of 6 satellites including ABS-3A at 3 West the latest addition to the satellite fleet. Its extensive teleport network provides comprehensive coverage to 80% of the world's population across 5 continents. ABS has strategic alliances and partnerships with state of the art communication hubs, to deliver the best possible satellite solutions.

ABS has procured two satellites, ABS-2A scheduled to launch in 2016 and ABS-8 for future deployment.

Headquarters in Bermuda, ABS has offices in the United States, Dubai, South Africa, Germany, Philippines, Indonesia and Hong Kong. ABS is majority owned by the Permira funds which are advised by European Private Equity firm Permira.

ACE Consortium

ACE is a consortium of telecom operators from Africa and Europe. The Consortium has recently launched segments one, two and three of the ACE submarine cable for commercial service since 19th December, 2012. These segments being the first phase stretched from France to Sao Tome connecting 15 coastal countries and 2 landlocked countries, namely, Mali and Niger.

The supply contract for the second phase, which will complete the 17,000 km cable distance to South Africa, has been signed and the construction is underway. This plans to provide landing stations in Congo Brazzaville, Democratic Republic of Congo, Angola, Namibia and South Africa, with the desire to further connect landlocked countries along the way. In the end, 23 countries will be connected to the ACE submarine system.

The ACE system that is being upgraded to the 100G technology, will increase its design capacity from 5.12 Tbps to 12.8 Tbps. The system is supported by wavelength division multiplexing (WDM) technology that would accommodate tomorrow's ultra-broadband networks.

The ACE submarine system has positioned itself as a key driver of Africa's social and economic growth. The 19 members of the ACE Consortium are Benin, Cable Consortium of Liberia, Canalink, Cote d'Ivoire Telecom, Dolphin, Orange France, Gambia Submarine Cable Company, GUILAB, International Mauritania Telecom, Republic of Cameroun, Orange Mali, Orange Niger, MEO, Republic of Equatorial Guinea, Republic of Gabon, Sierra Leone Cable (SALCAB) Limited, Sonatel and STP CABO ". The consortium is pleased to announce the formal launching into operations of the Benin, Lagos and Tenerife branches by June 2015.

Advantech Wireless

Advantech Wireless supports the critical need for High Throughput Satellite communications in a rapidly expanding digital environment. Our proven, low-cost, and highly reliable system solutions are meeting the ever-increasing need for high-bandwidth communications essential to military and government solutions, as well as cellular network providers, broadcasters, robust corporate networks, and security. We integrate award-winning research and development engineering into our designs. The result: custom solutions with lowest overall capital and operating costs, together with an unparalleled commitment to lead the industry in materials, design and reliability.

The company products include Second Generation GaN based SSPAs/BUCs, Next Generation VSAT Hubs and Terminals with A-SAT-II Optimization, Microwave Radios, Fixed and Mobile Antennas, Antenna Controllers, Frequency Converters, Routers, Satellite Modems and Ruggedized Products.
Visit AdvantechWireless.com

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Afrikanet Oxford Consultech		✓	✓	✓			✓	✓		✓	✓	✓	✓					✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			
Altec Alcom Matomo	✓	✓					✓	✓	✓	✓			✓					✓	✓			✓	✓	✓									
Amphenol Corporation	✓	✓	✓				✓	✓											✓			✓						✓	✓				
Anacom, Inc.				✓							✓			✓																			
ARABSAT				✓																													

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Afrikanet Oxford Consultech provides affordable, fast and reliable broadband internet solutions via satellite anywhere across Africa.

Leading telecommunications service provider with over 7.5M euros worth of joint investment in network infrastructure, Afrikanet is using proven technologies to provide you with the best network(s).

With more than 15 years of expertise, Afrikanet has developed a wide portfolio of solutions and services, including VSAT solutions in Ku, Ka and C-band, TDMA, SCPC, WLAN, WiMax, WIFI, LRCP, VoIP, CCTV, Solar energy and more!
We address each and every request with meticulous care to ensure that you get a tailored offer that perfectly fits your project as well as your

budget; with the assistance of our team members both remotely and on the ground, providing site surveys, training, installation, maintenance and 24/7 technical support.

We speak French, English, Spanish and Portuguese and are ready to kick-off your project today! Get in touch, we're waiting for you!

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Altech Alcom Matomo is a division of Altech Radio Holdings (Pty) Ltd and in turn a member of the JSE Listed Allied Electronics Limited (Altron) group of companies. We have operated across Southern Africa for over 45 years.

As turnkey communication network integrators we offer solutions and support across a wide range of digital voice and data wireless and fibre technologies for the private operator, IT and SCADA markets. Our emphasis is on supporting the Public Safety, Electrical and Water

Utility, Transportation, Communication, Heavy Industrial and Oil & Gas user communities. Strong partnerships, strategic alliances and joint ventures with international principals ensure that we have on-going access to the latest technology worldwide.

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Amphenol Antenna Solutions (AAS) is a leading global manufacturer of high performance antennas. As wireless networks have evolved so has the company and today AAS offers OEMs and operators the convenience of a one-stop shop, not only for quality antennas, but for transmission

line products like Feeder Cable, Hybrid Fibre, Surge Arrestors and Connectors as well as RF peripherals like TMAs, Combiners, Couplers and Splitters.

The company provides a comprehensive suite of solutions for virtually all applications and

global frequencies and all products support next generation wireless communication systems.

Whether it's a complex Base Station, an InBuilding System or Private Network Application, Amphenol supplies over 6,000 products with best-in-class performance.

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AnaCom, Inc. is known throughout the satellite communications industry for providing high performance products that are extremely reliable and available at a low cost. AnaCom's products are sold worldwide to most satellite communications systems providers, integrators and end-users. Located in the heart of Silicon Valley, AnaCom provides complete solutions for satellite communication based networks for

broadcast, data and voice communications.

AnaCom's RF/microwave products include several lines of Block UpConverters in ranges of power and size as well as indoor Rack-Mounted Converters. AnaCom's other popular product lines include AnaSat Transceivers, ELSAT BUCs, SSPAs, LNAs and other accessories covering C, Ku and X band frequencies in power levels from 4 to 400 Watts.

AnaCom today has a huge installed base of equipment covering the entire world. Whether it is a mountaintop in the Himalayas, an oil platform in the Gulf, or a wildfire in your state, behind the scenes - AnaCom is at work. Whether it is consumer, business, military or government applications, behind the scenes – AnaCom is at work.

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Founded in 1976 by the 21 member-states of the Arab League, Arabsat has been serving the growing needs of the Arab world for over 40 years, operating from its headquarter in Riyadh-KSA and two Satellite control stations in Riyadh and Tunis.

Now one of the world's top satellite operators and by far the leading satellite services provider in the Arab world, it carries over 500 TV channels, 200 radio stations, pay-tv networks and wide variety of HD channels reaching tens of millions of homes in more than 80 countries across the Middle East, Africa and Europe - including an au-

dience of over 170 million viewers in the Middle East and North Africa (MENA) region alone tuned into Arabsat's video "hotspot" at 26° E.

Operating a growing fleet of owned satellites at the 20°E, 26°E, 30.5°E, 39°E and 44.5°E, ARABSAT is the only satellite operator in the MENA region offering the full spectrum of Broadcast, Telecommunications and Broadband services. This capacity will continue to expand with the launching of new satellites; making ARABSAT satellites' fleet the youngest in the region.

Arabsat also maintains strategic partnerships with most of the world's leading satellite companies and VAS integrators and with the acquisition of Hellas Sat, one of the leading telecom groups in southeastern Europe. These partnerships and acquisitions continue to expand Arabsat's reach with new orbital slots and frequency rights, allowing customers to reach further than ever and deliver content and state-of-the-art solutions to any end-viewers audience or business partner around the world.

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C-COM Satellite Systems	✓		✓	✓			✓	✓							✓													✓	✓	✓	✓		
Coiler Corporation	✓										✓		✓					✓	✓													✓	
Controllis Limited	✓										✓								✓			✓											
CSG International																✓																	

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C-COM Satellite Systems Inc. is a leader in the development, manufacture and deployment of commercial grade mobile satellite-based technology for the delivery of two-way high-speed Internet, VoIP and Video services into vehicles. C-COM has developed a number of proprietary Mobile auto-deploying (iNetVu®) antennas that deliver broadband over satellite into vehicles while stationary virtually anywhere where one can drive.

The iNetVu® Mobile antennas have also been adapted to be airline checkable and easily transportable. More than 7000 C-COM antennas have been deployed in 103 countries around the world in vertical markets such as Oil & Gas Exploration, Military Communications, Disaster Management, SNG, Emergency Communications, Cellular Backhaul, Telemedicine, Mobile Banking, and others. The Company's satellite-based products are known worldwide for their high quality, reliability and cost-effectiveness.

C-COM is also involved in the design and development of a new generation of Ku and Ka-band (communications on the move) antennas, which will deliver satellite broadband solutions into vehicles, trains and buses while in motion. More information is available at: www.c-comsat.com

iNetVu® is a registered trademark of C-COM Satellite Systems Inc.

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Founded in 1991, Coiler Corporation is a world-re-nowned repeater specialist in the telecom indus-try. We offer an extensive portfolio of indoor/outdoor repeaters ranging from 7 to 43 dBm for RF signal enhancement, as well as innovative software tools for network diagnostics, man-agement and optimization. Our products allow mobile network carriers, system integrators and cell phones users to quickly and cost-effectively address all coverage considerations, and improve reception in iDEN, CDMA, GSM, DCS, PCS, UMTS, WiMAX and LTE networks. Many global operators such as Vodafone, Orange, T-Mobile, Telefonica o2, Telenor, Tele2, Singtel, KPN and others trust our experience and expertise.

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Controllis manufactures high-efficiency DC Generators, hybrid power systems, and remote monitoring systems. Our DC power solutions generate significant fuel savings and O&M cost reductions for cell-site operators.

Controllis' hybrid systems generate additional fuel savings when cycling battery packs and integrated to solar or wind-power systems. Our remote-monitoring solutions provide real-time monitoring of generator and site elements in order to reduce outages and site-damage.

Controllis technology is deployed on 5 continents. We manufacture branded-products in the UK and supply DC generator kits to OEM manufacturers in Africa Asia and South America. We welcome inquiries from other interested partners.

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CSG International (NASDAQ: CSGS) is the trusted global partner to help clients launch and monetize communications and entertainment services in the digital age. Leveraging 30 years of experience and expertise in voice, video, data and content services, CSG delivers market-leading revenue management and customer interaction solutions in licensed and managed service models.

The company drives business transformation initiatives for the majority of the top 100 global communications service providers, including AT&T, Charter Communications, Comcast, DISH, ESPN, Media-Saturn, Orange, Reliance, SingTel Optus, Telefonica, Time Warner Cable, Vodafone, Vivo and Verizon. For more information, visit our website at www.csgi.com.

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DAMM Cellular Systems A/S	✓		✓				✓											✓	✓				✓				✓					✓	
Elitecore Technologies Pvt Ltd	✓	✓			✓				✓							✓	✓	✓	✓	✓	✓			✓				✓		✓		✓	
Emcom Wireless			✓	✓			✓	✓											✓			✓		✓								✓	✓
Emerson Network Power	✓	✓	✓			✓	✓		✓		✓		✓					✓	✓	✓		✓	✓	✓	✓					✓			

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DAMM — Critical communication made easy

DAMM is a world-leading provider of scalable, flexible and user-friendly digital radio infrastructure systems to industrial, commercial and public safety customers.

Built for the future of critical communications, the DAMM Multi-Tech Platform enables voice and data communication across technologies, including TETRA, TEDS and DMR in one single system.

DAMM's TetraFlex® system offers a full solution and features intelligent, distributed network architecture, built-in applications and gateways for full asset management, and the freedom to choose any terminal brand. Our portfolio includes the TetraFlex® PTT mobile app utilizing WiFi or LTE on your smart devices.

Trusted by industry leaders worldwide
With over 30 years of experience in critical radio and broadband communication, we take the lead through superior engineering and a constant focus on customer needs and reduced complexity. You can rely on DAMM to keep you ahead with a solution that is simple, secure and built for the future. DAMM offers expertise and experience and provides easy access to highly skilled and experienced support.

Ready to move ahead? DAMM's exclusive network of Partners worldwide is ready to provide solutions and support that help customers stay in the lead.

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eLITECORE — Sterlite Company

Elitecore, a Sterlite Technologies company, offers global IT product and services for CSPs requirements with pre-integrated and modular BSS, Packet-core and Carrier Wi-Fi platform to handle business-critical revenue and customer management solution, monetizing across all IP networks including 2G, 3G/LTE, Wi-Fi, Cable, ADSL, FTTH. Elitecore is recognized as one of the fasted growing companies by Gartner.

Elitecore comprehensive offerings includes Wi-Fi Service Management Platform for Mobile Data offload, Public Wi–Fi and Monetization, Real-time Converged BSS for MVNE/O, LTE, Data Charging, Voice, PayTV, Core Session Management for network control and data monetization and 24online, internet billing and bandwidth management solution for ISP, hospitality and public hotspots.

Adhering to global industry standards, the offering addresses CSP's critical requirements of faster time to market and better TCO. The products are highly-responsive to next-generation services, fulfilling operators' monetization needs. Elitecore has over 150 network deployments worldwide for 52 Service providers in more than 40 countries serving satisfied customer base includes 11 of the world's top 30 operators. Elitecore's 24online has over 3500+ installations with presence across 60+ countries globally.
www.elitecore.com

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emcom — PROFESSIONAL RADIO COMMUNICATIONS

EMCOM wireless is a tried and tested industry leader in professional mission-critical radio communication solutions. With solutions deployed in over 30 African countries over the past 43 years, our products can be seen in operations covering Policing, Public Safety, Defence & Peacekeeping, Mining, Oil & Gas, Transportation (road, rail and air), Utilities (water & electricity), Agriculture and Wildlife Conservation. Our success results from long-term relationships with our customers and technology partners which ensures a customized fit for purpose deployments. Reliability, commitment, flexibility and excellence are some of the values that define us, the partner of choice, in the African professional radio communication industry. We lead the way in empowering our customers with the skills and knowledge required to make the correct decisions on their choice of two-way radio communication solutions.

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EMERSON — Network Power

Emerson Network Power is a global leader in network infrastructure for data center, telecommunications and industrial facilities of all sizes. The industry leader has operated in Sub-Sahara Africa for decades and offers a broad portfolio of software, hardware and services that includes AC and DC power, hybrid solutions, thermal management and DCIM solutions. Emerson Network Power enables fast, efficient and reliable network deployment and operations.

All solutions are supported globally by local Emerson Network Power service technicians.

Learn more at www.EmersonNetworkPower.eu.

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Ericsson sub-Saharan Africa (Propriety) Ltd 148 Kelvin Drive, Woodmead 2148 Gauteng Province SOUTH AFRICA	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		✓
Eutelsat SA 70 rue Balard 75015 Paris FRANCE				✓																													
Gazprom Space Systems Moscow Street, Bld. 77B Schelkovo, Moscow region 141112 RUSSIA				✓																		✓	✓					✓	✓				
Hughes 11717 Exploration Lane Germantown MD 20876, USA				✓					✓					✓					✓			✓						✓					

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Ericsson is the driving force behind the Networked Society – a world leader in communications technology and services. Our long-term relationships with every major telecom operator in the world allow people, business and society to fulfill their potential and create a more sustainable future.

Our services, software and infrastructure – especially in mobility, broadband and the cloud – are enabling the telecom industry and other sectors to do better business, increase efficiency, improve the user experience and capture new opportunities.

With approximately 115,000 professionals and customers in 180 countries, we combine global scale with technology and services leadership. We support networks that connect more than 2.5 billion subscribers. Forty percent of the world's mobile traffic is carried over Ericsson networks. And our investments in research and development ensure that our solutions – and our customers – stay in front.
Founded in 1876 and present on the continent since 1896, Ericsson sub-Saharan Africa supports over 100 customers in 43 countries and employs

more than 3,000 people. Ericsson has its global headquarters in Stockholm, Sweden. Net sales in 2015 were SEK 246.9 billion (USD 29.4 billion). Ericsson is listed on NASDAQ OMX stock exchange in Stockholm and the NASDAQ in New York. Regionally, Ericsson's headquarters is at 148 Kelvin Drive, Woodmead, 2148 South Africa.

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Eutelsat is one of the world's leading operators of communications satellites.

Through our global fleet of 40 satellites, we broadcast 6000 TV channels, to over 274 million

cable and satellite homes in Europe, the Middle East and Africa and have become an essential source of high performance and flexibility for telecommunications operators and companies in five continents.

The Group is based in Paris and has offices and a worldwide network of teleports. Eutelsat employs a workforce of 1000 people representing 37 different nationalities.

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Gazprom Space Systems (GSS) is a Russian non-governmental satellite operator. GSS operates four "Yamal" satellites and advanced ground telecommunications infrastructure.

Yamal-402 (55E) has 4 fixed Ku-band beams covering Russia, Europe, Sub-Saharan Africa,

and a steerable beam pointed over DRC and neighboring countries and cross-strapped with Northern Beam.

Yamal-202 (49E) has a good semi global coverage in C-band over Middle East, North Africa, Europe, South and South-East Asia.

Yamal-401 (90E) C and Ku-band beams cover the major part of Russia and its neighbours.

Yamal-300K (183E), provides Ku-band over the Far East, North Pacific and Alaska. Steerable beam is also available for Australia, Philippines or Indonesia.

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Hughes Network Systems, LLC (HUGHES) is the world's leading provider of satellite broadband solutions and services delivering innovative network technologies and managed services to enterprises and governments globally. Hughes has shipped more than 5 million systems to customers in over 100 countries, representing approximately 50 percent market share.

Hughes owns and operates service businesses in the U.S., Europe, India, and Brazil, delivering continent-wide Hughes broadband satellite and

terrestrial connectivity under the HughesON™ brand, a portfolio of managed network and digital media services. HughesNet® is the #1 high-speed satellite Internet service in the marketplace with over 1 million in North America, making Hughes the largest provider of high-speed satellite Internet access.

Around the globe, Hughes supplies authorized service providers, government organizations, and businesses with advanced broadband satellite systems and terminals including its advanced

JUPITER high throughput satellite system. Hughes designs and manufactures Network Operations Centers (NOCs) and gateways; broadband satellite terminals; and mobile satellite network infrastructure, handhelds and high-speed IP data terminals.

Headquartered outside Washington, D.C., in Germantown, Maryland, USA, Hughes operates sales and support offices worldwide. Hughes is a wholly owned subsidiary of EchoStar Corporation (NASDAQ: SATS).

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IDT Corporation 520 Broad Street Newark, New Jersey 07102 USA contactidt@idt.net www.idt.net +1 973-438-1000	✓	✓		✓														✓						✓							✓	✓	
Intracom Telecom 19,7 km Markopoulou Ave Peania, Athens 19002 GREECE info@intracom-telecom.com www.intracom-telecom.com +30 21 0667 1000 +30 21 0667 1820			✓		✓		✓	✓	✓			✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓		✓			
KATHREIN AFRICA LIMITED 40 King George VI Avenue Floreal 74112 MAURITIUS info@kathrein.mu www.kathrein.com +230 697 2600 +230 696 2070	✓		✓					✓	✓				✓											✓									

Hytera Communications Corporation Limited; a world's leading solution provider of Professional Mobile Radio communications, is dedicated to bringing most valuable and customized solutions to clients across the world. We offer complete and customized communication solutions to government, public security, utility, transportation, enterprise & business for higher organizational efficiency.

Founded in 1993 in Shenzhen, China, Hytera has grown to be a key player in PMR (Professional Mobile Radio) communication industry with a large customer base in more than 120 countries and regions across the world. In China, Hytera's market share ranks 1st among Chinese manufacturers; globally Hytera has reached the 2nd in Overall Terminal category.

IDT is one of the largest, global carriers of international voice traffic, generating over 30 billion international minutes annually. With our global reach of direct interconnects and billions of international retail minutes generated through our consumer international calling service, Boss Revolution, we represent a compelling proposition to help grow your business.

IDT has an extensive portfolio of market leading rates with a choice of voice termination quality, in addition to messaging and payment services that help people to stay in touch with home and business, wherever they are located in the world. www.idt.net

Intracom Telecom is a global telecommunication systems and solutions vendor operating for over 35 years in the market.

The company innovates in the areas of small-cell backhaul, wireless transmission and broadband wireless access and has successfully deployed its industry leading point-to-point and point-to-multipoint packet radio systems worldwide. Moreover, Intracom Telecom offers a competitive portfolio of revenue-generating telco software solutions and a complete range of ICT services, focusing on big data analytics, converged networking and cloud computing for operators and private, public and government clouds.

The company invests significantly in R&D developing cutting-edge products and integrated solutions that ensure customer satisfaction. Over 100 customers in more than 70 countries choose Intracom Telecom for its state-of-the-art technology. The company employs more than 1,900 people and operates subsidiaries in Europe, Russia and the CIS, the Middle East and Africa, Asia and North America. The Intracom Telecom Group has enhanced its presence in the African continent with the establishment of two subsidiaries in South Africa and Morocco, under the name INTRATELECOM SA. For more information, visit www.intracom-telecom.com

Company location, country, website	Cellular	Wireless Access	Critical Comms (PMR/DMR/TETRA)	Satellite	M2M/Internet of Things	Fibre Networks	Radio Access Networks	Masts, Antennas, Tower Products	Wi-Fi & Access Points	Optical Fibre; Network Cables & Accessories	Power Products & Accessories	Network Cables and Accessories	Test & Monitoring Equipment	Network Security (Hardware & Software)	Backhaul	OSS/BSS – Churn Management & CRM	Fraud Detection & Revenue Assurance	Traffic Analysis & Management	Network Planning & Optimisation	Inventory Management	Energy Efficiency	Network Build	Managed Services	Consultancy & Training	Data Centre Services	SIM Cards	Wireless handsets & End User Devices	Broadband	Broadcast	Enterprise Services	Mobile financial services	Mobile Apps	Other VAS
Mahindra Comviva A-26, Info City Sector 34, Gurgaon Haryana, INDIA info@mahindracomviva.com www.mahindracomviva.com +91 124 481 9000 +91 124 481 9777	✓	✓														✓	✓	✓	✓				✓					✓		✓	✓	✓	✓
MEASAT Global Berhad MEASAT Teleport & Broadcast Centre Jalan Teknokrat 1/2 63000 Cyberjaya MALAYSIA sales@measat.com www.measat.com T: +60 3 8213 2188 F: +60 3 8213 2233				✓																									✓				
MIRO 9 Landmarks Avenue Kosmosdal Ext 11 Samrand, SOUTH AFRICA sales@miro.co.za www.miro.co.za +27 12 657 0960		✓					✓	✓	✓			✓																					
PCCW Global 33F, PCCW Tower Taikoo Place, Quarry Bay HONG KONG marketing@pccwglobal.com www.pccwglobal.com +852 2888 6688 +852 2962 5388				✓	✓				✓			✓		✓	✓	✓	✓	✓				✓	✓	✓				✓	✓				

Mahindra Comviva is the global leader in providing mobility solutions. It is a subsidiary of Tech Mahindra and a part of the USD 16.9 billion Mahindra Group. With an extensive portfolio spanning mobile finance, content, infotainment, messaging and mobile data solutions, Mahindra Comviva enables service providers to enhance customer experience, rationalize costs and accelerate revenue growth. Its mobility solutions are deployed by over 130 mobile service providers and financial institutions in over 90 countries, transforming the lives of over a billion people across the world.

MEASAT is a premium supplier of services to leading broadcasters, Direct-To-Home (DTH) platforms and telecom operators. With capacity across six (6) communication satellites, MEASAT provides satellite services to over 150 countries representing 80% of the world's population across Asia, Middle East, Africa, Europe and Australia.

The MEASAT satellite fleet includes the state-of-the-art MEASAT-3, MEASAT-3a and MEASAT-3b satellites co-located at 91.5°E, supporting Asia's premium DTH and video distribution neighborhood; MEASAT-2 at 148.0°E; and, MEASAT-5 at 119.5°E. In Africa, the AFRICASAT-1a satellite at 46.0°E provides satellite capacity across the African continent with connectivity to Europe, the Middle East and Southeast Asia. The MEASAT fleet will be further strengthened early 2018 with the addition of MEASAT-2a at 148.0°E.

Working with a select group of world-class partners, MEASAT also provides a complete range of broadcast and telecommunications solutions. Services include UHD/HD and SD video play-out, video turnaround, co-location, uplinking, broadband and IP termination services.

PCCW Global is the international operating division of HKT, Hong Kong's premier telecommunications service provider, which is majority-owned by PCCW Limited. Covering more than 3,000 cities and 150 countries, the PCCW Global network supports a portfolio of integrated global communications solutions which include Ethernet, IP, fiber and satellite, voice and a suite of managed services to help customers to optimize communications, simplify operations and drive profitability.

Our advanced security solutions incorporate real-time threat intelligence to identify and combat known and unknown advanced network threats in their infancy.

Our global IPX network supports a one stop solution for next generation of voice, video, messaging, roaming solutions, enabling MNOs to deliver a high quality seamless mobile experience.

Our media and entertainment solutions include fast, efficient video contribution and distribution, high speed cloud-based transcoding and a fully integrated hosted online video platform facilitating rapid, low risk, cost-effective entry into the online video market.

PCCW Global maintains regional centers in Hong Kong, China, Japan, Korea, Singapore, the United States of America, the United Kingdom, France, Belgium, the United Arab Emirates and South Africa. To learn more about PCCW Global, please visit www.pccwglobal.com.

Company location, country, website	Technology						Infrastructure									Operations						Outsourcing & Ancilliaries						Network Services & Applications					
	Cellular	Wireless Access:	Critical Comms (PMR/DMR/TETRA)	Satellite	M2M/Internet of Things	Fibre Networks	Radio Access Networks	Masts, Antennas, Tower Products	Wi-Fi & Access Points	Optical Fibre; Network Cables & Accessories	Power Products & Accessories	Network Cables and Accessories	Test & Monitoring Equipment	Network Security (Hardware & Software)	Backhaul	OSS/BSS – Churn Management & CRM	Fraud Detection & Revenue Assurance	Traffic Analysis & Management	Network Planning & Optimisation	Inventory Management	Energy Efficiency	Network Build	Managed Services	Consultancy & Training	Data Centre Services	SIM Cards	Wireless handsets & End User Devices	Broadband	Broadcast	Enterprise Services	Mobile financial services	Mobile Apps	Other VAS
RADIO FREQUENCY SYSTEMS 1. Germany: Kabelkamp 20, D-30179, Hannover 2. South Africa: Johannesburg Eco Court, Ground Floor 340 Witch-Hazel Street, Eco Park Ext 17, Highveld, Centurion sales.europe@rfsworld.com www.rfsworld.com +49 511 676 55-0 or +27 12 648 3089 +49 511 676 55 – 118	✓	✓	✓				✓	✓	✓	✓					✓																		
RADWIN PO Box 3554, Rivonia Johannesburg 2128 SOUTH AFRICA sales@radwin.com www.radwin.com +27 74 114 2805 +27 82 131 114 2805		✓	✓						✓						✓													✓	✓				
Rohde & Schwarz SA (Pty) Ltd Bld 1, Clearwater Office Park Cnr Christiaan de Wet & Millenium Blvd, Strubens Valley Ext 12, 1724 Roodepoort Gauteng SOUTH AFRICA sales.za@rohde-schwarz.com www.rohde-schwarz.co.za +27 11 671 8800 +27 11 671 8809	✓	✓	✓	✓			✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓					✓				
Russian Satellite Communications Company 8 Bld.6, 1st Goncharny pereulok Moscow 115172, RUSSIA epolischuk@rscc.ru www.rscc.ru +7 (495) 730-0450 +7 (495) 730-0383				✓																								✓	✓	✓			

RADIO FREQUENCY SYSTEMS

RFS is a worldwide leading provider of innovative wireless and broadcast infrastructure products and solutions RFS serves OEMs, distributors, systems integrators, operators and installers in the broadcast, wireless communications, land-mobile and microwave market sectors.

As an ISO 9001 & 14001 compliant organization with manufacturing and customer service facilities that span the globe, RFS offers cutting-edge engineering capabilities, superior field support and innovative product design. The world-famous trademarks CELLFLEX, RADIAFLEX, HYBRIFLEX,

HELIFLEX are the industry standard. RFS produces antennas for Mobile, Microwave and Broadcast applications. RFS is committed to fulfilling the most demanding worldwide environmental protection directives and to integrating green initiatives in all aspects of its business.

RADWIN

RADWIN is a leading provider of wireless Point-to-Point, Point-to-Multipoint and FiberinMotion® solutions for broadband-in-motion. RADWIN's solutions deliver voice, video and data with unmatched high-capacity for long ranges.

Deployed in over 150 countries, RADWIN's solutions serve the needs of service providers, mobile carriers, governments, enterprises, public and private security companies and transportation organizations.

RADWIN's solutions power applications including backhaul, broadband access, private network connectivity, video surveillance transmission as well as wireless mobile in motion for trains and metros.

Russian Satellite Communications Company

The Russian Satellite Communication Company (RSCC) is the Russian state satellite operator whose spacecraft provide a global coverage. RSCC belongs to the ten largest world satellite operators in terms of satellites and orbital slots.

RSCC provides a full range of communications and broadcasting services via its own satellite fleet of 13 satellites and terrestrial infrastructure: video distribution and contributions, DTH services, satellite news gathering, presidential and government

applications, broadband access and Internet, IP trunking and cellular backhaul, mobility solutions for vessels and other. The company deploys regional TV satellite distribution networks as well as multi-functional corporate and government VSAT networks. Besides, RSCC provides satellite telemetry, tracking and control services to other operators.

Today RSCC is present at all geographically available markets, providing services for customers from 52 countries worldwide.

The company possesses the largest satellite constellation in Russia located in the geostationary orbital arc from 14 West to 145 East and cover the whole territory of Russia, the CIS, Europe, the Middle East, Africa, the Asia Pacific region, North and South America, and Australia. The company includes five teleports - Satellite Communications Centers (SCC): Dubna, Bear Lakes, Skolkovo, Zheleznogorsk, Khabarovsk and the Shabolovka Technical Center in Moscow as well as its own high-speed optical-fiber digital network.

Company location, country, website	Technology: Cellular	Wireless Access:	Critical Comms (PMR/DMR/TETRA)	Satellite	M2M/Internet of Things	Fibre Networks	Radio Access Networks	Masts, Antennas, Tower Products	Wi-Fi & Access Points	Optical Fibre; Network Cables & Accessories	Power Products & Accessories	Network Cables and Accessories	Test & Monitoring Equipment	Network Security (Hardware & Software)	Backhaul	OSS/BSS – Churn Management & CRM	Fraud Detection & Revenue Assurance	Traffic Analysis & Management	Network Planning & Optimisation	Inventory Management	Energy Efficiency	Network Build	Managed Services	Consultancy & Training	Data Centre Services	SIM Cards	Wireless handsets & End User Devices	Broadband	Broadcast	Enterprise Services	Mobile financial services	Mobile Apps	Other VAS
SatADSL Rue Royale182 bte 23 1000 Bruxelles BELGIUM caroline.devos@satadsl.net www.satadsl.net +32 2 351 33 74			✓	✓														✓	✓				✓	✓	✓			✓	✓	✓			✓
Singapore Telecommunications Ltd (Singtel Satellite) 31 Exeter Road #26-00 Comcentre 239732 SINGAPORE smlead@singtel.com www.singtelteleport.com +65 6788 0022	✓			✓						✓					✓								✓							✓			
SOLARWAY FZE 601, JAFZA View 19 Downtown Jebel Ali PO Box 61178, Dubai UAE info@solarway.com www.solarway.com +971 4 880 6122 +971 4 880 6166	✓										✓										✓												
Sparkle via Christoforo Colombo 142 00147 Rome, ITALY tisparkle.communication@tisparkle.com www.tisparkle.com/www.world.tisparkle.com +39 6 527 41 +39 6 527 45 347	✓	✓	✓							✓						✓	✓	✓	✓	✓		✓	✓	✓	✓						✓		

SatADSL

SatADSL develops innovative solutions for business professionals in need of cost effective and reliable Internet Solutions in areas with difficult or no web access.

SatADSL is a Belgian Company providing IP Connectivity via Satellite in Africa & Middle-East African corporate users operating in remote areas use SatADSL services in over 45 counties. Our offer recognized as being unique and competitive, combines high-quality with affordable cost of equipment and subscriptions. We provide both service quality guaranteed by SLAs and affordability for serving companies small branch offices performing business-critical transactions.

Examples of Applications are Corporate Networks Connectivity, e-Learning applications, Hotspots for Communities, Broadcasting, Money Transfer (MTC), Automatic Telling Machines (ATM), Virtual Private Networks (VPN), Mining and Oil & Gas Applications.

Singapore Telecommunications Ltd (Singtel Satellite)

Singtel is Asia's leading communications and ICT solutions group, providing a portfolio of services from next-generation communication, technology services to infotainment to both consumers and businesses. The Group has presence in Asia, Australia and Africa and reaches over 575 million mobile customers in 25 countries. For businesses, Singtel offers a complementary array of workforce mobility solutions, data hosting, cloud, network infrastructure, analytics and cyber-security capabilities.

With over 45 years of experience in fixed satellite services and over 33 years of experience in mobile satellite services, we have established a satellite footprint that covers Asia, Middle East and Africa. Our three teleports that point to more than 30 satellites and are supported by an extensive terrestrial network of more than 200 PoPs in over 160 global cities. Singtel is the trusted provider in fixed satellite services, satellite mobile solutions, broadcast solutions and maritime services.

Sparkle

Sparkle is a leading global service provider offering full range of IP, Data, Cloud, Data Center, Mobile Data and Voice solutions designed to meet the ever changing needs of Fixed and Mobile Operators, ISPs, OTTs, Media & Content Players, Application Service Providers and Multinational Corporations.

Thanks to a state-of-the-art advanced global backbone of around 570.000 km of fiber and through an extensive worldwide commercial presence distributed over 37 countries, Sparkle ranks #9 globally for voice traffic while #7 worldwide for IP.

Through a rich portfolio of services, a state-of-the-art network based on the latest technologies, a globally distributed sales force and advanced customer care capabilities, Sparkle is able to fulfil its mission of providing customers with top performing and tailored solutions worldwide.

With a truly global dimension and a local outlook, we stay close to our customers to understand their needs and ensure they receive the very best care.

Sparkle. The world's communication platform.

For more information, please visit; www.tisparkle.com or www.world.tisparkle.com

Company location, country, website	Technology						Infrastructure									Operations						Outsourcing & Ancilliaries						Network Services & Applications					
	Cellular	Wireless Access	Critical Comms (PMR/DMR/TETRA)	Satellite	M2M/Internet of Things	Fibre Networks	Radio Access Networks	Masts, Antennas, Tower Products	Wi-Fi & Access Points	Optical Fibre; Network Cables & Accessories	Power Products & Accessories	Network Cables and Accessories	Test & Monitoring Equipment	Network Security (Hardware & Software)	Backhaul	OSS/BSS – Churn Management & CRM	Fraud Detection & Revenue Assurance	Traffic Analysis & Management	Network Planning & Optimisation	Inventory Management	Energy Efficiency	Network Build	Managed Services	Consultancy & Training	Data Centre Services	SIM Cards	Wireless handsets & End User Devices	Broadband	Broadcast	Enterprise Services	Mobile financial services	Mobile Apps	Other VAS
Spectrum Communications FZE PO Box 8983 A4-42 Saif Zone, Sharjah, UAE sales@spectrummea.com www.spectrummea.com +971 6 557 2592 +971 6 557 2593	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓				✓		
Stratosat Datacom (Pty) Ltd 26 Spartan Road, Spartan Ext.21 Kempton Park 1619 SOUTH AFRICA alan@stratosat.co.za www.stratosat.com +27 11 974 0006 +27 11 974 0068	✓	✓		✓			✓	✓		✓			✓					✓	✓	✓		✓	✓	✓									
Viavi Solutions MEA Dubai Silicon Oasis HQ Building Office N: AG-08-10 PO Box 341339 Dubai, UAE sales.mea@viavisolutions.com www.viavisolutions.com +971 4 387 0900 +971 4 387 0909	✓	✓			✓				✓				✓					✓	✓	✓				✓									
Willcom 174 Sweetpea Close Amberfield Ridge, Rooihuiskraal Gauteng, SOUTH AFRICA heinb@willcom.co.za www.willcom.co.za +27 12 656 0773 +27 86 686 7940	✓	✓			✓				✓				✓					✓	✓	✓		✓	✓	✓									

Stratosat Datacom (Pty) Ltd

STRATOSAT DATACOM (Pty) Ltd is a technology company that specializes in the supply of innovative satellite, wireless communication and astronomy products for the African Markets.

STRATOSAT'S portfolio includes products from all major Satcom equipment manufacturers, including wireless broadband solution providers which enable them to provide excellent service through distribution centers located around Sub-Saharan Africa. STRATOSAT WEST AFRICA LTD, a subsidiary of Stratosat Datacom located in Nigeria, enables them to expand their reach into West African markets, with further affiliated divisions established in DR Congo and Mozambique.

Differentiating STRATOSAT from the rest of the market is their unique ability to offer their customer base complete Transmit & Receive Chain products, installation services and comprehensive project management. STRATOSAT DATACOM has also established production facilities manufacturing components for the satellite communications and Astronomy industries.

STRATOSAT has also established production facilities manufacturing components for the satellite communications industries.

Viavi Solutions MEA

Viavi Solutions (formerly JDSU and Arieso) provide the multi-dimensional visibility, intelligence, and insight service providers need to efficiently manage physical and virtual networks and profitably deliver optimum service levels, transition to new technologies, and identify new revenue opportunities. Our wireless portfolio offers cutting-edge capabilities to measure, monitor, troubleshoot and report the quality of service of subscribers to enable the highest quality experience at all times.

Our solutions provide the following capabilities:

- Installation, optimization and maintenance of cell sites
- Delivering exception VoLTE
- Transitioning to 5G
- Data monetization
- Customer experience management
- Virtualization/NFV
- SON
- HetNet deployments
- Location intelligence
- Pre-launch testing of new technologies and services

We deliver an end-to-end portfolio that helps service providers successfully deploy and maintain communications networks, applications and services and proactively optimize performance across the ecosystem.

Web: http://www.viavisolutions.com/en-us/solutions/wireless

Willcom

Willcom is a 100% South African owned company with Level 1 B-BBEE Contributing recognition, founded in 2003.

We provide Optical Network, OTN to Access, SDN, GPON and NFV solutions that assure full-lifecycle service quality, network-wide. From service activation to ongoing performance monitoring and optimization, our solutions offer the most granular, precise tools available for service operators deploying and maintaining performance-critical applications and Integrated solutions can that be tailored to assure a wide range of QoS-critical applications, effective data traffic conditioning establishes quality of service (QoS) at the service edge, traffic conditions can be enforcing per-flow performance policies, to optimize and prioritize bandwidth utilization across the entire network.

With the use of SDN and NFV these technologies allow network operators to break free from expensive, vertically integrated legacy network architectures and deliver the multi-vendor software control, service automation and orchestration that operators have been demanding for years.

Willcom also provides Test and Measurement solutions, Network monitoring from an end user experience, active and pro-active, synchronization audits and synchronization equipment for TDM, Sync E and PTP1588, and Transmission SLA verification and reporting, to the African Telecommunication Industry. We supply Mobile and Fixed line service providers, national and international operators and independent ISPs throughout Africa.

Our goal is to enhance our customer's network performance and give them a competitive edge through the wealth of knowledge our team has gained through many years of personal experience in Telecommunications and ICT.

Our RF and Optical division leads in the supply and support of RF Handset Test equipment with on and off site calibration for all our RF and Fibre testing tools.

We have permanently based engineers on some customer sites, providing product support and writing and developing scripts for our Monitoring solutions installed in the networks.

We maintain a high ratio of professionally qualified personnel as part of our workforce enabling us to provide extensive consultation facilities and a high level of on-going support.

ACKNOWLEDGEMENTS

Thanks to...

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