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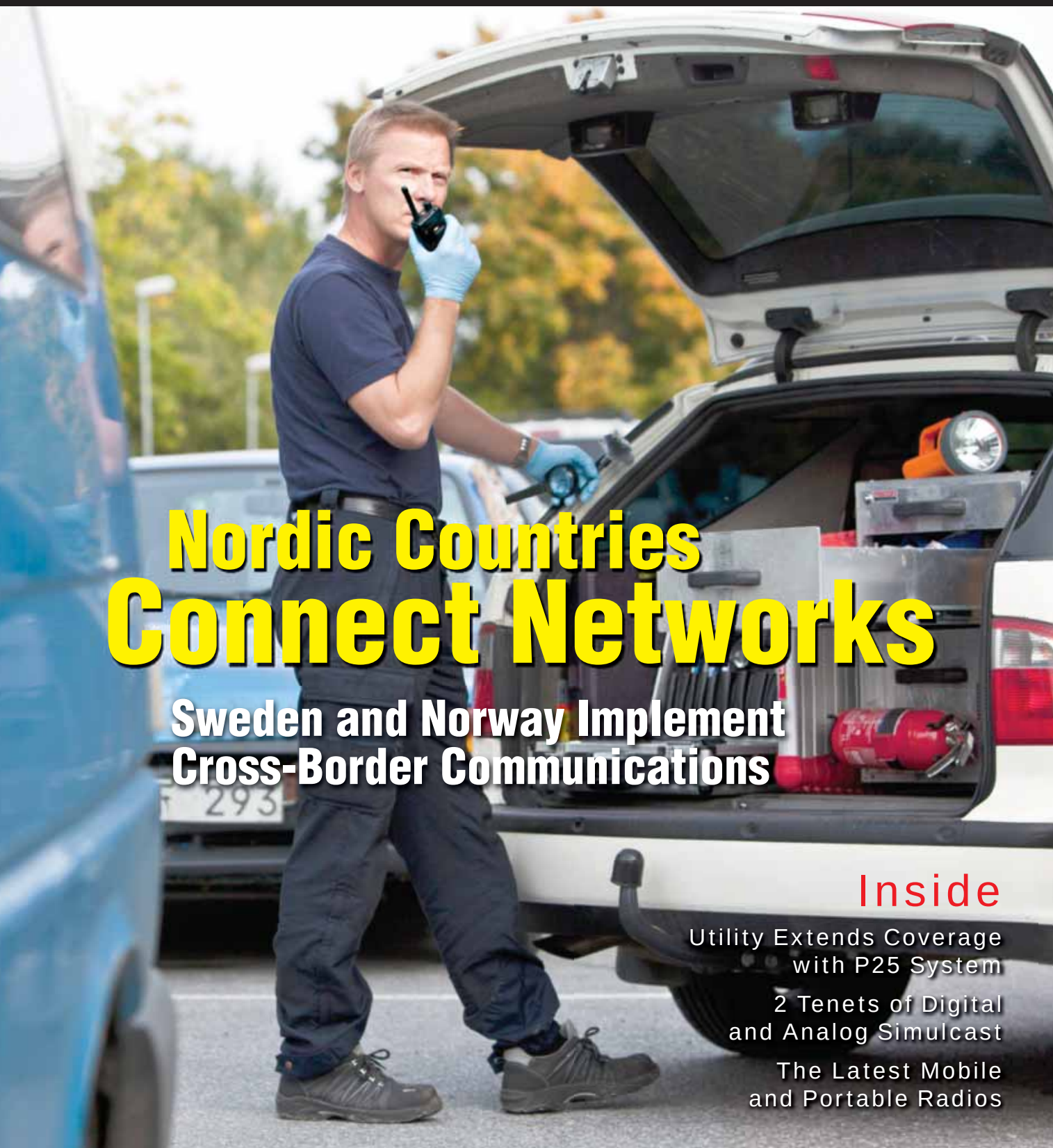

Nordic Countries Connect Networks

Sweden and Norway Implement Cross-Border Communications

Inside

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Communicate Across Borders

Interoperability became an industry buzzword following devastating natural and man-made disasters around the world. As we all know, disasters and large events are rarely confined to neat, concise borders. Events often occur in or spread throughout multiple jurisdictions with many communications networks and technologies.

Professional mobile radio (PMR) technology of the past didn't always lend itself to an open environment where one network could communicate with another network. With technology standards maturing, that is changing in some geographic locations and industries, mainly public safety. One vendor's equipment can more easily interoperate with another vendor's gear. And that allows one agency's entire system to communicate with another agency's network.

The work to get to that point isn't easy. Although there are technical hurdles to overcome, often the main challenges revolve around spectrum and governance. The problems go beyond allowing a secure public-safety network to communicate with another public-safety network to putting together the rules and scenarios when communicating across systems and jurisdictions is necessary.

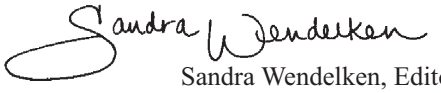
The Scandinavian region is taking the lead in Europe on cross-border communications. Although both Sweden and Norway have nationwide TETRA networks, communicating between the agencies on those networks was not originally possible. "The Nordic Region's Cross-Border Communications" on Page 32 describes not only the work between the two countries to achieve interoperability, but the push within Europe to develop communications strategies among countrywide networks and agencies.

In fact, the European Union granted funds to stimulate interoperability between TETRA and Tetrapol networks throughout the Continent. About 15 organizations and 10 European countries are involved in the project. Hammering out the first framework agreements could help make the process smoother in the future for other agencies.

We value your opinions! Please email your feedback to me at swendelken@RRMediaGroup.com.

Cross-border communications is difficult because although it's something officials likely don't need every day, when they do need it, they need it quickly and seamlessly. That makes the work underway in Europe and other areas of the world important for future emergency incidents.

We will continue to monitor the progress in Scandinavia and other areas of the globe. If you have a cross-border communications success story, please share it with us.



Sandra Wendelken, Editor
swendelken@RRMediaGroup.com

RadioResource INTERNATIONAL

RadioResource International delivers wireless voice and data information for mobile and remote mission-critical operations for professionals who reside or do business outside the United States and Canada. The magazine covers private and trunked mobile radio, wireless data, location technologies, public safety communications, microwave radio, satellite, paging/messaging, remote monitoring, and other wireless applications. Editorial content is international in scope and encompasses emerging technologies, industry reports and trends, innovative applications, product information and comparisons, news, standards, and troubleshooting tips.

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RadioResource International (ISSN 1080-3025) is published five times a year in the United States. It is circulated free, by name and title, to personnel responsible for purchasing, recommending, specifying or managing equipment and services for radio communications systems outside the United States and Canada. U.S. Postmaster: Send address changes to RadioResource International, P.O. Box 15863, N Hollywood CA 91615-5863. Canadian Post Publications Mail Agreement No. # 40065056. Canadian Return Address: DP Global Mail, 4960-2 Walker Road, Windsor, ON N9A 6J3.

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EUROPE

U.K. Preps for Broadband Mission-Critical Network

By Michelle Zilis

Photo courtesy U.K. Home Office

A new network that delivers mission-critical voice and broadband data services for England, Scotland and Wales has a desired completion date of 2020. The goal relies on enhanced commercial networks to meet mission-critical standards.

The Emergency Services Mobile Communication Programme (ESMCP), housed under the U.K. Home Office, must procure a replacement system for the current Airwave Solutions' TETRA system used by Great Britain's first responders. The TETRA system offers narrowband data and mission-critical voice services.

The Emergency Services Network (ESN) will deliver future mobile communications for the country's three emergency services (3ES) and other public-safety users, said Lorraine Russell, ESMCP stakeholder engagement and communications lead.

"ESMCP is keen to enhance the next generation of mobile technology — 4G Long Term Evolution (LTE) — to deliver the functionality, coverage, security and availability required by U.K.'s 3ES," said Russell. "ESMCP is planning to appoint a delivery partner in 2015 and hopes to start transition to the new service late 2016."

The Home Office is obligated to re-compete the current first responder services once the Airwave contracts expire, between 2016 and 2020, said Gordon Shipley, ESMCP program director. The Home Office is looking for ways to bring the costs down with a new system, he said.

"The annual cost of providing the Airwave service is approximately £350 million (US$542 million); plus an additional £80 million – £100 million (US$124 million – 155 million) is spent by users on providing non-Airwave communications services," Russell said.

The TETRA network is private, which contributes to the high costs, said Sue Lampard, president of the British Association of Public-Safety Communications Officials (APCO).

"The original contract also made the funding formula complex and expensive, especially for police forces," she said. "There is general acceptance that there should be a more cost-effective infrastructure where facilities can be shared with the commercial providers. …The proof will be in the delivery of a functioning mission-critical voice service as to whether these savings can become a reality."

ESMCP is engaging with the Third Generation Partnership Project (3GPP) international standards body to encourage the inclusion of public-safety functionality in LTE Release 12 and with mobile network operators (MNOs) to address coverage, security and availability.

The MNOs have indicated their intention to have a national 4G network deployed by 2015. Existing contracts with Airwave begin to expire in 2016, however, the exact date of service commencement will depend on when MNOs deploy and enhance their networks, and the delivery partner mobilizes and prepares for an orderly transition to ESN by 2020, when all Airwave contracts will be expired, Russell said.

Lampard said she expects that the current TETRA networks and the new broadband system will run in parallel until all the requirements are met for mission-critical voice over an LTE network.

"The TCCA is of the view that current technologies such as TETRA will continue to be the technology for mission-critical voice communications and that LTE-based critical broadband services will initially be implemented as a separate, data-only capability," said Tony Gray, chair of the Critical Communications Broadband Group (CCBG) of the TETRA + Critical Communications Association (TCCA).

Airwave did not reply to requests for comment.

STRASBOURG, France — European Commissioner Johannes Hahn answered a parliamentary question co-signed by 150 members of the European Parliament (MEPs) regarding the nonimplementation of the European Parliament resolution of 5 July, 2011, to raise awareness of 1-1-2.

In the question, the 150 MEPs requested the European Commission provide a detailed action plan for 1-1-2 with a precise timetable and resources. The question further addressed the insufficient achievements in the implementation of Article 26 of Directive 2009/136/EC.

Several aspects such as setting of accuracy and reliability criteria for caller location information, raising awareness of 1-1-2 and enabling access for disabled people were highlighted. Most MEPs who took the floor expressed their concerns about the benefits of 1-1-2 and why it hasn't been implemented effectively.

In response, Hahn highlighted the awareness work being done with

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AFRICA/MIDDLE EAST

Sub-Saharan Africa Makes Moves to Set Aside Digital TV Spectrum

Frequency coordination negotiations have succeeded in setting up the mechanism to deploy digital television in 47 sub-Saharan African countries. The consolidation of national plans to implement the digital switchover in the African region conforms to the deadlines of June 2015 for UHF and June 2020 for VHF in 33 countries set in 2006 by ITU's Regional Radiocommunication Conference (RRC-06), which adopted the GE06 TV Plan.

This makes Africa the first region to be in a position in 2015 to allocate bandwidth freed by the transition to digital television — called "digital dividend" — to the mobile service for both the 700 and 800 MHz bands. Decisions of the World Radiocommunication Conference 2012 (WRC-12) to facilitate availability of the digital dividend to the mobile service will be effective with some technical refinements immediately after the next World Radiocommunication Conference in 2015 (WRC-15).

"The objective was to enable African countries to allocate the digital dividend to mobile services in the 694 – 862 MHz band, as a regionally harmonized implementation of the decisions taken at the WRC-12," said François Rancy, director of ITU's Radiocommunication Bureau. "This objective was reached by re-planning the spectrum requirements of television broadcasting in the 470 – 694 MHz frequency band."

Some countries that are freeing digital dividend spectrum, including the United States, Canada and the United Arab Emirates (UAE), are providing some of the channels to public-safety broadband communications. Officials from the European spectrum community said WRC 2015 is its best and unique chance to get a dedicated spectrum allocation for Long Term Evolution (LTE) deployments for public safety in Europe.

Rancy announced that sub-Saharan African countries have begun submitting official modifications to the GE06 plan.

transport companies and travel agencies and mentioned the current project work of European Conference of Postal and Telecommunications Administrations (CEPT) and the responsibilities of the national regulatory authorities regarding the issue of caller location improvements.

He also said that the commission will provide greater transparency with the new key performance indicators (KPIs) and welcomed further developments on access, standardization and reverse 1-1-2 systems in the future. Hahn said the commission will stay vigilant on issues raised. He also invited MEPs to encourage member states to ensure 1-1-2 is being effectively implemented.

HELSINKI, Finland — Sepura acquired **Portalify**, an applications developer based in Helsinki, Finland. Portalify's products, primarily deployed within the public-safety sector in Western Europe, are highly customizable. As an established Sepura Solutions Partner of several years, Portalify has good knowledge of Sepura's customers, requirements and the capabilities of TETRA.

MILAN, Italy — About 40 percent of Europe, Middle East and Africa (EMEA) utilities expect to increase their workforces' mobility during the next 12 to 18 months, according to a new study from IDC Energy Insights. Mobility is one of the most pressing issues for utilities and has been a key area of investment for utilities, especially for workforces operating in the transmission and distribution fields, the market research firm said.

"Utilities across EMEA are embracing mobility to significantly enhance productivity across their entire organization," said Gaia Gallotti, research manager, IDC Energy Insights. "The mobility umbrella covers a wide array of devices, networks, platforms and applications that require holistic management to be efficient, effective and secure."

Just more than 36 percent of EMEA utility companies revealed they already have mobility strategies in place, while an additional 10.1 percent of respondents revealed plans to create one in the next six to 12 months. The study leverages results of the IDC Biannual EMEA Enterprise Mobility Survey covering 119 utility interviews.

UTRECHT, Netherlands — Airwave and **Royal KPN** signed a joint strategic agreement to leverage capabilities as industry specialists to benefit the Dutch government and its people.

"It will allow KPN and Airwave to focus on opportunities in the Dutch marketplace and means that we can jointly offer our experience and expertise in the delivery of world-class critical communications to organizations that provide vital public services," said Richard Bobbett, Airwave CEO.

Separately, KPN Critical Communications and **Motorola Solutions** won together a 10-year contract to supply, build and maintain a more than 200-site TETRA digital radio network for Entropia Digital in the Netherlands. Entropia Digital, a Belgian/Dutch TETRA network operator, will offer a subscription-based digital radio voice and data communica-

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Satellite-Based Wildlife Protection System Deployed in Kenya

Cambridge Consultants is helping conservationists at the Zoological Society of London (ZSL), in partnership with the Kenya Wildlife Service (KWS), protect some of the world's most rare and endangered species.

As part of the Instant Wild project, new satellite-connected and motion-triggered cameras are beaming near real-time images of animals from the remotest areas of Africa. A mobile app allows users anywhere in the world to view the photos and immediately identify the animals by cross checking with the field guide provided in the app. At the same time, the system provides early warning

Satellite-based technology is helping to deter poaching in Kenya.

of illegal poaching activity, as well as evidence for prosecutions.

"This technology will enable us to make a significant breakthrough in our day-to-day work with endangered species," said Patrick Omondi, deputy director of wildlife conservation at KWS. "We manage around 8 percent of the total land mass of Kenya, and these cameras will be critical in helping us monitor the well-being of rare animals and ensure their habitats remain protected from poachers."

The cameras can run on a single battery and use LED flash lighting to work at night as well as during the day. The captured images are sent over the Iridium satellite communications network. The officials are installing cameras in Kenya's Tsavo National Park with plans to extend it to other locations such as Indonesia, Sri Lanka, the Himalayas and the South Pole.

tions service for commercial users, such as transport and logistics, utilities and power generation, oil and gas, healthcare and seaport as well as other industries.

DUESSELDORF, Germany — Cassidian set up a TETRA TB3 base station at Duesseldorf Airport in Germany in cooperation with the airport's IT service provider, SITA Airport IT. The base station enables the authorities' nationwide digital network to be fed directly into the airport's indoor radio system.

The new digital radio system supplements the existing analog system available in Duesseldorf Airport's buildings and is fully integrated into the terrestrial digital radio network, BOSNet.

KAZAN, Russia — The 27th World University Olympics will see 12,000 international athletes and tens of thousands of support staff and spectators descend on the city of Kazan, capital of the Republic of Tatarstan within the Russian Federation. Competitions will take place at 64 different sports venues across the region, 30 of which have been specially constructed for the 2013 games.

Licensed TETRA operator MSSPETSTELECOM (MSS) will provide radio communications services. MSS chose **DAMM Cellular Systems**' TETRA solution, which met the requirements of the necessary combination of power, scalability, reliability and ease of deployment.

The government of Tatarstan is connecting close to 3,000 radios to the system, used for public security users responsible for safety during the University Olympics. Also MSS is providing services to 2,500 subscribers of the executive directorate of the XXVII Summer Universiade in Kazan. The TETRA system is integrated into the 1-1-2 emergency response center for management and for providing location data of subscribers to dispatchers.

CAPE TOWN, South Africa — The Cango Caves, a World Heritage site in South Africa, deployed a **Kenwood** NEXEDGE digital communications system with 100 percent underground coverage.

Steve Mouton, Cango Caves head guide, said that all communications proved to be troublesome until now. "This new digital system is the first to address our needs," he said.

The need for a comprehensive and reliable communications system was recognized 20 years ago, said Hein Gerstner, Cango Caves manager. The depths of the underground caves posed a challenge to digital communications systems, Gerstner said.

"We also required the entire system to be hidden from sight and be invisible to tourists," he said.

The system consists of seven antennas with cables and wiring. A battery pack allows for up to 12 hours backup power. Four repeaters, all linked via optic cable, are included. Several repeaters can be located at various sites.

The handsets function on a mini-voting system whereby they search for the repeaters and lock onto them automatically. A cell phone or a switchboard modem can be added and communicate with one of the radios or phone out from a radio. Additional software will also allow a person to speak to one of the guides from any laptop anywhere in the world. Laser mapping of the caves, immediate data capturing or the immediate capturing and relaying of video from within the depths of the caves are all future possibilities.

ASIA/PACIFIC

BEIJING — Hytera Communications will supply Digital Mobile Radio (DMR) infrastructure and radios

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Dean Hane, Radio Communications Manager, MACC 9-1-1, Grant County.

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Queensland Selects Telstra for $420M Public-Safety Network

A new government wireless network (GWN) in the state of Queensland, Australia, will improve communications for public-safety agencies and increase safety and security for emergency workers, Australian governmental officials said. Telstra was chosen to design, build, operate and maintain the technology and infrastructure project worth $457.3 million (US$420 million) during 15 years.

"This system should have been delivered a decade ago but the previous government was not focused on the frontline services provided by our public-safety agencies," said State Treasurer Tim Nicholls. "We've allocated $56.7 million (US$52.2 million) in the 2013 – 2014 budget to get this project underway. This network will have far-reaching and long-lasting benefits for community safety by modernizing radio communications."

The GWN will initially be rolled out to Brisbane, the Gold Coast and Cairns to support next year's G20 meetings. "The G20 meetings require a secure communications network to host state and commonwealth agencies and international security forces," Premier Campbell Newman said. "It will then be rolled out to the rest of the Southeast in time for the 2018 Commonwealth Games. There's also the potential to eventually extend the system to cover the rest of the state."

Queensland Minister for Police and Community Safety Jack Dempsey said the GWN would ensure emergency services were better prepared for future disasters or emergencies. "For police, fire and ambulance officers in the GWN service areas, there will be clearer radio communications and better coverage at key public locations," Dempsey said. "It's designed to reduce emergency response times by providing seamless interconnectivity between the agencies. It will also improve officer safety by providing for GPS-enabled duress alarms and officer down alarms."

The new technology for the network wasn't specified, but it will replace an existing analog network. Telstra and subcontractor Motorola Solutions will work with the government to start the detailed design and build of the network under a managed services agreement later this year.

to Three Gorges Dam in Hubei province, China, the world's largest power station.

Two series of ship locks are installed near the dam, and each is made up of five stages. The annual lock repair is critical to the security of navigable waters. The annual repair requires smooth communications between ground area and the corridors that are built 100 meters underground. Hytera designed a communications solution through a private radio network that realized the interflow between ground and underground, and each of the five stages, along with portable radios.

Three Gorges River Maritime Safety Administration (MSA) also expanded and updated a **Zetron** system that was originally installed for the MSA in 2009 and 2010.

Because of China's rapid economic growth, the required freight capacity increased sixfold in three years. As a result, the MSA's vessel traffic services (VTS) systems were expanded in late 2012.

CANBERRA, Australia — Simoco won a tender to supply the Australian Department of Foreign Affairs and Trade (DFAT) with a Project 25 (P25)-capable radio terminal and infrastructure solution that will be used by federal police, embassy staff and personnel at more than 50 embassies worldwide.

With around one-third of the rollout already complete, Simoco has installed more than 1,300 units around the world. Some of Australia's embassies are located in the world's most volatile environments.

The solution includes multimode portables, mobiles, conventional infrastructure and customized desktop units with enhanced portability. Once upgraded to P25, the technology will enable DFAT staff to select from multiple radio protocols including full analog, MPT 1327 as well as P25 conventional and P25 trunking at the touch of a button.

LATIN AMERICA

BRASILIA, Brazil — The Brazilian Army and **Motorola Solutions** announced the results of a Long Term Evolution (LTE) trial at 700 MHz. The trial, which started in May 2012, in Brasilia, had an investment of US$2 million from Motorola and showed the benefits of using the technology to improve public services in Brazil.

Several continuous tests were performed, including during three important events. The main benefits observed in the use of an LTE network include the possibility of promoting mobility for the activities already performed by the Army through video applications, push to talk (PTT) via VoIP, text messages and Web applications access. The information is sent in real time from the field to the Army's command-and-control room, where it is monitored so that appropriate measures can be taken immediately.

For the test, three sites were installed in Brasilia, providing LTE network coverage to the Esplanade of the Ministries and areas of interest to the Army, such as the airport and critical infrastructure, allowing its use by other security agencies.

During the Confederations Cup, a new site was installed to increase coverage of Mané Garrincha stadium and its surroundings. The Army could operate normally, with no communications problems, despite the unforeseen events that occurred in mobile phone networks. The Army operated in an exclusive band, which allowed full network availability before, during and

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The 3550 features a large color display with touch-screen operation. The 3550 is light and portable, weighing 8.3 lbs and has up to 4 hours of operation with an internal lithium ion battery. With both analog and digital test capability, the 3550 is a full featured radio test set. The 3550 can also perform testing on antennas, cables, pre-selectors and duplexers, making it the perfect solution for all your portable field testing.

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The 2013 Asian Youth Games held in Nanjing, China, in August incorporated both Digital Mobile Radio (DMR) and TETRA communications networks. Hytera Communications supplied DMR and TETRA equipment, and Cassidian provided a TETRA network for the games.

after the Confederations Cup opening game. Fixed and mobile cameras sent real-time images to Army's vehicles and military bases.

The Brazilian Army aims to fulfill a request by telecom regulator Anatel to extend 700 MHz band testing until December 2014. The goal is to have a more operational solution during the FIFA World Cup, as well as aggregate new public sector agencies so that they can test the benefits of an integrated and shared network.

INTERNATIONAL

LONDON — Digital Mobile Radio (DMR) counted more than 2 million subscribers last year in a major milestone since the first major network shipments started four years ago, according to a new report from IMS Research, now part of IHS. Growth in this market will be greater than for any other radio technology, IHS predicted.

While there was only one DMR supplier in 2010, more vendors have developed DMR solutions or have announced their intention to do so since then. Worldwide DMR subscribers last year reached 2.13 million, up 54 percent from 1.38 million in 2011. This year, user radios will increase by a projected 40 percent to 2.97 million. And by 2017, the total installed base for DMR active radios will hit 7.19 million, a leap from just 330,000 subscribers in 2009.

Among the factors driving the growth of the DMR market is the migration to digital. While the majority of the user base for licensed mobile radio still uses analog, the shift to digital is underway and gathering pace, offering potential for DMR and other digital technologies in the coming years.

JOHNSTON, Rhode Island, USA — FM Approvals developed and published a new product testing and certification standard specifically for manufacturers of professional mobile radio (PMR) equipment suitable for use in Class I, Division 1 hazardous (classified) locations.

Manufacturers whose products are determined by FM Approvals to be compliant with the testing criteria outlined in Approvals Standard FM 3640, "Land Mobile Radios for Use in Class I, Division 1 Hazardous (Classified) Locations," can place the FM Approvals certification mark on their product. Approved products are listed in the Approval Guide published by FM Approvals.

"This standard is several years in the making and addresses many of the suggestions we received from the critical infrastructure industry (CII) and public-safety communications groups," said Robert Martell, assistant vice president, area director, FM Approvals.

In April, the Telecommunications Industry Association (TIA) released its new standard for certifying two-way radios and other equipment used in Class I, Division 1 hazardous locations. The two separate standards came about after the adoption of the International Society of Automation (ISA) standard by FM Approvals, via its 3610 document, for other hazardous location equipment. That standard would have effectively reduced the power of portable radios, affecting communications network coverage and performance.

Therefore, two different draft standards for certifying two-way radios and related equipment used in Class I, Division 1 hazardous locations moved forward and are now complete. Each standard gives two-way radio manufacturers a less stringent option of certifying hazardous location radios and accessories.

FM Approvals offers worldwide certification and testing services of industrial products.

COLOGNE, Germany — PMRExpo will take place 26 – 28 November in Cologne, its 13th year. This year, the event added the International Public Safety Forum and is targeting a more international audience.

To underline the international character of PMRExpo, the International Public Safety Forum will launch 26 – 27 November. It will take place in the middle of the trade fair in the exhibition space of the Applications Forum. The main subject on both days will be public safety and concrete applications.

The roundtable debates will feature international experts from practice and will take place in English. The International Public Safety Forum is free for trade fair visitors.

PMRExpo is an international trade fair for professional mobile radio and control centers, offering a five-pillar-model with a trade fair, colloquium, Congress of Command and Control Centers, Applications Forum and the new International Public Safety Forum.

The traditional colloquium takes place 26 – 27 November.

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Photos courtesy Ergon Energy

Australian Utility Extends Coverage

Ergon Energy recently deployed a Project 25 (P25) trunked network using location services and out-of-vehicle technology to enhance coverage.

By Martin Cahill

Ergon Energy is a government-owned corporation with around 4,600 employees and about a US$10 billion asset base that supplies electricity to 700,000 customers in the northeastern state of Queensland, the second-largest state in Australia. Ergon Energy services an operating area of more than 1 million square kilometers from the coastal regions to the cities and townships and the remote communities of the outback.

The electricity network consists of about 1 million power poles, and nearly 100,000 miles of power lines with major substations, power transformers and various associated infrastructure. In remote areas distant from the main electricity grid, Ergon operates 33 independent power stations supplying electrical power to isolated communities across the far reaches of the state. Ergon Energy also operates the 55-megawatt Barcaldine gas-fired power station, supplying power to the main state power grid. In addition, Ergon Energy is involved in alternative renewable energy generation solutions.

Similar to many electrical utilities, economic realities meant the utility had to maximize the return on its prior radio communications investments. In 2012, following an evaluation of the emerging digital radio technology solutions, Ergon commenced the roll-out of a Project 25 (P25) open-standard

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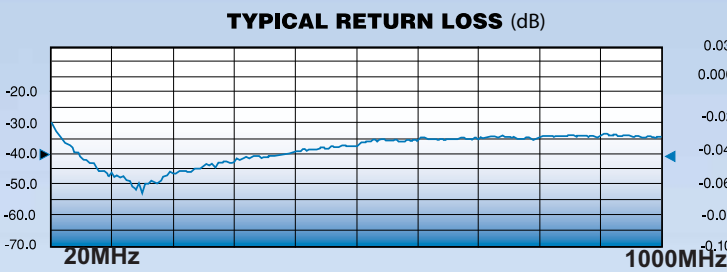

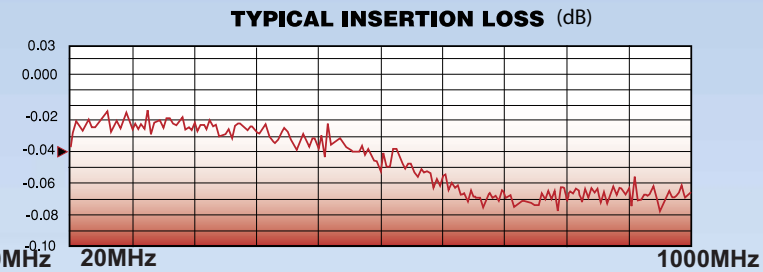

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Ergon Energy needed an out-of-vehicle solution to keep users connected while on the job.

trunked network. The massive system undertaking will provide mobile communications across the entire power delivery footprint via more than 200 antenna sites.

Largest Trunked P25 Network

Ergon Energy completed the initial rollout of a large P25 trunked system at the end of 2012. Following an initial proof of concept, the utility is proceeding to the next stage of the deployment. A staged rollout is planned during the next few years to cover the majority of the state on a regional district-by-district basis.

The initial rollout of 28 sites and about 300 radios as part of a 200-site system strategy will make the system the largest P25 trunked network in Australia, covering more than 266,000 square kilometers. The system is also the first open-standards P25 network to be deployed in Australia using the Inter RF Subsystem Interface (ISSI) and Console Subsystem Interface (CSSI) protocols, which allow the network to interconnect to other third-party P25 networks and equipment. The next stage is similar in scope to the first phase but with around 500 mobiles being installed.

The system operates at VHF high band, well suited and optimized for the rural geography of greater Queensland where Ergon operates. The system also employs Tier 2 GPS implementation, delivering improved resource/event location services for customer support teams, the key driver for the system. The network is expected to support more than 3,000 mobile radios.

Airwave Solutions partnered with Ergon Energy to design and build the initial phase of the digital radio system network. The partnership was the result of an extensive tender process designed to secure a trunked P25 digital radio system, initially in one of the inland regional areas with a plan to eventually roll it out across the state. The core network was equipped with an ISSI that allows dispatch and talk group interoperability and inter-network connectivity with other P25-compliant networks across regional and state borders.

Airwave operates large and complex public-safety voice and data networks, providing a secure nationwide digital radio network for some 300 government, police, fire, ambulance and emergency service agencies in the United Kingdom.

To resource and deliver the necessary skill sets seamlessly, Airwave teamed with three technology suppliers — Auria Wireless, Tait Communications and Wireless Pacific — to provide Ergon with current and advanced purpose-built private radio solutions. Auria is based in Sydney and is a 100-percent Australian subsidiary of Etherstack. Auria has more than 15 years of involvement in the development of the Telecommunications Industry Association (TIA) P25 TR.8 standard.

Tait Communications from New Zealand is a leader in the development of location services for P25 terminals. Provision of location services is paramount to the successful deployment of wide-area location-based services for Ergon Energy's vehicles and staff. Location services have increased the efficiency in operational deployment of field resources and enhanced safety to staff operating in some of Australia's most remote areas.

Wireless Pacific is a developer and supplier of specialist radio solutions and is the inventor of the X10DR secure wireless microphone. Ergon is the first utility globally to fully incorporate the use of lightweight wireless speaker microphones, ensuring users stay in contact with personnel in and out of their vehicles. The wireless microphone allows Ergon Energy's field personnel to communicate up to 300 meters from their vehicles.

Balancing the Deliverables

Deployment of wide-area mobile radio networks for large electrical utilities takes a significant systems engineering effort in balancing the deliverables. The design challenges include the desired and specific operational performance, defining the minimum working and peak levels of system access, and achieving the maximum usable financially achievable coverage. While the multisite technology available now to achieve nationwide coverage is becoming more accessible, the deployment cost still remains a financial challenge.

Unlike the amortized cost per subscriber of cellular network infrastructure, the total fleet size of even a large utility operating over such vast distances is high and requires the use of the best antenna site selection and engineering practices. This also demands that mobile terminal selection calls for optimum equipment performance. With the size of the geographical operational areas demanded by Ergon

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Energy's required footprint, the need to maintain service level performance and absolute coverage reliability is difficult, complex and expensive. Developing solutions for the competing requirements, two-way system engineers have little choice but to design network coverage for vehicle-installed mobile radios, with handheld portable coverage approached in most areas as a secondary consideration.

Operationally, as is with most vehicle-based personnel, the user typically does not conduct most work in the vehicle. The problem is that when the user arrives at a work site, the user exits the vehicle and leaves behind the connection with control room personnel and other work crews using the radio system. This lack of communications connectivity invariably affects vital field operational effectiveness and the user's personal safety. A system's inherent poor portable radio coverage greatly restricts users from leaving their vehicles because doing so leaves them unable to call a team member or control room for assistance. Portable handheld users in need of activating an emergency call may also be unable to get through, rendering those users at risk.

To address this black hole in the optimized mobile-based solution, Ergon Energy integrated 350 secure wireless microphones into the P25 trunked system to deliver the last 300-meter connectivity to users. The small, lightweight speaker microphone is worn on the user's shoulder and allows staff to instantly communicate using the power of mobile radio back into the entire network. Ergon's management now remains in seamless communications with field personnel when outside their vehicles.

The utility fitted dual units on its bucket trucks, which allows the lineman in the bucket to communicate with fellow workers at adjacent power poles or at remote grid control points via the trunked radio system. They also simultaneously communicate with their ground man, enhancing personnel safety and providing operational benefits to workplace practices and productivity. It is expected that most vehicles with dual personnel will have two of the microphones fitted to allow at-scene communications between crew, especially on bucket appliances.

Out-of-Vehicle Solutions

For more than 50 years, radio manufacturers and system designers have grappled with alternative solutions to enhance user mobility when away from the vehicle. The most adopted solution typically involved deploying more portable handheld radios in the vehicle with expansion of base station infrastructure or radio sites and complex remote receiver voting systems to back fill marginal coverage areas to provide talk-back capability to the powered radio devices. These "portable of the person" solutions could triple the infrastructure cost and double the vehicle fit out cost, so they have been implemented sparingly.

The utility is deploying the first P25 network in Australia that uses the ISSI and CSSI P25 interfaces.

Alternatively, some manufacturers developed vehicle-based mobile repeater systems where local simplex portable transmissions are repeated through a vehicle fitted with a cross-band or in-band mobile repeater back into the base station network. These expensive systems require use of additional LMR channels, specialist engineering considerations, bulky filtering devices and the incorporation of often complex contention management protocols to try to eliminate radio communications clashing from multiple vehicle mobile repeaters attending the same location. The mobile repeaters can cause system delays and often require user intervention to decide which channels, mode or status of the mobile repeater should be chosen.

Regardless of the complexity, the high implementation cost of the mobile vehicle systems could not be justified for every mobile user. Some smart mobile repeaters with the required handheld portable radios often incur costs up to four times the investment of a single mobile radio. For users of P25 trunked digital mobile radios, especially those requiring encryption, these approaches for out-of-vehicle communications have seen implementation costs significantly balloon.

Instead Ergon Energy's choice of wireless microphones is simple to use and performs much like a remote speaker microphone, connected invisibly to a vehicle's mobile radio, providing transmit, receive and emergency duress alarm functionality. The user experiences seamless operation with total control of the full-powered mobile radio without complexity and without the need for extensive training. User training and retained knowledge can be the bane of a major radio system rollout, so careful selection of the right intuitive products will always bode well for the successful acceptance by users of any new radio communications network.

Ergon Energy believes that a well-engineered P25 trunked system featuring advanced location services that are fully backed by a highly experienced network management team provided a solid core baseline. When coupled with wireless microphones, it gives the utility the ability to redefine historical work practices. Ergon is confident the microphones will better equip its operators to deliver best-in-class services to their clients and set a new performance benchmark for all electrical utilities in achieving the optimum operational and safety deliverables from a built-for-purpose private radio system. ■

Martin Cahill is vice president of global markets at Wireless Pacific. Cahill previously was a senior manager at Motorola Solutions Asia Pacific division. He left in 2002 to help found Wireless Pacific. Cahill is the original founder of the Australian Radio Communications Industry Association (ARCIA). Email comments to editor@RRMediaGroup.com.

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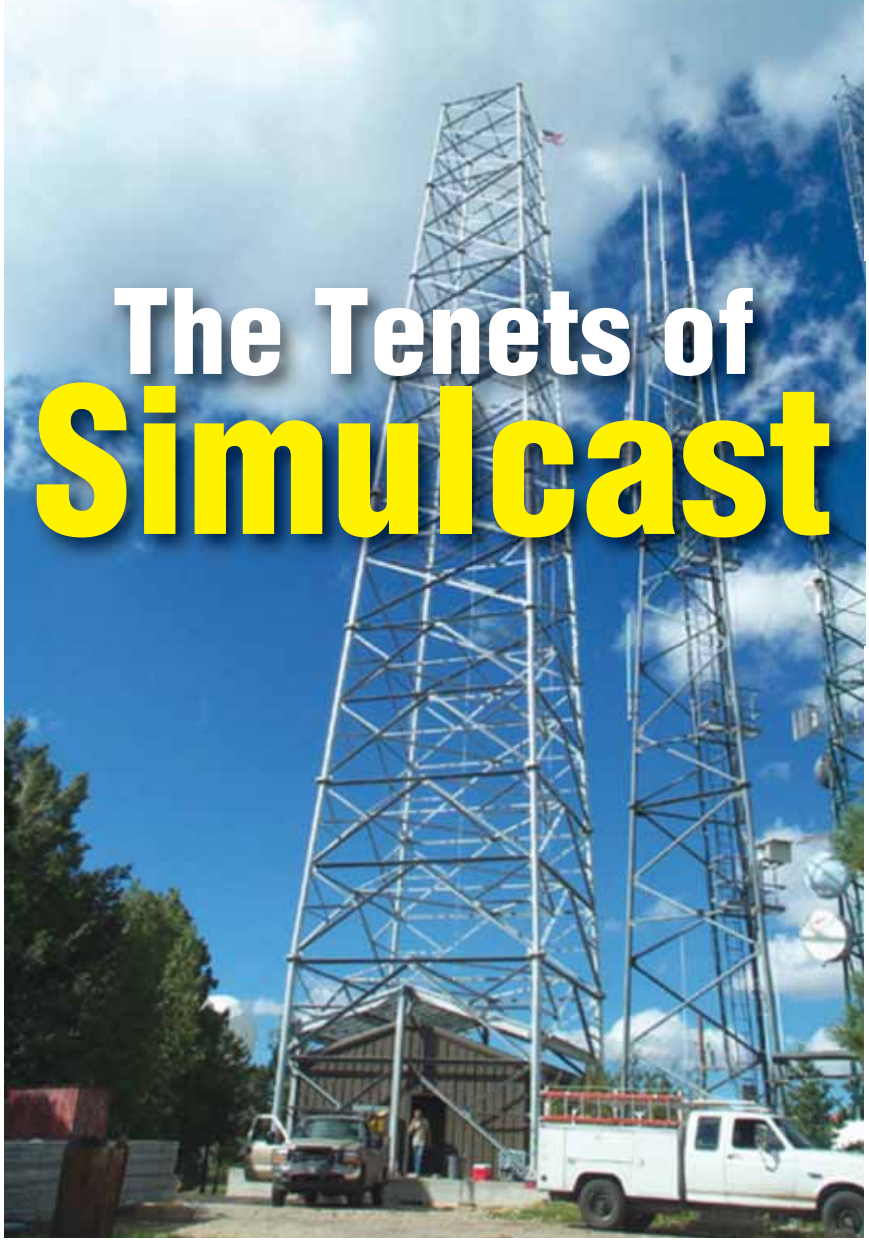

The Tenets of Simulcast

The differences and similarities between simulcast technology and design for analog and digital networks

By Scott Quintavalle

Many years have come and gone since the implementation of the first simulcast system. We have seen an evolution from the use of copper tie lines to analog microwave networks to audio distributed as pulse code modulation (PCM) over digital microwave networks to the use of VoIP-type protocols for distribution of mission-critical information over modern transmission control protocol (TCP)/IP networks.

Likewise, LMR systems have changed over the years. While simulcast systems using analog AM have been implemented in various places around the world, the predominate legacy system technology used analog FM with channel bandwidths that have also changed as the spectrum required to deploy a wireless system became more scarce. Simulcast systems are now deployed using the latest digital air interface standards.

The evolution of interconnect systems and the radio networks attached to them have caused radical shifts in the architectures of these systems and the associated parameters that must be carefully controlled.

The Problem

When done right, simulcast technology provides coverage to operators spread across a wide geographic area in a manner that uses the available spectrum efficiently. Likewise because the same information is broadcast from geographically separated locations, users in areas that are covered by multiple sites enjoy the benefits of macro diversity. Because the signals from each site fade independently, the probability that a user will receive at least one that is strong enough is greater than it is for a single site producing the same mean signal power at that location.

While much has changed over the years, the basic tenets required for successful simulcast deployment remain the same.

Tenet 1 — Signals at any given receive location must be closely matched, and remain closely matched, for acceptable reception of the transmitted information.

The technology used to implement simulcast systems ensures that transmitted signals are closely matched, remain matched and are transmitted at precise moments in time. Once transmitted, the signals must propagate from the transmit site to the receive location. The signals propagate fast; however, a finite amount of time is still required for the signals to reach their destination. For large enough site separations, the difference in propagation times between sites contributing to coverage at a particular area can be large enough such that tenet one is no longer true. This brings us to the second tenet of successful deployments.

Tenet 2 — The best simulcast technology in the world cannot make up for flaws in the RF system design that defines the sites, transmitted power levels, antenna heights, orientation and patterns, and specification of the transmit offset delays. As the old

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As RF energy is introduced into more and more industries, there is a greater need to detect and minimize personal exposure. As with all things, when such a need is created there is a rush to fill that gap with cheap and questionable imitations. While it might be okay to buy a knock-off Rolex, the same practice, when applied to RF safety could be quite hazardous to your health.

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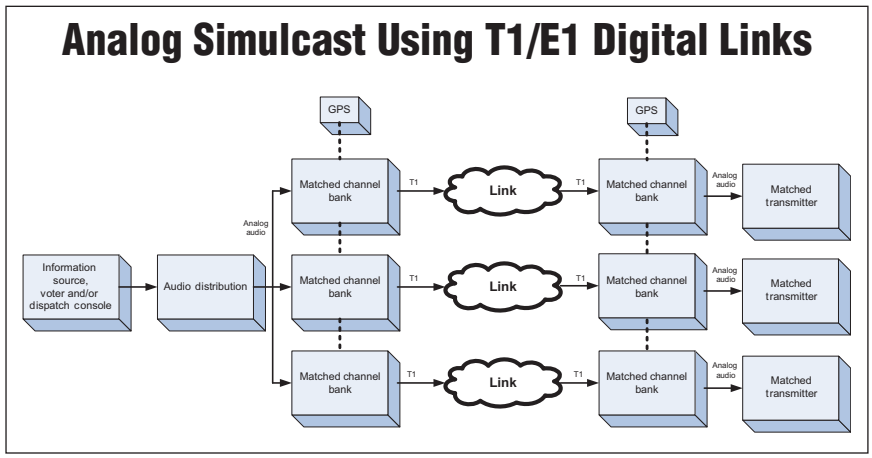

saying goes, "The more things change, the more things remain the same."

Analog FM Networks

Legacy FM base stations present analog audio as an input. An analog electrical signal is continuous in time and takes on all possible value (voltage) levels over a given range. An analog signal is what one would expect from an electrical transducer, such as a microphone that converts the mechanical pressure wave produced by the human voice directly into an electrical signal. The analog signal produced by the microphone is processed and scaled in the base station and then input into its frequency modulator.

The linking systems that interconnect legacy analog simulcast systems are required to transport the analog information to be transmitted from its central source to each of the remote transmitters in the system. Tenet one constrains the performance of the linking system and the base stations connected to it. Otherwise the signal transmitted from each base station will be different enough that it produces distortion in regions where a signal from multiple sites overlaps, resulting in unsatisfactory simulcast operation.

For satisfactory performance, the following specifications for a system were required:

■ Frequency Translation: 0 hertz, a potential characteristic of analog microwave systems that could potentially shift the frequencies of the baseband information sent across it

■ Amplitude Response Error: Less than +/-0.5 dB, this is the amount of error (in decibels) in the amplitude response (the magnitude of the signal at a specific frequency) of the system across a 300 hertz to 3 kilohertz bandwidth compared with an ideal desired amplitude response

■ Phase Response Error: Less than +/- 5 degrees, this is the amount of error (in decibels) in the phase response related to the delay of the signal at a specific frequency of the system across a 300 hertz to 3 kilohertz bandwidth compared with an ideal desired phase response

When done right, simulcast technology provides coverage to operators spread across a wide geographic area in a manner that uses the available spectrum efficiently.

Some of the earliest analog systems used copper phone lines to interconnect the remote sites to the central site. The characteristics of the phone lines would change over a fairly wide range with time and environmental conditions. As a result, these systems required ongoing maintenance to keep the parameters within the specifications. More often than not, this was not practical, and the performance of the systems was less than optimal most of the time they were in operation.

Analog microwave networks were also used and presented their own challenges. In many cases, special versions of the equipment specific to simulcast applications were developed to meet the system requirements listed above.

The advent of PCM allowed analog signals to be converted to digital code words. This opened up the possibility of transporting the analog signals across early digital networks and microwave radios supporting T1 or E1 interfaces.

When the digital links were used with legacy FM simulcast systems, analog information still had to be transported from the information source (voter and/or dispatch console) at the central site to the transmitters at the remote site. T1 channel bank equipment fitted with four-wire interfaces provided the functionality. The four-wire cards in the channel bank equipment sampled the analog information, converted it to digital code words, and multiplexed it onto the T1 for distribution to a similar channel bank at the remote transmitter site. At the remote site the process was reversed, and the original analog information from the central site was available at the four interfaces for interconnection to the remote site transmitter.

Even with the use of digital links, the specifications required for acceptable simulcast performance still had to be met, but often this was easier than with analog links. The four-wire interfaces in the channel banks could be specially designed to provide accurate and consistent amplitude and phase response. Given that the equipment was typically installed in temperature-controlled shelters, changes in the environment conditions were minimal, which helped with long-term stability.

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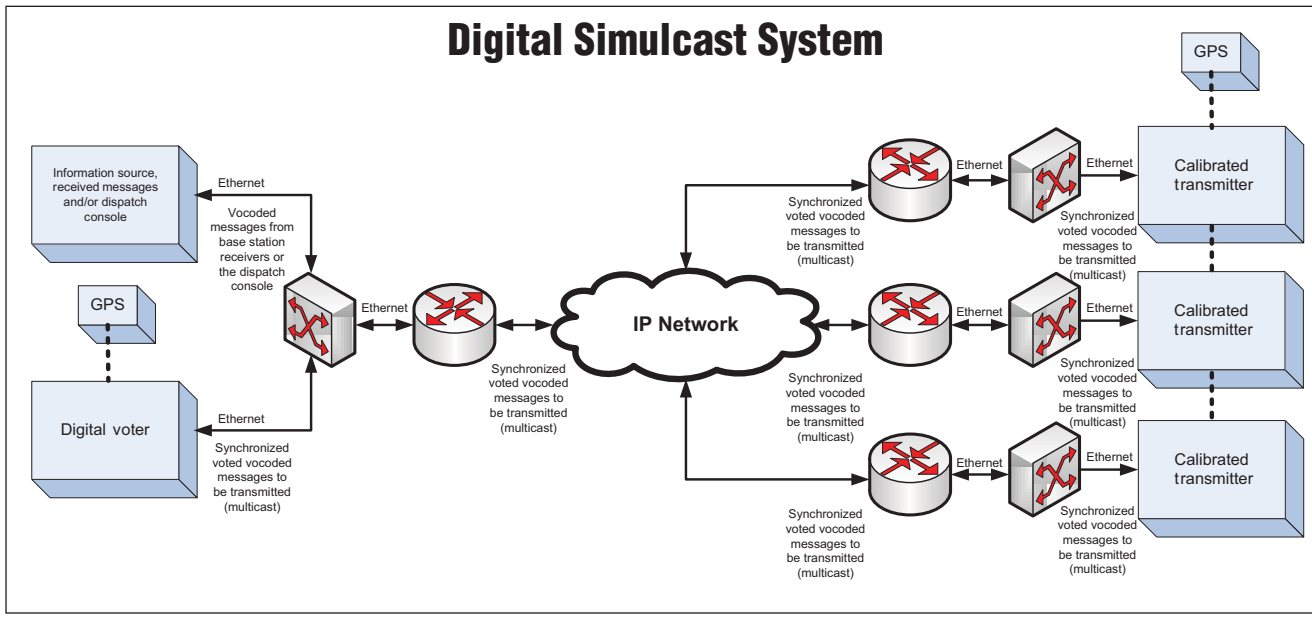

Digital signals are discrete in time and amplitude, meaning that they are only relevant at specific times and only take on a finite number of possible values (voltages) over a given range. Distortion of the T1 over the interconnecting network is not a big concern as long as the distortion does not impair the ability for the data to be accurately recovered at the remote end. This is in stark contrast to distribution of analog information over an analog network where any distortion affects the fidelity of the signal resulting in a negative impact on simulcast performance.

Later generations of T1 multiplexers could be synchronized with GPS and provide a specific and consistent end-to-end delay of the analog information presented to each site. This capability can be used to equalize the delay to each site that otherwise would result from unequal path lengths. Likewise, changes in the delay to remote sites could automatically be compensated for when the route between the central and remote site reversed because of a failure in linking systems configured in a redundant loop topology.

Analog simulcast over the years generally came in two varieties. The first type used an audio equalizer. The parameters of the equalizers were adjusted such that the audio amplitude and phase response of each transmitter were within the specifications mentioned previously, regardless of any differences in the response of the linking medium itself or the individual transmitters.

The equalizer is an electrical filter whose response has been adjusted as necessary to match each of the transmitted signals. The required response for each of the equalizers is determined by measuring each transmitted signal. In early systems, this measurement and adjustment process was manual and time consuming. In later systems, this process was completely automatic.

Early equalizers were built from resistors, capacitors and inductors and were difficult to adjust and keep stable over time. Modern systems implemented these equalizers using digital signal processors (DSP). Given that the response of DSP equalizers were determined by arithmetic performed on the digitized audio samples, their response was completely stable over time. In addition, the devices made automated measurement and adjustment a reality. This made the operation and ongoing maintenance of the systems more practical.

The architecture allowed the systems to be interconnected with analog links (telephone lines and analog point-to-point links) or digital links (T1 over digital point-to-point links) because the equalizer could correct both the amplitude and phase response of the network.

The second type of analog simulcast system interconnected sites using T1/E1 digital links. The four-wire interface cards in the T1 channel banks were carefully designed for simulcast applications to ensure that the amplitude and phase response met the system requirements. In addition, the T1s were synchronized with GPS and highly accurate time bases to ensure that the audio presented at the four-wire interface card of the remote sites channel banks was closely synchronized in time.

It was also important that the amplitude and phase response of each transmitter were closely matched given that there was no equalizer in the system to correct for these differences. The transmitters were typically specially built or carefully selected from the production line. Any spare or replacement base station also needed to be closely matched, sometimes resulting in long-term maintenance issues.

Digital Networks

The sites in a digital simulcast LMR system are often interconnected with TCP/IP networks. The output of

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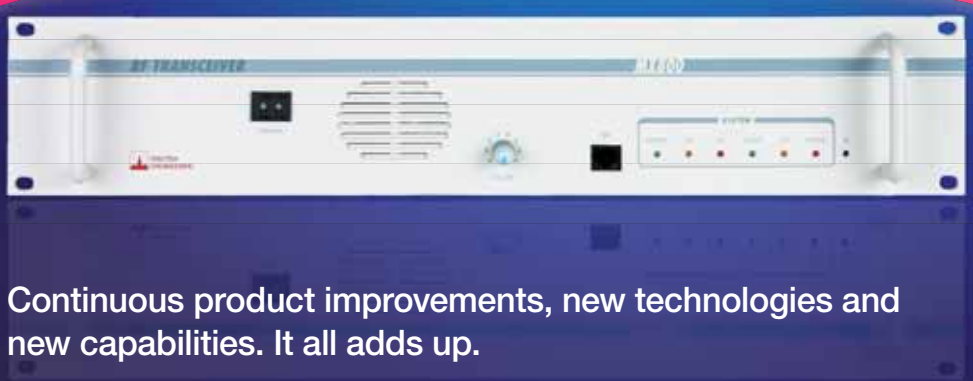

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The best simulcast technology in the world cannot make up for flaws in the RF system design that defines the sites, transmitted power levels, antenna heights, orientation and patterns, and specification of the transmit offset delays.

the dispatch consoles and voters are packets containing data representing the original vocoded voice message. All information presented to the linking medium and the base station interface is in the form of data packets instead of analog audio. As such, the parameters of concern in a digital simulcast system are different than an analog system.

A lot can happen to an IP packet as it makes its way across a network. For example, errors could be introduced. The packet could get delayed for long periods of time as it gets stuck in queues in highly congested portions of the network. A packet can be dropped completely or arrive out of sequence. To ensure proper performance of a digital simulcast system, the IP network must provide performance consistent with the specifications below. Note quality of service (QoS) typically needs to be configured in the IP network to ensure the required performance is met.

- Packet Loss: less than 0.01 percent
- Latency: less than 40 milliseconds (ms)
- Jitter: less than 20 ms
- Maximum transmission unit (MTU) length: serialization delay should be less than 5 ms

Digital simulcast systems such as Project 25 (P25) transmit only four different waveforms corresponding to the four unique symbols in its quaternary modulation scheme. As with analog, the four waveforms transmitted must be closely matched. However given that these are generated via signal processing in each transmitter, this is less daunting of a task than with analog. Many digital base stations calibrate the accuracy of these waveforms automatically while the system is inactive. Accuracy of better than 0.2 dB can be achieved.

Everything else associated with simulcast performance in the architecture of the systems is working to ensure that the data is transmitted in a synchronized manner from each site despite the challenges that the IP network that interconnects them will present. This is accomplished by time stamping of the voted vocoded voice data and the implementation of data buffers of suitable length in the transmitters.

The digital voter takes the received voice streams from the base station receivers and selects the one with the best quality for retransmission. Alternatively, the voice stream from the dispatch console could be transmitted. The digital voter time stamps the voted voice packet to be transmitted and sends it to the remote transmitters via IP multicast. The time stamp is set for some future point in time. The time stamp determines the point in time — minus any site-specific offset delays — in which the voted voice packet will be transmitted by each of the remote base stations. The digital voter and the remote base stations use GPS for synchronization to ensure each have a common reference for time.

Voice packets arriving from the digital voter are put into a buffer in the base station transmitter. If necessary, the packets are reordered so that they are sequential. The buffer must be long enough so that it does not empty between the time one packet and the next is received from the digital voter. Given that the arrival time of the packets can be variable because of network jitter, calculation of the required buffer length must take the maximum network jitter into account, as well as the average network delay. When set up correctly, the depth of the buffer at any instant in time will vary with the network jitter but will never empty if it is long enough. This ensures that the vocoded voice packets are transmitted from each site in the same order and at the correct point in time. However, the buffer should not be any longer than necessary, otherwise, unacceptable voice delays will result.

Final Thoughts

The architecture of LMR systems has changed over the years out of necessity with the transition to digital air interfaces and TCP/IP interconnecting networks. However, the basic tenet for proper operation of these systems remains the same; closely matched signals must be transmitted from each site with precise synchronization.

As an added benefit, the new architectures make the systems easier to install and commission, and less costly to maintain. While this is true, tenet two should not be forgotten. Digital modulation schemes that have not been optimized for simulcast are far less forgiving of excessive propagation delay spread differences. This typically requires closer site spacing and less site overlap. In many cases, careful optimization of transmitter effective radiated power (ERP), antenna patterns and site-specific offsets delays are required for acceptable operation. Given the simplified deployment and operation of modern simulcast systems, the quality of the RF system is the primary determinate in the performance of these systems. ■

Scott Quintavalle is the vice president of systems engineering and chief technology officer (CTO) at Tait Communications, based in the company's Americas headquarters in Houston. Email comments to editor@RRMediaGroup.com.

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The Nordic Region's Cross-Border Communications

Photos courtesy Rakel

Sweden and Norway implement an Intersystem Interface (ISI) to connect their TETRA public-safety networks.

By Ingela Rundström

Sweden uses a nationwide TETRA communications system called Rakel for security and safety operations. The Swedish government owns the Rakel system's infrastructure, and the Swedish Civil Contingencies Agency (MSB) has responsibility for expansion, operation, administration and development of Rakel and markets, sales subscriptions and connecting customers.

The system was initially conceived in 2003 by Sweden's parliament (Riksdag), which decided on financing, launching and expanding Rakel to strengthen the Swedish emergency preparedness capacity. The country's 200 analog communications systems were replaced by a single digital system. In December 2010, Sweden had a nationwide communications system for the first time.

Initially the system was intended for agencies and organizations that had a responsibility for the public's security and safety, such as the police, coast guard, and emergency and rescue services. However, in 2007 a government decision expanded the user base to include government authorities, county administrative boards, municipalities, county councils and energy companies.

Rakel covers 99.9 percent of Sweden's population and 95 percent of the country's area. The system is built and designed to manage crisis situations. It has its own infrastructure that can withstand harsh weather conditions, with redundancy throughout the network. Furthermore, all exchanges and base stations are equipped with backup power, which makes Rakel durable in the event of a power failure.

Users describe Rakel as a common system that makes interaction with other services much easier. For example, it is easier for agencies to plan and lead coordinated actions. The system is perceived as easy to use. Rakel mobiles are similar to cell phones, and users do not need

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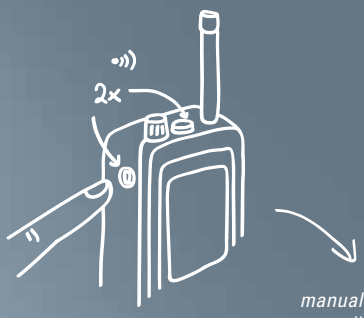
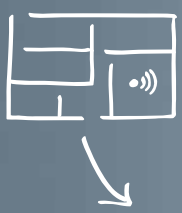


manual alarms – emergency call, warning

4 automatic alarms – position, no-motion, time and loss



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▸ *www.funkwerk-sc.com*

The Nor-Swe ICE-project aims to enable communications between Norway and Sweden.

to keep track of frequencies or channels, unlike the old analog radio systems. The system is protected against unauthorized tapping, and the privacy of patients and victims is protected.

Scandinavian Borders

Sweden has a long border, which means at times there is a need for cross-border collaboration. MSB wants to expand international collaboration, however, there is no standardized service for communications across national borders within the TETRA technology. MSB is therefore working with system suppliers and participating in international collaboration to drive the development of a standardized service for cross-border communications.

The Haga Declaration makes it clear that in the Nordic countries it is essential to work in national border areas to develop and ensure cross-border collaboration for work with emergency preparedness. The intention of the Swedish and Norwegian governments with the Haga Declaration is to further develop Nordic collaboration. With stronger and more focused cooperation, the possibilities of providing mutual support in a cross-border context increase.

Some special solutions have been developed to manage communications needs between Rakel and other TETRA systems while waiting for standardized services. These communications solutions make group calls possible between radio subscribers in Rakel and other networks. A gateway based on two TETRA terminals, one from each network that connects talk groups cross the border can be found:

- On the Öresund bridge, between Sweden and Denmark for communications with the Sine network;
- On the Svinesund bridge, between Sweden and Norway for communications with the Nødnett network; and
- Between Haparanda in Norrbotten and Torneå in Finland for communications with the Virve network.

“We will be first in Europe with a cross-border system.”

— Stefan Kvarnerås, Rakel

To secure international collaboration in Rakel over direct mode (DMO), an agreement was reached in September 2011 among Sweden, Norway, Finland and Denmark about how collaboration should proceed. In DMO the Rakel mobiles work like walkie-talkies. Users can communicate directly with each other without contact with the Rakel infrastructure.

Rakel and Nødnett

Since August 2012, Norway and Sweden have collaborated with the Nor-Swe ICE-project, which enables communications between Rakel and the Norwegian TETRA network counterpart, Nødnett. In the future, it will be possible to use Rakel subscriber units in Norway on Nødnett and vice versa.

“We will be first in Europe with a cross-border system,” says Stefan Kvarnerås, operations manager for Rakel at the MSB.

In practice this means that the police in both countries can talk to each other; a Swedish Rakel user in Norway can reach the Rakel network in Sweden through the Nødnett network. The agreement will be the same in both directions.

“We will also implement this with Denmark and Finland,” says Kvarnerås. “The fact this took place with Norway first is due to the long border we share and that both countries have registered that it is to be implemented. We have the finance in place for our part of the integration with Norway.”

The expansion of Nødnett is finished in the Oslo area and is in progress in the rest of the country to be completed by 2015. The aim of

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www.everge.vertexstandard.com

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Rakel replaced Sweden's previous 200 analog communications systems.

the project is to ensure efficient and user-friendly communications between critical services in Sweden and Norway.

Organizers of the meeting and initiators of the project are the Swedish MSB and the Norwegian Directorate for Emergency Communication (DNK). DNK is responsible for the development of Nødnett. The project comprises the following:

- Develop and introduce a standard Inter System Interface (ISI) in Rakel and Nødnett
- Produce models and procedures for collaboration across the borders
- Draw up the legal framework
- Produce guidelines and rules for communications and for the management of mobiles and parameter settings
- Train, demonstrate and exercise

The first step was to analyze the differences that exist in the communications systems based on the designed technical interface in the migrated state. That step is now complete.

"We produced talk groups for collaboration, as well as methods and procedures to ensure communications between the two countries are as effective as possible in the event of an accident or emergency situation," says Anita Galin, project manager at MSB.

Sweden and Norway each have three teams in the project, with representatives from the police, fire and ambulance. Sven Morin, MSB, coordinates the Swedish teams.

"All the teams from Sweden and Norway met in September 2013 to start up stage two," says Morin. "We will now move forward and look at how communications occur during cross-border collaboration and agree on a working method around this."

The ISI project is scheduled to be completed in 2015 with an exercise

“We produced talk groups for collaboration, as well as methods and procedures to ensure communications between the two countries are as effective as possible in the event of an accident or emergency situation.”

— Anita Galin, Sweden’s MSB

between Swedish and Norwegian officials to test the agreed functionality and methods for cross-border communications.

EU Interest

The project Nor-Swe ISI is closely linked to the European project Inter System Interoperability for TETRA TETRAPOL Networks (ISITEP), which was granted funds by the European Union (EU) and started in September.

The purpose of ISITEP is to stimulate management and collaboration between European parties involved in security and safety to improve crisis management and international law enforcement across borders. Some 15 European organizations and 10 countries are involved in the project. ISITEP is a part of EU’s seventh framework program for global solutions for interoperability between first responder communications systems. Italian company Selex Elsag, one of the TETRA manufacturers that supplies equipment to Rakel, leads the project.

Within the framework of ISITEP, the intention is to develop methods and technology, adapted terminals, support systems and legal agreements to attain a cost-effective solution, based on user needs, to make different networks for public protection and disaster relief (PPDR) in Europe compatible with each other. Furthermore, a legal agreement will be drawn up for the interconnection of networks between Norway and Sweden (Nødnett and Rakel).

It will be possible through ISITEP for parties involved in security and safety to improve collaboration effectively across borders, which in turn will benefit all citizens. ■

Ingela Rundström is a communications strategist for Rakel. Email comments to editor@RRMediaGroup.com.

Product Expo: Mobile and Portable Radios

Cassidian Secure Communications Solutions

The TH1n is a pocket-sized TETRA radio with a metallic finish and well-formed, rubber-coated sides. The radio retains the same large, bright color display similar to previous Cassidian radio models. The design elements are expected to open the market to new sectors, such as social workers and health care personnel who have the option of joining shared public-safety networks but have not found a radio model to suit their needs better than a heavy-duty radio targeted at firefighters or paramedics. Equipped with appropriate accessories, the radio is also suitable for covert use with its compact and thin design.

www.cassidian.com

Codan Radio Communications

For security, public-safety and humanitarian organizations in the developing world, the Envoy smart radio provides clear, dependable and secure voice and data communications without dependence on installed infrastructure, providing a cost-effective, easy-to-use communications solution. The software-defined radio delivers new capabilities through software upgrades and is intuitive, reliable and advanced. The scalable mobile and base station solutions are offered in an affordable platform.

www.codanradio.com

EF Johnson Technologies

The Viking VP900 multiband portable is loaded with advanced features, including a top display and dual-shield design. The portable is ergonomic and rugged with loud audio and noise cancellation. The SMARTNET/SmartZone-compatible radio is a small, multiband portable and comes with Project 25 (P25) Phase 2 capabilities.

www.efjohnson.com

Entel UK

The expanded HX400 radio series includes the 800 MHz frequency band, which means the range now offers more flexibility, from basic to high tier, whether conventional or trunked. The radio provides users with a reliable product at an affordable price while delivering attractive margins, company officials said. Five-tone, DTMF and MDC 1200 signaling options are included, with lone worker and man-down options also featured. The radios are widely used in the fields of civil aviation, rail networks and security, as well as during the London 2012 Olympics.

www.entel.co.uk

Funkwerk Security Communications

Funkwerk Security Communications released a TETRA radio for use in hazardous underground mining environments. The rugged FT4 S Ex, already approved for hazardous gas and dust environments, is now also IECEx- and ATEX-certified for M2 mining. The handheld terminal integrates enhanced personal safety features in combination with indoor localization. With clear voice, underground localization data and advanced motion-sensing technology generating no-movement and man-down alerts, the radio helps mine operators meet safety obligations and increase productivity.

www.funkwerk-sc.com

Giant International

The Olympia P324 UHF business two-way radio features 1- or 4-watt selectable power output and 32 programmable channel memories at an affordable price, providing users a practical communications solution. Additional features include a Li-ion battery pack, drop-in charger, hands-free operation and audible low-battery alert. The radio is fully programmable for use of fixed frequencies. For those who use itinerant frequencies, the first 10 channels come pre-programmed on the common itinerant frequencies. A complete line of accessories is also available.

www.olympiaradio.biz

Harris Public Safety and Professional Communications (PSPC)

The XG-75P portable radio is easily customizable to meet public-safety users' needs. The single-band radio operates in the VHF, UHF, 450 – 512 MHz and 700/800 MHz frequency bands and offers Project 25 (P25) Phase 2 capability in a future software release. The portable is available in a variety of colors and options including an easy-to-read display and knobs that are easily adjusted by users wearing heavy gloves. The XG-25M mobile radio features Bluetooth functionality and is ready for operation in narrowband frequencies. The mobile radio is a feature-rich, economical solution for public-safety users that offers exceptional audio performance in a rugged and compact design and a remote mount.

www.pspc.harris.com

Holzberg Communications

Holzberg's new portable radio, model HC-V88, transmits 8 watts of output power, features 16 channels, houses a 2.8 ampere hour (Ah) Li-ion battery and is available in UHF and VHF. The DB-ANDY dual-band radio operates in 136 – 174 MHz and 420 – 490 MHz and features 4 watts and 100 channels. The F6-8 VHF operates in 136 – 174 MHz and features 5 watts and 16 channels. The F6-16 UHF operates in 450 – 490 MHz with 4 watts and 16 channels. The PX-555U UHF operates in the 450 – 470 MHz band with 4 watts and 16 channels.

www.holzberg.com

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Hytera Communications

The X1 series operates within the European Telecommunications Standards Institute (ETSI) open-standard Digital Mobile Radio (DMR) guidelines and is ideal for security, hotels and airports. The slim, 5-watt, lightweight, discrete radio is backwards compatible with analog systems and features GPS, Bluetooth capability, advanced level encryption (ALE), text messaging, vibrate, telephone interconnect and a trunking upgrade option. The X1e is a nondisplay model with 32 channels, while the X1p features a display with full keypad and 1,024 channels. Both are capable of dual mode (analog and digital).

www.hytera.us

Icom

The IC-F3260D/F4260D series is a 5-watt, 512-channel VHF/UHF handheld radio that combines analog FM and IDAS digital modes with auto-sensing function. The IDAS digital mode uses 6.25-kilohertz narrowband FDMA technology and offers a flexible choice of the NXDN digital protocol or the European Telecommunications Standards Institute (ETSI) digital Professional Mobile Radio (dPMR) protocol, with common hardware. The radios feature rugged IP67 dust and waterproof protection, integrated GPS receiver, man-down and lone-worker safety, voice scrambler, full dot-matrix display, 800 milliwatts loud audio and voice activation (VOX) capability. The series is available in 10 keypad and simple keypad versions.

www.icom.co.jp/world

Kenwood

The NX-240/340 is the latest NEXEDGE radio that extends offerings into lower price segments, completing the product line-up that spans from easy-to-use, entry-level radios to the system radio. The unit offers enhanced digital features, such as over-the-air alias, true 6.25- and 12.5-kilohertz digital modes, and optional GPS microphone connectivity, while keeping compatibility with analog FM modes. Other features include 32 programmable channels, 1-watt audio output and a four-color multistatus LED.

www.kenwood.com

Motorola Solutions

The APX 3000 Project 25 (P25) portable radio is designed for covert, discreet communications. The radio design removes traditional elements — the keypad, display, speaker and microphone — to create a slim, compact unit. The radio ships with an IMPRES 3-Wire Surveillance Kit, and a variety of optional wireless Bluetooth accessories are available for flexibility in how the radio is worn or hidden.

www.motorolasolutions.com

Sepura

The Sepura STP9000 hand portable offers functionality coupled with IP67-rated (dust- and waterproof) hardware, an enhanced and intuitive user interface and advanced sensitive GPS. The portable provides users with a robust and secure radio that enables them to operate safely and efficiently in a wide variety of scenarios, including dusty and wet hostile environments. The radio offers high-quality full-duplex audio, which improves operational efficiency; safe and convenient wire-free accessory compatibility, with its Bluetooth capability; a unique tactile feedback with gloved use through haptic-based technology; and interaction with third-party systems, with an integrated RFID tag.

www.sepura.com

Simoco

Future-proof and resilient, Simoco Xd is a complete end-to-end Digital Mobile Radio (DMR) system including mobiles and portables with integrated IP dispatching. The hardware is software upgradable from Tier 2 to Tier 3 and scalable from a single base station to large networks. The digital portable, available in two variants, is an intuitive, robust handheld radio designed with a range of digital features to support users. The portable includes internal GPS, man-down and lone-worker options. The mobile brings the same intuitive interface to vehicles and features flexible installations.

www.simocogroup.com

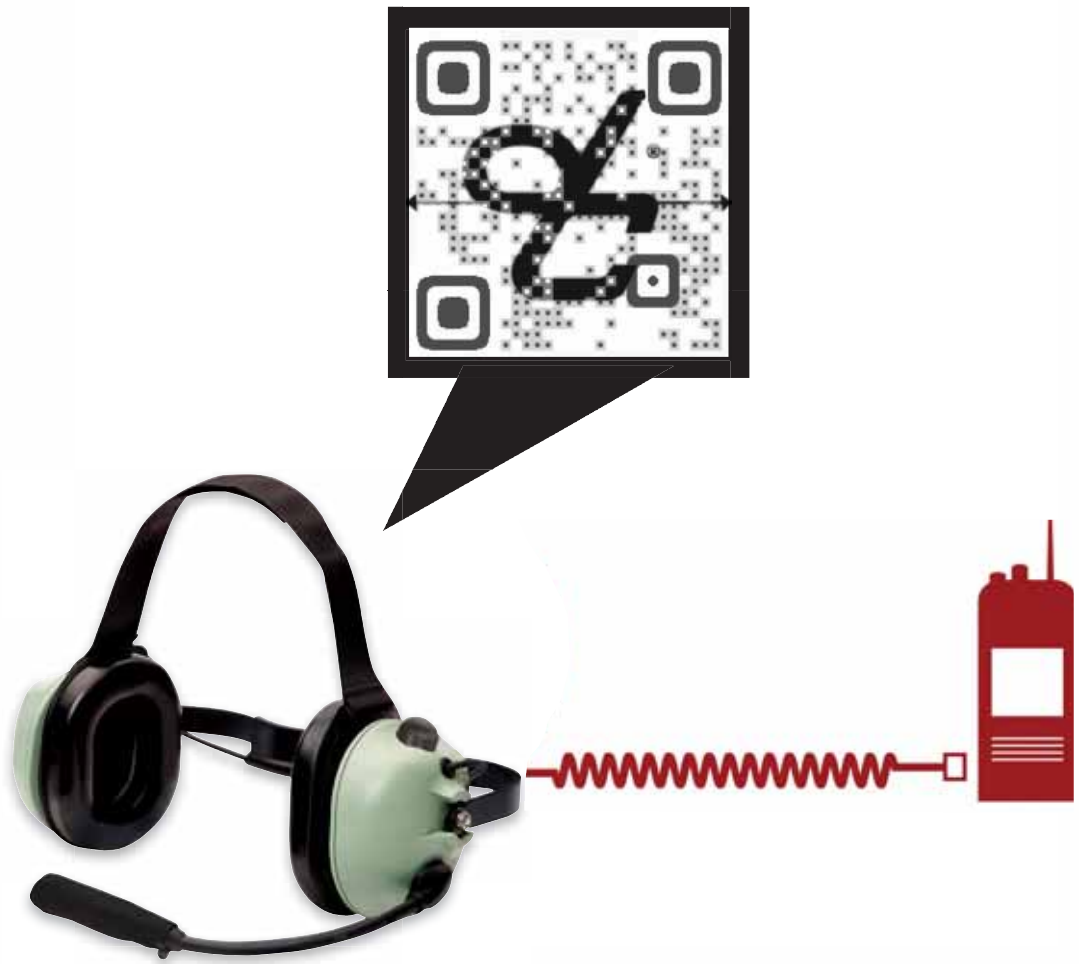
Tait Communications

Featuring software upgradability to Project 25 (P25) Phase 2, the T9400 series features a compact portable design. The P25 portable enables first responder effectiveness and safety with internal GPS, Bluetooth wireless technology, IP67 protection and advanced encryption standard (AES). The TM9400 mobile features AES encryption, over-the-air rekeying (OTAR), various emergency modes and an IP54 rating. The radio also features an options slot to extend its capabilities, and a range of remote mounting, control head and display options.

www.taitradio.com

TecNet International

The TM-8000 series of mobile radios provides durability and affordability in the VHF or UHF (400 – 512 MHz) spectrum. The radio offers 512 channels with a dynamic dot-matrix display that allows choice of font size. Additional features include 50 watts of output power for VHF and 40 watts UHF, multiple scan options, user-selectable squelch control and voice scrambler. With the XRC-31 cable, a simple repeater (VHF/UHF or cross-band) can be made through the 15-pin data connector. Add the TBM-800BTD Mobile



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www.tecnetusa.com

Teltronic

The HTT-500 handheld features 3 watts of RF output for improved coverage, 1 watt of audio and more than 18 hours of battery power. The radio features Bluetooth connectivity, a tamperproof E2EE module, a WAP browser, GPS and man-down capability. The radio is tough and durable, yet small and lightweight, with an intuitive graphical color interface, company officials said.
www.teltronic.es

Thales Communications

The Liberty Multiband professional mobile radio (PMR) is a multiband portable radio covering the public-safety bands from 136 to 869 MHz with performance equivalent or superior to existing single-band portable radios, company officials said. The radio provides all modes standardized for public-safety use, including analog FM and Project 25 (P25) conventional and trunked; full encryption capabilities, including data encryption standard-output feedback (DES-OFB), advanced encryption standard (AES) and over-the-air rekeying (OTAR). The radio is designed to Class A specifications.

www.thalescomminc.com

Vertex Standard

The eVerge digital series includes full-featured Digital Mobile Radio (DMR) models EVX-534 (four-key) and EVX-539 (full keypad) portables and the EVX-5400 mobile radios. The radios operate in VHF/UHF bands with 512 channels and channel name display, as well as operation in analog and digital modes using the TDMA digital protocol. The radios feature text messaging, enhanced call management, enhanced privacy and option board expandability for custom applications. The Auto-Range Transpond System II (ARTS II) monitors connection status.

www.vertexstandard.com

Wireless Pacific

The 250-channel GTR professional handheld is available with built-in Bluetooth operation. The radio is available in 66 – 88, 136 – 174, 350 – 390 and 403 – 520 MHz bands and meets IP54 environmental conditions as well as Mil-Std-810. User features include mobile voting, auto-scan, channel scan, lone worker, unit ID/emergency identification, five-tone selective call, safety tone and remote kill/ revive. The radios come with or without a full keypad and meet global type approval standards.

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Airborne Radios

Harris introduced tactical radios that allow international air and ground forces to cooperate during joint operations. The RF-7850A Airborne Networking mission radios deliver secure voice and wideband data communications for ground-to-air missions including intelligence, surveillance and reconnaissance (ISR), close-air support and border patrol. An extension of the company's Falcon line, the radio comes with a simple user interface and embedded applications. Two configurations are available, including the RF-7850A-UA single-channel radio for use with unmanned aerial systems and the RF-7850A-MR multiband dual-channel radio for use in helicopters and airplanes.
www.harris.com

Mobile App and Gateway

MOTOTRBO Anywhere from **Motorola Solutions** allows users to communicate with MOTOTRBO radio users and talk groups using an application on their Android or iOS smart phone via a wireline gateway connection. Communications within and outside MOTOTRBO coverage areas is supported and is integrated into the radio system infrastructure to deliver system scalability and a radio-like experience. Hundreds of users can be accommodated and every user can be configured with a unique profile defining talk groups and private call capabilities. Access is secure, and the system administrator remains in control.
www.motorolasolutions.com

TETRA Cross-Link Base Stations

South Midlands Communications developed rugged transportable and fixed base station versions of a radio cross-link to allow communications between TETRA

systems and analog FM or Digital Mobile Radio (DMR) systems. The cross-link unit features programmable transmit power outputs of up to 10 watts (W) and will link any TETRA talk group or direct mode operation (DMO) channel to a DMR or an analog FM two-way radio system. Internetwork communications is transparent to the user. The transportable version features a rugged weatherproof case and is powered by an internal rechargeable battery. Charging options include mains, 12 volts direct current (VDC) input, solar panels and battery packs. Single and dual antenna variants are available. The fixed version features a three-unit (3U) high by 48-centimeter rack form factor and can be supplied for in-situ mounting or in a standalone tabletop cabinet. Options include single- or two-antenna operation, an external battery standby and comprehensive front panel channel/talk-group mode selection.
www.smc-comms.com

Digital Integrated Base Station

The DIB-R5 from **Hytera Mobilfunk** is a line of base stations for ACCESSNET-T IP TETRA systems. The base stations include TETRA Release 2 and TETRA Enhanced Data Services (TEDS) capabilities. An advanced model includes a modular and flexible design, and the compact version is a two-carrier model with an integrated hybrid combiner. The advanced model includes channel units, the base station control unit, power supply and RF splitting and filtering equipment. Each station supports transmission link redundancy and can be connected to two switching nodes. The products can operate with or without satellite synchronization.
www.hytera.de

LTE and TETRA System

Rohill Engineering and **Huawei** showcased LTEtraNode, an integrated Long Term Evolution (LTE) and TETRA solution the companies jointly developed. The system provides mobile broadband capabilities for public safety, government, enterprise, transportation, utilities, and oil and gas markets. The solution provides the same data capacity and capabilities available in public markets along with mission-critical requirements for equipment. The companies plan to develop solutions that can be deployed on generic Third-Generation Partnership Project (3GPP) defined frequency bands, as well as in low- and high-frequency bands to satisfy specific coverage and capacity requirements.
www.rohill.com

TETRA System

Claricor 3 from **Cassidian** is a TETRA-based system for networks of up to 5,000 users. Outdoor and indoor coverage are

supported for airports, factories or power plants, as well as larger areas such as cities. The network can be interconnected with multiple switches to cover a larger area. TETRA Enhanced Data Services (TEDS) support is included. The system includes the company's DXT3p switch.

www.cassidian.com

LTE Core TETRA Base Station

Etelm unveiled a gateway-free TETRA base station designed to operate on Long Term Evolution (LTE) networks. The e-TBS

is a fully converged TETRA and LTE solution, allowing single or multiple e-TBS TETRA base stations or a complete TETRA network to sit on the LTE core without the need for external gateways. TETRA voice features can merge with LTE high-speed mobile broadband. Existing TETRA networks can be expanded using the solution and all subscriber equipment retained.

www.etelm.fr

Dispatch System

Zetron's MAX Dispatch system is available outside North America. The end-to-

end IP-based console system includes an intelligent user interface, complete redundancy, network health monitor and a distributed design. The system supports 10 radio interfaces that connect to standards-based and proprietary equipment.

www.zetron.com

Mobile ANPR

CIVICA and **TETRAtab** introduced an automatic number plate recognition (ANPR) system on demountable multipurpose tablets. The system allows ANPR to be deployed more widely than the fixed, in-vehicle computers that have been deployed in specialist ANPR vehicles in the United Kingdom, company officials said. General beat patrol and response vehicles can host the TETRAtab C series to provide simple CIVICA ANPR facilities to all general patrol vehicles at an affordable price. The demountable tablets allow access to force processes and systems away from the vehicle. The ANPR functionality can be set to run in the background or programmed to report hits to the patrolling officer. Forces that have already rolled out TETRAtab devices can layer ANPR onto the computer at a later date.

www.tetratab.com

Covert Body Antenna

Procom UK Systems introduced a covert body antenna for TETRA systems. The DDEFD 70/390 MHz is flexible and consists of two 0.5-watt (W) antennas that operate in the 380 – 400 MHz range. A metal back minimizes radiation to the body. The antennas also can be concealed in car bumpers and other spaces.

www.procomuk.co.uk

Noise-Eliminating Covert System

NN5 from **Sepura** is a noise-eliminating system designed for covert teams to operate in environments with high levels of electromagnetic interference. The system includes a variety of discreet earpieces and a facility connector. A transmitter uses a specialized audio signal modulation method developed to provide optimum performance in conjunction with advanced digital signal processing.

www.sepura.com

Wideband Dual-Feed Antennas

Tallysman Wireless introduced the TW4421 and TW1421 Global Navigation Satellite System (GNSS) antenna. The TW4421 is a low-cost, dual-feed magnetic mount antenna covering GPS L1, GLONASS L1, Galileo and Satellite Based Augmentation System (SBAS) frequency bands from 1.574 to 1.606 GHz. Featuring a 25-millimeter dual-feed wideband patch element, the antenna provides excellent multipath rejection with a linear carrier phase response via a low axial radio across the full frequency bandwidth. The antenna is ideal for high-accuracy applications and offers high out-of-band signal rejection. The lightweight TW1421 embedded antenna weighs 30 grams and has a small footprint, making it ideal for applications where performance and small size are desired.

www.tallysman.com

Spiral Antenna

Cobham Antenna Systems introduced a sinuous spiral antenna suitable for security and surveillance applications in the 2 – 18 GHz bands. A rugged, machined housing makes it ideal for harsh environments. Directional beamwidth is 65 – 95 degrees in azimuth and elevation. Dual circular polarization over the band means there is no likelihood of any frequency being missed at any polarization, company officials said. The antenna weighs 250 grams and is 8.4 by 6.7 centimeters (cm).

www.cobham.com

GNSS Antennas

PCTEL launched next-generation multiband Global Navigation Satellite System (GNSS) antennas for global timing and precision tracking applications. The antennas can be used with the GPS, GLONASS, Beidou and Galileo positioning systems. The GNSS1-TMG-26N is a fixed-mount network-timing antenna covering all four positioning system frequencies. The GPS-LB12GL-MAG covers GPS L1, GPS L2, GLONASS and L-band constellations, addressing the precision market in the U.S. as well as differential correction signals needed in Europe and Asia.

www.pctel.com

Automated Test Set

The 7215 Configurable Automated Test Set from **Aeroflex** is designed for production and depot-level testing of military and software-defined radios (SDR). The standard configuration includes a high-resolution touchscreen user interface, RF testing up to 2.6 GHz, 90 megahertz of instantaneous bandwidth for digital signal generation and analysis, and multiple RF and audio instruments in a single package. Advanced digital signal analysis tools, including error vector magnitude (EVM) measurements and power drop-out tests on frequency hopped waveforms, are optional. The set operates at DC to 2.6 GHz.

www.aeroflex.com

Emergency Application

Leda Nasta from **Codea** is an application that receives alarms from emergency response centers and automatically routes them to the incident site. Location and status information are relayed in real time, and transport codes and targets are relayed to treatment locations. The system automatically calculates the estimated time of arrival and allows the electronic entry of an emergency report, updating data for fleet management requirements and becoming part of the patient's medical record.

www.codea.fi

Network Design Software

EDX Wireless upgraded its flagship wireless network design and optimization software to enhance planning capabilities and add features. Version 8.1 of EDX SignalPro includes support for indoor and outdoor distributed antenna system (DAS) and small cell deployments as well as wide-area broadcast and broadband networks. Planning capabilities include area coverage networks as well as route/transportation, complex mesh and microwave point-to-point and point-to-multipoint systems. Expansion options include indoor and outdoor system design, citywide Smart Grid system design and outdoor-to-indoor RF prediction with a ray-tracing

feature. The software supports native 64-bit operation and can open a Google Earth site or street view window centered on the project map point of interest.
www.edx.com

Security Pager

Birdy TETRA is an individual security pager from **TPL Systemes de Communications** that works on private TETRA and commercial GPRS networks. The pager manages reception of messages and

enables preprogrammed and operation availability messages to be sent. A GPS module provides location information, and an accelerometer provides man-down and verticality loss functions. A high-capacity Li-ion battery provides power to the paging unit, which has high TETRA sensitivity.
www.tplsystemes.com

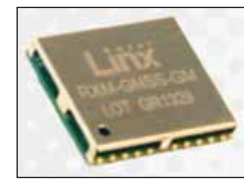
Two-Way Radio Processors

The CMX7031 and CMX7041 multimode two-way radio (TWR) processors from **CML Microcircuits** operate in marine

VHF mode and are enhanced to enable the ITU-R M.821 recommended marine digital selective calling (DSC) expansion sequences. Continuous transmission mode is included for use in distress alert situations. The DSC expansion sequences allow precise geographical coordinates to be transmitted, providing position accuracy to less than 1 meter. The processors are built on Firm-ASIC component technology, allowing on-chip subsystems to be reconfigured by a Function Image (FI).
www.cmlmicro.com

GNSS Receiver Module

The GM series Global Navigation Satellite System (GNSS) receiver module from **Linx Technologies** is an autonomous, high-performance receiver designed for navigation, asset tracking and positioning applications. Based on the MediaTek chipset, the module can simultaneously acquire and track several satellite constellations, including the U.S. GPS, Europe's Galileo, Russia's GLONASS and Japan's



Quasi-Zenith Satellite System (QZSS). The module provides exceptional sensitivity even in dense foliage or urban canyons, company officials said. Hybrid ephemeris prediction can be used to achieve cold start times of less than 15 seconds. The system is self contained, requires only an antenna, and powers up and outputs position data without software setup or configuration.
www.linxtechnologies.com

Industrial Panel PC

The IPPC 1960T from **Nexcom** is a fanless, heavy industrial panel PC designed for harsh operating conditions. The PC features the third-generation Intel Core i5-3610ME processor, a 48-centimeter SXGA 4:3 LCD industrial touch display, various expansion and industrial fieldbus interfaces, a metal chassis and an IP66-rated aluminum front panel. Up to 8 GB of DDR3 1333/1066 memory is included. The front panel protects against airborne dust, chemicals and water ingress.

www.nexcom.eu

Mounting Belt Stud

Peter Jones added a Klick Fast stud to fit MOTOTRBO products. The stud slides into the belt clip slot on the battery and locks into place to provide an instant quick release and ratchet mechanism via the mounting belt dock.

www.peterjonesilg.co.uk

Broadband System

Cambium Networks launched ePMP, a wireless access platform for connecting underserved and unconnected global communities. The point-to-multipoint (PMP) system operates in the 5 GHz frequency band, delivering throughput of at least 200 Megabits per second (Mbps) using two-by-two multiple input multiple output (MIMO) orthogonal frequency division multiplexing (OFDM) technologies. Intelligent bandwidth algorithms direct bandwidth where it is needed, and GPS synchronization makes the system ideal for networks with high reliability and quality of service (QoS) requirements. The system can be deployed in a point-to-point configuration. The product provides rural, municipal, satellite office, primary and redundant connectivity; video surveillance backhaul; device and site monitoring; LAN extension; and leased line replacement.

www.cambiumnetworks.com

Digital Dispatch Console

RediTALK from **Omnitronics** is a PC-based digital dispatch console supporting analog, digital, conventional, trunked, open standards and proprietary systems. Built on radio over IP (RoIP) infrastructure, the console does not use a server or switch and can be placed anywhere on the network. The interface can be customized and features intuitive touchscreen controls. Advanced digital functions such as individual calls, text messaging and GPS are standard.

www.omnitronicsworld.com

P25

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P25: What's Next for the Global Standard?, the latest e-book from RadioResource Media Group, is packed with invaluable information for every agency that uses Project 25 (P25) technology, is planning a P25 upgrade, or is considering a new P25 system. The e-book is divided into 5 sections containing 26 chapters that examine P25 and LTE integration, interoperability developments, CSSI and DFSI console interfaces, P25 Phase 2, international deployments, security issues, technology advances, and much more.

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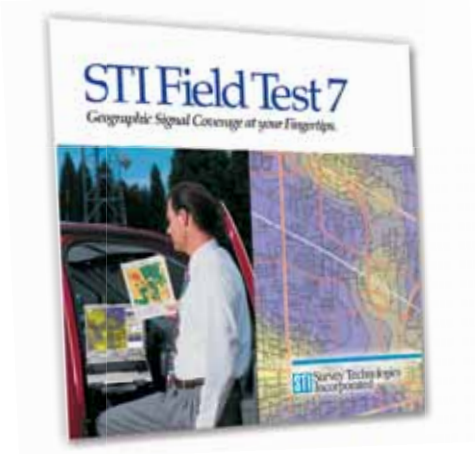

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2. Which of the following best describes your organization?
❑ A Mobile Communications Dealer/Reseller
❑ B Distributor, Agent, Importer, Exporter, Rep
❑ C Commercial Trunked Radio and Other Wireless Service Providers
❑ D Government/Public Safety/Military
❑ E Business/Industrial/Transportation User
❑ F Communications Manufacturer/OEM/Software Developer
❑ G Engineering and Consulting Firm
❑ Z Other—please specify _____

3. What is your function?
❑ A Corporate/Senior Management
❑ B Operations/Administration Management
❑ C Technical/Engineering Management
❑ D Sales/Marketing
❑ Z Others Allied to the Field—please specify _____

4. Do you recommend, specify or purchase mobile communications equipment or services?
❑ A Yes ❑ B No

5. Is there any servicing of mobile communications equipment at your location?
❑ A Yes ❑ B No

6. In what areas of the world do you do business? (mark all that apply)
❑ A Western Europe
❑ B Eastern Europe
❑ C Middle East
❑ D Asia
❑ E Australia/New Zealand
❑ F Africa
❑ G Mexico/Central and South America
❑ H United States/Canada

7. What wireless technologies does your organization plan to use/buy over the next 2 years? (check all that apply)
❑ A Conventional Two-Way
❑ B Cellular/Personal Communications
❑ C Paging/Messaging
❑ D Mobile Data
❑ E SCADA/Telemetry
❑ F Microwave radio
❑ G Trunking
❑ H Location Technologies
❑ I Tone Signaling (ANI, Encryption, etc.)
❑ J Interconnect
❑ K Satellite
❑ L CAD
❑ M Wireless Broadband
❑ Z Other _____

Q413

By Peter Clemons

TETRA's Role in a Digital, Broadband World

The global mobile radio industry has embraced the benefits of moving from analog to digital communications, and the switch should largely be completed before the end of this decade.

TETRA was at the forefront of this digital trend during the late 1990s and early years of this century. The standard has been adopted in more than 125 countries providing secure, reliable, high-capacity voice and data services. More than 3 million TETRA terminals have now been sold.

Of course, TETRA has had — and continues to have — worthy rivals that have pushed it hard along the way. Matra Communications withdrew early on from TETRA standardization to develop a rival technology, named TETRAPOL. TETRAPOL rolled out successfully in a limited number of global markets. Matra has since become part of EADS and then Cassidian, the main network supplier to the German government rolling out the largest TETRA network in the world.

In North America, the Project 25 (P25) standard was chosen by authorities to solve the acute lack of interoperability among the radio solutions of federal, state, tribal and local authorities serving a diverse range of urban, suburban and rural communities. P25 adoption was encouraged and accelerated by the U.S. government through a combination of legislation and grants.

In 2005, Motorola launched its MOTOTRBO solution, based on the emerging European Telecommunications Standards Institute (ETSI) Digital Mobile Radio (DMR) standard. Other companies have developed solutions, fully compliant to the DMR standard. DMR Tier 2 is seen as a digital replacement for the large, global installed base of conventional analog radios, offering clear benefits and additional capacity for low-tier, traditional PMR users; whereas DMR Tier 3 is targeting the analog trunked radio market — MPT 1327 and logic trunked radio (LTR) — and could be seen as a potential threat to TETRA and P25 in some vertical markets.

And then we have Long Term Evolution (LTE), public safety's planned broadband technology. Although European public-safety operators are looking beyond TETRA to satisfy their requirements, the non-European public-safety sector continues to choose TETRA, with the exception of North America. The majority of TETRA deployments around the world are now outside of public safety.

The transport sector has long embraced TETRA. The majority of airports, metros, mass transit systems and light rails choose it for their communications because of its unique functionality and resilience in demanding environments. Railways outside Europe now have a choice between TETRA and GSM-R because of TETRA's enhanced functionality and capacity to handle signaling and short data. Utilities are also deploying TETRA, dispelling the myth that the technology is unsuitable for low-density areas. TETRA's secure simultaneous voice and data capability adds protection for lone workers and remote control of key assets through supervisory control and data acquisition (SCADA) and telemetry applications. A wide variety of intrinsically safe radios makes TETRA a viable candidate for oil and gas and industrial applications.

The standard is also still evolving. ETSI recently extended the standard into the VHF bands, opening up new markets where coverage might still be an issue. TETRA Enhanced Data Service (TEDS) is now available from multiple suppliers. Customers requiring higher speed data applications over secure networks during the next decade or so can purchase TETRA networks in the knowledge that the vast majority of existing applications will be protected and enhanced. Depending on spectrum availability, TETRA Release 2 will provide sufficient bandwidth and speeds for an increased use of data within professional sectors. TETRA is a good fit as the secure component of a fully integrated, advanced multibearer solution.

It will take a long time for LTE to replace TETRA. Direct mode and some group call features are currently being studied in LTE Release 12, and mission-critical voice could be included in Release 13. Even the most optimistic supporters concede that serious wide-area solutions are unlikely to be available before 2018 – 2020, if at all. It is still far from certain that LTE will ever replicate the full functionality available on TETRA networks.

The long-term future for a large section of global PMR users in transport, utilities, and oil and gas will see TETRA at the core of advanced IP-based, fully integrated critical communications solutions. Customers do not want to take unnecessary risks when choosing their critical communications. They like standards, and they like proven, global technologies that satisfy basic core requirements. ■

Peter Clemons has been reporting on the global PMR industry since 1996. He has worked with a number of PMR vendors over the years, and written and presented extensively in major events around the world. Last year he set up his own next-generation consulting company, Quixoticity, and since May, he is head of TETRA business for the Americas at Hytera Mobilfunk. Email comments to editor@RRMediaGroup.com.

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