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Germany's TETRA Network

An Interview with the Operator

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End of Year Brings Broadband Decisions

New developments continue on the broadband front for public protection and disaster relief (PPDR). Particularly in Europe, the fourth quarter of the year is important as the World Radiocommunication Conference (WRC) 2015 gets underway 2 – 27 November in Geneva. The conference, held every three to four years to review and revise radio regulations, is expected to establish spectrum for PPDR Long Term Evolution (LTE) networks across Europe.

The LTE direction in Europe has been uncertain because of a lack of established spectrum for broadband public-safety networks. Although some operators moved forward with mobile virtual network operator (MVNO) models and the United Kingdom is in the middle of a tender for a commercial operator for public-safety broadband service, others are waiting for a spectrum decision before moving forward.

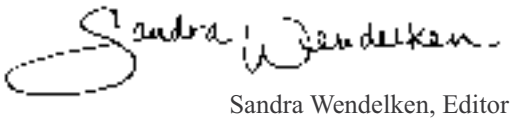
Nokia announced its presence in the PPDR broadband arena in October, re-entering the market after selling its professional mobile radio (PMR) business and exiting the mission-critical communications industry in 2005. The company obviously sees potential in the market, and the timing a month ahead of WRC is no coincidence.

In Australia, a commercial broadband solution offers the best way forward for public-safety agencies, a draft report from the country's Productivity Commission said. The draft report cited lower costs, faster launches, and a higher likelihood of adopting technology upgrades as the main benefits of a commercial approach. A commercial approach carries higher risk of supplier lock in, but good procurement processes and careful contracting can reduce the risk, the report said. A final Productivity Commission report is scheduled to be released in December.

South Korea also is conducting a public safety LTE pilot this year. The US$45 million pilot network will offer testing and validation of the country's planned nationwide public-safety LTE network, scheduled to be deployed by 2017.

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

With developments around the world moving forward, the last quarter of the year will likely be buzzing with mission-critical LTE activity. Watch our new website at RRImag.com and our semimonthly WORLD NEWS e-newsletter for the latest developments.



Sandra Wendelken, Editor
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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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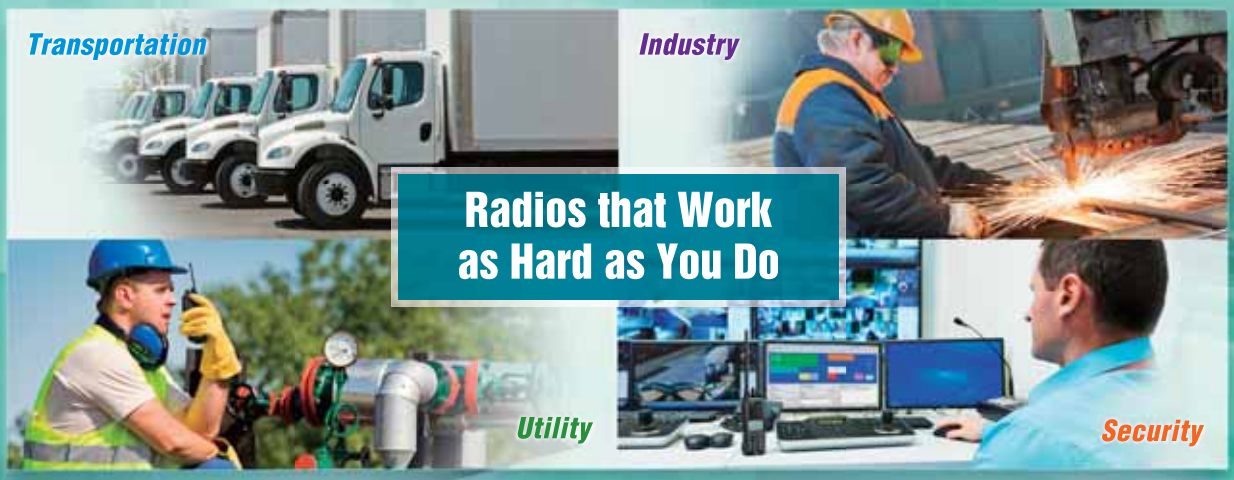

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ASIA/PACIFIC

Australian Report: Commercial Networks Are Best Option for Public-Safety Broadband

A commercial broadband solution offers the best way forward for public-safety agencies (PSAs) in Australia, a draft report from the country's Productivity Commission said.

The draft report cited lower costs, faster launches, and a higher likelihood of adopting technology upgrades as the main benefits of a commercial approach. A commercial approach carries higher risk of supplier lock in, but strong procurement processes and careful contracting can reduce the risk, the report said.

Earlier this year, Australia's Productivity Commission began a cost-benefit analysis on the best way to deliver mobile broadband capability for PSAs in the country by 2020. Written comments about the report are due 28 October. A final report is scheduled to be released in December.

The commission evaluated the costs of several specific delivery options during a 20-year period. The cost of a dedicated network was estimated at about A$6.1 billion (US$4.3 billion) compared with A$2.1 billion (US$1.5 billion) for a commercial option. Even the lowest-cost hybrid option is twice as expensive as a commercial option, the report said.

"The benefits of each option are not expected to vary markedly, because the options under evaluation have been designed to deliver a similar level of public-safety mobile broadband (PSMB)

Sydney, Australia

capability," the report said. "On that basis, the cost evaluation is likely to provide the best guide to net community benefit for each option."

The report said trials would provide an opportunity to develop confidence in a commercial approach.

"There is considerable evidence to suggest that it is technically feasible for commercial carriers to deliver priority access for PSAs without dedicated spectrum," the report said. "Given the additional costs involved, the commission considers that the case for using dedicated spectrum to deliver PSMB (that is, a hybrid approach) is weak."

Only if pilots and trials of commercial networks fail would it be appropriate to consider using dedicated spectrum to deliver PSMB services. LMR voice networks will continue to be available for at least the next five to 10 years in all jurisdictions, creating a relatively low risk environment for experimentation with new technology, the report said.

Further, commercial carriers are expected to minimize PSMB operating costs by spreading certain costs, such as maintaining base station site equipment, across a larger number of users. The report did not model those efficiencies because of data limitations. However, the input assumptions used in the quantitative analysis were adjusted so that operating costs were lower under a commercial option, the report said.

"Any state or territory government that wishes to access spectrum for PSMB is not dependent on the outcome of this process — they can apply to Australian Communications and Media Authority (ACMA) for an apparatus license, or obtain a spectrum license either at auction or from an existing license holder," the report said.

The report said competitive procurement is essential. Splitting up tenders, leveraging infrastructure assets and insisting on open technology standards can help governments secure value for money. Achieving interoperability will require jurisdictions to agree on common technical standards. PSAs will also need to adapt their operations to make the most of PSMB. This includes protocols for sharing information and network capacity among agencies.

EUROPE

BRUSSELS — Fifteen European countries said they are committed to work together to establish a common roadmap for the evolution of European Union (EU) public protection and disaster relief (PPDR) radio communications via the BROADMAP partnership.

The BROADMAP partnership created a proposal to answer the Horizon 2020 DRS-18 call for proposals. Specifications and transition road mapping of future broadband PPDR radio communications in the EU will be available in 2017, if the proposal is agreed by the Horizon 2020 evaluation process.

In August, Public Safety Communications Europe (PSCE) submitted the proposal, which intends to take the first steps toward future co-funded procurement necessary to enable "interoperable next generation of broadband radio communication systems for public safety and security" to enhance interoperability across borders and improve PPDR service to European citizens.

BROADMAP proposes to collect and validate PPDR organizations' existing requirements to establish a core set of specifications and a roadmap for procurement to achieve future evolution of EU broadband applications and interoperable radio communications solutions for PPDR.

The partnership comprises 15 potential buyers/end users representing

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KBR Awarded First Contract in U.K. Public-Safety Broadband Tender

The U.K. Home Office announced the first Emergency Services Mobile Communications Program (ESMCP) contract was awarded for Lot 1 to Kellogg Brown & Root (KBR) as the delivery partner for the program.

Negotiations with the preferred bidders for the remaining contracts — Motorola Solutions (Lot 2) and EE (Lot 3) — are continuing and contract awards are expected in the fourth quarter.

Atkins, Lockheed Martin and Mott MacDonald also competed for the Lot 1 contract. The Home Office announced in July that only one potential commercial operator, EE, and one potential user services provider, Motorola Solutions, were still in the running.

The ESMCP will replace the existing Airwave TETRA private network, which provides mainly voice communications, from mid-2017 as current contracts expire. The new Emergency Services Network (ESN) will use a commercial 4G network to also deliver broadband data services.

KBR will be responsible for transition support, cross-lot integration and user support. That includes program management services for cross-lot ESN integration in

transition, vehicle installation design and assurance, training support services and delivery support during the implementation of the ESN.

The company will deliver the program management and training working with Mason Advisory, Piran, MacNellies and Amethyst on other aspects of the program. The contract is scheduled to run for more than four and a half years and will be delivered by a team that includes a range of experts from both the public sector and industry, including the emergency services that will use the ESN.

"We are determined that our goal to provide the U.K.'s emergency services with the best communications network in the world is implemented as quickly as possible, and I am delighted that I can now announce we have awarded the first contract," said Minister for Policing, Crime, Criminal Justice and Victims Mike Penning. "We remain on course to sign further contracts later this year.

"Making sure our emergency services have the best tools to help them do their job is paramount. As well as offering the emergency services much more capacity, flexibility and functionality than the old system, the new network will also save the taxpayer well over £1 billion (US$1.5 billion) over the next 15 years."

KBR is an international operator specializing in technology-driven engineering, procurement and construction, and is a market leader in the successful program management and delivery of large infrastructure schemes. Company officials said revenue associated with the project is estimated to be £30 million (US$46.2 million). KBR provides support services to the U.K. Metropolitan Police.

Mission-critical voice will not be added to the Long Term Evolution (LTE) standard until Release 13, scheduled to be completed in the first or second quarter of 2016. Manufacturers generally take at least 18 months to add the latest standards into products, industry experts said.

EU member states and associated countries. Eight represent the ministry within the country responsible for public safety, and seven represent end users and network operators. In addition, 48 additional PPDR organizations signed letters of support for the project, expanding geopolitical coverage within seven additional EU and associated countries and support from the U.S.

The proposal is now with the Horizon 2020 evaluation process, and results are expected in early in 2016. If the proposal is accepted, the group will be the broadest team of EU public-safety end users ever to formalize requirements, specifications, solutions and roadmaps that will lead toward new interoperable broadband capabilities deployed with an operational expectation within eight to 10 years.

PSCE will hold its next conference 9 – 10 December in Oxford, United Kingdom. Attendees will discuss the outcomes of spectrum decisions made at the World Radiocommunication Conference (WRC) 2015, security and resilience of next-generation networks, steps to achieve broadband capabilities for PPDR, the potential for 5G, and data protection and privacy issues.

BRUSSELS — ASTRID, the Belgian TETRA operator for the emergency and security services, announced the number of communications devices connected to its network recently topped 70,000. Each year, 12 million minutes of radio communications are processed through the ASTRID network.

A total of 70,344 terminals, radios and pagers are now connected to the ASTRID network. Radios are used for both voice contact and for transmitting data during routine tasks or large-scale disasters. Pagers primarily notify volunteers for the fire brigades, civil protection and medical service to report to a local base or hospital.

ASTRID radios are standard for workers throughout the security chain in Belgium. ASTRID users include emergency and security services such as the local (24,555 radios) and federal (5,057) police, fire brigades (29,519), medical services (2,197), Red Cross

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Nokia Re-Enters Public-Safety Market, Launches Partner Program

Nokia is re-entering the public-safety communications market after a 10-year hiatus with Long Term Evolution (LTE) products that include added public-safety features and functionality.

Nokia executives said the company will offer an end-to-end public-safety product portfolio based on Third Generation Partnership Project (3GPP) standardized public-safety features and will open a partner business model to help the company expand the scope of its customer base and solutions.

The public safety LTE offering is built on Nokia Networks' radio access network (RAN), evolved packet core (EPC), voice over LTE (VoLTE) solution, IP multimedia subsystem (IMS), core in a box solution, subscriber data and device management, network management, self-organizing networks and Nokia Liquid Applications technology.

"As a market leader in LTE, we want to capture this market plan," said Hermann Rodler, Nokia global head of public safety. "We want to address this market. We have added features into the product roadmap, and we will launch additional products

such as Network in a Box."

In August, Nokia announced its Network in a Box (NIB), which integrates the BeOn communications suite offered in the U.S. market by its public-safety partner Harris. The compact, rapidly deployable LTE NIB now offers BeOn LMR applications, including push to talk (PTT), situational awareness, group messaging, location tracking and streaming video over a public-safety broadband LTE network. Nokia and Harris partnered in 2010 to develop broadband public-safety equipment.

The company launched the product worldwide in October at the Critical Communications Middle East conference and exhibition in Dubai, United Arab Emirates (UAE). The Middle East is a target region for the new offering, said Rodler. The United States, United Kingdom, South Korea and Australia are all additional markets where public safety LTE is expected to roll out soon.

Nokia has a public safety LTE contract in Qatar and several other agreements in the region that it has not yet publicly announced. The company also is supplying equipment to the U.S. New Jersey early builder public safety LTE project through partner Oceus Networks.

"We are returning," Rodler said. "We have mainstream LTE technology, and that's our core technology. … We know we don't have all the products in our hands, so Nokia wants to be part of the public-safety ecosystem and work with partners."

Release 13 of LTE, which enhances proximity services or direct mode communications as well as group communications or PTT, is slated to be completed in quarter one or two of 2016. Once the first public-safety features are standardized, product development and trials will begin, followed by commercially available products.

EADS, which is now Airbus Defence and Space, acquired Nokia's professional mobile radio (PMR) TETRA and Tetrapol business in 2005.

(1,180), civil protection (790), defense (720) and customs (616). Those users represent 93 percent of the total number of terminals connected.

Local emergency planning departments and community stewards are increasingly being supplied with ASTRID radios. Private companies involved in public security, including security services, hospitals, utility companies and airports also use the network. ASTRID's high-speed data service Blue Light Mobile will play an increasing role in the efficient distribution of information in the field.

Every day, the ASTRID radio network processes an average of 57,000 group calls. Each of those calls involves an average of 37 people in contact with each other. That's equivalent to more than 2 million contacts between emergency service providers per day. About 6,400 messages are sent via the paging network each day.

INTERNATIONAL

LONDON — The TETRA + Critical Communications Association (TCCA) introduced a formal testing process for the TETRA Peripheral Equipment Interface (PEI), which the association said will accelerate the introduction of new services over TETRA networks.

The TETRA Interoperability (IOP) testing and certification process is an independent and tightly controlled process developed and managed by the TCCA to ensure a truly open and interoperable multivendor market.

An increasing number of manufacturers and application developers are looking for assured compatibility of peripheral equipment to deliver extended value on TETRA networks and terminals. The approval of TETRA PEI testing by the TCCA Technical Forum (TF) means that TETRA terminal manufacturers can obtain an official IOP certificate showing that their implementation of the PEI protocol stack complies with the European Telecommunications Standards Institute (ETSI) TETRA PEI standard.

This certificate will not only help the terminal manufacturers, but also the application developers, operators and users who have invested in TETRA. Users can be confident that products awarded an IOP certificate

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have been rigorously tested for conformance, and that the functions listed in the certificate fully meet the TETRA standard. This allows users selecting equipment from a number of suppliers to reduce the amount of system integration and testing, TCCA officials said.

"The IOP process has created a large, global TETRA marketplace, which in turn has driven up functionality and driven down prices," said Phil Kidner, CEO of TCCA. "This latest addition to interoperability testing will further benefit both manufacturers and users."

The TETRA TF provides a general forum for technical knowledge exchange. It develops and oversees the TETRA IOP and coordinates user and operator input with ETSI, which maintains the TETRA standard. Independent testing house ISCOM carries out all TETRA IOP testing. TCCA members can now request an IOP test session for testing the PEI. The testing can be done either in a dedicated PEI test session or as part of another test session for the TETRA Air Interface or Direct Mode Interface. After each session, the testing house analyzes the test results and issues a detailed official IOP certificate.

Test schedules and certificates are posted on www.tandcca.com.

CENTENNIAL, Colorado, USA — RadioResource Media Group launched a new website. The new RRImag.com offers improved user features; more resources; a clean, updated look; and the latest technology platform.

The site is based on HTML 5.0 and works on any device from a PC to a smartphone to a tablet computer. Site organization was improved by adding a topics pull-down menu that groups news and features by current industry categories such as public safety, broadband, regulatory, critical infrastructure and several others.

The site is easy to navigate with links to most-read stories, editor's picks, and the digital editions of *MissionCritical Communications* and *RadioResource International* magazines on the right-hand side of the page. Readers will also find it much easier to comment on stories by scrolling to the bottom of a story and adding comments directly to the website. Comments will go through a quick approval process.

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Private vs. Commercial for Data Networks

Mission-critical communications firms are improving field productivity and safety through private mobile data networks using a mix of technologies.

By Renner Vaughn

During the past year, crude oil prices have fallen from more than US$90 per barrel to less than US$50. In a business environment dominated by declining prices, improving the productivity of oil field workers — also known as company men, pumpers or roustabouts — has become a paramount concern for upstream oil companies, perhaps second only to worker and environmental safety.

Mobile data access can increase oil field and utility worker productivity by turning vehicles into offices with direct communications links to wells and other remote assets. By reducing vehicle miles driven and providing a lifeline in areas without cell coverage, mobile data improves field worker safety. Mobile data in the field can also enhance environmental safety by decreasing response times to incidents such as leaks.

To understand how mobile data can enhance roustabout productivity, look at the life of an oil field worker without mobile data access. Typically, a field worker will drive a predefined circuit of well pads and wells. In many cases, the pad or well requires no attention. In some cases, the roustabout may need to take and make note of flow, pressure, temperature and volume measurements or supervise the transfer of crude oil to a hauling truck. In a few cases, the well or pad will require onsite work.

Because oil fields are often in vast, remote areas with lease holdings that are not contiguous, a roustabout driving a circuit will clock many hours of windshield time and possibly hundreds of miles every day. In many cases, these areas lack cellphone coverage or have coverage limited to major highways that may be miles away. In areas of extreme heat, such as Texas, or cold, such as North Dakota and Canada, it is standard procedure for roustabouts to never turn off their vehicles, because a failure to get a truck started again can be fatal.

Productivity and Safety

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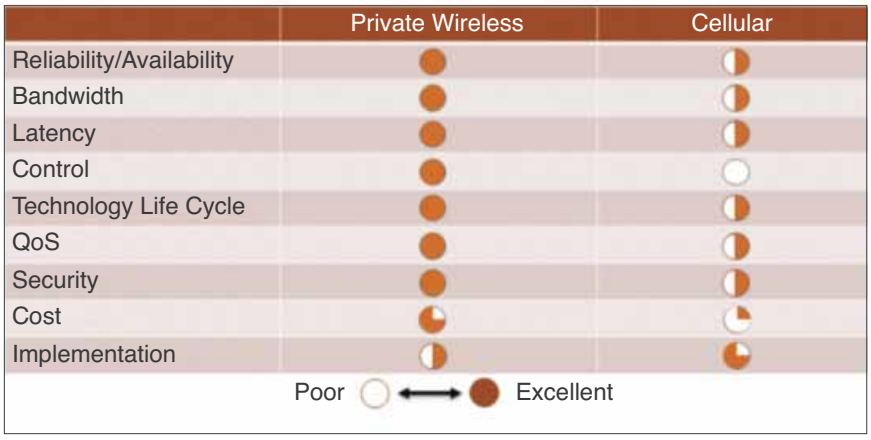

driving to all wells in inventory and production in his service area, a worker can park in the oil field where there is mobile data access and pull information from all the well pads and wells.

By eliminating the need to drive a daily circuit, upstream oil and gas companies can monitor all pads and wells in a field with fewer workers. In addition to reducing personnel costs, lowering the number of miles driven on a daily basis decreases fuel and vehicle maintenance expenses, which can be substantial. Even if a company's safety policies require that pads or wells be visited daily, field workers with mobile data access can prioritize the order of the circuit and visit the wells requiring maintenance first.

Additionally, fewer miles driven means better worker safety. According to the Bureau of Labor Statistics, oil and gas field workers suffer 8.5 fatalities per 100,000 workers annually versus the national average of 3.3 fatalities per 100,000 workers. The message is clear — working in upstream oil and gas is significantly more dangerous than typical employment. Of oil field worker deaths, 42 percent were because of motor vehicle accidents. Because there is a causal relationship between miles driven and motor vehicle accidents, less driving will generally mean fewer oil and gas field worker deaths.

Using his vehicle as a virtual office, an oil field worker can read and record flow, pressure, temperature and volume measurements from well pads and wells directly on a laptop or tablet computer. Entering information directly into a computer eliminates the transcription errors inherent in recording information in the field on clipboards and driving back to an office to enter the written notes into a database.

Mobile data enables workforce management suites that increase mobile worker productivity with in-field dispatching, work progress monitoring, and reporting and analytics. On-demand field operations reports provide visibility into real-time data from multiple sources, allowing supervisors to quickly identify problems and prioritize on-site visits. When a pad or well requires on-site work, the roustabout can go directly to that location, rather than driving a complete circuit of wells. Remote equipment diagnostics enables field workers to use audio and video to communicate with engineering operations in real time, hastening problem resolution. During a well shut-in, this minimizes lost production, and during a leak, it reduces the environmental damage and resultant regulatory penalties.

Many oil and gas fields are in remote areas with no cellular coverage.

By eliminating the need to drive a daily circuit, upstream oil and gas companies can monitor all pads and wells in a field with fewer workers.

With mobile data, workers in the field can remain in voice contact using VoIP and email contact with the dispatch center, offering additional safety improvements beyond reducing the number of miles driven.

Network Comparisons

A fundamental choice upstream oil and gas companies must make is if they want to subscribe to a cellular data service or if they want to build a private wireless network. In areas without cellular service or where cellular service is limited to major highways, there's not much choice — private wireless it is. But even in areas with complete cellular coverage, there are compelling reasons for upstream oil and gas companies to implement private wireless broadband networks.

Reliability/Availability. Private wireless can be designed and operated to deliver five nines of system availability. The oil and gas company specifies design and redundancy requirements and controls the operations and maintenance strategy and structure, as well as network access.

Cellular data services are less reliable. A recent study by RootMetrics found Verizon Wireless' network has 99.2 percent reliability, while AT&T's network was 98.3 percent reliable under normal conditions. That translates into five hours of downtime on Verizon and 12 – 14 hours of downtime on AT&T per month. Because cellular network operators serve mainly consumers, oil and gas companies have little influence on network design or operations and maintenance. For example, cellular network maintenance windows tend to open at midnight, an inconvenient and potentially costly time for oil and gas companies to implement configuration changes, because of overtime. Further, cellular networks are likely to be unavailable during force majeure events because, even if the network is operational, it will likely be swamped by consumer data traffic.

Bandwidth. Private wireless networks provide more than 10 Megabits per second (Mbps) of bidirectional

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bandwidth at each network device. Cellular Long Term Evolution (LTE) networks provide 5 – 12 Mbps downstream and 2 – 5 Mbps upstream. Earlier generations offer lower bandwidth.

Latency. Private wireless networks average 1 microsecond per hop. Cellular LTE networks experience 50 – 200 microseconds per hop. Earlier generations may have higher latency.

Control. With private wireless networks, the oil and gas company designs and implements the network based on its needs. With cellular networks, the company has little control over the network.

Technology Life Cycle. Private wireless networks can have a lifespan of 15 years or more, and the oil and gas company controls end-of-life and next-generation technology. Cellular networks have a lifespan of less than 10 years, and the carrier controls end-of-life and next-generation technology.

Quality of Service (QoS). With private wireless networks, the oil and gas company controls the network's QoS. With cellular LTE networks, QoS may be available depending on the carrier. However, the carrier service-level agreements (SLAs) may contain carve outs for force majeure events, meaning that QoS priorities may not apply when the company most needs the network. Additionally, earlier-generation cellular technologies don't support QoS.

Security. Standard, IP-based, enterprise-class security is built into private wireless network products, and logs are readily available for compliance and forensics. Security services on cellular networks may incur additional costs, and log access may vary by carrier and contract.

Total Cost of Ownership. Private wireless networks incur higher initial costs because of infrastructure buildout, offset by opex savings during the life of the field network. Private data break-even versus cellular data services generally is less than three years, including security and QoS costs. Cellular networks incur a higher total cost because of monthly fees. Data usage and services, such as security and QoS, may add costs, and fees can increase at any time.

Implementation Timeframe. Private wireless networks take up to six months to build, depending on the scope and complexity. Cellular networks can take as little as one day to a few months to implement, depending on scope and complexity.

While it is tempting to declare that one technology fills all private wireless network needs, a more realistic approach is to optimally combine several technologies.

Technology Variety

Upstream oil and gas companies have a number of technologies at their disposal for designing and deploying private broadband wireless networks, including broadband mesh, broadband point-to-multipoint (PTMP) and sub-l GHz PTMP. While it is tempting to declare that one technology fills all private wireless network needs, a more realistic approach is to optimally combine several technologies.

Broadband mesh is an excellent choice for covering the core of the oil field where its capability to automatically select the best route through the network from multiple RF paths, channels and bands provides superior reliability and throughput. Broadband mesh routers also provide enterprise-class security capabilities such as firewalls and IP security (IPsec) virtual private networks (VPNs).

Oil and gas fields may be located many miles from the upstream operator's nearest field operations center. As a result, long-distance broadband PTMP links are often used to provide backhaul between the wireless mesh field network and the operations center.

In the field, there may be remote well pads or wells that are not economically feasible to connect with broadband mesh. There may also be off-grid pads and wells that cannot supply enough electrical power to support broadband mesh routers. In both cases, power efficient, sub-1 GHz PTMP radios can provide a solution. These devices have traditionally been narrowband radios that supported proprietary communications protocols and provided little or no software functionality. However, a new generation of sub-1 GHz PTMP radios is emerging that supports higher data rates, IP networking and enterprise-class security capabilities. These products complement broadband mesh routers and PTMP radios, filling a lower performance and power consumption niche while providing reliability and security consistent with the technologies used elsewhere in the network.

In all cases, to support mobile data connections, the chosen technology must support standard 802.11 Wi-Fi interfaces, either directly in the case of broadband mesh routers, or via access points when PTMP is used without mesh routers.

With mobile data access, oil field worker productivity can be increased, worker safety improved and environmental safety enhanced. Choosing a network to support mobile field data presents upstream oil and gas companies with a classic rent versus own decision. Even when renting — using a cellular data service — is feasible, there are compelling reliability, cost, performance and security reasons to own, deploy and operate a private wireless network. When implementing a private wireless network, it's best to eschew the one-size-fits-all approach; instead, deploy a mix of broadband mesh, broadband PTMP and sub-l GHz PTMP to achieve the optimal blend of technical features and performance, as well as economics. ■

Renner Vaughn is global program lead, oil and gas, at ABB Wireless. Email comments to editor@RRMediaGroup.com.

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Construction Industrial Aviation Racing Logistic

Use Cases for dPMR

Photo courtesy Icom

Digital Private Mobile Radio (dPMR) standards are evolving, and many companies are taking advantage of the benefits of the digital technology.

By Ken Buckfield

Advances in digital technology have driven the world of professional mobile radio (PMR) during recent years, but there remains a large number of users with existing analog or partially digital systems — both conventional and trunked systems such as MPT 1327 — who don't require the more advanced features and capabilities of full digital operation. Digital Private Mobile Radio (dPMR) provides an ideal solution for those users because they can incorporate a repeater or digital trunking controller into their systems to have the option of operating in analog or digital modes.

Other users are building or renewing their systems and want to employ digital, and dPMR offers a competitive alternative that many users are choosing.

dPMR Advantages

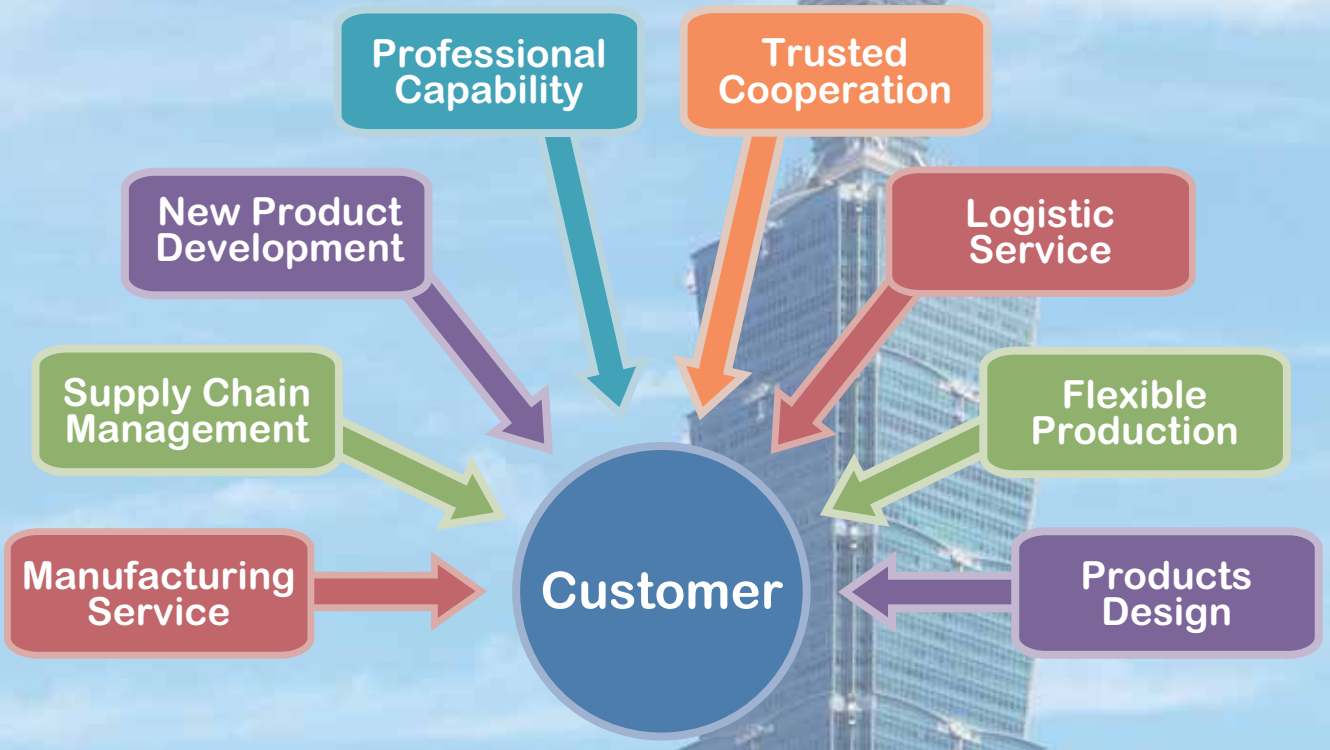
dPMR appeals to users of existing analog systems and those who only need to operate one base station and a few portables and mobiles, as well as to small radio-linked communities where the reasonable cost of dPMR equipment makes it a sensible proposition.

Another advantage of dPMR is its flexibility. For example, there are dPMR446 products that are the digital version of PMR446 in Europe, or family radio service (FRS) in the United States. There also are conventional and repeater and/or IP-linked conventional systems for small-area applications, such as within a large university campus or hotel resort. Finally, dPMR is fully scalable to trunked systems capable of providing nationwide network coverage.

The dPMR standards and accompanying modes take a little getting used to. Following is a quick summary of each.

- dPMR446, license-free operation covered by the European Telecommunications Standards Institute (ETSI) standard TS 102 490
- dPMR Mode 1, the general purpose peer-to-peer application of dPMR for all forms of licensed PMR use and part of ETSI standard TS 102 658
- dPMR Mode 2, covering base station and repeater functionality and interfaces via gateways, is part of ETSI standard TS 102 658
- dPMR Mode 3, covering the full functionality of dPMR in managed-access multisite complex systems including all the same interfaces and gateways as Mode 2

Connecting Your World



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Applications

The dPMR standard and product ranges have been used in a variety of ways, including the following examples.

dPMR446 Although dPMR446 is license free, radios currently available are typically derived from proven professional-grade PMR product lines. Users range from event organizations to highway administration entities that want the simplicity that a license-free solution provides but with the robustness of professional-grade hardware and the ability to use dPMR446-specific features such as simple status messaging. The added bonus of twice the number of channels against analog PMR446 (16 digital vs. eight analog) is another strong selling point, especially in dense built-up areas.

The Wordsworth Trust, which manages Dove Cottage — the first family home of William Wordsworth in Grasmere, England — chose dPMR446 radios to save time and effort in delivering a first-class visitor experience. The decision to employ dPMR446 resulted from research conducted by the trust into the various options available for on-site radio communications. The trust decided on dPMR because of the simple, discreet and effective means of communications it provided, the rugged construction of the radios and the dPMR digital signal option, which proved effective throughout the site, including buildings constructed from solid stone walls.

Humanitarian Community While the specific details of dPMR systems deployed by the United Nations and related agencies are confidential, Mode 2 dPMR systems are increasingly used by a number of humanitarian agencies for many applications ranging from communications training to in-field systems in specific hot spots around the world. Some agencies have also moved to standardize on dPMR for their future digital communications.

Prisons, Airports and Local Government dPMR was not

dPMR was not specifically designed as a mission-critical protocol, but it has been implemented in mission-critical sectors.

specifically designed as a mission-critical protocol, but it has been effectively implemented in mission-critical sectors, including prisons, the police service (both Mode 2 conventional and Mode 3 trunking), airports and local government authorities. Other typical users include the business and industry sector, where transport companies, the hospitality industry and others have opted for dPMR systems.

A specific example is Sharjah International Airport in the United Arab Emirates (UAE), which employs a dPMR Mode 3 trunked radio system. The system offers eight simultaneous radio channels for general operation requirements. The design goal was to provide a flexible radio communications system that supports a centralized application system for user management and monitoring, as well as maximum channel recourse availability, particularly during peak traffic hours.

dPMR's Future

dPMR has attracted attention and support within the industry from chipset and equipment manufacturers in Europe, Asia, Australia and other territories. Seventeen members of the dPMR Association offer equipment and solutions compliant with ETSI dPMR standards.

In addition to significant activity in conducting interoperability testing at all levels from radio equipment to infrastructure, chips and test equipment, the dPMR Association is also involved in the development of the ETSI standard itself and using it as the basis to develop and scale radio networks.

Where these systems have been implemented, the technical team within the association liaises with the manufacturers and, where necessary, prepares proposals to the ETSI working group for updating the standard, all of which ensures dPMR continues as an open ETSI standard. The open standard brings together multiple vendors supplying interoperable dPMR products, solutions and services across a diverse range of applications in commerce, industry, emergency services and aid agencies around the world. ■

Ken Buckfield is a management consultant with more than 20 years' experience in marketing within the radio communications industry. Email feedback to editor@RRMediaGroup.com.

Germany's Network Nears Completion

With Germany's nationwide TETRA deployment scheduled to be completed by the end of 2015, Barbara Held, head of directorate operations for Germany's Federal Agency for Public-Safety Digital Radio (BDBOS), updates *RadioResource International* on one of the world's largest TETRA networks.

RRI: Tell us about the network's coverage.

BH: With the coverage at about 98 percent of the German territory, our public-safety network is nearly complete. There are only some white spots left in the very south of Germany, in the Alpine regions of Bavaria. The region is a complex territory in topology. We expect to be done with the buildout of the Digital Radio BOS, which began in 2008, by the end of the year.

RRI: Please describe the users.

BH: For total numbers, Germany has about 244,000 policemen and more than 1.1 million firefighters. We do not have the numbers of professionals and volunteers working disaster relief and emergency services, but the Federal Agency for Technical Relief (THW) alone comprises more than 80,000 volunteers.

The network has more than 560,000 subscribers, also called registered terminals. Our agency and organization generally don't use personalized terminals. When we talk about subscribers, each terminal has a unique ID on our network. For encryption and communications purposes, it also contains an individual subscriber identity module (SIM) card. When you come to your shift, you take a terminal from the docking space. Afterwards you put it back for the colleagues of the next shift. Therefore, there are many more users than subscribers.

With the distribution of terminals, the police are the most advanced, because they function in a well-organized hierarchy mostly under the responsibility of the 16 German state governments. In contrast, volunteer firefighters are organized locally in municipalities; they have less money and fewer technical staff, so it takes longer to roll out the new technology.

RRI: Please explain the network governance.

BH: BDBOS is a federal agency that operates the network with headquarters in Berlin. We are the provider that delivers services. The agency is jointly financed by the 16 German states (Länder) and the federal government. It is led by a CEO and supervised in strategic and financial matters by a management board. The board includes one seat for the federal government and each of the 16 states. The management board decides on the strategic affairs of BDBOS digital radio, and expert groups report to the board.

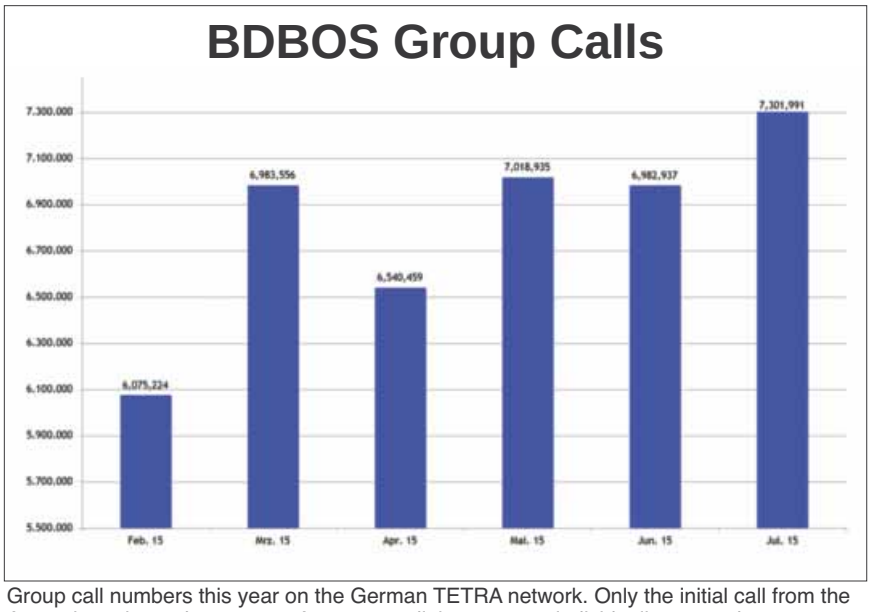
BDBOS is undergoing a complete reorganization to respond more efficiently to the challenges of the operational phase and especially to the requirements of the users. In this context, the number of permanent BDBOS employees will increase from 148 to 497 with a focus on operation and optimization of the TETRA network.

RRI: How is the network priced?

BH: The users jointly finance network infrastructure and operations, as far as the normal use of the network is concerned. There are no user fees based on number of actual users or data volume; it's basically a flat rate. We distribute the cost of infrastructure and operation of the network among all 17 partners using the network. There is a key, which gives each user the percentage for how much they have to pay for infrastructure and operation. It is more or less based on the population of a state, with the federal level always being the biggest payer. There are also some differences based on service levels; some states choose higher service levels than others. Agencies can use the network as much as they want; there are not additional charges. If an agency wants special services — mobile base stations or additional services for a special event for example — then the respective state will pay extra for that.

RRI: Can you describe the terminal certification process for the network?

BH: The agencies and organizations are responsible for tendering the terminals they need. To use a terminal wherever you are in the country, make calls or liaise with others in Germany, the terminal must adhere to TETRA and BDBOS standards. That is why we introduced a certification process, which is tedious but necessary. There is the TETRA + Critical Communications Association (TCCA) certification, which is at a generic TETRA level, and then a BDBOS certification that tests whether the terminal interoperates without problems on our network. The terminal hardware is always



Group call numbers this year on the German TETRA network. Only the initial call from the A user is registered as a case. Answers or dialogs are not individually counted.

certified together with a certain version of software. If the manufacturer implements new software, a new certification process is required.

We have established the process, and we update the underlying interoperability (IOP) documents from time to time with our clients because interoperability is a moving target. The certification is performed by a third-party company we pay.

RRI: What is the network's capacity, and has there been any network congestion?

BH: There are no issues on a daily basis. The network should be able to handle 1 million users at a time. So even if we add more devices, it will be fine. We have run into capacity issues when there were large-scale events and there was not adequate planning. We learned if there is not proper planning and with too many police or rescuers on one cell with limitations or limitations between two cells, we might experience jamming. To avoid this, we made a secondary control channel available.

The 41st G7 Summit was held at the Bavarian Schloss Elmau in June. The Elmau luxury resort is located in a steep Alpine valley about 2 kilometers from the Austrian border. For the meeting of the heads of state, the entire area was converted

into a high security zone. We had around 50,000 first responders there with nearly 20,000 users on their handhelds and mobile radios. That was a European record. Never before had so many terminals been on the air using so few cell sites. The network worked fine.

RRI: What other technologies besides TETRA are integrated into the network?

BH: The TETRA infrastructure and its integrity were delivered and implemented by Airbus Defence and Space. Some components are from other companies, but they are delivered by Airbus. The technical operator is Alcatel-Lucent. You have all kinds of suppliers for buildings and other local components, but it's mostly the states that tender and build those components. The states are also responsible for the access networks that connect the local base stations with the switches of the core network. Here you might find different models including commercial providers.

This is a big system with several hundred control centers across Germany that are organized in different ways. Some are only police or fire departments or ambulances. Others integrate the different services. They use different products because the states organize the infrastructure, so they tender the technology they want. They have different workflows and technology providers that cover those workflows with their technology.

RRI: Does the network allow cross-border communications?

BH: We were involved with Airbus, at that time Cassidian, to develop phase three of the TETRA Inter-System Interface (ISI). Now we are waiting for phase four to be established as a European Telecommunications Standards Institute (ETSI) standard, because this allows roaming from one country to the other. The current phase three would imply the registration of first responders in the host system of the other country. Because European public-safety systems work under quite different security systems, this entails a prohibitive amount of bureaucracy. While waiting for the progress of standardization of German agencies and their partners in neighboring countries — for example in Switzerland and the Netherlands — different workaround solutions for cross-border communications have worked satisfactorily.

Germany has more than 1.1 million firefighters, many of whom are served by the Digital Radio BOS radio communications network.

Currently, no trials based on ISI phase three are planned. It's very costly to do, and we have not found a solid use case that would deliver sufficient surplus value for the testing parties. We are looking forward to the next standardization phase from ETSI that might offer more features.

RRI: What are future plans for the network?

BH: We plan to harden more sites on the network. The core network will survive a power outage of more than 72 hours. The agency is assessing which base stations must be hardened with power generators to ensure a minimum running time of 72 hours for the entire network.

RRI: Do you have plans for public safety Long Term Evolution (LTE)?

BH: We don't have concrete plans, but the German states and the federal government are investigating options and monitoring the developments in other regions of the world. The Federal Ministry of the Interior initiated a working group that is discussing the topic with the 16 states' interior departments. They will present their recommendations on how to proceed later this year. Apart from that, in the different states, mainly special forces already use LTE through contracts with commercial providers but not for mission-critical communications.

RRI: How are the users adapting to the network?

BH: Most of our customers are quite happy. They are happy with the speech quality and with the fact that they can travel across Germany without changing frequencies. We have fleet mapping that is easy to handle; the technology makes it easy to select groups or redefine groups. If we have a large-scale event or emergency, incoming first responders from other regions can be easily integrated into the event group and can communicate easily.

Sometimes it is a little difficult for the volunteers to handle the terminals. They offer a lot of functionalities and they differ from manufacturer to manufacturer. Channel selection is in one place on one terminal but it is where the volume knob might be on another terminal. We are addressing that now with more training. ■

Airbus Defence and Space

The re-engineered, intrinsically safe THR9 Ex TETRA handheld offers ATEX and IEC-Ex certification with protection against physical and environmental exposure in explosion-prone areas. The

audio design offers clear sound and audibility even in noisy environments. Integrated Bluetooth technology combines with Ex-certified accessories to eliminate wires, and the battery and accessories can be changed inside the ATEX area. A global navigation satellite system (GNSS) positioning chip provides faster time to fix, greater accuracy and more reliable location information than other radios.

www.airbusdefenceandspace.com

Alinco

The DR-638 analog mobile features 758 programmable channels, full duplex operation with independent volume and squelch controls, and a variety of signaling features. The device supports four power output setting levels, including 5 to 50 watts (W) for VHF and 5 to 40 W for

UHF. Other features include a large six-character alphanumeric display, removable control head, expanded receive range including AM civil aircraft, and 250 and 350 MHz land mobile channels. The company's NXDN-format conventional DJ-NX40 digital handheld features 450 – 520 MHz coverage, 5/1 W switchable, 700 milliwatt (mW) audio output, selective calling, digital scrambling, voice activation (VOX) and scanning functions.

www.alinco.com

Barrett Communications

The Barrett 2090 ruggedized portable transceiver operates in 1.6 – 30 MHz HF spectrum with a maximum of 30 watts

(W) peak envelope power (PEP). The product weighs 5.2 kilograms (kg) and includes a 10 ampere-hour (Ah) battery. A built-in automatic antenna tuner works with a variety of portable antennas. The company's FirstLink RFDS extends the band 14 Long Term Evolution (LTE) footprint from any location over short-, medium- and long-haul distances back to the core. The product supports reach back and forward capabilities over HF radio, which extends the product's reach to hundreds of miles away without additional infrastructure and is free to air.

www.barrettcommunications.com.au

Codan Radio Communications

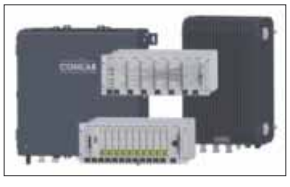
The Envoy smart radio is intuitive, reliable and advanced. With clear and dependable HF digital voice and data communications, users can communicate

anywhere, anytime, without existing infrastructure. A true software-defined radio (SDR), the device delivers new capabilities through software upgrades. With Ethernet and USB connectivity, a large high-resolution color display and multilanguage user interface — combined with performance, reliability and support — the smart radio is a new standard for digital HF communications, company officials said.

www.codanradio.com

Comlab

The MUD/RUD(19)-5 is a highly flexible and modular multiband digital repeater



system that supports up to five independent frequency bands and is designed to extend radio coverage in various networks. The system supports a variety of interfaces including Long Term Evolution (LTE). Digital fiber-fed remote or radio repeater unit configurations are available. The product supports 25 and 40 decibel-milliwatts (dBm) output power per band. Applications include outdoor coverage extension, as well as in-train, in-building and in-tunnel applications. Digital filtering allows the product to operate in channel selective or band selective mode. The company's COSweb interface provides remote control and supervision of a large number of network elements from anywhere in the world.

www.comlab.ch

EF Johnson Technologies

The TK-30 series of Project 25 (P25) portables and mobiles provides budget-

constrained small and rural agencies with reliable equipment at an affordable price without compromising on capabilities or features, company officials said. The portables have a large 4.4-centimeter color LCD that can be viewed clearly in the dark or direct sunlight. The mobile series features a 6.5-centimeter color LCD with an integrated luminance sensor that automatically adjusts the brightness of the backlight.

www.efjohnson.com

Entel

The HT700 series of intrinsically safe radios is approved to ATEX and IECEx

standards. Including both conventional and trunked variants, the radios deliver loud and crisp audio, company officials said. The devices conform to the IP68 waterproof rating, which allows total immersion in water to a depth of 5 meters for one hour. Coupled with military-standard construction, the radios are resistant to corrosion

and are designed to endure tough environments. The devices comply with the SOLAS 2012 MSC.338(91) regulation for intrinsically safe radios used by firefighters on board ships.
www.entel.co.uk

Harris

The XL-200P portable is a small, full-spectrum Long Term Evolution (LTE)-capable radio. With a new, ground-up design, the radio is rugged and easy to use. The radio provides single-band and multi-band capability, access ranging from LMR to broadband, and voice and data capabilities. Features include an intuitive user interface, unparalleled audio, extended battery life, standard Bluetooth, GPS and Wi-Fi connectivity.

www.harrisradio.com

Hytera Communications

The PD362 is an open-standard Digital Mobile Radio (DMR) device that provides quality voice communications in a pocket-sized design approved to IP54 and Mil-Std 810 standards. The 2 ampere-hour (Ah) long-lasting battery yields about 12 hours of service under a 5-5-90 duty cycle in digital mode. The radio is ideal for small organizations looking for a cost-effective way to migrate to digital communications, company officials said.

www.hytera.us

Icom

The IC-F1000D/F2000D series is a compact VHF/UHF handheld radio combining analog FM and IDAS digital modes with auto sensing functions. IDAS digital mode uses 6.25-kilohertz narrowband FDMA technology and offers a choice of the NXDN digital protocol or the European Telecommunications Standards Institute (ETSI) digital Private Mobile Radio (dPMR) protocol with common hardware. The series features rugged IP67 dust and waterproof protection, voice announcement, 800 milliwatt (mW) loud audio and voice activated (VOX) hands-free capability. Integrated motion detection, lone worker and man-down functions enhance worker safety. A digital license-free variant, the IC-F29DR, complies with the dPMR standard, as well as the IC-F1000/F2000 series as analog FM mode complementary models.

www.icom.co.jp

JVCKENWOOD

The NX-5000 series is available in the Europe, Middle East and Africa (EMEA)

region. The versatile portable and mobile radios support multiple digital formats, including NXDN conventional and trunking, and Project 25 (P25) Phases 1 and 2, as well as FM analog. The radios also

support the latest NEXEDGE generation, Gen2 the Enterprise Network Solution, which is capable of linking up to 1,000 sites or 24 networks and can accommodate 4,000 channels with 512 channels per zone and 128 zones. Other features include a large thin film transistor (TFT) color display, GPS capability, Bluetooth for hands-free operation, 56-bit data encryption standard (DES) and a 256-bit advanced encryption standard (AES) option. Active noise reduction (ANR) provides superior voice quality, and a memory card slot increases voice and data memory capacity. All models meet or exceed Mil-Std 810 C/D/E/F/G and IP68 immersion standards.

www.kenwood.com

Klein Electronics

The SEAL two-way radio from Klein is waterproof to IP67 standards and meets military specifications. Features include two-tone, five-tone and MDC1200 signaling.

www.headsetusa.com

On Demand Communications

The STACS RM system supports Project 25 (P25), digital and analog radios,

including trunked radio systems, in any combination for public safety, military, amateur and commercial applications. Communications staff can monitor radio communications in the field from anywhere in the world with an Internet connection in real time. The units can connect to a radio at a central repeater location or integrate with a STACS IH or field unit and portable radio. By connecting a second STACS RM to the field unit or a visiting agency's communications system, instant communications between disparate radio systems is possible regardless of frequency or modulation. Windows and Android radio over IP (RoIP) clients monitor and participate in radio communications.

www.stacsondemand.com

Quanzhou Risen Electronics

The RS-629D is a digital/analog dual-mode Digital Mobile Radio (DMR) device

that ensures a smooth analog-to-digital transition. The radio works in VHF, UHF and customized frequencies and complies with DMR's two-slot TDMA protocol. Functions include call digital encryption, individual call, group call, all call, messages and more.

www.recentchina.com

RadioData

The DIPRA Digital Mobile Radio (DMR) Tier 3 vehicular radios — MS2217D for low VHF and MS2221D for high VHF —

include a transceiver, handset, optional GPS receiver and a DECT unit to receive and set up calls outside the vehicle. The handset's multiline display and alphanumeric keypad facilitate reading and writing of status and text messages. Voice communications can operate in full duplex mode. Variants are available as data modems (DM22xyD) with an Ethernet interface, IPv4 protocol for supervisory control and data acquisition (SCADA) applications, and a serial RS232 interface with AT command set for packet data.

www.radiodata.biz

Royal Communications

The Micom RDP-3-DHS (Rapid Deployment Package) is a portable hand-carried,

case-mounted Micom-3-RDP radio containing alternating current (AC) power supply, antenna tuner and a long wire antenna. The radio supports voice, data, e-mail and fax applications. The unit is lightweight and compact enough to take on an airplane.

www.royal-communications.com

Satel

Satel's compact digital radio modem operates at 330 – 473 and 869 MHz and

features an autonomous rechargeable battery and a robust IP67 housing. The product operates fully autonomously as a repeater station in the field for more than 15 hours and recharges in five hours. The modem is easy to install and supports manufacturer protocols including Pacific Crest and Trimble. A temperature range of -30 to 65 degrees Celsius and a wide tuning range make the product ideal for outdoor measurement applications. The product can attach with a back plate and screws to any surface or can be carried with a hook or belt loops for easy portability, company officials said.

www.satel.com

Sepura

The Sepura series of portable radios is the cornerstone of the company's Digital Mobile Radio (DMR) line. With an IP67

environmental protection rating, the series offers ruggedness and robustness, coupled with advanced functionality and high-quality audio. The series features products in UHF and VHF frequencies and offers two distinct variants — full keypad and without keypad. The full keypad model features a color screen and is designed for users who require full access to a wide range of functionality. The model with no keypad and display is designed for users requiring access to basic functionality. Easy to use with

gloved hands, this model also features colored inserts to enable differentiation between teams or groups of users.
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

The TP9400 features rugged construction with IP67 sealing and shock absorbing impact-protected corners, and exceeds Mil-Std-810G standards. The product offers an excellent migration path with multiple operating modes, including analog simulcast, 12.5-kilohertz Project 25 (P25) Phase 1 FDMA conventional/trunked, upgradable to 6.25-kilohertz (equivalent) P25 Phase 2 TDMA trunked, and LSM (CQPSK) decode capability. The portable is part of a complete P25 system. In addition, the TM9300 Digital Mobile Radio (DMR) mobiles provide an efficient, digital voice and data communications solution for users in mission-critical environments. The rugged mobiles feature a clear migration path by offering quad-mode functionality. Each mobile can operate in trunked DMR, conventional DMR, full MPT1327 and conventional FM modes. The mobile is part of a complete DMR solution that is ideal for both business and mission-critical organizations looking to achieve voice and data capabilities on a single network, company officials said.

www.taitradio.com

TecNet International

The TPD-1000 series offers durability and affordability for Digital Mobile Radio (DMR) TDMA portables in the VHF and UHF frequencies. The radio offers 1,024 channels, a standard 2 ampere-hour (Ah) battery with vibrate, and an easy-to-read color

display. Additional features include choice of analog or digital per channel, text messaging compatibility with other brands, IP67 and Mil-Std-810F compliance, enhanced push-to-talk (PTT) capability, and volume and channel selector knobs. Analog signaling includes two-tone, five-tone and MDC-1200.
www.tecnetusa.com

Unimo

The dPH series digital Private Mobile Radio (dPMR) devices operate in the 136 – 174 MHz VHF and 400 – 470 MHz UHF bands. Features include 1,024 channels, digital and analog dual-mode operation, 6.25-kilohertz digital and 12.5-kilohertz analog channel spacing, individual and group call capability, short message service (SMS) support, and a 2.6 ampere-hour (Ah) Li-ion battery. The radio is waterproof to IP67 standards.
www.unimo.co.kr

Vertex Standard

The EVX-530 eVerge two-way radio operates in both digital and analog modes and provides good call quality, message control and built-in privacy.

ARTS II provides improved coverage and connection monitoring. Direct mode allows dual communications paths on a single frequency, and site search allows movement among multiple sites seamlessly. Transmit interrupt allows an operator to halt any current transmission. The enhanced dot matrix display is functional for use in six different languages. Intrinsically safe features are included.
www.vertexstandard.com

Wireless Pacific

The XFB-LW lone worker special function box for use with the X10DR secure wireless microphone gives a single mobile radio user the traditional lone-worker

safety capability available in premium handheld portable radios. A user operating in remote locations where portable radios are not an option can be monitored for activity and for an emergency to be automatically triggered in the event of a lack of expected responsiveness. X10DR is a long-range wireless speaker microphone that allows mobile radio users to leave their vehicles while staying constantly connected to team members and dispatch control rooms via their vehicle's high-powered mobile radio. The mic maintains a reliable, secure link to the mobile radio up to 300 meters from the vehicle.
www.wirelesscorpltd.com

P25 and MOTOTRBO Radios

Motorola Solutions introduced the Project 25 (P25) Phase 2 compatible APX 1000 portable two-way radio and the APX 1500 mobile, both of which have Advanced Digital Privacy (ADP) software encryption. The APX 1000 features advanced noise suppression, a dual microphone, an adaptive algorithm, embedded digital signaling, user programmable voice announcement and optional global positioning to identify the locations of outdoor workers. The APX 1500 includes a control head with a built-in speaker for easy installation.

The company's SL500 radio uses analog and MOTOTRBO digital radio technology and features Range Max technology, which delivers enhanced range while maintaining a slim profile and long battery life, company officials said. The device has a shatterproof LED and an IP54 rating.

www.motorolasolutions.com

VHF/UHF Radios

Icom introduced the IC-F1000D and IC-F2000D compact VHF/UHF radios that users can program for Type-D single-site trunking, conventional digital and analog communications. Features include individual and group calls, 15-bit digital encryption, IP67 rating, Mil-Spec compliance, 800-milliwatt (mW) loud audio and a channel announcement function. The radios automatically send an emergency signal when motion detection, man-down or lone-worker functions are activated.

www.icomuk.co.uk

IS Radio and Digital Trunking

Hytera Mobilfunk introduced the PD715 Ex, an intrinsically safe (IS) handheld radio that meets the ATEX standard. The radio supports both conventional and trunked Digital Mobile Radio (DMR) as well as analog. The radio operates without a display and keypad, making it an inexpensive alternative to other fully equipped radios, company officials said. The product is IP67 rated for dust and moisture protection and complies with Mil-Std-80.

The company also introduced its XPT (Extended Pseudo Trunk) system that allows two-way radio users to double channel capacity without using a dedicated control channel. With the product's distributed trunking protocol, users can build a trunking system in a shared-channel environment. The system supports up to eight repeaters at one site, provides 16 traffic channels and supports 1,200 users. The XPT system is available by upgrading the firmware version of conventional Hytera equipment. The system offers a way to migrate analog Logic Trunked Radio (LTR) systems to digital, company officials said.

www.hytera.de

DMR Radios and TETRA Base Station

Sepura announced a version of its Digital Mobile Radio (DMR) portfolio that supports the 450 – 520 MHz frequency band in Australia and New Zealand. The radios support applications such as SICS eXpress dispatch software, Site Link that can link up to 32 repeaters via a standard IP network, and Dynamic, allowing network traffic to be shared automatically across available resources.

The company's SOLO Instant Coverage TETRA base station provides temporary TETRA infrastructure for emergencies and special events in locations with poor or no network coverage. Users can remotely activate the system through a simple control panel, which also monitors performance. The device allows three levels of radio terminal access: open, allowing any TETRA radio to access it; filtered, allowing radios with specific features and attributes to access it; or closed, which checks each user's unique ID number.

www.sepura.com

TETRA Server and Monitoring System

Airbus Defence and Space introduced the DXTA TETRA server that provides improved capacity and increased flexibility for both TETRA and hybrid networks. Software allows the server to handle non-TETRA subscribers and assets, including commercial broadband services.

The company's Viewcor is a real-time monitoring system for tactical operations that displays the current status of a radio network using maps, tables, trend graphs and reports. Users can access the platform through a Web browser. The system shows which base stations are handling less traffic than they are dimensioned for, allowing more efficient use of network capacity, company officials said.

www.airbusdefenceandspace.com

DMR Infrastructure

The ZXTS eTC 500 core network from **ZTE** consists of a push-to-talk (PTT) dispatch server, a PTT home register, a dispatch agent server and a PTT application server. The device supports all trunking and dispatch services as well as carrier-class authentication and authorization for the trunking service. The product is compatible with MPT, Digital Mobile Radio (DMR) and Long Term Evolution (LTE) systems and supports hybrid grouping. Other features include end-to-end encryption, two-way authentication, air-interface encryption, multilevel authorization, centralized management, a modular design, and a capacity expansion to support user growth.

The company also introduced the DMR

ZXSDR BS8700 software-defined radio (SDR) base station with a distributed architecture that separates the baseband from the RF. The base station supports 16 carriers simultaneously and can be deployed quickly. The product can operate in temperatures from -15 to 50 degrees Celsius and is IP20 certified for dust and water intrusion.
www.ztegota.com.cn

PTT Platform

Mobile Tornado Group expanded its push-to-talk (PTT) platform for U.K. emergency services. Users can deploy the platform across any IP network to ensure a smooth transition from Wi-Fi to cellular. PTT features include Web-based enterprise management tools, a Web-based dispatch console and a software development kit (SDK). Other features include instant text messages, location and emergency alerts, and a call setup time of less than 0.5 seconds.
www.mobiletornado.com

Explosion-Proof Tablet

Getac introduced the T800 explosion-proof tablet that is ATEX Zone 2 and 22 certified, and meets Mil-Std-810G and IP65. The tablet comes with an Intel Quad-core Bay Trail N3530 2.16 GHz processor, has a 20-centimeter high-definition (HD) screen and weighs about 915 grams. The device's ports and Internet connections are wireless, and built-in 802.11ac and Bluetooth 4.0 network cards are equipped with 3D antenna technology that strengthens signal reception. The tablet supports Long Term Evolution (LTE) technology.
www.getac.com

Handheld Microphone

Imtradex added a USB port to its Aurelis handheld microphone that allows users to connect the microphone to a control center's computer system regardless of the computers' operating systems. The microphone weighs 180 grams and is equipped with a push-to-talk (PTT) button, high-quality speakers, an emergency button, three-level volume control and two-color LED. The microphone also has a connection for external accessories, and certain models can integrate with different data applications.
www.imtradex.com

eCall Test System

Spirent Communications introduced a system to test eCall and ERA-GLONASS

in-vehicle systems (IVS) for functionality and protocol conformance. The system simulates elements of a real automotive environment to enable IVS testing or a whole automotive environment for closed loop testing. Designers can also optimize emergency and location systems through performance testing to ensure better sensitivity or greater resilience in weak signal areas, company officials said.
www.spirent.com

Vehicle Location and Messaging

CalAmp introduced the LMU-4230, a location and messaging unit that includes a range of wireless and peripheral connectivity options and is equipped with the company's vehicle interface technologies

for both light and heavy-duty vehicle telematics. The unit also has configurable fleet features and connectivity to cellular, Wi-Fi, Bluetooth and satellite. The company's triple-axis accelerometer technology allows the device to detect and report hard braking, aggressive acceleration and vehicle impacts, company officials said. The company's Programmable Event Generator (PEG) embedded alert engine, continuously monitors the operating environment and responds instantly to predefined and configurable threshold conditions such as time, date, motion, location and geo-zone crossings.
www.calamp.com

In-Vehicle Computer

The **Attobus** A-PC1 in-vehicle computer features 4G Long Term Evolution (LTE)

connectivity and five video input channels that support up to two automatic number plate recognition (ANPR) cameras and full video recording without additional hardware, company officials said. The computer also has two USB 3.0 ports, storage capacity of up to 16 Gigabytes (GB), an Intel Haswell processor, full desktop PC compatibility, and shock and vibration protection. Solid state drive (SSD), hard disk drive (HDD) and dual disk configurations are available.
www.attobus.com

Field Computer Expansion

Handheld Group announced long-range Bluetooth and barcode scanner expansion packs for its Nautiz X8 rugged PDA. The Bluetooth pack features a u-blox

module that allows long-range communications of up to 300 meters and is well suited for forestry, surveying and construction work, company officials said. The barcode pack has an imager module with an LED aimer that allows scanning and is useful for field service, warehouse and logistics applications. The company also announced an empty add-on cap expansion pack that adds flexibility and allows users to adapt the device to specific needs.
www.handheldgroup.com

SDR Receiver

The AR-DV1 from **AOR** is a software-defined radio (SDR) receiver that receives signals from analog and most digital

modes including MOTOTRBO, Digital Mobile Radio (DMR), digital Private Mobile Radio (dPMR), Project 25 (P25), NXDN, Icom D-STAR, digital CR, JVCKenwood and Alinco EJ-47U. Two vocoder chips in a multimode digital demodulation receiver process transmissions with wideband reception from 100 kHz to 1.3 GHz. The receiver can be used without a computer and features a micro USB socket and built-in secure digital/secure digital high-capacity (SD/SDHC) card reader for audio recording, timer recording, CSV memory data uploads and downloads, and firmware

updates. Users can operate the unit independently or with a computer.
www.aorja.com

Wireless Transceiver

The CacheCrumb node from **Rajant** is a wireless transceiver with a built-in applications processor tuned for distributed video,

sensors, algorithms and up to 1 terabyte of storage. The device pushes applications, data and computing power to the network edge, reducing transmission costs, shrinking latency and improving quality of service, company officials said. This edge processing allows the product to store video and data, groom the data and enable data consumption from the device.
www.rajant.com

Communications Bridge

The T.Bridge from **TASSTA** allows an

organization to connect users outside existing network coverage with smartphones using 2G, 3G and Long Term Evolution (LTE) or desktop PCs using the company's application. The product can connect two professional mobile radio (PMR) systems regardless of the manufacturer. Other features include group call, individual and group messages, GPS tracking, support for up to eight TETRA groups, and an application programming interface (API) that allows connections to a Damm Cellular Systems TETRA or Motorola Solutions MOTOTRBO system. The device supports the 380 – 400 and 410 – 430 MHz bands.
www.tassta.com

Automated Spectrum Testing

The Remote Spectrum Monitor platform from **Anritsu** automates radio surveillance, interference detection and government spectrum policy enforcement. The platform features two spectrum monitor modules that each have power of arrival (POA) algorithms to monitor for interference and approximate where an interfering signal is being generated. The MS27102A is a rack-mountable

multiport RF In probe that constantly monitors spectrum to ensure optimal performance and covers 9 kHz to 6 GHz frequencies with sweep rates of up to 24 gigahertz per second. Vision Monitor software automatically records spectrum data, maintains a searchable spectrum history database, enables alarm functions for unusual signal activity and provides tools for managing the spectrum monitoring system.
www.anritsu.com

Satellite Antenna

PCTEL announced a series of

GPS/GLONASS asset tracking and synchronization helix antennas that capture

the frequencies needed for GPS, Galileo and GLONASS satellite reception. That cross-compatibility allows global OEMs to use one platform to serve both European and U.S. markets, company officials said. A proprietary filtering design allows wideband coverage while providing strong out-of-band rejection.
www.antenna.com

LTE Antenna

Panorama Antennas introduced the Fez Long Term Evolution (LTE) wideband

antenna that covers the 698 MHz to 2.7 GHz bands. The product provides 2 decibels isotropic (dBi) peak gain on its cellular and Wi-Fi elements and 26 decibels (dB) of low-noise amplified gain on its active GPS patch. The antenna comes with short fly-leads for simple connections and requires a single hole for mounting.
www.panorama-antennas.com

MIMO Antenna

L-Com announced the HyperGain DPU series 802.11 ac multiple input multiple output (MIMO) omnidirectional antennas

that can operate in both horizontal and vertical polarization. The dual-polarization technology supports the attenuation of unwanted signals from adjacent channels and collocated equipment. The antennas support two-by-two, three-by-three and four-by-four systems, and are available with 6, 9 or 11 decibels isotropic (dBi) gain. Each antenna comes with a UV-resistant PVC radome.
www.l-com.com

Dual Polar Antennas

Cobham Antenna Systems released a range of dual polar multiple input multiple

output (MIMO) antennas that cover the UHF and 2, 3, 4 and 5 GHz bands. The antennas offer azimuth beamwidths of 60, 90 and 120 degrees with peak gains between 14 and 17 decibels isotropic (dBi). Each antenna includes interleaved vertical and horizontal polarized antenna elements within a single aperture and has a rugged and UV-stable radome.
www.european-antennas.co.uk

ATEX Antennas

AntennaPro, formerly Procom, announced a series of ATEX-certified antennas that span 25 antenna types and

uses. One antenna is an omnidirectional base station antenna for the international aircraft band. Other models include an omnidirectional VHF/UHF marine and base station antenna and an omnidirectional base station and marine Wi-Fi antenna.

The company's PRO-ISO-PHY-TETRA-S4 combiner connects up to four TETRA radios into one common antenna. The device has isolation between ports of more than 62 decibels (dB) and low insertion loss. The PRO-ISO-PHY-TETRA-8 combiner connects up to eight TETRA radios in one antenna and has isolation loss between ports of more than 60 dB. The PRO-PHY-500-3400-4 four-station ultra wideband combiner is useful for coupling four transceivers on one common antenna and for parallel operation of four two-way radios where the highest possible decoupling is necessary, company officials said.

www.procomuk.co.uk

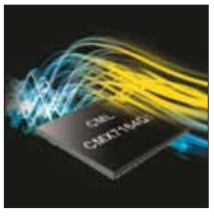
Multiband Antenna

Polomarconi IT Holding's multiband indoor antenna covers the 166 – 174, 380 – 470 and 870 – 960 MHz and 1.71 – 2.7 GHz bands. The antenna was developed for traditional indoor applications but is also suitable for tunnels, train and metro stations, mills and other underground construction with harsh environmental conditions, company officials said.

www.polomarconi.it

Wireless Modem

CML Microcircuits added V.23 modem capabilities to its CMX7164 multimode wireless data modems that allow communications with legacy telecom systems to support 1200 baud 1 – 8 byte data blocks with start bit, stop bit and parity generation in transmit and start bit, stop bit, and parity checking and removal in receive. The modem covers both constant envelope and linear modulation schemes including Gaussian minimum shift keying/Gaussian frequency-shift keying (GMSK/GFSK); 2-, 4-, 8- and 16-level frequency-shift keying (FSK); 4-, 16- and 64-quadrature amplitude modulation (QAM); and V.23.



The company also introduced the CMX994A and CMX994E direct conversion receiver integrated circuits (ICs) that feature I/Q demodulators with low power consumption. The circuits were designed for use with narrowband and wideband software-defined radios (SDR) for wireless data and two-way radio applications, company officials said. The circuits' design provides an optimum route for high integration, allowing for a small RF receiver with a minimum of external components in zero-IF, near zero IF and low-IF systems.

www.cmlmicro.com

EMF Monitor and FFT Analyzer

Narda Safety Test Solutions introduced the AMB-8059 wideband area monitor that monitors electromagnetic fields (EMF) in conformance to the International Telecommunication Union Standardization Sector's (ITU-T) recommendation K.83. The device captures field strengths from 100 kHz to 7 GHz and can capture the 10 Hz to 5 kHz range with probes. Measurement data is stored internally and accessed through Ethernet, USB or RS-232, or it can be transferred to an SD card or accessed remotely by transmission via a mobile modem. The EMF Observatory software automatically collects data from area monitors, stores it on a server, generates reports and statistics, and reacts immediately to alarms. Probes that allow testing of different types of environments are available as well.

The company also introduced the EHP-50F, a Fast Fourier Transform (FFT) analyzer for low frequency EMF. The device

covers a range of 1 Hz to 400 kHz and evaluates complex signal shapes in the time domain using the weighted peak method. The product uses built-in three-axis probes to detect electrical and magnetic fields isotropically. The device is battery operated and can operate standalone for up to 24 hours with internal data. PC software is included.

www.narda-sts.us

Tower Mounted Amplifier

Radio Frequency Systems (RFS) introduced a line of tower-mounted amplifiers (TMAs) with variable gain for 700 MHz. The TMAs can overcome limitations of Long Term Evolution (LTE) by allowing the LTE system to take advantage of the device's uplink gain, company officials said. The TMAs feature direct current (DC) sense and DC/AISG bypass, reducing the number of cables and jumpers on a tower. The device has passive intermodulation (PIM) performance of 158 decibels relative to the carrier (dBc). The 700 MHz TMA was designed with a low-noise figure that overcomes feeder losses and can be set up in a dual-duplex configuration that allows the use of a single feeder for both transmission and reception.

www.rfsworld.com

Rapid Deployment Tower

The Rapid Deployment Solution (RDS) from **Webb Industries** is a tower system that can be set up and re-used, relocated and erected on most sites, company officials said. Installation does not require excavation or concrete and takes one to four days to erect depending on the size. Because the product does not require the same licensing as permanent towers, it can act as a stopgap solution while waiting for the completion of licensing processes.

www.webb.co.za

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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 _____

Q415

New Technology Targets Private Data Networks

By Geof Heydon

Australian data radio manufacturer RF Technology partnered with the Commonwealth Scientific and Industrial Research Organisation (CSIRO),

Australia's government-owned science research facility, which invented wireless LAN technology. The Sydney-based research laboratory developed Ngara technology, delivering scalable solutions from a single narrowband channel to 100 channels.

"This radio technology leads the way with a significant improvement in the state of the art in spectral efficiency, and a software-defined radio (SDR) architecture provides a flexible and scalable solution," says Dr. Mark Hedley, CSIRO's research director for the Wireless and Networks Program.

RF Technology and its U.S. subsidiary IPMobileNet are developing next-generation emergency services products that leverage Ngara for scalable and flexible private radio networks.

Products based on the next generation of controller electronics called the Eclipse 3 can deliver new levels of software-controlled flexibility. The product operates in 30 – 900 MHz bands with a single radio and features software channel selection and allocation, software-defined beam forming, and dynamic performance of narrowband and broadband capacity. The all-IP product leverages noncontiguous spectrum, offers spectrum on demand and simulcast, and supports numerous simultaneous users without degradation of bandwidth. Those features meet the emergency response sector's demanding requirements. One example is adaptive video delivery to and from police vehicles.

Software control manages video delivery in different ways depending on specific user needs. Bandwidth can be adjusted to a maximum while spectrum use can be held constant. Or bandwidth can be maintained by varying the number of channels used to deliver it. Depending on the application, video quality can improve as the vehicle slows or stops, while lower quality can be delivered at higher speeds. Modern video compression techniques enable a high-performance and flexible solution for video scenarios.

While commercial Long Term Evolution (LTE) networks handle more users per cell and more bandwidth per user and ubiquity, private networks strive for more spectral efficiency, flexible channel allocation, spectral fragmentation and more rapid responder support into targeted areas with increased bandwidth and limited spectrum. The special needs of emergency responders are pushing suppliers to use the software-controlled nature of all-IP networks to their advantage in satisfying customer requirements.

Individual narrowband channels can be combined to leverage whatever spectrum is available in the bandwidth required. For example, if a 25-kilohertz channel can deliver 128 kilobits per second (kbps), then two channels can deliver 256 kbps. Flexibility increases because the two channels do not need to be adjacent. Any number of channels can be combined to provide the bandwidth required. Five noncontiguous channels can deliver a bandwidth of 640 kbps. In an uncontended network with appropriate IP protocols, throughput could equal or exceed traditional public networks with greater security and control. Furthermore, software control can dynamically allocate channels to allow the system to work around unavailable or noisy channels.

A typical LTE antenna array, for example, uses two 20-megahertz channels, resulting in an ABAB pattern. This approach minimizes poor radio performance at the boundaries if the same spectrum is reused in adjacent sectors. The result is 4 x 150 Megabits per second (Mbps) bandwidth using 2 x 20 megahertz of spectrum.

In the beam-forming Ngara model, a 20-megahertz block of spectrum is used, and individual beams are transmitted to each remote device. Twelve beams reuse the same spectrum and all deliver 150 Mbps bandwidth, resulting in 12 x 150 Mbps of available bandwidth, even if two adjacent beams are only 3 degrees separated. This results in a spectral efficiency six times that of the LTE example. That efficiency benefits agencies with limited contiguous spectrum or fewer channels.

The LTE coverage approach and the Ngara beam-forming approach will likely be highly compatible technologies. The beam-forming approach is excellent for backhaul, as well as a multipoint mobile solution. Because the beam is software controlled, complex, time-consuming and expensive antenna alignment is not necessary. The software can dynamically adjust the beam between transmitter and receiver to maximize performance, allowing quick deployment of low-cost towers. This is especially valuable for special event deployments for planned and emergency events.

The innovation in scientific radio propagation research combined with the continuing innovation and product development will see new products and markets emerge for this all-IP software controlled network technology. ■

Geof Heydon is an independent consultant working to commercialize information communications technology (ICT) innovation. At CSIRO he was responsible for business development for the Information Science Group including the Australian Centre for Broadband Innovation, digital productivity and services flagship, and radio astronomy. Email feedback to editor@RRMediaGroup.com.

PD712 Ex PD792 Ex

Hytera DMR
PD712 Ex/PD792 Ex ATEX Radio

More than ATEX

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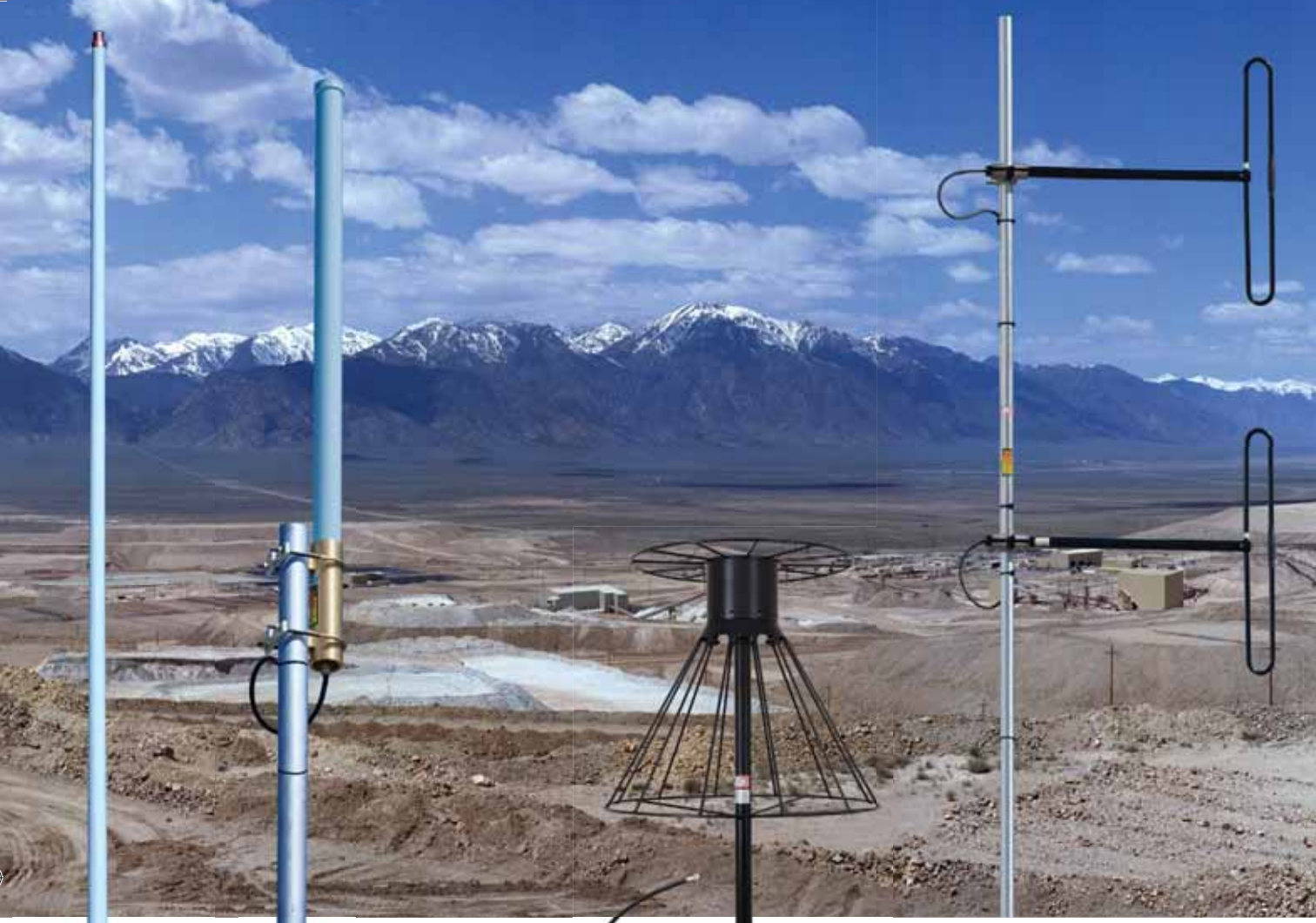

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