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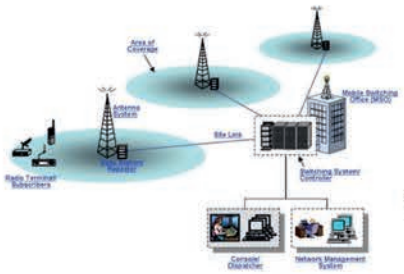
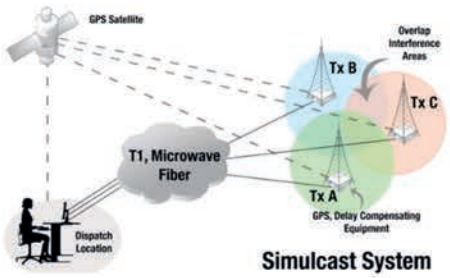
MISSION-CRITICAL RADIO COMMUNICATIONS





Simulcast System

EMCOM INTEGRATED SOLUTIONS

EMCOM Design | EMCOM Deploy | EMCOM Manage

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 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.

Our partners:

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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 their mobile wallets. Based on the success of the implementation, Ericsson says it will potentially incorporate its services at additional *EKOCENTER* locations.

Coca-Cola has been testing its solar powered *EKOCENTERs* in Africa with the help of partners that include Qualcomm and IBM.

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 CO2 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.

Issam Darwish, Executive vice chairman & CEO, IHS Towers

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.

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 in Rwanda after acquiring the tower assets of MTN Rwandacell and the entire shareholding of Rwanda Towers (formerly a subsidiary of Airtel Rwanda).

> "IHS has reduced its diesel consumption by up to 50 per cent on average across Africa."

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."