chapter 4
Critical Communications

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With 54 nations distributed across more than thirty thousand square kilometers, Africa is a sprawling and diverse continent with critical communications opportunities and challenges. Just as other regions of the world continue to leverage a blend of communications technology serving public protection and disaster relief (PPDR) requirements, so too does Africa. But stark differences in economic development and geography create unique challenges for national governments and civil authorities.

As mission-critical LTE deployments emerge in Asia, Europe, and north America, Africa remains a land where analog radio support dominates. But times change, and government officials across the region recognize the value of digital critical communications capabilities based technologies such as TETRA, DMR, or even LTE mobile broadband. The challenge, however, is finding the right approach that works within the context of each nation's unique geographic and economic situation.

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As the United States, the United Kingdom, and South Korea moved towards deployment of mission-critical broadband networks based on LTE, a vision of a single converged infrastructure supporting group voice communications and data-rich applications took shape. In Africa, that vision has failed to become a reality. Early adoption of Huawei's eLTE architecture in Kenya has not spread more broadly across the continent. Thoughts of a technology leap-frog that takes public safety agencies from aging analog infrastructure to cutting-edge mission-critical never gained traction in the face of the realities of spectrum availability, regulatory constraints, and the physics-based limitations of LTE propagation.

When it comes to affordable long-distance coverage solutions across the African continent, few options have historically beat simple analog voice transmission. And while that may remain the case for enterprise deployments, public safety officials understand the advantages of upgrading the aging analog systems with secure TETRA networks as funding permits. TETRA offers public safety authorities a rigorous security feature set along with a competitive and interoperable device ecosystem.

DMR also has potential for regions that see benefits in digital communications without higher-end TETRA capabilities. Conventional DMR systems, as an example, offer the potential to replace old analog systems with a simple - but modern - digital approach. As a reflection of these trends, Omdia's recent market forecasts for the Middle East and Africa anticipates the analog installed base to decline between 2020 and 2025 at a -20.4% compound annual growth rate (CAGR).

Beyond the extremes of all narrowband or all mobile broadband is the prospect of devices supporting both approaches. There is a growing trend of public safety authorities embracing hybrid mission-critical deployments that blend the best of both narrowband and mobile broadband capabilities. Hytera, for example, supports the Johannesburg public safety agencies with devices operating standardized TETRA radios and LTE. The combination provides increased network resiliency, expanded coverage, and data capacity for information-intensive applications. The options for multi-mode hybrid devices are growing, with Airbus SLC also offering device and network solutions for TETRA customers. Likewise, public safety agencies in the North American market have access to hybrid land mobile radio (LMR)/LTE devices from L3Harris and Motorola Solutions.

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As the future of African critical communications evolves towards a mix of technologies favoring digital narrowband complemented by islands of dense LTE/5G topologies, regulators and mobile network operators (MNOs) must evolve. National communications regulators must provide MNOs with the ability to offer quality-of-service, priority, and preemption (QPP) services. And spectrum policies must ensure sufficient high-capacity LTE and 5G spectrum resources. On the services front, MNOs need to go beyond best-effort consumer-grade mobile broadband services to deliver QPP offerings that public safety can access reliably. Without these moves across the 54 nations of Africa, effective hybrid critical communications deployments will remain crippled. ■

Looking ahead: While the prospect of modernising Africa's critical communications networks is daunting, the results have the potential of driving positive change across the region. New capabilities bolster the delivery of health care, fire protection, and law enforcement. And while the diverse sub-regions of the continent will embrace various approaches, the common goal will remain: protecting people and property.

LTE and 5G Disruption

Though land mobile radio systems have proven valuable tools for group coordination, the data limitations and high deployment costs are forcing enterprises and governments to shift from narrowband to broadband technologies. For enterprises, a variety of push-to-talk over cellular solutions are available that operate over mobile LTE networks. Government users are turning to a standardized mission-critical push-to-talk over cellular technology that incorporates quality of service, priority, and preemption.

Unfortunately, however, a shift to LTE presents a particular challenge to public safety operations. The ability for users to communicate with nearby users, even when the network is not reachable, is paramount but not available with today's LTE devices.

Though the 3GPP standards effort that created mission-critical push-to-talk included the proximity services feature as a direct mode alternative, the capability has not entered the market. This gap means that the shift towards LTE and 5G depends upon hybrid push-to-talk devices that can handle LTE and a legacy LMR radio technology. Most major LMR device suppliers now provide hybrid options.

As the options for land mobile radio expand and users contemplate a future shift towards LTE and 5G communications, the fundamental need for simple group voice communications remains. For many years, and in many parts of the world, narrowband land mobile radio coverage will remain the foundation for enterprises and public safety.

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The challenges of geography and economy make analog the dominant land mobile radio technology across northern and southern Africa. Still, modern cost-optimized digital technology such as DMR is becoming popular as systems get refreshed. TETRA also plays a role for security services that require the enhanced security features provided by the technology. ■

Looking ahead: Projections from the Public Safety and Critical Communications division of leading analysts Omdia show that the Middle East & Africa region will continue to adopt digital communications technology, and by 2025 it will be one of the most digitized regions in the world, with 95% of LMR users converting to digital. In 2020, it was one of the LMR shipment markets most affected by the global pandemic and it experienced considerable decline in all the technologies including Cost Optimized Digital technology, TETRA shipments, P25 and TETRAPOL. However, OMDIA projects a recovery from the market and forecasts it to reach above pre-pandemic levels by 2024.

Uwe Niske,
senior sales director, sub-Saharan Africa & United Nations, Motorola Solutions

The complexity of crime associated with the modern technological era poses greater challenge for worldwide public safety organisations and requires greater resource allocation than ever before. To add to this burden, emergency services along with private companies are facing additional new challenges that have arisen over the last eighteen months of the pandemic.

Right now, body-worn cameras and video solutions are at the forefront of public consciousness, and soon, every frontline officer might be wearing a body-worn camera, seeing it as essential as the badge that they wear in establishing trust between the frontline and the communities they serve. Globally, we are witnessing a significant shift towards public safety policing and the realisation of how body-worn cameras can improve the safety and accountability of frontline teams, capture crucial evidence and also promote increased transparency.

Body-worn video solutions are already making a positive impact on public safety agencies globally, with various successful deployments. Recently, Motorola Solutions – a technology company specialising in mission-critical communications, video and analytics – secured a contract to provide French national and military police with 30,000 body-worn video cameras, believed to be one of the largest deployments of the technology anywhere in the world.

According to Uwe Niske, Senior Director sub-Saharan Africa & United Nations at Motorola Solutions, the company has also begun to deploy body-worn cameras to public safety agencies in sub-Saharan Africa and is also in the process of various pilot projects across the continent to prove the effectiveness and value video and analytics solutions can provide for end-users in terms of safety, transparency and judicial processes.

Niske continues that, it was also somewhat unforeseen that body-worn video technology would be deployed by emergency response services, but this has proven to be extremely beneficial especially during the pandemic where frontline personnel faced the challenge with an increasing number of difficult situations.

“As an example, in the Western Cape in South Africa there have been ongoing attacks on paramedics while they are out on call. Body worn cameras assist by capturing interactions between the paramedics, patients and members of the public, helping to identify what transpired. It also protects the paramedic against allegations of malpractice.

“There is no doubt that body worn video radically and incrementally increases officer safety and accountability. The use of video solutions does not fundamentally change the manner in which first responders operate, users soon realise that members of the public conduct themselves differently when they know they’re being recorded. Frontline crews not only feel safer, but as it also records interactions with members of the public, there is irrefutable proof of the interaction.”

Niske says it is key that when body-worn technology is deployed, it is tailored to

local conditions. "There are many variables to consider. For example, you also have to consider whether you automate the technology or permit the user to decide when to switch it on or off. You may decide to automate recording once a firearm is drawn or even have your colleagues' cameras also start recording automatically in sync in order to capture the activities in the background. In many cases this type of evidence simply becomes undeniable!"

"Technology is meant to support the organisation, its processes and its people – and if you don't deploy it correctly, you may not get the results that you're hoping for. This is what separates Motorola Solutions from our competitors"

Local regulations need to come under consideration here. Some countries have fairly complex laws around video, requiring people to be informed when they're being recorded, or their faces blurred out. "In South Africa, one has to be cognisant of General Data protection Regulations (GDPR) and Protection Of Personal Information Act (POPIA) legislation, but we don't have regulations specifically around body-worn cameras, which poses a challenge to deployment. Regulation is required to ensure that the footage captured by body worn technology will stand up in court."

"The use of video solutions does not fundamentally change the manner in which first responders operate, users soon realise that members of the public conduct themselves differently when they know they're being recorded"

While some local private security firms have already adopted body worn technology, adoption by the police service is pending finalisation of the necessary regulations. These regulations will protect the police as much as they will protect members of the public, concludes Niske.

Motorola Solutions is a global leader in public safety and enterprise security. The company's solutions in land mobile radio mission-critical communications, video security & access control and command center software, bolstered by managed & support services, create the most integrated technology ecosystem to make communities safer and help businesses stay productive and secure. ■

Looking ahead: Demand for mission-critical communications in the South African and pan-African market is growing, particularly as public safety and emergency services increasingly depend on advanced technologies. This trend is supported by recent research which found that 88% of citizens globally now want to see public safety transformed through the use of advanced technology.

As we look towards 2022, there is a consensus for change and a demand to transform safety through the transparent use of advanced technology. Safety is becoming a shared responsibility among service providers, industry and society and these groups need to work together to ensure that safety technology is used in fair and inclusive ways. This will increase trust, collaboration and further improve the way public safety services are delivered.

Marnus Kruger,
sales director for Africa at Rajant Corporation

As the African continent and the rest of the globe continue to recover from the social and economic effects of the Coronavirus pandemic, Rajant Corporation has continued to support its clients across heavy-duty industries, including mining and energy. Handsomely bestowed with mineral and oil deposits, Africa is set to bounce back in 2022, increasing its output to meet the heightened consumption as normal service resumes. The African region has a wealth of valuable and extractable natural resources, highlighting its position as a global mining leader.

With the mining industry deploying more autonomous and semi-autonomous equipment and applications every day, they require mission-critical, high bandwidth, and secure machine-to-machine communications systems. Having access to increased throughput and low latency to overcome any interference, above or below ground, enables all autonomous applications and trackable systems to support worker safety.

One thing is certain in the mining industry, fleet automation and optimisation continue to be key drivers behind the need for resilient and adaptable wireless networks. Africa has been notably behind its counterparts in Europe and the United States, in terms of "legacy" landline infrastructure and high-capacity cellular wireless is largely focused on consumer and enterprise use. Operators are eager to roll out 5G technology deployments and develop new services by investing in existing infrastructure. This focus of African operators on public and private networks for data and commercial uses stresses the growth potential.

However, the likes of LTE or 5G technology may not offer the most robust and reliable connectivity in industrial settings. Traditional wireless networks such as LTE and Wi-Fi with fixed infrastructure, have limited range and coverage, as well as being asymmetric, meaning data upload is slower than download – an issue when streaming high-bandwidth applications such as video. Mines and ports need sufficient resilient, low-latency and symmetrical upload and download bandwidth. By deploying a private network solution, and subsequently owning the industrial network infrastructure, operators can make changes, ensuring maintenance is performed when needed. If it is not privately owned, then the organisation has no control over the network and any initial discounted tariffs are likely to increase to full price later.

As nations and organisations adapt their working practices accordingly, automation has become even more important in the open and underground mining space. The need to be able to operate systems will continue to accelerate remotely. Autonomous technology will no doubt evolve at different speeds across different continents. But African mining operators are planning for the long-term, preparing for the years ahead while simultaneously considering the cost ramifications before taking a shovel to the ground.

Autonomy is essential if operators and their workforces are going to safely navigate hazardous sectors, and autonomy can ensure conditions are significantly safer. By turning to autonomous vehicles and robotics, they can undertake the more dangerous work and keep workforces safe. This can help protect staff from risks inherent with mine sites, ensuring they are not exposed to unnecessary dangers. As location environment and conditions change, autonomy can offer mission-critical scalability to adapt to customer demands and allow assets to operate at maximum efficiency. Taking the most optimal route and offering unparalleled consistency can increase productivity even higher for an operator.

For those mining operators across the continent eager to exploit the potential of automated technology, adopting and embracing this is not always a simple process. A key consideration is the operating costs that will be high when autonomous equipment and

networks are first deployed. Therefore, affordability is a crucial requirement. For those intent on relying on networking technology, it is essential to have a dependable autonomous network. Partnering with the right company is crucial. Deployed in more than 230 of the largest open-pit and underground mines globally, Rajant Corporation thrives in providing global market-leading technology with a local presence and working alongside partners that can ensure its existing customers continue to expand their growth.

Rajant Corporation continues to deliver connectivity to the mining industry in sub-Saharan Africa. The resilient and reliable Rajant Kinetic Mesh® Networks have been deployed at many major open-pit mines with attention now shifting to underground mine deployments. Historically, wireless networks in an underground setting have been achieved using radiating "leaky feeder" cables, with gaps in the insulation that allow RF signals to leak out for data and voice-only communications. Line amplifiers act as an antenna for devices to receive a signal and need to be installed at regular intervals to allow communications between mining staff. However, if the cable were to break, the communications would also cease to operate.

By utilising a Kinetic Mesh network, not only will deployments be enhanced with greater flexibility, but underground mines can experience the multi-radio high-speed connectivity that open-pit mines typically enjoy. Rajant offers a robust and redundant alternative to fibre that is easy to install and maintain and supports real time location services – or tracking of assets and people. With the Kinetic Mesh BreadCrumb® nodes overcoming the mine's continuously changing conditions, it provides resilient communications in adverse and mobile environments. The self-optimising network works via multiple-frequency, peer-to-peer connections and can be deployed on both fixed and mobile assets, helping to make the digitalised mine a reality. Rajant can provide site-wide connectivity and a complete view of operational data regardless of layout and terrain, instilling full confidence for operators.

Rajant recently collaborated with ESG Solutions, an industry-leading micro seismic solutions provider for the oil and gas, mining, and geotechnical industries, for carrying micro seismic data to the surface. Many mines install micro seismic systems for rockburst monitoring and collect data from micro seismic events that can lead to a better understanding of rock mass deformation. However, an issue with certain wireless solutions is the receipt of accurate seismic system timing synchronisation. This is not the case with Rajant. Its wireless network can be used for micro seismic system monitoring in the field for up to 10 kHz sampling rates in micro seismic systems that use geophones and or accelerometers.

As mining operators continue to seek greater levels of efficiency and safety with tele-remote operation for dozing and heavy equipment, NEVIL ELETRO MECANICA worked with Rajant for its iron ore mines in Brazil. Rajant's connectivity in NEVIL's tele-remote operation software and controls allowed an operator to control multiple dozers, excavators, loaders, and trucks.

With mining personnel remotely operating heavy equipment, connectivity enables increased scale, expansion, and profitable exploitation of the mine site. Rajant also recently announced the launch of its own MeshTracer solution, a software-based personnel and asset tracking solution that can provide the location of Rajant BreadCrumbs, other manufacturers' location tags – such as AeroScout, and any Wi-Fi device that uses a static MAC address. Being able to track BreadCrumbs both above and below ground allows a mine to track personnel and assets, providing the ability for enhanced two-way communication in emergencies.

As connectivity demands change, it is vital for organisations to have access to a "living network" that can evolve and adapt in a dynamic network environment. Rajant's Kinetic Mesh technology provides the mobility, ruggedness, and autonomy for companies to build their private wireless networks in the IIoT arena. For mining operators across the African continent, it is essential to introduce and deploy trusted and reliable wireless technology to maximise the full potential that the connected mine has to offer. ■

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We provide end-to-end broadband and mission-critical implementation services, enterprise and business-critical telecommunication services and distribution of mobile radio products and systems.

With over 52 years of industry experience, Altron Nexus strives to consistently deliver to specification, on time, and within budget.

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At Motorola Solutions we are constantly working to provide solutions that improve safety and productivity. Our wide range of push-to-talk communications and video security solutions are purpose-built and highly scalable to fit the different needs of various mission-critical operations including transportation, logistics, mining and other industries.

Motorola Solutions is a global leader in mission-critical communications. Our technology platforms in mission-critical communications, command center software, video security & analytics, bolstered by managed & support services, make cities safer and help communities and businesses thrive. We have a rich history of firsts, including pioneering mobile communications in the 1930s, making equipment that carried the first words from the moon in 1969 and developing the first commercial handheld cellular phone in 1983. Today, our global employees are committed to designing and delivering the solutions our customers refer to as their lifeline. At Motorola Solutions, we are ushering in a new era in public safety and security.

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Rajant Corporation is the broadband communications technology company that invented Kinetic Mesh® networking, BreadCrumb® wireless nodes, and InstaMesh® networking software. With Rajant, customers can rapidly deploy a highly adaptable and scalable network that leverages the power of real-time data to deliver on-demand, mission-critical business intelligence. A low-latency, high-throughput, and secure solution for a variety of data, voice, video, and autonomous applications, Rajant's Kinetic Mesh networks provide industrial customers with full mobility, allowing them to take their private network applications and data anywhere. With successful deployments in over 70 countries for customers in military, mining, ports, rail, oil & gas, petrochemical plants, municipalities, public safety, agriculture, and warehouse & factory automation. Rajant is headquartered in Malvern, Pennsylvania with additional facilities and offices in Arizona and Kentucky. For more information, visit Rajant.com or follow Rajant on LinkedIn and Twitter.

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