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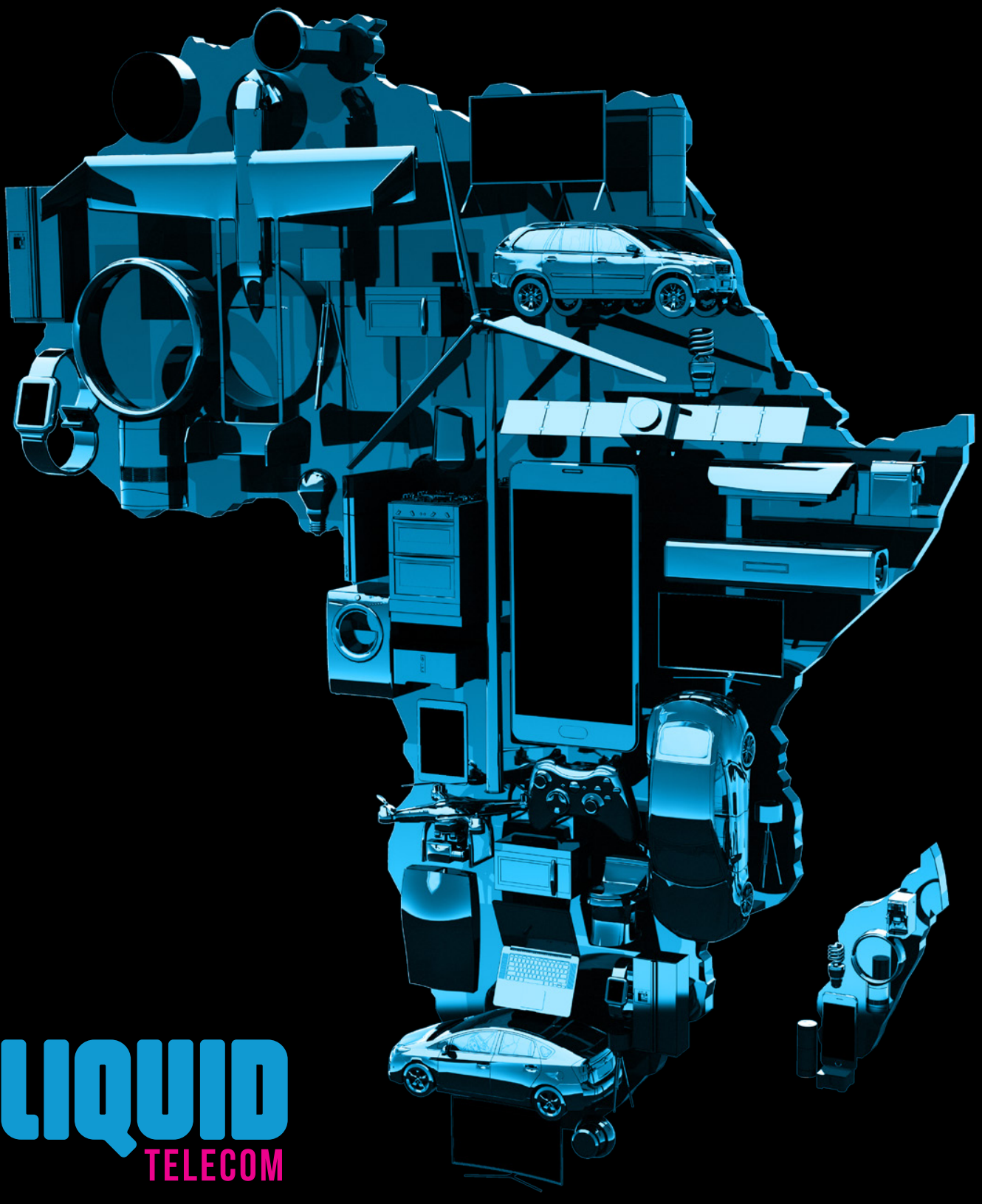

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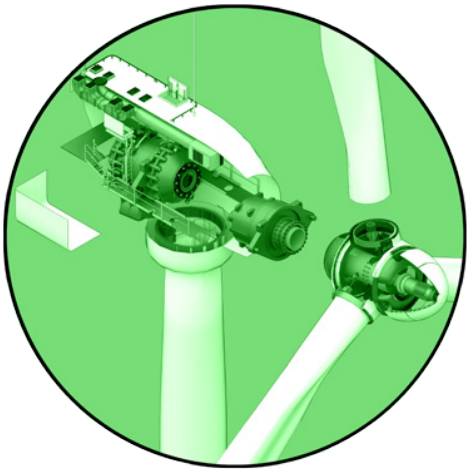

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African countries embark on their IoT journey

When the internet was first invented over 25 years ago, no one could have predicted that it would have such enormous social, economic and technological significance, attracting over 3.5 billion users globally. Certainly, nobody envisioned it ever being used to connect toasters, egg trays and toothbrushes.

The Internet of Things (IoT) is the logical next step for our increasingly connected world. IoT focuses on embedding connectivity and intelligence in devices, enabling businesses to collect vast volumes of data in near real-time. Analysing this data presents new levels of information and intelligence for businesses, which they can use to drive efficiencies, reinvent business models and transform customer experience.

The IoT ecosystem is rapidly taking shape. According to Gartner, there are already an estimated 8.4 billion connected things in use worldwide in 2017, which is set to reach an astonishing 20.4 billion by 2020. Furthermore, the analyst firm believes IoT will reach mainstream adoption in the next two to five years in Africa, where it is expected to have a "transformational impact" on local businesses. Be it a connected home, connected car or even a connected dustbin, the journey towards IoT always begins with the simple question: what problem are we trying to solve by embedding connectivity?

Africa's challenges are different to other regions and so are the solutions presented by IoT. IoT can be used to help deliver clean water to thousands of people. Or it can be used be used to better protect endangered species. It can be used to make roads and streets safer for citizens. Or it can be used to better inform farmers and increase crop production.

The vision of a completely smart home - that effectively manages itself and provides homeowners with greater insights into running costs such as a water and electricity – is all well and good. But does that vision need to be more security-centric to succeed in some African countries, where crime rates are high? The application of IoT can take on greater significance in Africa, but the barriers to adoption are also fiercer. The investment required to make IoT a success is significant, particularly with limited existing infrastructure to support its growth.

Nevertheless, many African countries have already embarked on their IoT journey: intelligent traffic lights in Nairobi are helping to ease traffic congestion, load-limiting smart meters are helping to combat outages in South Africa, while unmanned aerial vehicles (UAVs) are being used as part of conservation efforts in national parks.

IoT should be considered more than just a technology – it is rather an ecosystem of products and services at the heart of which is connectivity. Liquid Telecom is building Africa's digital future by supporting African businesses with their IoT journey through the rollout of high-speed networks across the region. As eventually, IoT will become an opportunity that African businesses cannot afford to ignore.

> **The Internet of Things is the logical next step for our increasingly connected world.**

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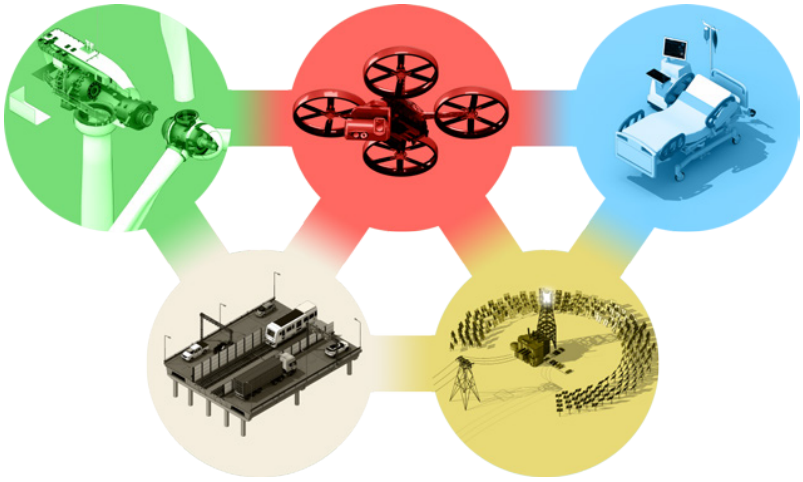
SMARTER BUSINESSES FOR A SMARTER FUTURE

It might be early days, but an IoT ecosystem is emerging across the region that has high hopes of transforming African businesses. Find out more about the industries and technologies that are leading the way.



IoT has captured consumer imagination with its vision of a futuristic world in which intelligent devices interact with their daily lives. Yet it is the application of IoT within industry not the home that has the potential to be truly revolutionary.

According to global information and analysis firm IHS Markit, the industrial sector – driven by building automation, industrial automation and lighting – will account for nearly half of all new connected devices globally between 2015 and 2025.

In Europe and North America, fluctuating prices and external demand have led many industries to pursue greater automation and deploy IoT within their operations. This is slowly bringing about fundamental structural changes to entire industry verticals and their supply chains.

The drivers across Africa, however, can be very different. Here IoT can radically improve agricultural outputs, increase efficiencies at understaffed and over-worked hospitals, and help reduce the enormous number of people dying on African roads in traffic accidents. "A big part of IoT's role in Africa will be to contribute to sustainability – energy and resource development and usage, agriculture, and conservation efforts can all really benefit from the efficiency, precision and actionable data that the IoT can deliver," says Alexandra Rehak, Practice Head of IoT at Ovum.

An IoT ecosystem is rapidly appearing across Africa. In East Africa, an emerging developer community is taking a stronger interest in IoT, while IoT is making advancements in South Africa where there are already maturing machine-to-machine (M2M) services. According to global market intelligence firm IDC, the IoT market opportunity in Africa is poised to grow by 17% from $837.9 million in 2016 to $1.8 billion by 2020. This presents opportunity across a range of verticals - find out more about the industries leading the way...

Energy & Utilities

Over 630 million people in Africa live without access to electricity, while an estimated 40 billion hours a year are spent fetching water in the sub-Saharan region. Conventional utility providers are simply struggling to serve the continent's population.

IoT can be a huge help in addressing the challenges facing Africa's utility providers. Smart meters are gaining popularity and traction globally, and the technology has a compelling business case across the continent.

Smart meters give both businesses and consumer a more accurate overview of usage patterns, enabling more accurate billing and improved energy efficiency. With smart metering adoption rates growing globally, the technology is attracting increasing attention from investors. "Companies with IoT as a central plank of their business model have received tens of millions of dollars in investment over the last five years in Africa. The investment they receive is because IoT is an enabler for providing underserved, remote consumers assets on credit in a scalable way," says Hugh Whalan, co-founder and CEO of PEGAfrica.

PEGAfrica is an asset financing company focused on providing useful and productive assets on credit to underserved customers in West Africa. PEG works with companies that supply sophisticated IoT enabled solar systems and has deployed tens of thousands of these systems in remote areas of Ghana and Ivory Coast.

Whalan says perhaps the biggest benefit of IoT in the energy space is the ability to perform monitoring and maintenance remotely - making it a very attractive opportunity for energy providers, which typically spend large amounts of money on upkeep of rural assets. "IoT gives companies the ability to connect to assets in the field and troubleshoot issues, reduce operational costs, perform over the air updates and the like. This is very important when your customer base is rural and remote, and the cost of servicing an asset can be very high if you need to do it in person," he explains.

Sensors are also an important tool for utility providers to remotely monitor systems for damage and leakages, and carry out maintenance accordingly. However, their success hinges on reliable connectivity: "The key challenge is when the network goes down and you lose connection to a remote device, and you are left with an asset that is hard to service remotely," says Whalan.

With an estimated one million hand pumps that supply water to over 200 million rural water users across Africa, IoT can also play a crucial role in improving maintenance of this equipment and help supply communities with clean water.

For example, start-up SweetSense installed about 200 sensors in rural water pumps in Rwanda in 2014. The sensors helped dramatically reduce the number of pumps broken in an area at any given time, as well reduce the repair interval at pumps.

In South Africa, IoT is being used for an entirely different purpose: load limiting smart meters are helping to warn residents of imminent outages. In 2015, Johannesburg-based electricity utility City Power began a pilot of load limiting smart meters which limited electricity to households in a bid to avoid load-shedding. Such smart meters monitor household power usage in real-time and if residents are using too much electricity, they receive a SMS asking them to reduce power usage.

Such compelling use cases suggest that IoT is well positioned to take a central role in energy and water provision across Africa in the years ahead.

Agriculture

Ranging from subsistence farmers to large-scale commercial farming, there are 1 billion farmers across Africa – and so agriculture plays an enormous role in both African society and its economy.

But it is a vital yet struggling industry. An estimated 95% of agriculture across sub-Saharan Africa relies on rainfall for water, leaving communities vulnerable to food insecurity.

Enter IoT. While traditional farming practices are still widely used, new technologies are beginning to infiltrate the sector.

Wireless sensors can track crop growth, soil moisture and water tank levels. The potential for these and more advanced solutions to revolutionise the farming sector is immense – namely because the valuable data sets they produce can help farmers make more informed farming decisions.

Zimbabwean startup Hurukuro has built a B2B2C cloud-powered mobile platform focused on enhancing farmer productivity and creating agro-industry linkages. The platform includes production content for various crops, as well as a specially designed wallet to facilitate mobile payments.

Hurukuro is working on projects that deploy IoT in various parts of the agricultural value chain, from livestock tracking and logistics, through to cutting edge solutions such as agricultural drones. Jefrey Matenje, CEO of Hurukuro, predicts his company's future going further in this direction.

"IoT is crucial in data collection and monitoring systems. We hope to increase our business in the direction of agro based analytics. This is a growth area for us, as more players come into the agri-tech space," Matenje says.

Not only will IoT increase efficiencies across agricultural operations and reduce costs, but it will also minimise the environmental impact of widespread farming, and ultimately help in the fight against climate change.

"IoT could be the game changer that makes agriculture cost effective and efficient. The immediacy of the internet, big data and cloud-based Artificial Intelligence (AI) are together crucial to taking African farming to the next level. The impact of climate change can be quantified, measured and corrective action can be taken through the data gathered," says Matenje.

However, there are larger barriers to introducing smart technologies in farming operations, which are typically in rural and remote areas and underserved with the necessary infrastructure.

Reliable, affordable electricity and broadband are most critical for the success of IoT. In addition, he says the cost of sensors and other hardware is still too high to be attractive for agricultural producers. Currently the focus of tech investments remains on the mechanisation of farming systems -investment in smart solutions and building out dedicated information and technology systems is very limited, he says.

Nonetheless, IoT can play a vital role in the future of Africa's agricultural sector: "I believe the future of Africa is in her farmers and the future of farmers is in our technology," says Matenje.

Healthcare

Healthcare systems across Africa are consistently ranked among the lowest in the world. The potential for IoT to maximise efficiencies in the healthcare setting - where resources are typically thinly stretched - is particularly pertinent to Africa. While IoT in healthcare is becoming big business globally - digital research firm eMarketer projects an $163 billion value for IoT-related healthcare by 2020 - it remains in an early stage of adoption across Africa. South African start-up Vitls, for example, is building a platform that enables healthcare providers to continuously and remotely monitor a patient's vital signs, reliably and undisturbed. The company's wearable device monitors pulse, respiration rate, body temperature, sleep and movement. It sends the data to the cloud where algorithms create actionable insights for medical staff. "75% of all adverse events and preventable deaths in hospitals occur outside the intensive care unit in unmonitored beds. By continuously monitoring patients we can alert healthcare staff before something goes wrong," explains Werner Vorster, founder of Vitls. However, Vorster says medical establishments are slow to implement new technologies on offer at scale. "We've seen a few hospitals trialling new technology, but for them to get to adoption is a whole different kettle of fish," he says.

According to Vorster, there are a number of obstacles blocking the path to IoT adoption by Africa's healthcare sector. First and foremost is the fact that many hospitals in the region are still reliant on paper-based processes. "Most African hospitals still run on paper. Most of the data that nurses collect on patients during a hospital stay is recorded on paper and filed away when they are discharged. In order to see significant implementation of IoT in African healthcare, we would need hospitals to run on Electronic Medical Records (EMRs)," he explains. This could become a reality within the next three to five years, he estimates.

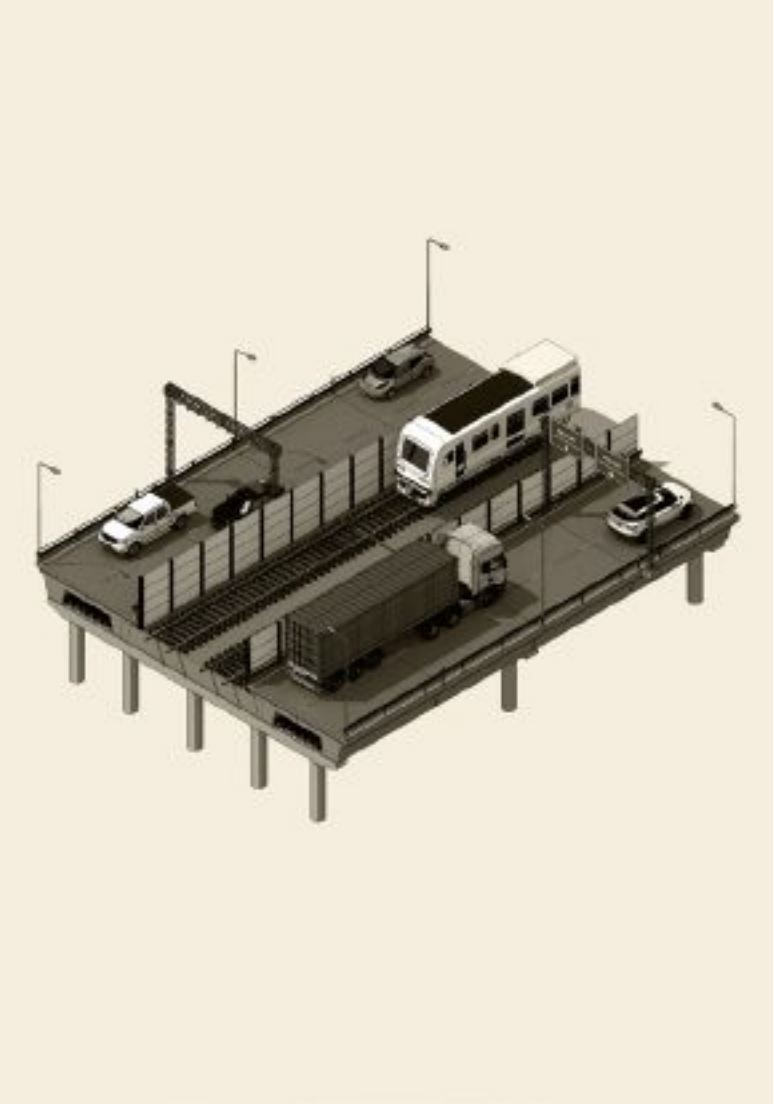
Greater investment is also needed to support the region's IoT entrepreneurs. While some seed funding is available to start-ups, these are not sufficient in scale for most IoT ventures, and governments and financial institutions are failing to provide viable financing options, says Vortser.

One area of future investment could be in technology designed to limit the effects of virus epidemics – which could prove invaluable in West Africa in controlling ongoing Ebola outbreaks.

SAP, for instance, has joined forces with several institutions, such as the Hasso Plattner Institute and the Helmholtz Center for Infection Research, to develop SORMAS; the Surveillance and Outbreak Response Management and Analysis System designed to help fight the spread of diseases like Ebola. SORMAS analyses incoming patient data in real-time and predictive tools help project where the disease is likely to spread. Infographics are used to inform the public, and help quickly mobilise medical suppliers in the region.

From strengthening application and end-user management at hospitals and clinics to enhancing home monitoring and remote care, IoT has the potential to transform patient engagement. However, at the same time, it has the potential to be the most sensitive when it comes to data collection. While the next-generation of healthcare providers across Africa will likely experience major benefits from a more digitised environment, they will also face greater security risks *(see page 15 for more)*.

Transport



Uber is perhaps one of the most famous examples of technology's ability to seriously disrupt traditional business models.

Uber now has an estimated 40 million riders worldwide and is on the rise across Africa, where it faces healthy competition from local and international rivals – such as Kenya's Maramoja, Egypt's Ousta, and Taxify to name but a few.

GPS tracking was a vital ingredient in Uber's success, and more use cases are now emerging on the market. It has also been used, for example, to provide real-time location of buses and provide insights into driver behaviour.

More importantly, IoT can also be used to improve road safety on a continent with the highest rate of road traffic fatalities in the world

SafeMotos provides a safer Uber-style service for Africa's popular motorbike taxis. The solution equips motorbike drivers with smartphone-based sensors, from which data is pulled to gauge acceleration, braking and speed. The data is then inputted into a risk model, ensuring customers are only paired to drivers above a certain threshold on this risk model. "With the rapidly declining price of technical hardware, the green field aspect of the continent and the incredible problems of congestion and traffic fatalities, IoT can be a natural disruptive agent in Africa," says Barrett Nash, co-founder of Rwandan transport tech start-up SafeMotos. "The future is going to be IoT enabled - the problems of congestion and road danger are increasing simply too fast to allow the current rate of progress to happen without some form of disruption."

Cost remains a potential roadblock for IoT adoption in the transport sector, despite hardware prices continuously falling. "Many of the sensors, on-board computers and traffic solutions seem affordable by Western standards, but a US$20 sensor is ten days' profit for a motorcycle taxi driver," says Nash.

Much further down the line, connected car technologies are likely to emerge more on the market, bringing with them innovations such as self-parking and emergency braking assist. "Frost & Sullivan strongly believes that connected cars will drastically change the way people interact with vehicles, due to the numerous communication technologies and associated services that will be available," says Jean-Noël Georges, Global Programme Director of Digital Transformation, Frost & Sullivan.

These types of innovations will eventually lay the foundation for a future in which cars think and drive themselves. The era of driverless cars still seems light years away for Africa, but the technology is very much real and ready.

"Cost remains a potential roadblock for IoT adoption in the transport sector, despite hardware prices continuously falling."

The race to connect billions more things to the internet

The successful deployment of IoT across Africa will go hand in hand with the rise of cloud services.

Ben Roberts
CTIO, Liquid Telecom

The true value of IoT comes from the huge volumes of data an application generates over time. All that data can be used by businesses and consumers to provide insight and intelligence that saves money and drives efficiency, but first it must go somewhere to be analysed. And increasingly that data is heading to the cloud.

Many of today's IoT applications run on cloud platforms that bring together operational and information technology to enable real-time analytics of data. To give it greater context, the cloud is where all the information from hundreds of smart meters, for example, goes to be processed before it provides a utilities firm with a comprehensive overview of usage patterns.

Technologies in the Low Power Wide Area Network (LPWAN) space will facilitate the deployment of millions of expected low bandwidth IoT sensors. Although IoT doesn't consume as much bandwidth as other cloud-based applications, it will be yet another driver of cloud adoption in Africa.

Many of the world's largest cloud and content players have already arrived in the region or are on their way. The likes of Microsoft, Google, Amazon Web Services and Alibaba are currently battling for a head-start in Africa's cloud market. Many African users of cloud services are using platforms hosted in Europe or the US, but Microsoft recently announced the deployment of its first cloud data centre in Johannesburg, which will surely improve the quality of experience for African cloud users by virtue of lower network latency.

One of the biggest lessons for today's cloud computing players is that success in Africa usually comes from paying attention to local needs.

Across most areas of business, government and society in Africa there is a 'data gap'. The role of IoT in the collection of accurate data will really come into life as the cost of data sensor devices lowers, and the ease of connecting them to the network increases. Machine learning and big data analytics, mostly running in the cloud, will be able to use this data to solve business and social problems.

Liquid Telecom has already seen first-hand some of the unusual IoT use cases that are appearing across Africa. Earlier this year, for example, Liquid Telecom provided a timing solution for the 2017 Safari Rally, held in East Africa. Using start-of-the-art TAGHeuer timing equipment and connectivity supplied by Liquid Telecom, all timing information from the rally was captured along with relevant driver and car data, and sent to a cloud server.

From there, a cloud server processes the data to show instant timing results for a completed section of the rally, including intermediate ranking. All rally cars are also fitted with GPS tracking devices which provide automatic position updates every second. The geo-location data is available online superimposed on Google Earth, allowing fans to follow rally car positions and race progress through a website or mobile phone app. Drivers were also happy as it identified a number of cars who took short-cuts. With these cars penalised the system meant the results were accurate and correct in a very tight race.

Be it social networking, video streaming or leading-edge rally timing equipment, more demand for cloud-based services is on its way, and with it comes a greater need for network infrastructure and data centres across Africa. That's where Liquid Telecom comes in. Through our 50,000km fibre network – which connects more African countries on a single network than any other – and three state-of-the-art data centres, we're preparing for Africa's digital future, which increasingly belongs in the cloud.

ABOUT BEN

Ben Roberts is Group Chief Technology and Innovation Officer at Liquid Telecom.

Ben became CTO at Liquid Telecom in 2006, and he has been responsible for network and product strategy as Liquid Telecom's fibre network has expanded. Ben brings experience in a range of technologies in design, support, integration and operations roles.

He is also Chairman of the Board at Liquid Telecom Kenya, and lives in Nairobi..

IoT is even being used to support the Safari Rally in Kenya

TAKE A TOUR OF A CONNECTED SAFARI

Find out how IoT is helping to create a more safe and sustainable future for Africa's endangered animals.

Connected cameras have been used in Africa's game reserves and national parks for years, capturing the best night shots of animals at the watering hole, alerting safari operators on the location of that elusive lion and providing new information on animals' movements and behaviours throughout the seasons.

However, as more sophisticated and affordable IoT solutions have emerged on the market, technology is playing a much bigger role in animal conservation.

Just over 25,000 rhinos remain around Africa, living in constant threat of poaching. Criminals target rhinos for their horn - used in China and neighbouring countries to "treat" a whole host of ailments from a hangover to cancer. With the largest rhino population in the world, South Africa has seen poaching levels soar - growing by 9,000% between 2007 and 2014; peaking in 2014 with 1,215 rhinos killed by poachers.

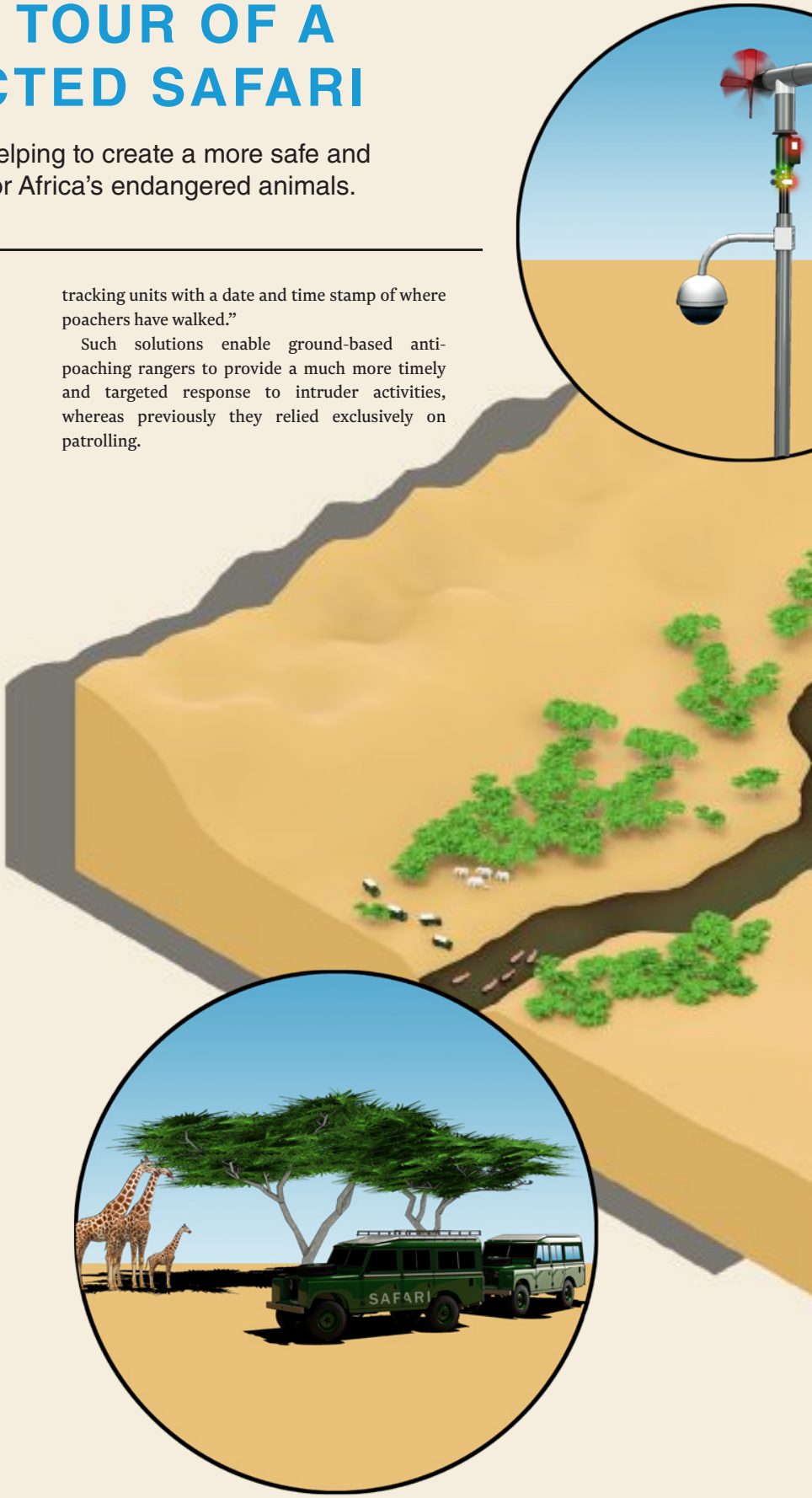
Elephants across Africa are also dying faster than the natural birth rate, prized by poachers for their tusks. While the lion population stood at approximately 200,000 one hundred years ago, today's figure is under 23,000. If the current rate of poaching continues, lions could be extinct by 2050. National parks need a helping hand in guarding these precious creatures and increasingly that is coming in the form of IoT.

Conservation conversation

Camera and IP networking provider Axis Communications is one company that has stepped forward to help implement IoT in the conservation arena. Axis has installed IoT systems in a number of game reserves around South Africa, including at a large rhino sanctuary in the Bela Bela region. At this site, the system setup includes seven thermal network cameras, multiple solar panels, loudspeakers and cutting-edge video analytics software integrating the network.

"Using perimeter mounted thermal cameras with smart analytics that can detect activity in no-go zones or loitering have been hugely successful. This then automates an alert to guards or anti-poaching units," says Roy Alves, Country Manager for Axis South Africa. "Good intelligence is also provided by strategically mounted cameras that notify dog tracking units with a date and time stamp of where poachers have walked."

Such solutions enable ground-based anti-poaching rangers to provide a much more timely and targeted response to intruder activities, whereas previously they relied exclusively on patrolling.



> As more sophisticated and affordable solutions have emerged on the market, technology is playing a much bigger role in animal conservation.

However, with national parks often stretching over tens of thousands of kilometres, power and connectivity supplies are a major challenge for IoT applications of this kind.

"Many of these deployments tend to be in outlying areas lacking infrastructure that would normally be available in urban areas," says Alves. "The use of solar panels and batteries connected to inverters solves the problem of power, then either Wi-Fi or satellite links help solve the issue of communications."

Alves says Axis is seeing interest in its perimeter solution from private game reserves and through corporate sponsorship.

Technology-focused wildlife conservation has in fact attracted high-profile investment in recent years. In 2012, Google.org awarded the World Wildlife Fund for Nature (WWF) a $5 million grant for its Wildlife Crime Technology Project, which, as its name implies, aims to tackle the poaching crisis in Africa and Asia through technology.

Active in Kenya, Namibia, South Africa, Malawi and Zimbabwe, the project focuses on the full gamut of leading-edge technology: from micro-radars for monitoring and detection to thermal cameras and human detection software, through to digital monitoring systems and acoustic detection software that monitors animal sounds.

Elsewhere, the likes of the Zoological Society for London Zoo (ZSL) has also invested in developing new technologies to solve conservation challenges. ZSL has worked alongside a number of technical partners to develop Instant Detect (ID); a camera trap system that uses satellite technology to send images in real-time from virtually anywhere in the world.

The technology is being used to help tackle poaching of endangered species by providing an early warning system for rangers and for remote wildlife monitoring. The solution was a finalist in the 2016 Wild Crime Tech Challenge, where it was selected from a pool of 300 applicants from 52 countries, each coming up with new innovations to help combat wildlife crime.

Drones to the rescue

Unmanned aerial vehicles (UAVs) - also known as drones – have recently taken a more prominent role in anti-poaching efforts.

In Tanzania, Bathawk Recon, a local UAV anti-poaching surveillance company, recently concluded trials of its Superbat drone in Mkomazi National Park.

Even operating at the maximum altitude agreed with local civil aviation, the device could detect people, follow them through the bush and zoom in on game - both in video and infrared.

The drone achieves a 30km range and eight hours in flight. "Our position is that UAV surveillance is certain to eventually become the most cost effective and widely used solution to poaching," Bathawk says.

Elsewhere, South Africa's UAV and Drone Solutions (UDS) is providing UAVs to national parks in Zimbabwe and Malawi to combat wildlife poaching, while the WWF has made the technology a key part of the its Wildlife Crime Technology Project.

With drones integrated into IoT anti-poaching solutions of the near-future, smart technologies will be able to provide perimeter based and on-the-move intelligence to support the work of ground-based conservation teams - ultimately creating a safer future for Africa's animals.

Illustrations by Liam Keating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We believe in the ambition and potential of African business. It's why we've built Africa's largest fibre infrastructure and provide an award-winning satellite network, capable of keeping any enterprise connected, protected and competitive at all times. Because we are not just a telecoms company.
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Preparing for the IoT of tomorrow

The success of IoT in Africa hinges on close collaboration between enterprises, telecoms providers, vendors, system integrators, tech innovators and developers. But how big are the barriers to adoption across Africa and what is the IoT ecosystem doing to bring them down?

The business case for IoT

While there is a universal business case for adopting IoT in industries across Europe and North America, the same can't be said of Africa, which is made up of many countries that are very different economically and politically.

George Kalebaila, Director of Telecoms and IoT at IDC warns about the risks of a "me too" approach to adopting IoT. "While some use cases will be relevant to all businesses in many developed regions, Africa's IoT journey may require a different approach and the starting point depends on the local situation," he says.

For example, outside of South Africa, there is currently little appetite for connected cars - understandable given that many African countries have deeper problems to address. Most global tech firms bring with them a western perspective, and there is a clear and apparent need in Africa for more of a localised approach.

"I think the IoT opportunity in Africa should address local problems. It should be about developing IoT applications that can be shared across Africa and then gain traction," says Kalebaila.

Stephen Bell, Senior Analyst of IoT at Heavy Reading, believes the IoT journey for a business always begins with cost. "Few industries have yet to find a way to really monetise IoT. The solutions must save money and the data must improve your product and service as well as better interact with your customers," he says.

The issue of cost is multifaceted. Not only does the cost of hardware and network access need to come down for African businesses to afford IoT applications, but the cheaper cost of labour in Africa means there isn't such a strong driver for replacing the workforce with automation.

This must force businesses to carefully evaluate where there are real opportunities to deploy IoT. The technology is beginning to show signs of its worth in areas such as utilities, agriculture and animal conservation, but elsewhere it may be a case of IoT finding its own niche.

Crime rates across Africa remain high and IoT can play a role in improving physical security. Global ICT solutions provider Huawei first entered Africa in 1998, and is seeing growing demand for its IoT platform in South Africa, Nigeria and Kenya.

"Security is a big problem – particularly in South Africa, where all the houses have alarm systems. This has driven demand for smart home applications focussed on improving security," says Jinwei Zhang, Regional Solution Manager for Southern Africa at Huawei.

Likewise, security also takes on a more important role with connected cars.

"Through our partners, Huawei can help collect data location and behaviour on its backend IoT platform, which provides service analysis that can be used by the car industry. There is strong demand to more accurately monitor cars in order to prevent theft," he says.

Images: Shutterstock

IoT networks get underway

The arrival of billions of new connected things brings with it enormous new challenges for networks, prompting the telecoms and tech industry to begin work on new network technologies and standards that they hope can sustain the future demands of IoT.

There are a growing number of network technologies emerging on the market – a sign that there is no one size fits all when it comes to IoT.

While the likes of Bluetooth, ZigBee and Wi-Fi remain adequate for consumer level IoT applications, the needs are often very different in an industrial or commercial environment. These require networks with different range, power and efficiency, which has led to the development of low-power wide area (LPWA) networks.

LPWA networks are designed with much wider coverage than traditional mobile networks. They're also able to support many more devices while operating at a lower cost and with greater power efficiency. As a result, these networks are only useful for infrequent or low data rate communications.

"Over the last few years, mobile operators have looked at the network standards and tried to figure out which IoT applications can work with them. They designed two main cellular- based technologies – NB IoT and LTE-M – which aim to support applications that require longer battery life. These networks are beginning to be deployed in Europe, but it is still early days as the networks were only standardised last year," says Julian Watson, Senior Principal at analyst firm IHS Markit.

While 4G networks are used for high-bandwidth applications such as smartphones, connected cars and CCTV, 2G and LTE-M networks are viewed as a strong fit for medium- bandwidth applications such as smart grids, smart watches and high value object tracking. NB-IoT meanwhile is seen as a solution to low bandwidth applications, such as smart meters, smart parking and smart street lighting.

The first deployments of these LPWA IoT networks are already underway in Africa. In November 2016, MTN and Huawei jointly launched a NB-IoT- based smart water metering solution available across the region, while Vodacom has also announced an initial rollout of NB-IoT across South Africa. "What is interesting for Africa is that these technologies provide flexibility in remote areas, which existing infrastructure might not reach," says Alexandra Rehak, Practice Head of IoT at Ovum.. "We expect Africa will be an active region for LPWA network rollouts in the coming years."

NB-IoT has strong competition – particularly in Africa - from alternative wireless technologies, such as SigFox and LoRa. While Sigfox is a proprietary network technology owned by the company but an open ecosystem of chips, modules, devices and platforms, LoRa is an alternative open network (but proprietary on the chip side) with an alliance that focuses the evolutions of the protocol – both are making a strong play for the low power and low bandwidth share of the IoT market.

"If you look at the utilities market as an example, the main cost with smart water meters is in the maintenance and replacement of batteries. These applications often need to have over 15 years of battery life, which is not possible with traditional telecoms protocols as the data rates fluctuate, which impacts the battery life. SigFox technology can sustain 100 bits per second (bps) anywhere in the cell, ensuring batteries are not drained," says Maxime Schacht, Marketing Manager at Sigfox.

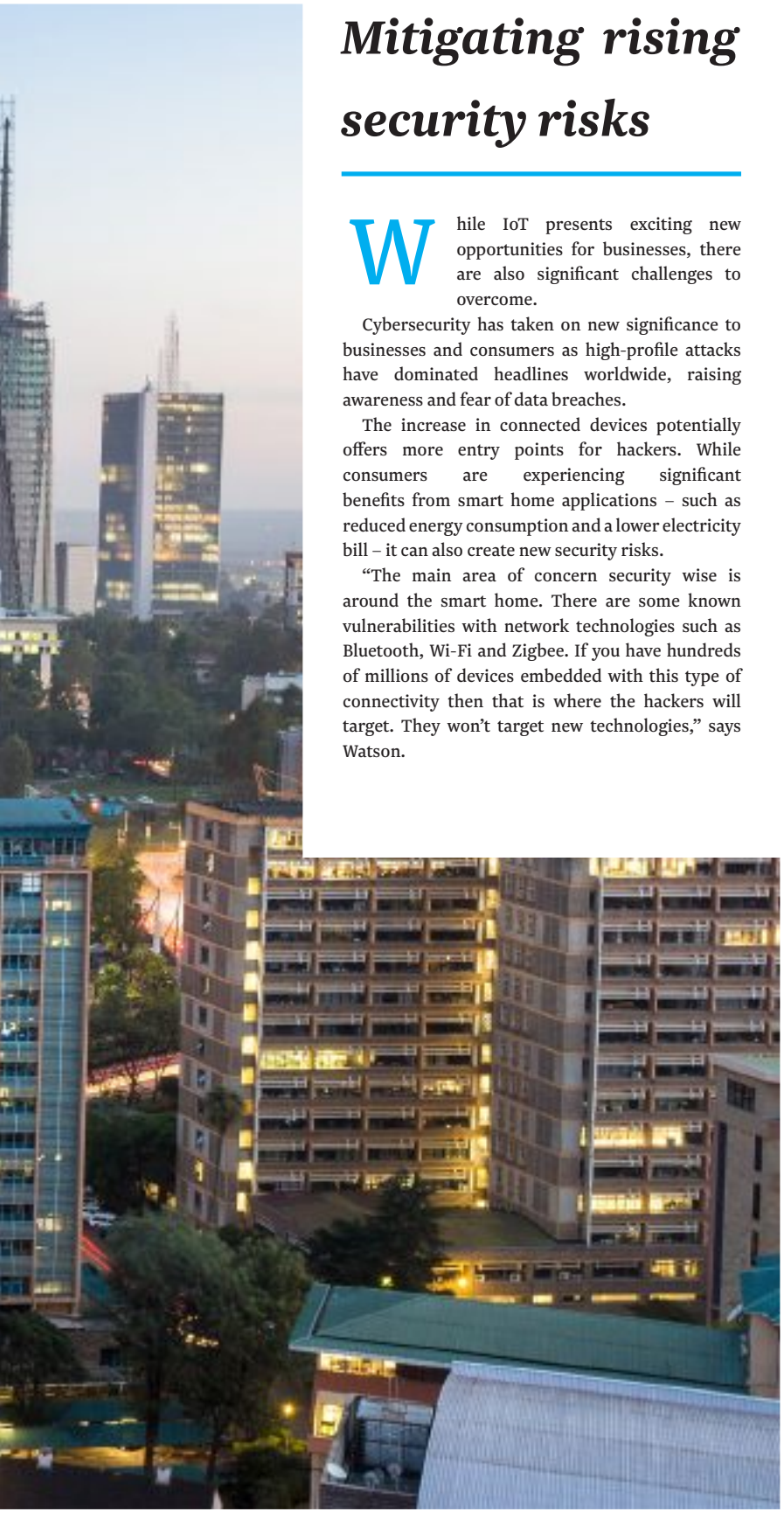
The reliability of Sigfox also makes it's a good back-up option for cellular technologies. "We also add value to existing cellular deployments. Our strong value proposition is that we have a single network and there is no high roaming fee. We see ourselves as a complement to existing technologies, and help build the overall business case for IoT," says Schacht.

The first major Sigfox network in Africa is currently being deployed in South Africa. Operated by Sqwidnet; a licensed Sigfox operator that is a subsidiary of open-access fibre connectivity provider DFA, the network hopes to offer coverage to 85% of the South African population by the end of the year. Unlike other African countries, Sqwidnet's CEO Reshaad Sha believes there is already pent- up demand for IoT connectivity in South Africa. "M2M and IoT are not new in South Africa. This network will enable companies that have been operating with elements of IoT for years to truly utilise end-to- end solutions," he says.

As well as being further ahead with its adoption of IoT, South Africa also has more advanced infrastructure than many neighbouring African nations. "I would liken the IoT ecosystem here to what Sigfox experienced in Europe a few years ago, which led to major traction," says Sha.

Additional networks are likely to fuel demand and accelerate the adoption of IoT solutions across multiple industry verticals. "We see pent up demand for our network from businesses focussed on areas such as vehicle tracking or smart metering, which need networks that handle large volumes of data over wide coverage areas," says Sha.

Identifying the right network technology often comes down to finding the right balance between price, power consumption and accuracy needed for the application to work. And with more IoT network rollouts underway, there will be more choices for businesses when putting together a business case.



Mitigating rising security risks

While IoT presents exciting new opportunities for businesses, there are also significant challenges to overcome.

Cybersecurity has taken on new significance to businesses and consumers as high-profile attacks have dominated headlines worldwide, raising awareness and fear of data breaches.

The increase in connected devices potentially offers more entry points for hackers. While consumers are experiencing significant benefits from smart home applications – such as reduced energy consumption and a lower electricity bill – it can also create new security risks.

"The main area of concern security wise is around the smart home. There are some known vulnerabilities with network technologies such as Bluetooth, Wi-Fi and Zigbee. If you have hundreds of millions of devices embedded with this type of connectivity then that is where the hackers will target. They won't target new technologies," says Watson.

IoT therefore presents an extension of existing privacy issues for consumers - as more of their life becomes connected, how do they know which data is off limits to the rest of the world?

"Consumers are concerned that they are being monitored and that their data is accessible to hackers. They want to know that their connected devices are secure, and because IoT is so distributed and diverse, it is much harder to secure than a laptop," says Rehak.

The major challenge facing businesses is how they structure their organisation to protect customer data: "Businesses must think about who has access to their customer data. Security is as much a corporate governance issue as it is a technology one," says Watson. "Businesses must take simple steps like ensuring employees have access to only the correct systems, or that visitors to their operations are unable to leave with stolen data on a USB."

But on the technology side, there is also much work to be done.

"The vendors are very aware of the issue and it's an ongoing challenge. It's a case of when not if there will be any cyberattacks and they need to have protection already in place," says Rehak. "Working out security standards and protocols is not a new issue, but it is necessary."

Rehak expects that for the time being enterprises will lead the way with IoT security and protocol: "Typically regulation lags behind. A lot of existing personal data protection legislation can be extended to IoT, but I expect it will be certain industries that drive legislation more than others. It is more important, for example, that effective data protection legislation is in place in the healthcare sector, where there are sensitive patient records to consider," says Rehak.

One technology that could solve a piece of the IoT security puzzle is blockchain. In a nutshell, blockchain works by using a network of computers, all of which must approve a transaction in a chain of computer code. Details of the transfer are then recorded on a public ledger for anyone on the network to see.

Blockchain is currently being explored by businesses as a mechanism to lower the cost, simplify and secure remittance payments for guest workers in various countries.

Remittances to developing countries are expected to grow to $444 billion in 2017, according to World Bank.

But blockchain could also eventually be used in an IoT environment for microservices payments. "As mobile operators deploy virtualisation and software defined networks they can create targeted IoT microservices. Blockchain provides the opportunity to securely track and charge for these microservices. This may have application in preventing fraud in metering services," says Bell.

Images: Shutterstock

Investing in smarter cities

The adoption of IoT looks set to connect society with new and improved services. Nowhere is this more the case than in cities, where technology is being put to the test against urban challenges such as safety and security, traffic congestion and aging infrastructure.

Urban development projects are increasingly incorporating ICT and IoT, paving the way for future Smart Cities. Frost & Sullivan expects Smart Cities to be a $1.5 trillion market by 2020, with the analyst firm seeing multiple opportunities to tap into infrastructure development, technology integration and energy and security services.

Smart city initiatives are on the rise globally, and Africa is no different.

Established in 2013, the Smart Africa alliance hopes to accelerate sustainable socioeconomic development on the continent and usher Africa into the knowledge economy through affordable access to broadband and usage of ICT.

Currently, the alliance is backed by 11 African countries, including Ivory Coast, Gabon, Kenya, Mali, Uganda, Senegal, South Sudan, Chad, Angola, Rwanda and Burkina Faso, as well as supported by organisations such as the International Telecommunications Union (ITU), World Bank and the GSM Alliance (GSMA).

Rwanda is spearheading the alliance. The Government of Rwanda has recently collaborated with Nokia and SRG to improve the lifestyle and social sustainability of its citizens in 2017. As part of the project, the government of Rwanda will invest in network connectivity and sensor deployment in different applications, which will serve local citizens in areas such as public safety, waste management, utility applications and healthcare.

The hope is Kigali will eventually become a world-class reference model project for the Smart Africa Alliance.

Kenya has also attracted strong interest and investment. Known as the Silicon Savannah, tech investment has poured into the Kenyan capital Nairobi, which has positioned itself as a centre for start-ups, accelerators and investors in East Africa.

The country has recently focused on harnessing the power of technology to improve security. For the first phase of its Safe City project, Huawei teamed up with Safaricom to implement new ICT, covering the most densely populated cities of Nairobi and Mombasa. Following the completion of the project, these cities are said to have improved their local security.

According to the Kenya Police annual report, crime rates from 2014 to 2015 decreased by 46% in areas covered by the Safe City project.

"There is big opportunity to make cities safer using IP cameras," says Huawei's Zhang. "Smart cameras also help in areas such as incident prevention, emergency response and evidence collection."

Other major global tech firms that have established research centres in Nairobi include IBM, which in collaboration with Kenya's Ministry of Information, Communication and Technology (ICT) opened a research lab in 2012, and Intel, which last year partnered with the University of Nairobi's innovation hub C4DLab to run design thinking courses within the incubator's Africa Technology and Innovation Accelerator (AfTIA) programme.

Elsewhere, there is a growing trend across Africa to develop entirely new urban centres with ICT at their core. Examples include Eko Atlantic; a new coastal city constructed on reclaimed land near Lagos, and Ghana's Hope City; a $10 billion tech hub on the outskirts of the capital Accra. Such projects really heavily on overseas investment – from both ICT and construction companies – and there are some concerns that their vision overlooks the actual socioeconomic realities of many African countries.

Moving forward, access to capital and ICT infrastructure will be essential to these projects, and to the deployment of IoT in general across Africa.

"Access to connectivity and infrastructure is key, but there is a long way to go," says Ovum's Rehak.

"Again it all goes down to having a clear business case. It is not straight forward to make money out of IoT, and businesses must have a clear understanding of what the solutions are, what problem is being solved by them, and what business model is needed for them to be a success."

Images: Shutterstock

Building Africa's digital future

Liquid Telecom is the leading independent data, voice and IP provider in Eastern, Central and Southern Africa.

It supplies fibre optic, satellite and international carrier services to Africa's largest mobile network operators, ISPs, financial institutions and businesses of all sizes. , creating the first pan-Africa fibre player.

Working under various brands, the Liquid Telecom Group has operating entities in Botswana, DRC, Kenya, Lesotho, Mauritius, Rwanda, South Africa, Tanzania, UAE, Uganda, UK, Zambia and Zimbabwe.

Why Liquid Telecom?

It takes an African company to really understand the challenges of connecting businesses in Africa. Liquid Telecom provides connectivity services for enterprises across many sectors.

In an increasingly competitive environment, we are one of the few African operators able to use carrier-grade services to enhance network efficiency.

Our network

Liquid Telecom has built Africa's largest single fibre network currently spanning over 50,000km, across borders and covering Africa's fastest-growing economies where no fixed network has existed before.

Liquid Telecom has built Africa's largest independent fibre network which runs from the north of Uganda to Cape Town, covering Africa's fastest-growing economies, where no fixed network has ever existed before.

Our history

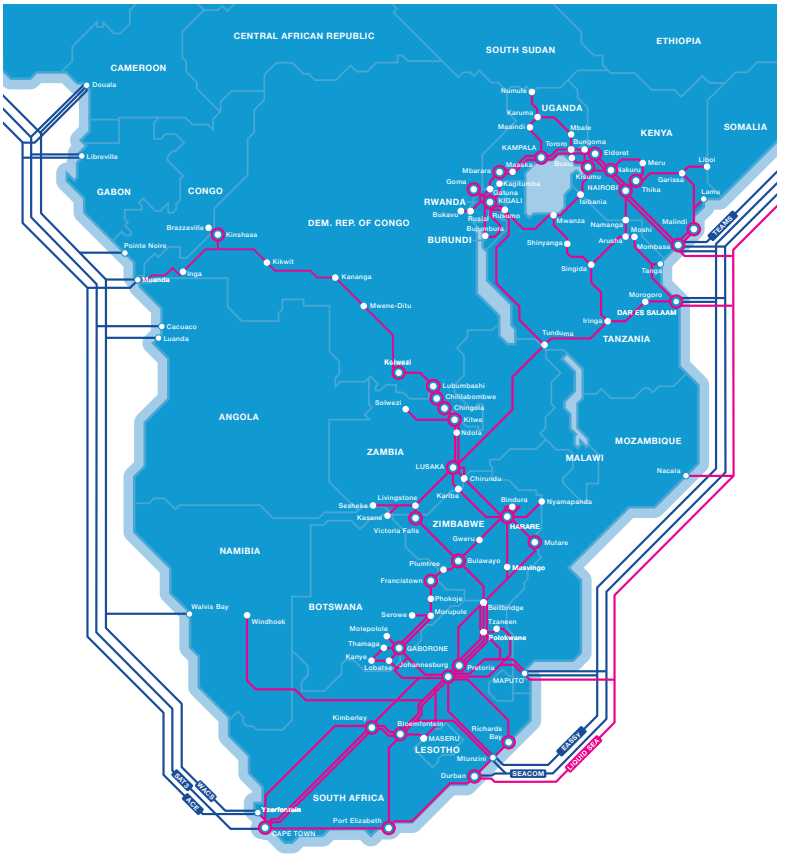
A subsidiary of Econet Global, Liquid Telecom began life as the satellite and voice operator Econet Satellite Services, which was founded in 1997.

Rebranding to Liquid Telecom in 2004, we went onto launch our high-speed, cross-border fibre network linking southern Africa to the rest of the world. in 2009. Operators and users alike are seeing the benefits of our reliable, cost-effective communications infrastructure.

We set out to challenge the status quo. Today, we're changing the African telecoms industry, the lives of millions and even the continent itself.

Award-winning company

We're extremely proud to be recognised by our peers in numerous industry awards held in Africa and across the world.



> We've worked hard to build a network like no other in Africa.

The awards below highlight just some of our most recent achievements :

- Best Connecting The Unconnected Operator 2017 at the Global Carrier Community Meeting (GCCM).
- Enterprise Service Innovation award at the 2017 Global Telecoms Business Innovation Awards.
- Best African Wholesale Carrier for the last five consecutive years at the annual Global Carrier Awards.
- Marketing campaign of the year at the 2016 AfricaCom awards for the AfriCAN Marketing campaign.

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