

# chapter 8

## Critical Communications



**Ken Rehbehn,**  
mobile  
communications  
analyst,  
IHS Markit

Now is a time of change for critical communications. From simple voice-oriented field communications to sophisticated control room situational awareness systems, the capabilities of our critical communications systems are growing along with expanding adoption across the blue light services. Looking

forward to the future, the IHS Markit Critical Communications research team believes that voice communications will remain a foundation component of mission-critical communications even as richer applications arrive to make mobile broadband a valuable operational asset.

Future critical communications will continue to center around voice transmissions thanks to two characteristics: immediacy and ubiquity. During mission operations, the ability to rapidly communicate status and commands with a short, simple voice transmission to fellow group members is essential. Law enforcement and fire service operations entail heads-up, hands-engaged activities that do not make use of keyboards practical. A simple push-to-talk button that opens a simple broadcast voice communication path to all team members remains an ideal user interface during times-of-crisis.

Voice, however, is an inefficient communication method when a large volume of information must be transmitted. For example, a complete description of what an officer sees will take many words, tying up a valuable voice channel. The future of critical communications depends on a world where law enforcement and fire service teams can augment voice communications with graphical images and videos. Control rooms, as well, will use the future functionality to transmit pictures

and videos contributed by citizens calling into 1-1-2 with incident information. Getting this valuable information to and from the field is the job of mission-critical broadband systems.

Early experience with LTE-based deployments for mission-critical broadband support, such as FirstNet in the United States and SafeNet in Korea, points to the value these systems offer. Mobile data terminals, handheld smartphones, and tablets serve as potent tools for delivering dispatch information and speeding the business processes that underpin law enforcement, fire operations, and emergency medical response.

While LTE-based mobile broadband provides vital data transmission resources for demanding public safety mission operations today, more capability is on the horizon, as 5G standards progress continues. New techniques, such as ultra-reliable, low-latency networking, network slicing, and edge computing, enable new wireless-enabled tools that can increase responder safety and mission effectiveness.

Ultimately, these advances translate into lives saved and property preserved. Yet, as valuable as LTE-based mobile broadband and future 5G functionality are, the simple voice transmission will remain the essential critical communications tool for mission operations.



**Mladen Vratonjic,**  
chairman of the  
board,  
TCCA

A broad look at the African market shows a scattered technology environment – this is a continent where generalisation is impossible. There is combination and parallel usage of analogue systems, TETRA, DMR, PDT, limited 3G and 4G, and some proprietary systems.

As in many other parts of the world, increasing security threats and political

instability in some regions generates demand for the modernisation and transformation of public safety and defence networks, and this drives favourable conditions for growth in the African critical communications market.

According to the latest research from analysts IHS Markit, the TETRA market is showing steady if not spectacular growth, with peaks of demand across the verticals. Nigeria for example is predicted to increase its use of TETRA in transportation by a compound annual growth rate of more than 13% for the five years to 2023.

Ramya Balakrishnan, Senior Research Analyst at IHS Markit Technology, sums up the general viewpoint thus: “Secure mission critical voice communications coupled with push to talk capabilities through multiple mediums including smartphones, tablets and desktop computers have become the need of the hour for effective public safety and emergency services. Having said that, TETRA has definitely become one of the most dominant technologies in the public safety domain, with massive refreshes emerging in mature markets. TETRA is also gaining momentum in other business verticals, including transportation and utilities with its new first of the kind deployments in the emerging and developing nations.”

Several African countries are looking to complement their public safety narrowband systems with broadband capabilities. As always, TCCA as a leading advocate for open standards, would state that it is crucial for African public safety agencies and the wider critical communications market on the continent to implement 3GPP-based technology. This is the baseline adopted globally for transforming legacy mission critical communications.

Mission critical broadband has huge room to grow, however there can be long project cycles due to funding difficulties, spectrum availability and sometimes multiagency interlock delays. 3G mobile broadband

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coverage is patchy across the continent, especially in remote areas, and 4G is in the early stages, mainly in urban areas.

Sustained growth and therefore productivity relies on having the basics in place, and these include adequate telecommunications, utilities and transport infrastructure. While many areas of Africa have limited financial resources with which to develop their communications infrastructure, according to the African Development Bank, Africa's economic growth continues to strengthen, reaching an estimated 3.5% in 2018 and predicted to accelerate to 4% in 2019 and 4.1% in 2020. This growth is set to be higher than that of other emerging and developing countries, with the exception of India and China.

There is growing interest in the region from mobile network operators who are increasingly looking at public safety/emergency use cases to generate new revenue streams by providing mission critical connectivity. These networks are unlikely to be country-wide due to cost limitation, rather they will be built where the operators can achieve a reasonable return on their investment.

And yet despite the well-documented financial and political issues that Africa has to negotiate, the continent has successfully launched 5G services. A limited number of users are on networks in Johannesburg and Tshwane in South Africa, and in Lesotho, while Nigeria and Gabon are holding trials. So from the established TETRA networks to the emerging promise of 5G, Africa is embracing the potential of critical communications across both narrowband and broadband options.

There are many TCCA members active in the region, helping to build and operate critical networks that contribute towards the safety of citizens and communities. It is the ongoing work of TCCA and its members that has

created the strong and stable TETRA market of today, and the same principles are being implemented to ensure that critical broadband and its users benefit from the same success.

We are currently celebrating TCCA's 25th anniversary year, and our core principle of open standards – the foundation for the success of TETRA – has remained unshakeable since we were originally founded as the TETRA MoU Association in 1994. The success of TETRA is built on the unique Interoperability (IOP) Testing & Certification Process, developed and led by TCCA's Technical Forum (TF). The first IOP certificates were published in November 1999. 20 years later the TETRA IOP process continues to lead the world in independent certification for critical communications.

TCCA's IOP process was developed to enable a truly open multi-vendor market for TETRA equipment and systems. This approach gives users clear benefits in terms of a wide portfolio of compatible equipment, competitive pricing and rapid development of new product models. The IOP process also benefits industry by creating a wider accessible market, faster market take-up and greater potential for investment in new developments. TCCA's IOP testing is witnessed by an independent body, currently by ISCOM, part of the Italian Ministry of Communications. ■

## Year in review

Critical communications in Africa are developing at a steady pace. The demands from air, rail, road, utilities, mining, oil, gas, police, military, first responders and emergency services for reliable, secure and robust communication systems, that can work in harsh and varied environments is always present and within those demands are ones

related to cost and affordability.

Each service provider has unique requirements on top of the universal ones covered by communications devices. TETRA, LTE, P25, Land Mobile Radios, DMR (Digital Mobile Radio) etc. are the back bones of critical communications. Terrestrial Trunked Radio (TETRA) is a standard for the needs of public safety and security, such as police forces. LTE (Long Term Evolution) provides the standard for high volume data transmission over 4G that the narrowband technology of TETRA and P25 can't. P25 is the standard derived from public safety organisations in the USA. Within Africa critical communication providers need to address the needs for enhanced voice services, data applications and capability for integrated incident management. The future capability of a 5G network to provide the critical communication system comprising sensor, camera, video streaming and command and control centre link with low latency data flow is the goal. Being able to monitor environmental conditions such as air quality, gas leaks etc. combined with the use of drones will be a bonus.

## *Botswana sees a clearer picture with CCTV*

Huawei completes its safer city project in Francistown Botswana. Francistown is the second largest city in Botswana and was facing growing crime rates, but its local council and the Botswana Police Service took the decision to employ the Chinese company to install a network of Closed Circuit Television Cameras (CCTV) in Francistown. The company completed the installation of the network, infrastructure and hardware to enable a more intensive surveillance of the city for the

### JANUARY-APRIL

GCF certifies LTE devices for critical communications. The Global Certification Forum (GCF) extends its certification scheme to critical communications devices. In response to demand from public safety authorities for access to secure wireless broadband communications, 3GPP begins to develop specifications to deliver a variety of mission critical capabilities over LTE networks. MCPTT provides enhanced voice-based PTT communication based on the 3GPP Evolved Packet System. It leverages Group Communication System Enablers and Proximity-based Services, and is part of Release 13 of the 3GPP specifications. Mission Critical Video over LTE and Mission Critical Data over LTE have already been standardised within Release 14, while further enhancements are being developed for Release 15.

### MAY-AUGUST

Siemens works with critical comms specialist DAMM to successfully implement and test an open and interoperable TETRA packet data solution which complies with the demands for ETCS L2 (European Train Control System Level 2). The tests mainly focus on bandwidth requirements and the reliability of data delivery. The scenario was implemented so that the only main change was to replace the GSM-R hardware with TETRA equipment. The test results showed that data transmission quality in both directions was always above the requirements of the standard and that TETRA delivered equal or even better results than a GSM-R system.

### SEPTEMBER-DECEMBER

Hytera launches its new ACCESSNET-T IP for partners and promises it's an "infinitely

scalable" IP TETRA radio system that offers high performance and versatility, along with an "intuitive and user-friendly" web-based network management system (NMS). The system fully links TETRA radios from Hytera and Sepura to ensure what's claimed to be smooth voice communication, high availability, and efficient data transmission. It also integrates PTT over Cellular(PoC), LTE and Wi-Fi. Available in both indoor and outdoor versions, Hytera says the ACCESSNET-T offers "unlimited" TETRA functionality and "virtually limitless" connection possibilities for external applications, thanks to its diverse configuration options and modular hardware design which means components can be easily exchanged or added to during ongoing operation.

purposes of crime prevention and reduction. There is also the additional advantage in that not only is the system designed to make citizens and their work environments safer it also encourages potential foreign investment if cities in Botswana are not only safer but seen to be safer.

## *Critical Communications are they ready for an African emergency?*

At the tail end of 2019 Coronavirus hit an unexpected world. It was first reported by China, the home of Huawei and ZTE, two major players in the communications world. It hit production of telecoms equipment as workers were struck down with illness. China responded by constructing hospitals, taking 10 days from commission to completion, though they were of a modular design and suffered water leaks. It progressed to the rest of the world causing concerns for Centres for Disease Control and Prevention.

It wasn't long before Africa was hit with its first cases of Coronavirus. As country after country subjected themselves to lock down, controlling both movement within their national borders and into them, the strain on maintaining communications systems started and that pressure increased.

Across Africa there is a disparity in the level of telecommunication infrastructure in place and it is at times of emergency, as Coronavirus has certainly caused, that critical communications systems become of paramount importance to first responders, emergency services, health services, police and the military. There is no one size fits all proprietary critical communications system that fits all African Nation's requirements and fits all environmental conditions. It is self-evident that a secure, robust and adaptable emergency communications system is the backbone of a country's security and provision of safety for its peoples. As the workforce is denuded due to infection, so will the numbers of skilled persons responsible for the operation and maintenance of critical communications dwindle. There are of course the infection

control requirements needed for handsets and mobile systems to prevent cross contamination. The use of satellite communications that are controllable and maintainable via countries that have the virus under control, give satellite critical communications an edge over fixed land line, and fibre optic communications requiring maintenance within the country. The maintenance of towers and provision of their power source is a potential problem if a work force is not available to refuel generators on remote tower and base station sites or if the grid goes down cutting off power. Solar battery powered towers, suddenly gain an advantage in this situation. ■



**Uwe Niske,**  
senior director,  
sales, SSA & UN,  
Motorola

// It would be hard to specifically point at a single challenge that's both relevant for the whole continent and also specific for 2019," says Uwe Niske, senior director of sales, SSA & UN at Motorola. "As in all the markets we serve there are different challenges we face - in some countries it's around government budget challenges,

in others it could be frequent government leadership changes. But one thing is for sure, and that's that our public safety customers, like anywhere else continue to see changes in the kind of challenges they face every day - and we work hard to ensure our technologies and sales teams align to help find the right solution.

Niske says the world of radio communication continues to shift globally from analogue to digital and the company is definitely seeing a growth in demand for its digital LMR systems across the continent. "The African continent continues to show a great deal of interest in our mission-critical P25 systems - notable success stories are a new ASTRO 25 system we've deployed for a police agency in east Africa and we have also recently concluded our second largest sale ever on the continent, for the supply of a new ASTRO P25 system into

As in all the markets we serve there are different challenges we face - in some countries it's around government budget challenges, in others it could be frequent government leadership changes

Southern Africa," he adds.

Now in 2020, Niske says the company's core radio business, especially in the developing countries, will naturally remain firmly in its focus as it continues to compete in this space for public safety and commercial LMR.

"However, in the past couple of years, we've been working hard to build our video and software solutions portfolio to a point where we have an impressive ecosystem of public safety solutions, so one of the biggest drives will be expanding our footprint in video, video analytics, and software in Africa," he adds. "Another area we are working hard on is our WAVE or PTT applications in the public safety and commercial LMR segments where we see good user requirements and growth opportunities."

Learning from conversations with customers, Niske thinks 2020 will see a rapid increase in the adoption of new technologies by customers. He predicts a spike in mission-critical video penetration, whether it's body-worn, vehicular or fixed cameras. "We will see more agencies and organizations benefiting not only from the extra eyes they provide but also the power of AI and analytics that goes hand in hand with video, all integrating into an effective command & control system couples to our Tetra or P25 radio networks," says Niske.



**Mladen Vratonjic,**  
chairman of the  
board,  
TCCA

**The year ahead:** For mobile broadband, TCCA together with a number of our members and other stakeholders who are active in 3GPP, have succeeded in getting critical broadband features included in 3GPP standards for 4G, and that work is ongoing to include 5G. TCCA is the 3GPP Market Representation Partner (MRP) for critical communications, and has worked with other

industry partners to drive the inclusion of standardised features such as the MCX series (Mission Critical Push to Talk, Mission Critical Video and Mission Critical Data) in 3GPP Releases. The implementation of these and other standards relevant to critical communications gives the sector a solid platform for the long-term transition between narrowband and broadband.

As Africa moves towards mobile broadband, deployments will need to be done in a way that demonstrates all the benefits of standards, such as interoperability, economies of scale and multisourcing. This

will give user organisations and operators confidence to enter the market. TCCA is now working with partners such as GCF (Global Certification Forum) to develop and implement a global MCX interoperability and conformance certification regime.

There is a huge amount of work that goes on behind the scenes to ensure that critical users in Africa - and all around the world - benefit from technology and services that they can trust, and we look forward to continuing to support the critical communications market as it develops into the next decade.



**Peter Hudson,**  
products director,  
Sepura

The African critical communications market is one that traditionally experiences peaks and troughs and it is notoriously hard to predict future demand. The limited availability of budget and appropriate communications infrastructure has often restricted investment in security systems, despite massive investment in infrastructure and commercial operations across utilities and industry.

Growth areas in demand for critical communications systems are in a number of markets, primarily transport, utilities and mining. Here the traditional strengths of TETRA systems are shown to their best advantage: tough, reliable terminals; secure networks and encrypted communications; clear audio and excellent coverage. These practical capabilities allow for improved security.

The increasing availability of 4G and broadband networks is enabling organisations to further enhance their critical communications platform with data and other services, enabling them to improve efficiencies within their operations. By connecting, people, devices and systems, organisations can have a better understanding of the resources at their control, and as a result have improved efficiencies, security controls and response to urgent situations.

In the last 18 months Sepura solutions have been sold to organisations with critical communications requirements across transport and utilities in South Africa, Nigeria, Senegal, Morocco, Algeria and Egypt, with numerous projects in the pipeline for the next 18 months in these and other regions.

**“The limited availability of budget and appropriate communications infrastructure has often restricted investment in security systems, despite massive investment in infrastructure and commercial operations across utilities and industry”**



**Gerald Zhang,**  
deputy general  
manager,  
Hytera overseas  
sales central dept.

In general, for Hytera the African market in 2019 presented both challenges and opportunities. We made a large human resource input to the professional communications market in Africa.

With an increase in sales promotion, we found that the professional wireless communication resources of African public security departments were very scarce and that there were many opportunities for us. The market had obvious demands for private network communication products. Users had a certain understanding of the data, voice and comprehensive applications in the private network industry.

The southern Africa region for Hytera has seen significant progress over 2019 and Hytera achieved many important opportunities in public safety, utility, transportation and mining etc. Our unified communication solution and convergence solution received much interest and favourable views on many occasions and at conferences held by Hytera. I believe the future of the PMR industry will be about the unification and integration of various technologies and solutions into one large network.

The gradual acceptance of narrowband (NB) and broadband (BB) convergence was a high point for us. The argument existed for a long time between which technology, LTE, TETRA or DMR is more suitable for mission critical users and this caused confusion for customers.

Since Hytera launched its NB/BB convergence solution in 2017, customers have more and more realised the migration from NB to BB won't happen overnight, due to the heavy investment and infrastructure needed for deploying a pure private LTE network, especially for covering the same areas with NN standards. The benefits and ease of satisfying the need for critical voice and broadband data and applications are more revealing and obvious. One project implemented in Africa for a public safety customer showed them the path and how to realise migration based on their budget and capability.

What's more, through the establishment of local branches and recruitment of local staff, our ability to serve customers has been further enhanced. Hytera's brand and products have been widely recognised by users, especially government users.

Hytera has many successful cases in Africa, such as Angola Police, oil projects in Algeria and Gabon railway. The economic situation was tough, currency depreciation, national debt, power shortages and drought made business even more difficult, which affected us to some extent. Many expected projects were delayed.

Resolution to address public security issues and fighting crime have been emphasised in a number of countries in order to create a safe and stable environment for foreign and domestic investors. We see this as creating a lot of demand and opportunities for the use of PMR solutions such as NB and BB convergence solutions, body worn cameras, unified communications and satellite solutions etc.

Also, Hytera will balance the needs of public security customers and the basic conditions of the strategy, to achieve instant construction and use, and to maximise the benefits of user's investment.

With Hytera's 7 main product portfolios, we are confident that Hytera is going to make good progress by providing the right solution for a customer's various needs. ■

**“The economic situation was tough, currency depreciation, national debt, power shortages and drought made business even more difficult, which affected us to some extent. Many expected projects were delayed”**

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