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RadioResource INTERNATIONAL

THE GLOBAL INFORMATION RESOURCE FOR MISSION-CRITICAL COMMUNICATIONS

TETRA-Critical Communications World Issue

The Market for TEDS

Six Years After the Standard's Release, Products Finally Roll Out

Inside

A Rail Radio Renaissance

DMR Interoperability Progresses

The Latest Advances in Paging

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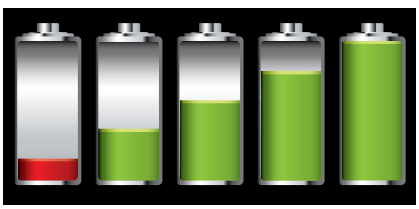

IN EVERY ISSUE

READER SERVICES

Cover photo courtesy Cassidian

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Inbox

Following are reader comments from content in WORLD NEWS, a monthly email. Subscribe at RRImag.com.

1-1-2 Day in Europe

Editor:

What a pity 1-1-2 was not publicized in the United Kingdom. My comment was prompted by having been sent a YouTube video (search MicroNavigation) and wondering why I didn't know about 1-1-2. Although the video says the number will work in the United States, the U.S. still has a huge number of CDMA phones, so I doubt the number is valid for them.

And there is another problem here in the U.K. Our emergency number is 9-9-9 (from rotary dial phone days), but in a survey, a large proportion of U.K. teenagers replied 9-1-1 when asked what the emergency number is, because they watch a lot of U.S. TV shows.

Nic Houslip

Multiband Radios

Editor:

What I did not see in the report on multiband radios from the U.S. Department of Homeland Security (DHS) is over-the-air-programming. Maybe the technology was not available at the time of testing. This is a fantastic feature. We use this technology extensively in TETRA (through LAN and chargers) and radio in the NXDN protocol. This makes it easy because you don't need to pull in the radios. You can add frequencies and features simultaneously over a large volume of radios during an emergency by having each radio out of commission for a few seconds instead of hours.

The report discusses alkaline batteries. They should look at Lithium battery technology. We have on our retail market Lithium batteries that are not rechargeable and give four to nine times the same life as alkaline batteries. Some even do 40 times in lower power systems.

Leon van der Linde
Technical Support and Training
Global Communications
Pretoria, South Africa

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Critical Communications World Conference Coverage

Daily coverage from the TETRA + Critical Communications Association (TCCA) 2013 annual conference in Paris, 21 – 24 May.

400 MHz Broadband

Cassidian demos LTE over 400 MHz using Tetrapol sites in France.

White Spaces

Vendors launch a trial of TV white space technology in South Africa.

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New Advisors Join Editorial Board

The 2013 trade show season is in full swing with Association of Public-Safety Communications Officials (APCO) Australasia and International Wireless Communications Expo (IWCE) wrapped up in March and several events in May. We added two new editorial advisors to our board to help us stay on top of the latest trends in the global professional mobile radio (PMR) markets.


Malachowski


Spring

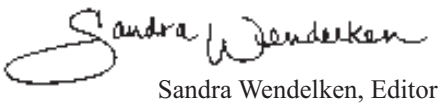
I'm pleased to welcome Kazimierz J. Malachowski to our board. Malachowski is an electronic engineer who graduated from Mackenzie University in São Paulo, Brazil, in 1971. He spent his early career in the former Philips Telecommunication Division with international training in France, the United Kingdom, Holland and the United States. He finished his professional connection with Philips in 1990 as managing director of the Mobile Radio Division. Since 1990, he has been commercial director of SGM Telecom, a value-added reseller covering Brazil and specializing in digital systems for vertical professional markets.

Malachowski is a member of the Brazilian Association of Electronic Manufacturers (ABINEE) and of the Brazilian Association of Service Providers (ABPREST). He is a partner and distributor of several industry manufacturers. Malachowski has written for the magazine, and we welcome his expertise.

I also welcome Geoff Spring, executive director of GAPStrategic, to our advisory board. Spring provides advisory services for the public-safety communications and information management technologies sector and is director of international business development and strategy for APCO Australasia. Possessing more than 20 years of experience in strategy development and project management for public-safety communications, Spring is the immediate past president of the Global Alliance of APCO Partners and a member of the Project 25 (P25) Steering Committee.

He is also a member of a number of Australian commonwealth and state government advisory committees through which he promotes the importance of mission-critical public-safety communications. Spring has contributed content to our magazine, and we welcome his industry knowledge.

If you plan to attend the Critical Communications World and TETRA World Congress 21 – 24 May in Paris, please stop by stand F509 and say hello.



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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INTERNATIONAL

TETRA Standard for VHF Expected in Coming Months

The European Telecommunications Standards Institute (ETSI) confirmed in March that its work to extend TETRA into the VHF frequency band is basically complete, with final publication expected in a few months.

"The changes to the standard have been finalized," said Ultan Mulligan, ETSI director of communication, membership and partnership. "However, the revised standard containing these changes may take another one to two months for approval and publication, as other maintenance work needs to be incorporated into this update."

Phil Kidner, CEO of the TETRA + Critical Communications Association (TCCA), said the association completed technical work to prove that TETRA was able to operate successfully in VHF frequencies last year. ETSI used the data to extend the TETRA standard to the VHF frequency range.

Once the final standard is published and available, "products could follow shortly afterwards," Kidner said.

The VHF spectrum is used in the United States and other countries for mission-critical communications systems.

LONDON — Despite the ongoing rollout of consumer Long Term Evolution (LTE) networks, LTE-based data services for mission-critical communications will not be available until 2018 at the earliest, according to an industry association. Acceptable-quality voice services over LTE for mission-critical users are not expected until at least 2020, according to the Critical Communications Broadband Group (CCBG), a working group of the TETRA + Critical Communications Association (TCCA).

Implementation of critical mobile communications services over LTE demands standardization from the Third Generation Partnership Program (3GPP) and other standards groups.

"As the world moves to LTE, it is essential that the communications industry operates in a coordinated and coherent way to bring to maturity standards relevant to public safety and other critical users," said Tony Gray, chair of the CCBG. "We are working to ensure that such requirements are incorporated into the LTE standards effectively."

There are four key areas to be addressed within the LTE standards to enable a suitable foundation for critical communications services. The areas include group communications system enablers for LTE (3GPP GCSE_LTE), proximity-based services (3GPP ProSe), public-safety networks resiliency, and the push-to-talk (PTT) voice application standard over LTE and its evolution toward multimedia group communications.

The first two areas were accepted by 3GPP as work item descriptions (WIDs) that will be incorporated into Release 12 of the 3GPP LTE standards specification, planned for publication at the end of 2014.

Critical networks resilience is an additional area of weakness in existing LTE network design. Compared with current critical communications technologies, there is no capacity for graceful degradation of service if the connection between the base station and the core network is lost. The objective is to include this evolution in Release 13 of the 3GPP LTE standards specification, planned for publication at the end of 2016.

LAS VEGAS — The Project 25 Technology Interest Group (PTIG) hosted Project 25 (P25) demonstrations applicable to fixed system interfaces and console system interfaces. Twelve equipment vendors participated in the demonstration along with technical support from other PTIG members.

"The P25 community of users and suppliers and other stakeholders have recognized the maturity of legitimate multiple vendor interoperability among the range of mobiles and portables as subscribers on P25 systems. This demonstration also confirms that equivalent range of multiple vendor interoperability is available and applicable for the fixed equipment in infrastructures, networks, RF stations and dispatch centers," said a PTIG press release.

Vendors that participated included **Avtec**, **Cassidian Communications**, **Catalyst Communications Technologies**, **Codan**, **Harris Public Safety and Professional Communications (PSPC)**, **Modular Communications Systems**, **Motorola Solutions**, **Pantel International**, **Relm Wireless**, **Team Simoco**, **Tait Communications** and **Zetron**. System technology contributors were **Cisco Systems**, **Cynergyze** and **Etherstack**.

LAS VEGAS — Cassidian Communications launched its full TETRA product line, including infrastructure, consoles and radios, into the North American market. The FCC released a report and order in September allowing TETRA in non-public-safety spectrum in the United States, and Industry Canada approved TETRA's use in Canada in 2011.

Cassidian, one of the largest TETRA manufacturers in the world, said it will focus on the North American transportation, utilities, agribusiness and industrial segments.

"We've done some research, and we found that in the transportation and utility market segments, there is a definite need for TETRA products," said

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Rich Cagle, vice president of sales, with Cassidian. "The technology works well where there is more high-demand density, where lots of users are stacked in a small population."

Cagle said the company will continue to offer Project 25 (P25) products to the North American public-safety market. "We fully support P25 as the solution for public safety," said Cagle.

Cassidian offers only infrastructure products under the P25 standard. He said the company has an advantage with TETRA because of its full portfolio. "There's a cost benefit and fit for both standards," Cagle said. "The excitement we're seeing is the ability to buy a full-featured radio product at much less cost than you can buy a P25 product."

Cagle said there isn't a difference in product margins between the two standards. "We have the same level of confidence in both product areas," he said. "If a customer wants our complete package of TETRA, then there's more of a dollar volume in the opportunity than in P25, because in P25, we provide just the infrastructure piece."

EUROPE

SOPHIA ANTIPOLIS, France — The European Telecommunications Standards Institute (ETSI) announced the public-safety cluster, including all types of communications during an emergency. The four scenarios comprise communications from authorities to the public, between authorities, from the public to authorities, and between the public.

ETSI Emergency Communications (EMTEL) technical committee produced specifications for each of the four scenarios and updates them as necessary. For example, ETSI EMTEL developed the European requirements for the public warning system.

ETSI said each of its clusters represent a major component of a global information communications technology architecture and includes the work of a number of technical committees and associated working groups.

GENEVA — CERN, the European Organization for Nuclear Research, located near Geneva, is implementing a **3T/Sepura** TETRA infrastructure for communications.

3T Communications was appointed to install the infrastructure in two phases. The first phase gave 123 Sepura radios to firemen, guardians and rescue workers at the end of 2012, along with three base stations and numerous repeaters and gateways, to address the site's immediate operational needs. The second phase deployment of STProtect beacons will be carried out in 2013 and will equip third parties, such as scientists and experts working at the laboratory, with further radios.

"CERN chose Sepura and 3T after a competitive bidding process, followed by stringent tests and the solution selected fully met CERN challenging requirements," said Aurélie Pascal,

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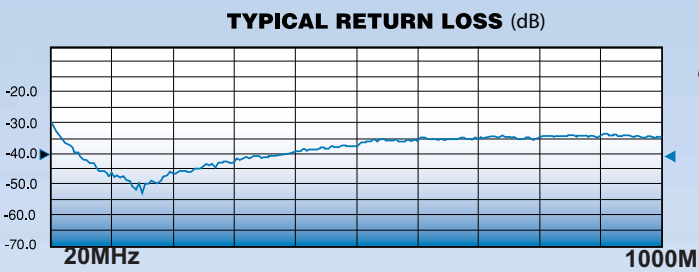

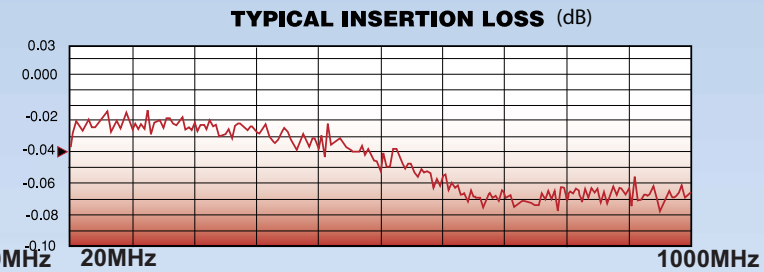

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CERN project manager. "For us, the ability to communicate with, and to track, workers in the area and underground were a crucial criterion."

BRON CEDEX, France — Acomo joined the **Sysoco Group**, consolidating the existing structures of Sysoco based on the French "Grand Ouest" area. Acomo has been operating for many years in the area of Nantes where it occupies premises in Saint-Herblain.

This company is a subsidiary of Radiance-Com founded in 1994, with expertise in PMR communications and microwave links.

STX uses a TETRA network for its own needs but also entrusted Acomo to provide radio systems or paging on 100 large ships, equipping the latest digital technology. Many fire and rescue departmental services daily use radio communications systems achieved and maintained by Acomo.

6 New Countries Join eCall

Six new countries — Belgium, Bulgaria, Denmark, Luxembourg, Spain and Turkey — met in Madrid to share common goals and further steps to successfully implement eCall, a service based on the common European emergency number 1-1-2. This meeting marks the beginning of the second phase of Harmonized eCall European Pilot (HeERO), an international project that coordinates pilot sites in 19 countries working together to deploy the EU-wide eCall.

Beginning in 2015, eCall, a new service aiming to enhance road and general safety, will begin in all EU member states. Officials said eCall could save several hundred lives yearly by establishing a direct connection with voice and location data between the vehicle and the 1-1-2 services in case of a car crash.

eCall is an electronic safety system that automatically calls the emergency services in case of a serious accident, even when the driver and passengers are unconscious. eCall will be available across the European Union, plus Iceland, Norway and Switzerland. For three years, the nine European countries forming the HeERO 1 consortium — Croatia, Czech Republic, Finland, Germany, Greece, Italy, the Netherlands, Romania and Sweden — carried out the start-up of an interoperable and harmonized in-vehicle emergency call system. The second phase of the HeERO project, HeERO 2, began Jan. 1, 2013, and will last two years. The six new countries — Belgium, Bulgaria, Denmark, Luxembourg, Spain and Turkey — joined the other nine pilot sites of HeERO 1.

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The technical, commercial and administrative teams from Acomo will join with Sysoco Nantes to take advantage of the resources of a large group, specialized in wireless technologies.

TONSTAD, Norway — The Sira-Kvina Power Company, which engages in the production of renewable energy, chose a 15-site TETRA system from **DAMM Cellular Systems** to replace an MPT 1327 system. The new system was delivered by DAMM partner 123 Communications.

Sira-Kvina has an objective of an uptime of its production facilities of 90 percent. And Norwegian law dictates that utility companies must have their private internal communications system able to operate in 72 hours even if regular power supplies are cut off.

The supplied TETRA installation consists of 15 sites. Eight outdoor units are mounted in equipment rooms on mountaintops, ensuring outdoor coverage across a vast distance. Seven installations are in tunnels housing the hydroelectric facilities. The system is also fitted with a voice gateway toward the customer's telephone system and two dispatchers. A main challenge for the project installation is the remote sites where equipment and personnel must be airlifted by helicopter or transported by snow scooters.

SENLIS, France — Tait Communications installed the first phase of a Digital Mobile Radio (DMR)-ready critical communications solution for one of Europe's largest motorway operators. Sanef, which operates more than 1,700 kilometers of motorways in the north and east of France, implemented two interconnected TaitNet MPT-IP trunked networks comprising 34 four-channel sites in the northern half of Sanef's operations.

The network incorporates a gateway from Tait, allowing migration from Sanef's legacy analog network to a fully redundant digital IP backbone. Twelve more sites will be added to the network in 2014.

Sanef uses its mobile radio network to link its motorway surveillance teams with its central operations room — a critical requirement, especially at peak traffic times. The fully redundant Tait network design eliminates any single points of failure, providing Sanef with a truly resilient network for critical wide-area communications.

BAD MUNDER, Germany — Mark-E, one of the largest energy suppliers in the state of North Rhine-Westphalia, commissioned the first Digital Mobile Radio (DMR) Tier 3 trunked radio system supplied by **Hytera Mobilfunk** in Germany.

The project for Mark-E includes

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nine DMR base stations, two switching nodes connected to the telephone network, network management, a dispatcher system and more than 80 mobiles for installation in vehicles and handheld radios. In November, the system was set to test mode; once the test phase has been completed, operation will commence, and it will completely supersede Mark-E's analog private mobile radio system.

STOCKHOLM, Sweden — MedHelp, a private health-services and ambulance operator based in Sweden, agreed with **Mentura Group** for delivery of an AVL system for ambulance location services in the Rakel network.

The system is based on Mentura Group's TETRA Tracker Location Platform, providing real-time location information from the field to control rooms on Web-based maps.

ASIA/PACIFIC

PILBARA REGION, Australia — Selex will supply its TETRA mobile radio system to Ansaldo, main contractor of the Roy Hill Iron Ore Project signaling and communications systems in Australia.

Roy Hill is leading the development of integrated iron ore mining, rail and port operations. Within this project, Ansaldo, another Finmeccanica company, is responsible for the integrated communication-based signaling solution for the management of the automated heavy-haul train operations between port and mine.

The TETRA system offers communications between the trains and the operations and control center, the train drivers and all other railway personnel involved in daily operational and maintenance activities. The system includes network infrastructure, radio terminals and value-added applications.

It provides essential core network services for integrated voice and data communications, as well as a comprehensive range of supplementary and enhanced services. The system consists of a duplicated core network implementing disaster recovery architecture, high-performance base stations that provide improved radio coverage and Wireless Network Node (WiNN) Mobile version 2 platform as trains' mobile radio and controller.

HO CHI MINH CITY, Vietnam — Frequentis won an 8 million euro (US$10.8 million) contract with FDC Vietnam, a fire brigade agency.

After nearly 10 years of preparation, the contract covers the first construction and modernization phase of dispatch centers for fire brigades and EMS. The order comprises the refurbishment of control centers in four cities — Ho Chi Minh City/Saigon,

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Da Nang, Hai Phong and Binh Duong — including all fire brigade dispatch centers, fire stations, mobile equipment and one training center in Hanoi.

The technical solution is based on the Frequentis voice and data communications system with an integrated voice and data recorder. The system will also be equipped with call-taking and CAD applications combined with a geographical information system (GIS). The implementation phase is scheduled for more than two years.

The Austrian funding agency Oesterreichische Kontrollbank (OeKB) facilitated by providing an export guarantee issued by the Austrian federal government in combination with a soft loan. Soft loans are intended for projects contributing to sustainable development in the recipient countries and are supported by public funds.

In January, a delegation of the Vietnamese Ministry for Planning and Investment and representatives of the OeKB visited Frequentis to see how the project is progressing. This event marked the beginning of the preparatory work for phase two and the further project rollout.

TAIPEI, Taiwan — Chunghwa Telecom, as the prime contractor, awarded **Cassidian** a contract to deploy an islandwide TETRA network in Taiwan for the Ministry of National Defense of the Republic of China (ROC). Cassidian will deliver the network and terminals through its local value-added reseller (VAR) Highpull Technology.

The deployment of the TETRA infrastructure across the island and the delivery of the terminals will be concluded within three years. Sixty base stations and 1,500 terminals will be delivered for the use by the Military Police Command, responsible for all military police units and operations. Together with the existing TETRA system in Taipei, also supplied by Cassidian in 2005, a nationwide network with almost 5,000 terminals will support the customer's operations.

Sepura will supply more than 500 TETRA digital portable radios to Currenta, an operator of specialist chemical business parks in Germany. About 150 of the radios will be intrinsically safe.

QUEENSLAND, Australia — Simoco was selected to supply and install a Tier 2 Digital Mobile Radio (DMR) system to Brisbane Bus Lines in Queensland. The contract signifies Simoco's first major commercial deployment of its new Xd DMR product range.

The order includes DMR mobiles installed across the entire fleet of buses and coaches. The contract also includes DMR portables, being deployed at the Brisbane Bus Lines headquarters.

The bus company will use the system to communicate and coordinate its various bus operations throughout Brisbane, covering an area of 5,950 square kilometers extending to Dayboro, 40 kilometers northwest of the Brisbane area. The system runs across two radio sites, one in Mount Coot-Tha and another at Ocean View.

LATIN AMERICA/ CARIBBEAN

SAO PAULO, Brazil — ATDI sold its spectrum management system to Brazilian regulator Anatel. The regulator bought the software in preparation for the unique demands on frequency resources it will face as the country gears up to host the world's two biggest sporting events, the Olympics and the World Cup.

ATDI, along with its Brazilian partner, Isofreq, is supplying Anatel with the software and training and consultancy services as well.

PORT OF SPAIN, Trinidad and Tobago — Harris was awarded a $31 million contract for a public-safety answering point (PSAP) and 800 MHz Project 25 (P25) trunked radio system for the Trinidad and Tobago Police Service. The unified, national secure communications system will serve more than 6,500 emergency responders in the Republic of Trinidad and Tobago, including the military, law enforcement agencies and government officials.

Harris will replace the existing hybrid public-safety communications systems across both Caribbean islands with a single digital system. The solution will support the 21st Century Policing Initiative under way. The network will use the country's existing UHF frequency and provide the island's first responders with increased radio coverage.

PEOPLE

NEW YORK — PowerTrunk promoted Jose M. Martin to CEO from chief operating officer (COO) and hired two new executives to focus on its North America markets. Martin joined PowerTrunk's parent company, Teltronic, 14 years ago and has led the company's commercial expansion across the globe.

Carlos Fernandez was appointed vice president of business development, and David Torres was named director of sales Canada for the company.

BRUSSELS, Belgium — The European Emergency Number Association (EENA) elected Wolfgang Kampichler as vice chairman of its next-generation 1-1-2 (NG 1-1-2) committee. Kampichler is a chief scientific researcher at Frequentis and is an expert on next-generation 9-1-1 (NG 9-1-1) in the United States and NG 1-1-2 service in Europe.

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The Latest Advances in Paging

Agencies are turning to dual-frequency paging to extend the scope of their alerting and messaging capabilities.

By Chris Jones

Guaranteeing resilience and backup for critical communications can be a major challenge in rural or low-lying areas, especially when constrained budgets are forcing organizations to re-evaluate their processes to reduce costs. Technological developments are helping U.K. fire and rescue services meet this challenge, while also delivering a more efficient and responsive service.

With a focus on maximizing technology for smarter partnerships, this year's British Association of Public-Safety Communications Officials (APCO) conference highlighted the ongoing challenge of delivering more for less. Although this is no new or revolutionary concept, organizations that continue to collaborate and work in partnership with technology vendors are ultimately able to deliver more progressive and accomplished solutions.

Nowhere is this truer than within the U.K. fire and rescue services, which had to dramatically change how it operates after the government's cancellation of the ambitious FiReControl project. Initiated in 2004, FiReControl's aims was to reorganize the 46 control rooms handling public emergency calls via the 9-9-9 system into a network of nine regional control centers. Driven by a wider intention to improve national resilience, efficiency and interoperability through a better-coordinated response to national disasters, the project was abandoned in 2010 with none of the original objectives achieved and a £469 million (US$708 million) deficit.

As a result, individual fire and rescue services are expected to endure the ramifications of the fallout and absorption of sizeable funding cuts, while also being held accountable for improving public safety among local communities. One benefit stemming from the vacuum left by the cancellation of FiReControl is that fire and rescue services now have complete freedom over developing their own control rooms and collaborating with other authorities to meet local needs and contribute to wider resilience.

Ensuring adequate coverage for critical communications networks has always been a pressing issue for fire brigades. Given the parameters of FiReControl, many had put on hold plans to refresh their local on-site paging networks, fast approaching the end of their useful working lives. Fire and rescue services are now faced with the challenge of updating their technology to provide guaranteed resilience, continuous interoperability and the capability to unlock efficiencies or improve response times.

Developments in Paging

Ultimately the effectiveness of any emergency response can be broken into the ability to receive, respond and act on

The dual pager scans the two channels and delivers the message either via the on-site network if within range or via the wide-area network.

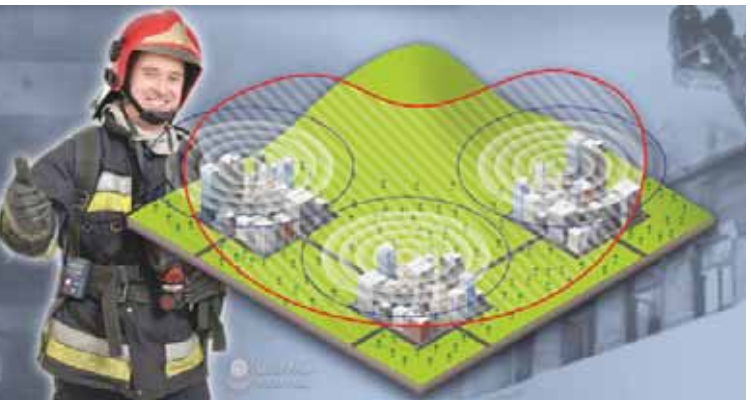
timely information. Paging not only fulfills this need but also provides a prime example of a proven technology developed and improved through smarter partnerships between both users and suppliers.

Synonymous with reliability, speed and resilience, paging has proven its value as a communications tool in the most demanding environments. Extensive coverage, broadcast capability and long battery life are also some of the technology's compelling benefits as it remains a key enabler for communications for emergency service alerting, thereby providing an unrivalled mechanism to instruct and direct personnel when responding to or coordinating an emergency response.

Paging continues to develop its services as a result of customer and market feedback and investments in developing and refining new technology. The emergence of two-way paging closes the loop on traditional pager messaging. The ability to know whether a message has been received and the user able to confirm attendance or register current work availability can allow command-and-control centers to respond quickly and manage resources more effectively. Ultimately, message confirmation ensures the swift mobilization of the most appropriate resource, at the right time, to the right location, to render urgent assistance.

New technologies allow the United Kingdom's use of dual-frequency paging, which enables a single pager device to simultaneously scan two paging channels. Having dual frequency enables users to capitalize on both channels without the need to extend coverage, because the alert is either dispatched on both channels or whichever is within range of the device. In practice, the alert goes out from the command-and-control center to the on-site network and the commercial paging network simultaneously. The dual pager then scans the two channels and delivers the message either via the on-site network if within range or via the wide-area network. If the pager receives two messages, the duplication function will prevent the second message from alerting the user again.

Not only is further resilience ensured because of the overlap in coverage, but more significantly the addition of wide-area paging extends the scope of communications, allowing responders outside the remit of the on-site channel to be reached. This technology is already being used in Western Europe and in the United States, allowing hospitals to communicate more effectively with doctors living out of range of the local on-site alerting. The system has already helped such organizations save significant sums of money



A dual-frequency pager first tries a local-area network, but if the network is unavailable, the pager will try the wide-area network.

by eliminating the need to extend and even maintain existing on-site paging networks. This advantage is also true of the emergency services, helping reduce costs, consolidate devices and extend coverage with resilience against local system failures.

The latest innovation is in augmenting the dual-frequency pager with a short message service (SMS) fallback facility that is used when both primary and secondary paging routes become unavailable, creating the ultimate resilient pager. A dual-frequency pager with SMS fallback works by locking onto its preferred paging channel, for example a fire service local on-site paging network, and if this channel is no longer available, the pager scans to PageOne's national paging network. In the unlikely event the pager does not detect either the local or wide-area paging channels, it reverts to SMS fallback mode to receive messages, notifying the servers, which automatically re-direct paging messages out via SMS.

Post-incident inquiries into several events, such as the July 7, 2005, terrorist bombings in London or the April 2012 fire in Vodafone's mobile-phone network center in Rotterdam, the Netherlands, demonstrate the difficulty and risks of relying on one single form of communications, particularly public mobile networks. Dual-frequency paging, combined with SMS fallback delivers a triple layer of resilience to maximize message delivery for critical messages.

Essex Fire and Rescue and Durham Fire and Rescue Service are assessing the benefits of dual-frequency and two-way pagers in delivering more robust alerting, improving response and extending messaging to staff outside the range of existing local paging systems. Pilot schemes are open to any other brigades looking to trial the service.

Essex Fire and Rescue, a long-standing customer of PageOne, initially trialled a handful of pagers and is now undertaking a full pilot at its Corringham-based station. Prior to testing, responders were provided with a local alerter device that only worked on the on-site frequency located at the station's base. Now that dual-frequency pagers have been issued to all retained firefighters, the station can transmit messages from a new mobilizing system placed in the fire agency control and directly linked to PageOne. In this instance, the dual-frequency solution provides added resilience and allows Essex Fire and Rescue to extend the paging coverage area, as well as improve the management of retained staff.

These are interesting times for emergency services with the economic reality of having to improve service delivery and response times against a backdrop of access to fewer resources. However, technology continues to evolve and when deployed correctly can help to increase resilience and achieve substantial savings within a framework of interoperability. Smarter partnerships are the way forward to drive the next innovation in critical communications. ■

Chris Jones is CEO of PageOne Communications and has more than 30 years of experience in the telecommunications industry. He is vice chairman of the Wireless Messaging Association (WMA) and director for the Mobile Data Association (MDA) and European Mobile Messaging Association (EMMA). He can be contacted via pageone@saycomms.co.uk.

Paging for German Public-Safety Services

The TETRA network rolling out in Germany will include paging technology. Cassidian was awarded the first contract for paging within the new German public-safety authorities' digital radio network (BOSNet). German security authorities and organizations in the state of Hessen will use a pocket-size TETRA pager.

Cassidian officials said the TETRA pager will be the first product of this kind on the market that fully complies with the respective interoperability requirements for the digital radio network of the German Federal Agency for Digital Radio of Security Authorities and Organizations (BDBOS). Deliveries will start at the end of 2014.

More than 50,000 professional and volunteer firefighters and other rescue and relief forces in Hessen will be equipped with the new terminal. The pager allows corresponding control centers to inform dedicated operational units in case of an emergency.

The TETRA pager enables secure two-way communications between the control center and the operational units. After receiving an alert from the operation control system, the user can provide a direct response, stating whether he or she is available for deployment. This new type of alert allows for improved resource management in cases of emergency.

In addition to the terminal device, Cassidian will provide a terminal asset management system to enable the BOS organizations to keep a record of all devices in the field, including parameter configurations. The system supports remote firmware updates to the pager via the Internet through secured connections and will facilitate the administration of the pager fleet in the field.

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Rail Radio Renaissance

Photos courtesy Motorola Solutions

The transit industry is moving beyond GSM-R to other digital communications technologies, including TETRA.

By Tom Quirke

Around the world, railways are undergoing a major renaissance, and the scale of planned investment is huge. According to a Frost & Sullivan report in 2012, the Brazil, Russia, India and China (BRIC) and Middle Eastern regions alone will account for around US$1 trillion in spending on both urban and long-distance rail systems before 2016. In addition, the maturing of high-speed rail technologies capable of directly competing with short-haul air adds a further US$900 million to the expected global spend on rail infrastructure.

The first days of rail in the 19th century saw the network evolve in a close and often symbiotic relationship with the telegraph system — in itself essential for coordinating operations across large areas. The 21st century's generation of rail systems will also require their own communications technologies and infrastructure if they are to operate smoothly, safely and cost effectively.

TETRA, designed specifically for mission-critical environments, is playing a vital role in many mass transit, metro and long-distance rail networks around the world. Indeed, transport applications, covering both operational communications and control systems, make up around one-third of the total TETRA market globally, estimated as being worth US$1 billion annually by IMS Research.

TETRA use is especially significant in the growing countries of the Asia/Pacific region where more than 100 systems have been installed. TETRA is also being widely adopted in Europe, the birthplace of GSM-R, to support signaling and control functions defined by the European Rail Traffic Management System/ European Train Control System (ERTMS/ETCS) standards, as well as operational voice and data communications in long distance and metro environments. But what are the precise benefits that TETRA brings to rail and how does it compare with other communications technology?

While the last two decades have seen a transformation of the world's telecommunications infrastructure,

Communications in rail networks are divided into two areas: systems used to control the trains and supporting signaling functions; and those that enhance train operations through voice communications and data applications.

the daily reality of transportation for many in the developed and developing world is congested, expensive and poorly integrated mass transit systems. Starved of investment over many years, often by governments with short-term agendas, both long-haul and urban rail systems have struggled to cope with the increasing demands.

3 Functional Needs

The social and financial drivers for change are certainly apparent. According to the UN, more than half of the population worldwide lives in cities, with the trend toward urbanization showing no sign of ending. Rising energy costs coupled with a need to find new environmentally responsible ways of working and living for still-expanding populations mean that transport systems that may have grown organically and inefficiently over decades now need major overhauls and rationalization.

The communications systems needed to support this new environment have three functional areas that must be supported. First, the workforce, management and varied assets, infrastructure and systems that collectively deliver a rail service must be interconnected reliably, securely and cost-effectively, irrespective of where those assets are. That requires a radio system that can operate consistently with high availability under the difficult conditions often associated with transport environments, including coverage in tunnels, within dense urban locations and in electrically noisy and dirty surroundings.

Second, a communications system must enable new, more efficient ways of working such as automating old labor-intensive and paper-based processes and opening decision making to an increased number of people. The speed and complexity of modern urban societies mean that small problems with transport systems can soon escalate into major citywide issues, requiring a holistic and coordinated response from multiple organizations.

Integrated Network in Germany

A digital radio communications project transformed a public transport network with the integrated transport for the Rhein-Neckar region in Germany.

Economic pressures and the need to improve service for travellers in the early 2000s encouraged the local tram operator for Mannheim, MVV Verkehr, to work with its neighboring tram, bus, metro and rail operators in the Rhein Neckar region and develop a joint solution. In total, five separate operators in the region, collectively carrying a total of around 165 million passengers each year, joined forces to implement an advanced integrated telematic control system supported by a TETRA digital radio solution.

In a strategic decision, the five companies agreed to implement one common automatic vehicle location (AVL) and monitoring system, improving radio communications and providing direct operational control, as well as the data needed to drive new passenger information systems. The goal was to have only one integrated command-and-control room for the whole region, replacing the existing eight centers.

As a result, in 2005 a new local transport company Rhein Neckar Verkehr (RNV) was created with the plan to invest €8 million (US$10.3 million) to implement an integrated telematic control system (ITCS) across the region.

The organization selected a VICOS LIO ITCS, an AVL system from Trapeze ITS, plus a TETRA digital radio infrastructure from Motorola Solutions. The system went live in 2009 and has delivered a number of benefits:

- Accuracy in time and reliability, including timetables that are optimized to reflect transport conditions;
- Secured connections supporting detailed information for drivers via on-board computers and optimization via the ITCS system features;
- Reliability of travel times with fast optimization in the case of traffic problems though coordination by the command-and-control center, and control of traffic lights;
- In-vehicle benefits of information about destinations, bus stop announcements, GPS-supported localization including automated alarms in the event of emergencies or audio broadcasts to passengers from the central control room; and
- At the bus stop with dynamic passenger information showing departure times or real-time changes in schedules.

The ITCS system has delivered increased customer satisfaction both through the more punctual and reliable services that it supports and the real-time information about arrival and departure times. In addition, the security of passengers and drivers has also increased through the use of automated alarm messages to the command-and-control center in emergencies. Significant economic savings totaling around €29 million (US$37.3 million) had been achieved by the end of 2012.

The communications network involved nine base stations, three of which were in tunnels to provide underground coverage. The final network covers about 1,000 square kilometers.

And third, if the population is to be convinced of the benefits of mass transit then the operational environment must be improved. This involves more than just the actual journey time or service reliability. It now increasingly includes sharing service information in real time through displays, announcements, and Web and text alerts; or offering new services such as e-ticketing.

In addition to the aforementioned three key building blocks, there's one final issue to consider: future proofing. While many significant improvements can be made using applications that require comparatively low data rates, higher bandwidth applications such as video to support driverless operations and remote monitoring will only grow in importance during the next years and decades. On top of this, the transport sector typically operates on investment cycles based on decades and, given current financial constraints in many countries, continuity of both supply and ongoing support is critical.

Available Options

When transport service providers, city councils or national governments consider their options in light of the above requirements, their choices are also going to be affected by other considerations, such as legacy technology or radio spectrum availability.

In Europe, for example, GSM-R — an enhanced version of the GSM standard developed nearly 20 years ago specifically to deliver the cross-border transparency needed to support international train operations across the continent — is showing its age with no defined evolutionary path for supporting higher bandwidths. GSM-R is adopted by a number of European countries that share borders, and the specification is maintained by the International Union of Railways. However, its failure to gain traction outside Europe has led to a number of the original vendors pulling out of the market, restricting customer choice further and eliminating the economies of scale and lower costs for both infrastructure and devices made possible by a global marketplace.

When compared technically to TETRA — designed from its start to deliver mission-critical wide-area coverage — GSM-R also involves more capital expense and operating costs, requiring twice as many base stations to provide coverage. On top of this, call setup times can be slow and variable, while data applications for train control are difficult to support with just native GSM-R. TETRA, by contrast, has multi-slot packet data (MSPD) and TETRA Enhanced Data Service (TEDS) to draw on for these functions.

Many countries are still reliant on traditional analog VHF/UHF systems to control rail operations. It is here, as many other countries around the world adopt ERTMS/ETCS train

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TETRA's real strength for the rail industry is through its variety of data applications.

control standards, that TETRA's demonstrated ability to support these critical functions, especially in a high-speed environment, will prove another added driver toward its long-term success.

TETRA in the Rail Environment

Communications in rail networks can be divided into two clearly defined areas: the systems that are used to control the trains and the supporting signaling functions; and those that enhance train operations through voice communications and a wide variety of data applications.

Both areas require close cooperation between the vendors of the communications systems and the companies from complementary industries involved in designing and manufacturing the trains, signaling and related infrastructure and management IT systems. This is when it is essential for the train operators to be able to take advantage of full managed service relationships with vendors to ensure that all the different systems are properly integrated and the applications have a clear fit with working procedures, safety practices and efficiency goals.

Where mission-critical applications are involved, any technology or application will only be as good as the system builder's understanding of the whole operational environment that it has to support.

Voice and Data Apps

While TETRA enables mission-critical and flexible voice communications in a number of ways — one-to-one, group calls and broadcast — the technology's real strength lies in its ability to enhance the security, reliability and cost-effectiveness

of rail operations through a rich variety of data applications. By automating what would once have required additional infrastructure or direct labor-intensive physical intervention, TETRA can act as a secure communications platform to link devices, displays and management systems, gathering and distributing information, reducing friction and improving workflows.

For example, while trains themselves are becoming increasingly "smarter," the increasing cost means that they must be used as much as possible. In this context, TETRA-supported applications such as automatically monitoring the health and status of the various onboard systems including air conditioning, lighting, wheel and brake wear, or remotely controlling them, can deliver valuable savings in maintenance and repair while also contributing to overall safety and reliability.

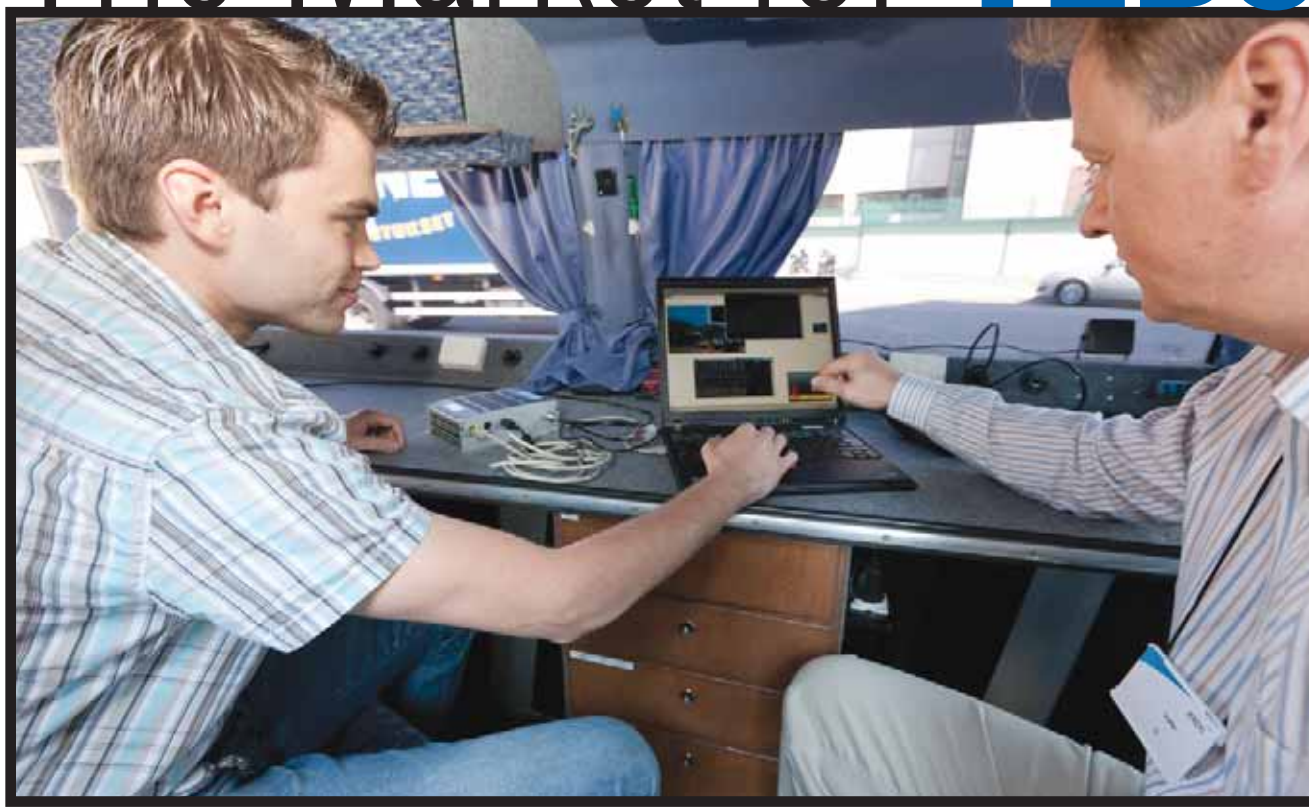
Location-based applications form a second key area for TETRA-enabled communications. While GPS may operate effectively in open long-haul environments, it runs into difficulties in urban areas where tunnels, cuttings and tall buildings may block signals. Here, alternative technologies such as wheel turn or trackside sensors using RFID or Bluetooth can be used to gather data for onward transmission.

Finally there is TETRA's ability to communicate voice securely and reliably in a number of different ways through person-to-person, group and broadcast calls. Systems can be used to remotely speak to passengers on trains, accept calls from emergency help points on those trains, or broadcast messages on service status to on-train displays to keep passengers informed. TETRA's inherent security, supported by a range of cryptographic options, also makes it suitable for supporting mobile data terminals for e-ticketing and e-payment.

Given the large sums that have been allocated to building new rail networks or upgrading existing ones, TETRA has a positive future in the rail and passenger transport sector. The nature of urban life now requires mission-critical perspectives to be applied to all the systems that keep a society functioning smoothly and safely. Until Star Trek matter transporters become a reality, rail networks are the only technology that can keep those cities and suburbs moving, and TETRA is one of the supporting technologies that must be seriously considered in any infrastructure development project. ■

Tom Quirke is vice president and general manager, Global TETRA Product & Solutions Organization, Motorola Solutions. In this capacity, Quirke has the oversight of both TETRA product management and TETRA engineering within Motorola Solutions worldwide. Email comments to editor@RRMediaGroup.com.

The Market for TEDS



Photos courtesy Cassidian

With the increased use of smartphones, mission-critical users are demanding access to more data applications.

By Harald Ludwig

The main requirement in mission-critical communications is still voice communications. All the available major technologies including TETRA, Tetrapol, Project 25 (P25) and GSM-R are optimized for voice transmission. Some also have data transmission capabilities for sending status messages, short data messages and IP packets. But the data throughput is limited.

Nevertheless there is a large range of data applications providing good services to users without using much bandwidth. For example, typing the registration number of a suspicious car into a radio terminal and receiving the car status does not require much data bandwidth but is a big support for a policeman who does not have to query a dispatcher for the car status via a voice call.

With the increased use of smartphones, mission-critical terminal users are asking why they cannot have the same data connectivity on their professional mobile radios. The demand for higher data rates has increased over the years for public safety and mission-critical communications.

The TETRA community addressed this requirement with the standardization of a high-speed data service, TETRA Enhanced Data Service (TEDS). The European Telecommunications Standards Institute (ETSI) released the TEDS standard in 2006. It took a while to develop TEDS products. TEDS prototypes and products were presented at congresses and exhibitions during past years but it was only recently that the first TEDS products passed the TETRA interoperability certification.

TEDS products from Motorola Solutions, Cassidian and Asia Pacific Satellite Communications (APSI) were successfully tested under the supervision of the appointed TETRA certification body, the Istituto Superiore delle Comunicazioni e delle Tecnologie dell'Informazione (ISCOM), an organization of the Italian Ministry of Economic Development.

The TETRA interoperability certification process (IOP) is a rigorous,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There is a lack of available spectrum for TEDS. Adding TEDS requires extra channels, but the extra frequencies are difficult to acquire because spectrum is a rare commodity.

strict, independent and tightly controlled testing program developed to ensure an open and competitive multi-vendor market. Just recently the 750th TETRA interoperability certificate was published. Each IOP certificate is issued for a specific infrastructure-radio terminal combination. There are some 3 million TETRA terminals in use worldwide.

The certification of TEDS products marks another milestone in the 15 years of TETRA interoperability testing. Users and operators of TETRA networks can be confident that their certified terminals will work in their networks.

TEDS Delay

Some are asking why it took more than six years from the release of the standard to see TEDS products for use. There are several possible answers to this question.

Manufacturers of TETRA equipment could say that they did not see a clear demand from users for TEDS, and therefore, could not justify the business case to develop TEDS products. Of the more than 20 manufacturers of TETRA infrastructure and terminal equipment, only three have TEDS products on the market. The other manufacturers are moving to Long Term Evolution (LTE), skipping TEDS or waiting for the market demand for TEDS.

Beside the big players, Motorola Solutions and Cassidian, at least two other manufacturers, Selex ES and Sepura, actively supported the TEDS standardization and interoperability work.

But why have we not seen a stronger market pull for TEDS? Users and operators said they were waiting for TEDS products on the market, but the products did not materialize. So the classic chicken or egg dilemma is presented. Users did not order products because manufacturers had not developed the products, and the manufacturers were waiting for users to commit to buy TEDS products before they invested in the product development.

These days you often get another answer as well: too little, too late. In some users' view, TEDS offers too few benefits, and the technology is too late because LTE is already on the horizon for mission-critical users. If an

operator needs to replace base stations to make them TEDS capable, the extra costs may not justify the upgrade. Also if additional base stations are required to meet the radio coverage requirements for TEDS, an extra investment is necessary. But if the base stations are already TEDS capable, the extra costs for the TEDS upgrade are low and may be justifiable.

Many operators do not see sufficient value for money in TEDS. The upgrade requires extensive redesign of a network but will not give as high of data rates as seen in 3G or LTE networks.

There is also a lack of available spectrum for TEDS. TETRA operates in dedicated frequency bands. Adding TEDS requires extra channels, but the extra frequencies are difficult to acquire. Spectrum is a rare commodity, and in some countries, additional channels in the TETRA frequency bands are not available. This lack of available spectrum for TEDS is probably the biggest obstacle for wider deployments.

However, there are projects to deploy TEDS. The biggest project is the nationwide mission-critical network in Norway where about 700 base stations will be equipped with TEDS. Other trials and pilots are being rolled out or discussed.

TEDS or LTE?

An option for many public-safety communications users is to skip TEDS and go directly for LTE. Commercial LTE networks are deployed in many countries. LTE technology is attractive for mission-critical users. The product development and product renewal cycles are shorter than those in the professional mobile radio (PMR) world. This is mainly because the market size for commercial devices is three to four orders of magnitude higher than the professional market. But for mission-critical users, commercial LTE networks do not cover all their requirements. Availability and resilience of commercial networks are too low for mission-critical use, and group communications is not well supported. However, there are activities to add these mission-critical requirements to the LTE standard.

The Critical Communications Broadband Group (CCBG) is working with other stakeholders, including governmental organizations, utilities and transport sectors, to drive standardization of a common global, mobile broadband technology solution for critical communications users and to lobby for enough dedicated harmonized spectrum for deployments of the networks.

LTE is widely expected to be the technology with which the broadband requirements of mission-critical users can be met. The CCBG is working with the Third General Partnership Project (3GPP) and the System Architecture Working Group 1 to standardize the additional necessary features in

TEDS products from Motorola Solutions, Cassidian and Asia Pacific Satellite Communications (APSI) have been successfully tested under the supervision of the appointed TETRA certification body, the Istituto Superiore delle Comunicazioni e delle Tecnologie dell'Informazione (ISCOM).

LTE to make it suitable for critical communications.

The main items that are addressed are a group communications enabler and proximity-based services. The group communications enabler will consider the evolution of the LTE standard to allow the TETRA application layer and the 3GPP system to support group communications. The proximity-based services will allow device-to-device services in LTE similar to the direct mode operation (DMO) in TETRA networks.

The roadmap for introducing mission-critical LTE will start with data services only. Voice services over LTE are expected to be introduced later in the process. The staged approach will first use commercial LTE networks as an overlay network for non-mission-critical data to the TETRA voice network. To increase availability and resilience, more than one commercial LTE network operator in a country can be used. For example, during the next few years, the Netherlands is looking to provide high-speed data to public-safety users via commercial networks as soon as LTE becomes available.

Commercial networks cannot be used for mission-critical data because the service levels delivered to commercial users are not sufficient for critical communications users. However, commercial networks will give users a high-speed data pipe for various non-mission-critical applications in addition to mission-critical voice communications. Many believe that once users start to rely on data applications, the data will become mission critical for their daily tasks even if delivered over non-mission-critical networks. Then this may be a driver to move the now mission-critical data transmission to a dedicated mission-critical (not commercial) network.

Of course one of the main aspects for broadband networks — as we know it from TEDS — is again spectrum. For LTE we not only need additional channels but a whole band of a few megahertz. To enable migration — the roaming of radio terminals to a foreign network — a harmonized frequency band across the countries is key. LTE is using more than 40 different frequency bands ranging from 800 MHz to 3.8 GHz. Radio terminals that are migrating to other networks must be able to operate in all the frequency bands or use an agreed (harmonized) subset of the frequency bands.

In Europe, activities are ongoing to dedicate spectrum for mission-critical LTE networks and to get harmonized frequency bands. This process may take some years, but once dedicated spectrum is available, public-safety organizations can start to build private LTE networks for mission-critical data. This is the second stage in the evolution vision for critical communications users. The last stage would be the introduction of voice services over the private LTE networks.

Because it is unlikely that nationwide LTE coverage will be available in the short term or even in the long term, it may be better for economic reasons to keep narrowband TETRA networks in scarcely populated areas rather than go for full LTE coverage. Hence the radio terminal devices will have the capability to roam between TETRA and LTE networks.

Should users skip TEDS and wait for mission-critical LTE? If we look at the time scales for the critical communications LTE enhancements, the objective is to include the group communications enabler and the proximity-based services into Release 12 of the 3GPP LTE standard, planned for publication at the end of 2014. Products will be available at the earliest in 2018.

Other additions to the LTE standard to increase the resilience of the network are planned into Release 13 of the 3GPP LTE standard, estimated at the end of 2016. Voice services over LTE are not expected until at least 2020.

TEDS products are available today. If spectrum is available and the network is TEDS ready, then moving to TEDS is probably the fastest solution. Standards for mission-critical LTE products are still being finalized. ■

Harald Ludwig is managing director of Arico Technologies, offering consultancy, training and project management services for the professional mobile radio industry. He is also chairman of the Technical Forum of the TETRA + Critical Communications Association (TCCA). This article represents the author's personal views and not necessarily those of the TCCA. Contact Ludwig at harald.ludwig@arico-tech.eu.

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DMR's Interoperability Progresses

Photo courtesy Motorola Solutions

As uptake continues, the digital standard moves forward on interoperability, direct mode and other features.

By Marco Morresi

The advantages and benefits that open and interoperable standards offer the markets are the very reason for their success. Why is interoperability so important? The most obvious reason is that open standards adopted by major manufacturers do not bind customers to a single supplier, and competitive markets foster continuous product innovation as well as price competition. Interoperability has far-reaching effects on standards with a significant impact on products, services and applications that enter the market.

The Digital Mobile Radio (DMR) standard was conceived to be open and developed by the European Telecommunications Standards Institute (ETSI), a leading standards development organization for information and communication technologies (ICT). A not-for-profit organization with more than 700 member organizations drawn from 62 countries across five continents, ETSI produces globally applicable standards for ICT, including fixed, mobile, radio, converged, broadcast and Internet technologies.

ETSI standards, such as DMR, could be described generally as "definitions and specifications for products and processes." If ETSI's role is to define standards, the DMR Association's role is to implement the standard, to develop and enhance features as a response to market feedback, and to be in charge of interoperability certification (IOP). DMR is a standard that is growing and in constant evolution, part of which takes place within the ETSI technical committee that looks after DMR and partly in the technical working group of the DMR Association that tackles functional developments of the standard typically brought back to ETSI. Developments in DMR technology and the growth of available products and applications are key to the success of the standard in a process of continual improvement.

Original Intent

The main purpose of the DMR standard was to define a series of open interfaces, as well as services and facilities, in sufficient detail to enable independent manufacturers to develop infrastructure and terminal products to fully interoperate and is a response to the demands of mission-critical users worldwide for an affordable, low-complexity alternative for digital replacement of legacy analog systems. The only interface defined in the ETSI standard refers to the air interface; one of the key activities of the DMR Association is to define additional interfaces such as an interface for control rooms and a data interface on mobile terminals.

DMR has built its success on the following key benefits:

■ With DMR, the channel as a whole maintains the same profile as an analog 12.5-kilohertz signal. This enables DMR radios to operate in a license holder's existing 12.5- or 25-kilohertz channels, which means there is no need for rebanding or relicensing, while also doubling the channel capacity.

■ DMR delivers backward spectrum compatibility with legacy analog systems to ensure backward compatibility with legacy radios. As DMR uses 12.5-kilohertz channels, the required spectrum compatibility is built in.

■ TDMA achieves 6.25-kilohertz efficiency while minimizing investments in repeaters and combining equipment with no extra equipment, new sites or extra maintenance.

■ To achieve 6.25-kilohertz efficiency and two communications channels, a repeater, antenna and simple duplexer are required. DMR systems can use existing sites and minimize investments in repeaters and combining equipment.

■ The technology provides better or equal coverage than legacy analog systems.

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DMR Tier 3 Interoperability Test Features

Mandatory

Registration

Single-Site Talk Group Voice Call Service

Individual Voice Call using OACSU on Single Frequency Pair

Individual Voice Call on Single Site Using OACSU

Individual Voice Call on Single Site Using FOACSU

Control Channel Hunting

Short Data Message on Single Site

Optional

Multisite Talk Group Voice Call Service

Individual Multisite Voice Call Service Using OACSU and FOACSU

Multisite Short Data Messages

Importance of Interoperability

If DMR has been successful thanks to the abovementioned key benefits, the size of DMR's success has largely depended on the interoperability of the technology. A healthy, competitive, open, multivendor market brings proven benefits to users such as choice of equipment and supplier, continuous development of new products with increased functionality and improved price performance. For manufacturers, it provides an increasing market and eliminates different and incompatible implementations of the DMR standard.

The DMR Association developed the IOP process to ensure users and equipment suppliers would benefit from a truly open multivendor market for DMR equipment. The interoperability process provides a formal and consistent test mechanism for competing manufacturers to test that their products are compatible. The IOP process encourages competition and creates a market of multiple and mutually compatible products. It enables customers to select the most appropriate products for their needs and to be confident that the products are compatible with others because they have been rigorously tested, and the functions listed in the certificate are interoperable. This allows users who select equipment from a number of suppliers to reduce the amount of system integration and testing that they need to undertake and gives them confidence that if they incorporate another supplier, the existing equipment will not become obsolete.

The DMR Association began to work on interoperability between vendors' equipment and to provide information about the DMR standard in 2009. The first successful completion of DMR interoperability tests (Tier 2) took place in May 2010. The first successful completion of IOP testing of trunked DMR (Tier 3) was announced in June 2012. The total number of DMR bilateral test sessions completed is 12, with nine radio manufacturers participating in test sessions.

Through this process, users can be assured that both vendors achieve interoperability through detailed documented evidence at the functional level and from the air interface record. The tests have been set up so that they can be reproduced if required and will be identical between test sessions. The tests took place in a laboratory set up to industry-accepted quality standards. Users also know the test results have been peer reviewed by technically skilled representatives of manufacturers in the industry.

Process and Testing

The results presented in the DMR interoperability certificates are derived from evaluating the results of functional testing and from signaling information from the over-the-air interface logs between live equipment. Certificates are hardware-platform specific and software-release specific. However, products not directly used in a test session but that belong to the same model class — equipment that manufacturers have determined through engineering analysis or internal functional testing to be functionally equivalent to the products tested — may be declared interoperable by manufacturers. DMR interoperability certificates and summary test reports are published on the DMR Association website. The certificates detail which features have been tested, whether interoperability has been achieved and other relevant details.

DMR Tier 2 mandatory IOP test features include group call, individual call (PATCS), individual call off-air call setup (OACSU) and all call. Optional features include call alert, radio check, remote monitor, emergency alarm, radio enable/disable and emergency call.

Mandatory DMR Tier 3 features are registration, single-site talk group voice call service, individual voice call service using OACSU on single frequency pair, individual voice call service on single site using OACSU, individual voice call service on single site using full OACSU (FOACSU), control channel hunting and short data message on a single site. DMR Tier 3 optional features are multisite talk group voice call service, individual multisite voice call service using OACSU and FOACSU, and multisite short data messages.

The number of IOP tests is a testament to the rapid uptake of the technology as is the increasing number of manufacturers now selling or in the process of building products built to the standard. The uptake has been a catalyst for further development of the specification, the bulk of which happens within the technical working group of the DMR Association.

Direct Mode, AIS

Recent developments have taken place in five key areas: improvements in spectrum efficiency for direct mode use, encryption of communications, text and location services,

and defining a common application interface specification (AIS). In the future, issues such as full duplex support, outlined in the DMR standard but not discussed in detail, are likely to be explored. See "DMR Standard Moves Forward" in the Quarter 4 2012 issue of *RadioResource International* for more details on the developments of the DMR standard.

The advanced features are introduced to deliver the benefits demanded by the market and companies that develop DMR products and applications, as well as to understand how the process works and affects the standard. A good example is the work done to improve the spectrum efficiency in DMR direct mode. A basic feature of digital systems is that thanks to voice encoding and compression techniques, they deliver high-quality voice communications in 6.25 kilohertz of bandwidth, a great benefit for PMR users who can take advantage of doubling, or even quadrupling, voice capacity compared with existing legacy analog systems.

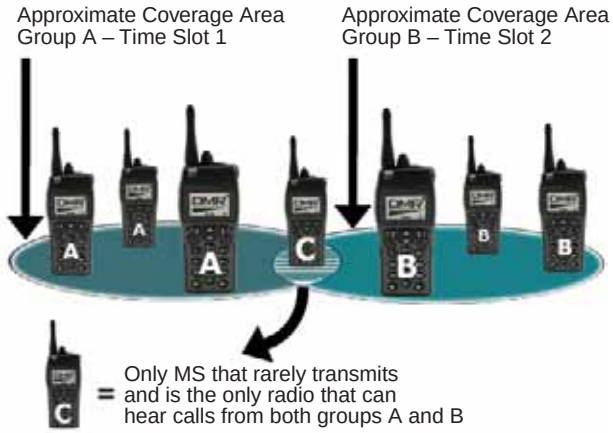
DMR is based on TDMA technology, so it does not require actual spectrum channels of 6.25 kilohertz because it can split existing 12.5-kilohertz channels into two virtual channels by using a two-time-slot timing pattern. In TDMA, user group A is allocated a first time slot of 30 milliseconds (ms) over the full 12.5 kilohertz and then stays silent while user group B uses the channel for the next 30 ms. This pattern repeats over time, effectively dividing the channel into two. Slot timing coordination between radios on the system is necessary; otherwise the transmissions of radios can overlap and users will experience interference.

In the initial version of the DMR standard, repeaters performed this coordination. The timing coordination requirements meant that in DMR direct mode use, when repeaters were absent, there was no timing coordination for the two time slots available in a channel. Without timing coordination, two radios on time slot one could not reliably share the channel with another pair of radios on time slot two. So in the original DMR specifications, the full 12.5-kilohertz channel was allocated for radios operating in direct mode, preventing any interference but giving an efficiency of one talk path per 12.5 kilohertz of bandwidth — the same as analog. As the target market for early DMR systems was for more complex systems in which repeaters are typically used, the lower spectrum efficiency in direct mode did not prevent the rapid adoption of DMR. But as digital PMR gathers pace, some of the less-sophisticated systems without repeaters started moving to digital, and it was necessary to tackle this limitation.

After careful review, the solution was to provide a mechanism for direct mode radios to use special signaling to share timing information with each other in a channel so that even without repeaters, slot timing coordination would be possible. To the user, this timing synchronization process is transparent, and the radios in a geographical area can operate on independent customer systems or use different radio manufacturers' equipment.

This was finalized at the end of 2011, and was formally released in version V.2.1.1 of parts 1 and 2 of the ETSI DMR

DMR Slot Timing Coordination



In TDMA, user group A is allocated a first time slot of 30 milliseconds (ms) over the full 12.5 kilohertz and then stays silent while user group B uses the channel for the next 30 ms. This pattern repeats over time, effectively dividing the channel into two.

standard, TS 102 361, in April 2012.

The work on direct mode TDMA has enabled the DMR standard to offer 6.25-kilohertz voice efficiency to radios in both repeater and direct mode — a benchmark for digital systems. By taking a highly standardized approach, the potential for all radios in an area, not just radios on a particular system, to benefit is realized.

Another feature under review relates to finding a common AIS to DMR infrastructure. It has been clear from market uptake that applications — dispatcher consoles and connectivity to database servers and control rooms — have been a major driver in DMR, often justifying the business case to replace an analog radio system. The increasing list of application providers in the DMR Association is also testament to the importance of applications, and the DMR Association reacted by searching for the best way to find a common approach to "match" the equipment provided by console makers to DMR systems. Work on the AIS is ongoing.

To have manufacturers use one standard interface makes the task of working with DMR technology more straightforward and cost effective, allowing for considerable cost and time savings related to the integration of consoles and dispatchers to DMR networks. ■

Marco Morresi is a member of the DMR Association's marketing working group and a marketing specialist at Selex Communications. Prior to moving to Italy in 2004, Morresi was director of marketing at the Alexander Graham Bell Association in Washington, USA, and founder and part owner of PrimaSat, an Inmarsat and Iridium satellite service provider, applications developer and software solutions integrator for maritime, aeronautical and land mobile users based in the United States. Contact him at marco.morresi@selex-es.com.

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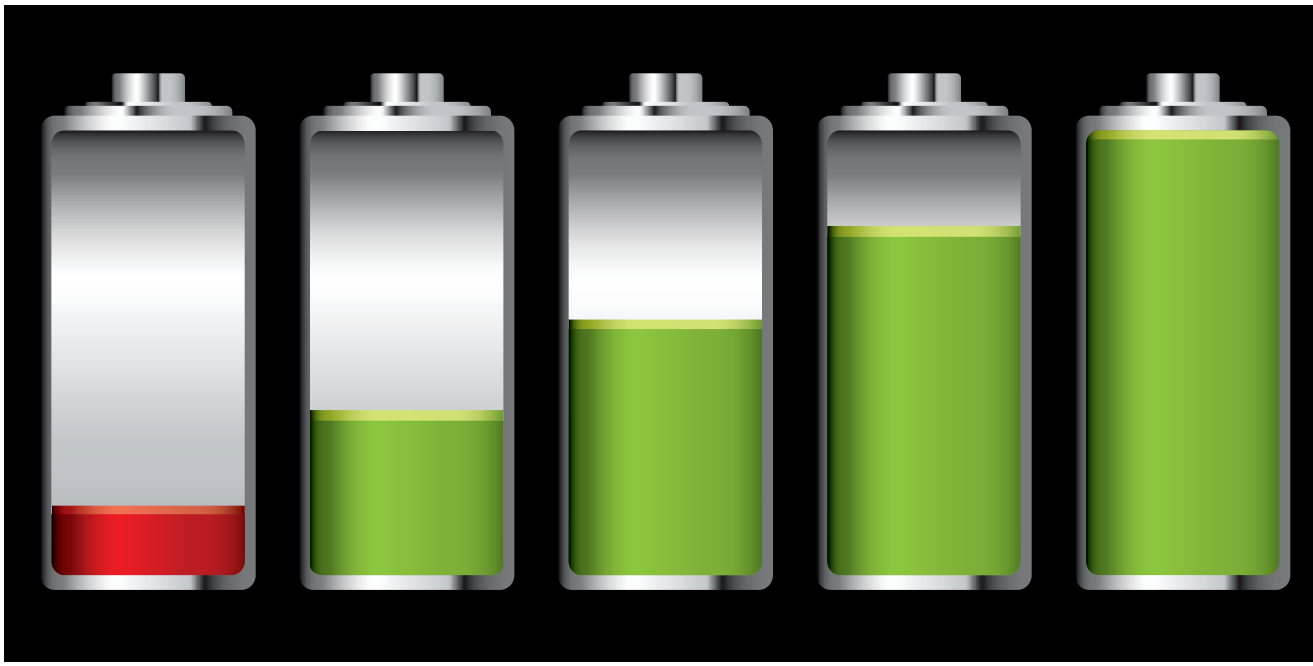


HEALTHY BATTERIES

New technology will guarantee optimal use of each battery and prompt replacement of a faded battery.

By Isidor Buchmann

The "ready" light on a battery charger will eventually illuminate, but this doesn't mean "able." There is no link between "ready" and battery performance. The amount of energy a battery can hold is measured in capacity, a value that gradually decreases with use and time. A faded battery charges quicker than a good pack because there is less to fill. Being ready first causes bad batteries to gravitate to the top, to be picked by the unsuspecting user. There is a caution: The "ready" light may give a false sense of security.

A new battery is rated at 100 percent, but few packs in the field deliver this; the acceptable bandwidth ranges from 80 to 100 percent. As a simple guideline, a battery on a portable device with a capacity of 100 percent should provide about 10 hours of runtime, 80 percent is eight hours and 70 percent is seven hours.

Recoverable Capacity After 1 Year of Storage				
Temperature	**Lead acid** at full charge	**Nickel-based** at any charge	**Lithium-ion (Li-cobalt)** 40% charge	100% charge
0°C	97%	99%	98%	94%
25°C	90%	97%	96%	80%
40°C	62%	95%	85%	65%
60°C	38% (after 6 months)	70%	75%	60% (after 3 months)

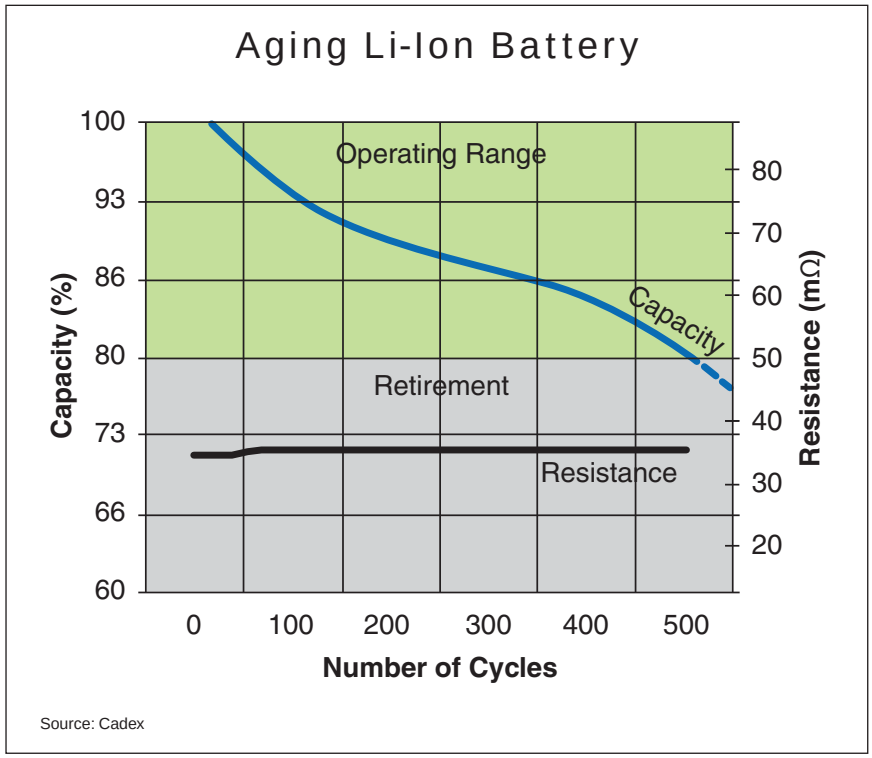
Source: Cadex

Elevated temperature hastens permanent capacity loss. Charge level also affects Li-ion.

The service life of a battery is specified in number of cycles. A lithium- and nickel-based battery will deliver between 300 and 500 full discharge/charge cycles before the capacity drops to 80 percent when replacement is recommended.

Cycling is not the only cause of capacity loss. Storage, especially at elevated temperature, also robs capacity; excess heat can be more stressful to a battery than cycling. A partially charged Li-ion that is kept at room temperature loses about 4 percent of its storage capability in a year. The loss increases to about 20 percent when stored at full charge. This occurs when keeping a laptop plugged into the main; laptop batteries are known to have a short life.

Internal battery resistance also plays an important role in battery



Batteries begin fading from the day of manufacture. This chart illustrates the fading capacity of modern Li-ion against a steady low resistance. Batteries should be replaced when the capacity drops to 80 percent.

performance. Applying a heavy load on a battery with elevated resistance causes the voltage to collapse. This ends the runtime before the capacity is depleted. Rising resistance with age is common with nickel-based and early Li-ion batteries.

The modern Li-ion no longer exhibits this problem. The resistance stays low, and the end-of-battery-life is solely determined by capacity. Capacity becomes the leading health indicator of most batteries. Improvements in Li-ion occurred around 2005; the same test on an older Li-ion would show an increase in resistance and likely cross the capacity line.

Lead acid batteries also keep low resistance with decreasing capacity. A starter battery cranks well until that one morning when a lack of capacity prevents turning the motor. Older starter batteries may run at less than 20 percent capacity but still start the motor well. Most battery

Storage, especially at elevated temperature, also robs capacity; excess heat can be more stressful to a battery than cycling.

testers only measure voltage and internal resistance; the capacity remains unknown. The end-of-battery-life often comes as a surprise.

Equipment manufacturers base the runtime of a wireless device on a new battery with 100 percent capacity, but this can only be achieved in roughly the first year. Realizing the difficulty to measure capacity, the medical industry often relies on date stamping to prompt battery replacement. With heavy use, the capacity could fade sooner than the mandated two years, but most modern batteries last much longer. Date stamping causes many good batteries to be replaced too soon, increasing operational costs and stressing the environment.

"Smart" batteries with SMBus come to the rescue by recording the cycle count and advising replacement after a given number has been delivered. But this technology comes with baggage as well. Smart batteries need periodic calibration to maintain accuracy. The largest limitation, however, is its inability to reveal capacity; the fuel gauge only indicates state of charge. This means that a battery that has dropped to 50 percent capacity will still show 100 percent charge. The result is a runtime that has been cut in half. SMBus batteries are found in portable computing, medical and military devices.

Public-safety organizations often use the battery until it stops dead. Failures almost always occur at the most awkward time during heavy traffic or in an emergency. Battery analyzers can prevent this from happening. Attaching a removable label to a battery indicating service date, due date and capacity offers a simple and self-governing way to manage a battery fleet. With this information on hand, prudent battery users only pick a pack that has recently been serviced. Expired units are removed, run on the battery analyzer and are relabelled. The setup is simple, and managing the system requires only about 30 minutes per day.

Conventional battery analyzers measure the capacity with a full discharge, but there is a need for faster test methods. Rapid testing has been offered, and the accuracy varies according to the method used. Early devices linked battery state of health (SoH) with internal resistance. While this may still be effective for

The test takes 30 seconds, provides a 90 to 95 percent correct prediction and services batteries with a state-of-charge from 40 to 100 percent.

nickel-based batteries, the steady low resistance of the modern Li-ion renders this method obsolete.

New technologies look at the mobility of ion flow between the electrodes and use electrochemical dynamic response to estimate battery SoH. The test takes 30 seconds, provides a 90 to 95 percent correct prediction and services batteries with a state-of-charge from 40 to 100 percent.

The next step is incorporating the SoH engine in a charger. When the "ready" light on this charger illuminates, the user is assured that the battery is fully charged and has a capacity of 80 to 100 percent. A faded battery with a low capacity or other anomalies is given a red "fail" light, prompting replacement. Placing health validation in a charger provides quality control at no extra effort. More importantly, the system guarantees optimal use of each battery while reducing fear of unexpected power loss. Only good batteries are kept in the fleet; faded packs are shown the exit door. This saves money and protects the environment.

The new charger can also check batteries on the fly. The user simply inserts the pack into the charger, presses "test" and a snapshot of the electrochemical battery is given in 30 seconds. The readings reflect the electrochemical condition of the battery independent of coulomb counting, impedance tracking and other data that may be stored in the battery.

The charger also assists in incoming inspection to verify proper function before releasing the batteries into the field. Another useful application is inventory control by evaluating unknown packs that have accumulated in boxes. Many batteries are protected with diodes, and the new charger can also service these, but the manual test is not possible. ■

Isidor Buchmann is the founder and CEO of Cadex Electronics. For three decades, Buchmann has studied the behavior of rechargeable batteries in practical, everyday applications and has written award-winning articles and the book "Batteries in a Portable World," now in its third edition. Email feedback to editor@RRMediaGroup.com

Product Expo: Tower Site and Test Equipment

Aeroflex

Aeroflex announced new Auto-Test II capabilities for the 3920 digital radio test set that include Relm Wireless BK KNG 800 series and

Harris Project 25 (P25) series. The new test automatic features are in addition to the Motorola Solutions APX, MOTOTRBO and ASTRO series. The test set also supports Kenwood's P25 series, EF Johnson ES series and Technicsonic Type 1 and Type 2 radios. With these new capabilities, the test set continues to be a versatile radio test set.

www.aeroflex.com

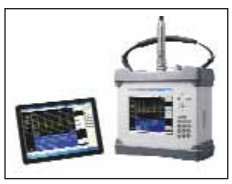
Agilent Technologies

Agilent introduced real-time spectrum analysis (RTSA) as an upgradable option for new and existing N9030A PXA signal analyzers. With real-time capability, the analyzers can detect intermittent signals with durations as short as 3.57 microsecond with 100 percent POI, scan with 160 megahertz real-time bandwidth up to 50 GHz frequency, and see small signals in the presence of large ones with up to 75 dB spurious-free dynamic range. The high-performance signal analyzer provides the ability to see, capture and understand the most elusive signals — known or unknown — inside signal-rich systems and environments, company officials said.

www.agilent.com

Anritsu

Anritsu introduced remote control software for the PIM Master MW82119A, a high-power, battery-operated, portable passive intermodulation (PIM) test analyzer. With the software, field technicians on the ground can control an MW82119A configured on top of the tower, making it easier and more efficient to conduct highly accurate PIM measurements. The free software is compatible with any laptop or tablet operating with Windows XP SP2 through Windows 7 64 bit. Connection to the PIM Master MW82119A can be made over Ethernet or compact Wi-Fi travel router.



www.anritsu.com

Antenna Products

The RTR-Series is available in 6.1- to 30.5-meter heights and is designed to support up to eight antennas, either UHF or VHF, for ground-to-air communications at airports or remote air traffic control sites. Self-supported antenna towers come in 3 – 6.1 meters bolted sections and vary in height from 6.1 – 21.3 meters. Guyed antenna tower versions are available in 21.3, 24.4, 27.4 and 30.5-meter heights. The self-supported and guyed towers are offered as knockdown or assembled sections and can be assembled at the factory or shipped unassembled. All towers are designed to the requirements of TIA/EIA-222-F, 105 mile per hour (mph) wind load.

www.antennaproducts.com

Asentria

The SiteBoss 450 (S450) is a cost-effective remote site monitoring unit used in large mobile operator network deployments. The unit is designed to integrate closely with external sensing devices for monitoring these variables. To overcome the challenge and cost of powering sensors in a DC environment, the device can directly power a variety of sensors. The unit also supports internal wireless modems for reliable transfer of status data as either its primary method of communicating or as a backup to a more conventional Ethernet connection.

www.asentria.com

C4i

The Exelis C4i radio interface unit (RIU) provides a seamless interface between radios and telephony using VoIP technology. The unit can be used standalone as a radio over IP (RoIP) gateway or as part of a larger Exelis communications solution. While stationed at the radio or repeater site, the unit allows customers to use an IP connection to communicate with consoles, saving cost compared with leased lines and providing greater flexibility. The standards-based unit allows for connection to a variety of other systems, such as the state police, paramedic systems or a public utilities control room.

www.c4i.com

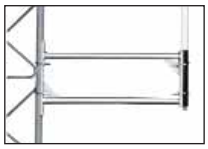
Carlson Wireless Technologies

Carlson engineered a high-gain omnidirectional base station antenna designed to meet the demands of TV white space, unused spectrum located between 470 – 698 MHz in the UHF range. The omnidirectional UHF antenna was designed to optimize the performance of the RuralConnect broadband radio. The design provides consistent gain across the UHF band and is not limited to specific channels or geographic areas. The antenna can withstand extreme weather conditions.

www.carlsonwireless.com

Comtelco

Comtelco's Tower Side Mount Kit was designed for use with Comtelco XL series base stations. The heavy-duty side mounts feature a galvanized finish. Each kit is supplied with 4.45-centimeter stainless U-bolts for easy installation on a Rohn 45-type tower. For a larger tower leg, stainless steel strapping (not supplied) can be used.



www.comtelcoantennas.com

Davicom, a div. of Comlab

The Modular Monitoring and Alarm System (MMAS) for NEXEDGE trunking radios secures the investment and helps prevent trunked system downtime and loss of service. Based on the company's

field-tested site monitoring and control units, the system is easy to install and comes with pre-assembled connectors and pre-configured software. The RF power amp, power supply and exciter for each channel are monitored and controlled while alarms can be sent by email, text message, voice call or directly to a monitoring computer if faults occur. Channels can be added as needed with Davicom Expansion Modules.

www.davicom.com

Eagle Eye Power Solutions

The iPQMS battery monitoring system is designed to monitor and analyze the aging status of up to 448 jars (or 448 cells) by measuring and recording string; voltage and current, and jar/cell; voltage, internal resistance, connection resistance and temperature. The

system is capable of monitoring batteries 10 – 6,000 Ampere hour (Ah), 1 – 16 volt with a maximum system voltage of 999.9 volt direct current (VDC). The system comes complete with battery monitoring software that offers a comprehensive battery diagnosis and reporting capabilities to ensure the integrity of the critical battery backup. The system protects users from costly downtime, maximizes battery life, reduces maintenance costs, and enhances safety and security, company officials said.

www.eepowersolutions.com

General Dynamics SATCOM Technologies

The lightweight, fully portable, software-defined R8000B communications system analyzer tests every major digital radio protocol,

including Project 25 (P25), TETRA, Digital Mobile Radio (DMR) and NXDN, and now features spectral purity in a multipurpose instrument. The feature-packed spectrum analyzer and bright 8.4-inch color LCD display make the analyzer ideal for on-site maintenance and interference measurement. Firmware upgrades are free for the life of the unit, and new software can be added in less than 30 seconds.

www.gdsatcom.com

Midian Electronics

Midian's VAE-10 voice alarm encoder can send a pre-recorded voice message and an emergency automatic number identification (ANI) when an event occurs at a repeater site. The event could be that the site is on backup power, equipment has failed, a tower light is off or an intrusion has been detected. For example, the unit can be set up to send a recorded message of "Radio tower 1 backup

power is on." The emergency ANI can be sent in Motorola's MDC-1200, Kenwood's Fleet-Sync, Harris' G-Star, DTMF and five-tone. The message and emergency ANI can be programmed to send once or periodically.

www.midians.com

Mobile Mark

Most Wi-Fi 802.11n and 802.11ac modems use multiple input multiple output (MIMO) electrical designs, but Mobile Mark offers direc-

tional, omnidirectional and in-building ceiling mount antennas. Wi-Fi MIMO antennas contain two or three antenna elements with each element covering the same spectrum (2.4 – 2.5 and 4.9 – 6 GHz) and offering the same gain. The PND directional MIMO panel antennas are housed in a compact radome with three SMA connectors exiting the back. The slim-profile DOD omnidirectional MIMO antennas measure less than 76 by 2.5 centimeters, with three cables. CMD-W ceiling mounts blend easily into the setting and are configured with flame-resistant cables.

www.mobilemark.com

Motorola Solutions

Motorola offers a comprehensive portfolio of building enclosures that protect communications equipment from the environment while

enhancing system performance and minimizing downtime. To provide organizations with an enclosure that meets unique requirements as well as R56 standards, Motorola has two building design choices: Motorola Standard Building (MSB), an all-inclusive, concrete shelter that provides maximum protection; and the Motorola Alternative Building (MAB), a lightweight fiberglass aggregate panel shelter, fully scalable and tailored to specific requirements.

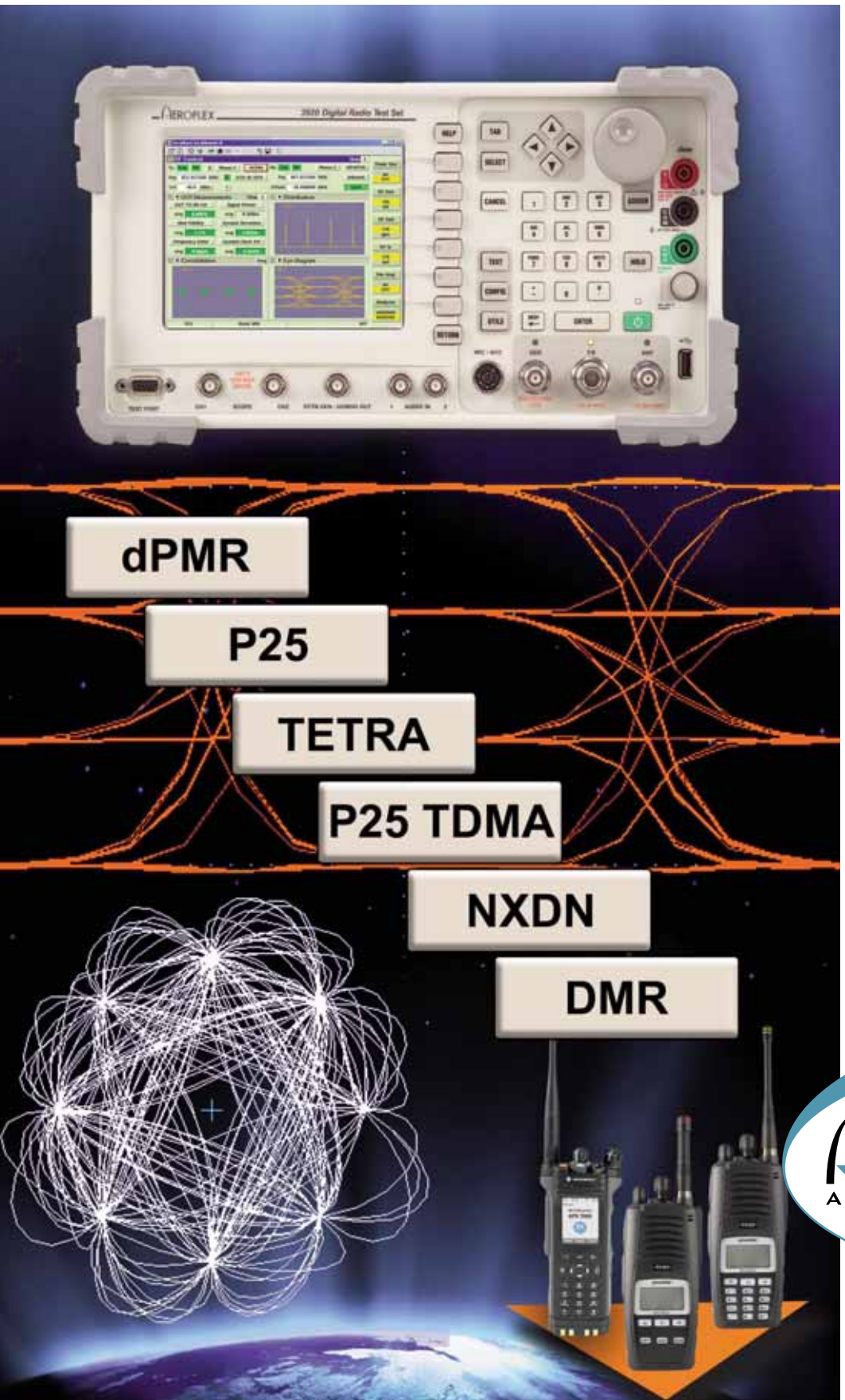
www.motorolasolutions.com

Narda Safety Test Solutions

Nardalert S3 is an advanced non-ionizing radiation (NIR) monitor designed to be used as a wearable or fixed-area sensor. The

unit features field-replaceable sensors, a large color display and comprehensive user-friendly software. The unit touts a new mechanical design with removable sensors that provide for rapid field support and unlimited upgradeability for users. The device is chargeable through a computer USB port, and employs light, sound and vibration alarms. The device can be deployed with NBM-580 for collecting readings from multiple Nardalert meters and probes. The unit was recently tested by the U.K.'s National Physical Laboratory (NPL) on an electrically and anatomically correct model. The laboratory found, at common TV and FM radio frequencies, the unit provides nearly isotropic

One Test Set for All Your Narrowbanding Test Needs



Whatever land mobile radio system you rely on, the Aeroflex 3920 has the capability to test it. With multiple radio test systems for P25, MOTOTRBO™, TETRA, NXDN™, dPMR, and now P25 Phase II TDMA, the Aeroflex 3920 has the POWER and accuracy to test today's technologies.

The Aeroflex 3920 is the first digital and analog radio test set to provide full coverage of all of the major narrowband digital radio standards, for both mission critical and professional radio systems. With the new capability to test P25 Phase II, the Aeroflex 3920 is leading the way in narrowband radio test. Other radio test sets can't measure up to the 3920. Only the 3920 provides accurate, reliable, and complete radio test and alignment. The Aeroflex 3920 is the one test set for all your test needs.

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www.aeroflex.com

detection performance when mounted on the body.
www.narda-sts.us

Optoelectronics

The Xplorer Test Receiver is a fast sweeping near-field receiver covering 30 MHz to 2 GHz in one second. The handheld displays the frequency captured, demodulates the FM audio and decoding of CTCSS, DCS, DTMF and logic trunked radio (LTR) subaudible tones. The test receiver can be used for performing quick radio checks in the shop or in the field, emergency preparedness frequency coordination where multiple agencies are involved, remote site surveys where transmitting frequencies are unknown or law enforcement for near-field surveillance and other applications.

www.optoelectronics.com

Racom Products

Racom manufactures two automatic station identifier models for transmitters, base stations and repeaters. Model 701 provides automatic transmitter identification in Morse code and has three timers and monitors. Call sign and parameters (pulsed tone or carrier) are programmed with a PC. Model 1214V is an automatic voice station identifier that identifies the transmitter in voice, and the call sign is recorded with a microphone. The unit features three system monitors, timers, 600-ohm output and speaker.

www.racominc.com

RF Industries

7-16 DIN to N adapters are desired in test applications such as base station passive intermodulation (PIM) testing. The low-loss, low-VSWR adapters are designed for use with portable antenna and cable analyzers. The P2RFA-4013-SS precision grade adapter kit gives users six of the most needed adapters for bench and field use. All 7-16 DIN adapters are machined to exact specifications with white bronze (tri-metal) plated bodies and stainless steel coupling nuts for tarnish-free service and superior electrical performance along with low PIM. The RFA-4013 professional-grade kit variation has silver-plated adapters and hex knurls for hand tightening.

www.rfindustries.com

Spectracom

Spectracom's Path Align-R test set is a high-performance test solution designed to quickly and accurately optimize the transmission path between two microwave antenna sites. The test set provides precise alignment results in about 20 minutes. The product drives the site's antennas, allowing the optimization process to be done without the need for on-site radios, complex test equipment, ground technicians, on-site AC power, cell phones or two-way radios. It also provides proof of alignment with recorded and documented records.

www.spectracomcorp.com

Survey Technologies Inc. (STI)

The STI-9400 system can test the coverage and quality of wireless mission-critical communications system with field measurements. From analog audio quality to signal strength to Project 25 (P25) bit error rate (BER) measurements, the test system can verify wireless communications system coverage and performance. Results are color contour plots of signal coverage and quality over the area tested or tiles quantifying the level of coverage in the area tested. Uplink testing is possible for test field to base coverage and quality with STI systems and solutions.

www.surveytech.com

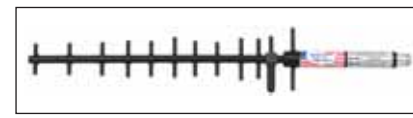
TC Communications

TC Communications offers an analog over Ethernet gateway and a 28-channel analog multiplexer for connecting police and fire dispatch, 9-1-1, public-safety answering points (PSAP) and CAD radio transceiver towers back to centralized control centers. The TC3846-6 analog over Ethernet gateway links analog, audio and intercom devices and dry contacts over Layer 2/3 IP networks. The TC8000 analog fiber multiplexer extends two/four-wire 600-ohm audio for voice applications, as well as data channels and dry contacts. Both products improve voice quality, increase system reliability in harsh environments, replace unreliable leased phone circuits and stabilize voice-level settings for 600-ohm audio channels.

www.tccomm.com

Telewave

The ANT2600Y12-WR is a small, high-gain yagi antenna covering 2.5 – 2.7 GHz, designed for handheld use with many types of portable wireless analyzers. The antenna can also be installed for fixed use in any environment. The antenna produces 12-dBd gain with excellent front-to-back performance, Telewave executives said. Each antenna is sealed with a high-tech Txylan coating, which protects the antenna from adverse environments. The feed line is sealed within the boom, and an RF-transparent radome protects the driven element. The antenna includes a small U-clamp for fixed vertical or horizontal polarization. An N-F or optional DIN-F connector is mounted in the end of the boom.



www.telewave.com

Trango Systems

The StrataLink 24 is an ultra-high capacity, carrier-class all-outdoor,

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

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www.narda-sts.com

point-to-point system that boasts industry-leading system gain (for longer links) and the highest spectral efficiency available in the 24 GHz unlicensed frequency band, company officials said. The product is built for a variety of service provider and enterprise applications requiring reliable, high-capacity connectivity between locations. The system reaches throughput speeds of 750 Megabits per second (Mbps) full duplex, 1.5 Gigabits per second (Gbps) aggregate, on a 60-megahertz channel. With XPIC/ 2+0 configurations, the system can support 1.5 Gbps full duplex (3 Gbps aggregate).

www.trangosys.com

Trilithic RF & Microwave

Model 8853S handheld spectrum and interference analyzer is a 3 GHz, 50-ohm handheld spectrum analyzer that can be used anywhere in 2G/3G/4G wireless, wireless LAN, satellite and microwave networks to analyze RF signals with a comprehensive scope of measurements. The analyzer includes a larger display, internal calibration, preselection, and a familiar and intuitive user interface. The unit also provides signal strength indication, spectrogram and waterfall diagrams to identify interference signals. The kit includes a soft carrying case with shoulder strap, Li-ion battery, AC-to-DC power adapter and battery charger, and more.

http://rfmicrowave.trilithic.com

TWR Lighting

The FCC-approved TWR/Hark DM900/DM32 remote monitoring systems allow the elimination of "Quarterly Light Inspections" that can save owners thousands of dollars annually, TWR officials said. The systems are designed to interface with Federal Aviation Administration (FAA)-approved alarmed lighting systems and additional site equipment such as generators or AC units using contact closures or voltage alarms. Remote monitoring options include CDMA/GPRS wireless modems, Ethernet transmission control protocol (TCP)/IP, satellite, POTS line and Windows-based software.

www.twrlighting.com

Warehouse Cables

Specific types of twisted pair Ethernet cabling are required for tower applications. Plenum-rated cable is needed to decrease flame propagation in a fire-rated space. Shielded cable is common where outside EMF or RFI interference is possible. Outdoor or direct burial (CMX) cable protects against UV damage and moisture intrusion. When choosing between Category 5E, 6 or 6a, overall distance is a factor when considering signal performance.

www.warehousecables.com

TETRA Radio with Camera

Motorola Solutions launched the first TETRA radio with an integrated 5-megapixel camera and image management solution. The radio gives officers the capability to capture evidential

images at the scene of a crime or incident, potentially reducing the time spent in court and increasing conviction rates, company officials said. The new MTP6750 handheld radio features the Photograph and Intelligence Communications System (PICS). Through PICS, images captured on the portable can be managed, authenticated and shared within a public-safety organization's existing workflows, enabling verification of captured images at any point and reducing the chance of evidence being deemed unusable in a prosecution. The radio is built on the newly launched MTP6000 platform and includes integrated Bluetooth, multi-slot packet data and support for TETRA Enhanced Data Services (TEDS). The handheld offers an integrated direct-mode repeater. Working range can be extended by up to 14 percent through the radio's transmit power capability and receiver sensitivity. PICS covers three key areas — Integrated Terminal Management (iTM), indelible digital marking and application programming interface (API). iTM allows a fleet of radios to be managed remotely from a central location. Indelible digital marking verifies that images have not been tampered with before being used in law courts. Images captured include metadata such as time and date, location, user identification and more. The iTM API allows Motorola and its partners to integrate PICS into an organization's existing systems and processes, or to develop further applications tailored to the needs of public-safety and other end-user organizations.

www.motorolasolutions.com

Multiband Portable

EF Johnson Technologies introduced its Viking VP900 multiband portable,

including loud audio, noise cancellation and optional internal GPS, immersion protection, top display and voice annunciation. The Viking series is based on Phase 2 TDMA technology. The radios are compatible with SmartNet/SmartZone trunking and Project 25 (P25) trunked and conventional modes.

www.efjohnson.com

TETRA Switch

The DXT3p is a TETRA switch from

Cassidian Communications. The portable switch offers voice and data services in a compact form factor. Ideal for

temporary networks or applications where the network needs to be mobile, the switch is the size of a suitcase at 48 by 34 by 30 centimeters. The switch weighs 20 – 30 kilograms, light enough for one person to carry, and consumes about 150 watts of power.
www.cassidian.com

Digital Interfaces

Tait Communications' digital Project 25 (P25) and Digital Mobile Radio (DMR) Tier 3 platforms were upgraded to support Avtec IP Scout dispatch systems. The console interfaces are compatible with Tait's standards-based P25 Phase 2 upgradeable TN9400 and DMR Tier 3 TN9300 core networks. Tait's P25 solution provides 12.5-kilohertz P25 Phase 1 FDMA operation and a software upgrade path to 6.25-kilohertz-equivalent P25 Phase 2 TDMA compliance.
www.taitradio.com

Intrinsically Safe Headsets

The CT-ClipCom series from **CeoTronics** includes in-ear headsets for industrial applications that meet European Union

ATEX directives for equipment used in explosive environments. The CT-ClipCom/EX is intrinsically safe and complies with high protection class specifications. The ATEX certification applies to both the in-ear microphone and the flexible boom mic versions of the product. The boom microphone version also includes a boom arm. Both versions come in a single-ear version but are also available for both ears. The headsets are approved as certified hearing protection (PPE) and are lightweight. The product can be connected to all current digital and analog radio models.
www.ceotronics.com

Speaker Mic and Headset

Pryme Radio Products enhanced its SPM-2200 Trooper II speaker microphone, adding a

waterproof feature and integrated GPS capability. The waterproof feature raises the product's rating to IP57, which means it can be fully submersed in water up to 3 meters deep for up to 30 minutes.

Pryme also introduced an updated tactical bone conduction headset that includes bone-conducting speakers that vibrate the mandible, bypassing the eardrum and producing audio directly to the inner ear. The headset also includes a flexible boom with a noise-cancelling mic element that can be placed close to the mouth. A thin, over-the-head Velcro strap holds the headset firmly in place.

Finally, the company announced a new Bluetooth adapter that can be attached to any headset, earmuff or throat mic. The adapter makes the unit Bluetooth compatible with all of Pryme's Bluetooth mobile and portable radio adapters as well as any cell phone.
www.pryme.com

PTT Unit and Controller

Savox Communications extended its line of radio accessories with a two-way radio push-to-talk (PTT) unit and communications controller. The C-C440 connects to the radio and provides a remote PTT capability with a large and easy-to-access surface button. The unit can be

secured to clothing, eliminating the need for users to reach for their radios, which works well in situations where the radio must be worn under protective clothing. The unit is designed to be used with heavy-duty gloves. An emergency button allows for distress alerting, and the unit includes a four-pole quick release connector that connects to the company's bone microphones and other headsets.

Savox also announced PTT-over-cellular accessories, including the Promate BTH-101 Bluetooth headset and the Promate BTR-155 remote speaker microphone unit.
www.savox.com

Dispatch and Communications Platforms

Harris Public Safety and Professional Communications (PSPC) introduced dispatch and communications platforms. VIDA Premier is a fully scalable communications platform that includes options for high availability and network redundancy to increase mission-critical communications reliability across multiple locations. The platform provides interoperability through the Harris VIDA network and provides unified interoperable communications for voice, data and applications across professional mobile radio narrowband to Long Term Evolution (LTE) broadband data networks.

Symphony is a customizable hard-

ware platform that integrates dispatcher capabilities into a single, public-safety-grade console. The product can run Harris' C3 MaestroIP dispatch console application and allows agencies to migrate to next-generation technology and manage the convergence of narrowband and broadband communications.
www.pspc.harris.com

Interoperability Gateway

Raytheon upgraded its INTEROP-7000 interoperability gateway to include Project 25 (P25) Inter RF Subsystem Interface (ISSI) capability. The P25 ISSI capability allows P25 talk groups to be linked to any of the member agencies of the interoperable system, including talk groups of another P25 system. ISSI also enables the use of key metadata, including user IDs, alerts and messages, while eliminating donor radio infrastructure costs and coverage concerns. The system includes mobile applications optimized for laptops, tablets and smartphones.
www.raytheon.com

Portable Satellite System

The RapidSat700 from **Beam Communications** is a portable satellite communications system that operates with the Inmarsat Broadband Global Area Network (BGAN). The product is ideal for rapid setup in emergency situations, first responder and disaster recovery work.

The system supports data rates of up to 492 kilobits per second (kbps), provides outdoor Wi-Fi connection up to 45 meters, 10/100 Megabits per second (Mbps) LAN ports, RJ11 voice/fax and handset, voice/data connectivity and integrated power management with status indicators and fan-forced cooling. A built-in Lithium battery backup of 538 watt hour (WHr) provides continuous 24 hours of transmit time.

www.beamcommunications.com

Indoor Tracking System

Cambridge Consultants introduced an indoor tracking system concept that

incorporates sensors and a custom algorithm to determine a person's location with an accuracy of within 1 percent of distance travelled. The technology uses low-power sensors and a small device and does not require existing internal infrastructure. The platform can be embedded in an existing design or operate as a standalone unit with options to compute the location locally or transmit location information to a remote system.

www.cambridgeconsultants.com

POCSAG Testing

Aeroflex added a Postal Office Code Standardization Advisory Group (POCSAG) testing option to its 3920 digital radio test set, which allows both sending and decoding of POCSAG-encoded messages to verify the operation of pagers and paging systems. The operation includes user control of the modulation deviation, bit rate and message format. Pre-defined messages are available to transmit, or users can create a custom message. Pages can be sent to a user-selected radio identification code (RIC) or to a sequence of RICs. RF frequency and power levels are controllable, allowing receiver sensitivity testing to be performed on any POCSAG receiver.

www.aeroflex.com

P25 Simulcast Base Station

The SB2025NT Project 25 (P25) simulcast base station from **Simoco** offers P25

performance in a compact two-unit form factor. The product supports a wide range of frequency bands. Building on the plug-and-play principles of analog Solar 25 simulcast systems, the integrated simulcast and voting controller offers enhanced resilience and full remote management of base station networks. The unit incorporates a received signal strength indicator (RSSI) voter that can operate in talk-through mode with simulcast transmit.
www.simocogroup.com

Base Station Antenna Platform

The RF X-TREME is a base station antenna platform from **Radio Frequency Systems** that will serve as the foundation for a high-performing line of multiband

base station antennas. The platform, which supports multiple bands including Long Term Evolution (LTE) 700, provides triple-band capability by orienting the antennas side by side to achieve high gain and optimal performance in a single package. A 1.2-meter triple-band model will be the first commercially available option. An integrated field replaceable AISG 2.0 antenna control unit (ACU) for remote electrical tilt and a model without ACU also are available. The platform is designed for low wind load to minimize tower loading.
www.rfsworld.com

Directional Antenna

Narda Safety Test Solutions introduced a loop antenna, extending the range of application for its interference and direc-

tion analyzer IDA-3106 to very low frequencies. The antenna is suited for detecting interference caused by switching power supplies or data transmission over electricity supply lines. The antenna covers a frequency range from 9 kHz to 30 MHz. The company also offers an improved antenna handle with a built-in switchable preamplifier that covers the extended frequency range and increases sensitivity by an additional 20 decibels (dB).
www.narda-test-solutions.de

UWB Omni Antenna

Cobham Antenna Systems, Microwave Antennas released an ultra wideband compact omnidirectional antenna. The product supports distributed antenna system (DAS) applications covering PMR, TETRA, cellular, wireless LAN and Wi-Fi

systems. Operating in the 380 MHz to 6 GHz band, model OA-0.4-6.0V/2028 features vertical polarization and -1 to +5 decibel isotropic (dBi) gain across the band. The omni pattern has very low ripple and does not require any additional ground plane. The antenna can be mounted to the ceiling using a variety of optional mounts. The protective radome is constructed of fire-retardant material, and the unit has been specific absorption rate (SAR) tested.
www.cobham.com

TETRA Diplexers

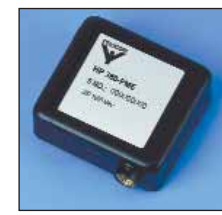
The TETRA diplexers 380 – 410 MHz developed by **Antennentechnik Bad Blankenburg** offer the capability of using

one antenna for two transceivers. Tuneable or fixed, the diplexers are suitable to use in vehicles as well as in buildings with quick and easy mounting, using one hole for two radios and allowing simultaneous receive on both devices. The diplexers have a built-in impedance matching section for the highest isolation up to -60 decibels (dB) and operate from -30 to +60 degrees Celsius. Power splitters for TETRA, 2- and 4-meter band, tuneable or fixed, are designed to equally separate one signal input into two receivers.
www.antenne-ag.de

Diplexers and Filters

Procom launched a series of 100-watt diplexers for VHF, UHF and TETRA. The PRO-DIPX diplexers use the Chebyshev characteristic, ensuring low insertion loss and high isolation. The product covers the 0 – 960 MHz range with several connector options. Diplexers are passive devices that multiplex two ports into a single common port. They prevent intermodulation and keep reflected VSWR to a minimum for the input transmitters.

Procom also added two filters to its range of products. The LP 174-FME is a



low-pass filter with a pass band of 0 – 174 MHz and a stop band of 380 MHz to 1 GHz. The HP 380-FME is a high-pass filter with a pass band of 380 MHz to 1 GHz and a stop band of 0 – 174 MHz. Both filters are designed to avoid interference between VHF radios and TETRA radios. The filters also can be used separately as a harmonic filter or preselector in VHF or UHF radio systems.
www.procomuk.co.uk

Voice Processor

CML Microcircuits updated its CMX7011 digital voice processor with the voice store/retrieve (VSR) capability, as well as packet data functionality. The VSR function offers storage of more than 20 seconds of vocoded speech in receive mode. Recordings can be played back,

paused, resumed or erased. A step-back feature allows the device to step back in discrete steps during playback mode. Packet data operation allows the device to send packetized data with cyclic redundancy check (CRC), forward error correction (FEC) and interleaving as a complete transaction.
www.cmlmicro.com

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SIGNATURE: _____

DATE: month _____ day _____ year _____

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 _____

Q213

By George Spencer

Insights into South Africa's PMR Market

The South African PMR market can be segmented into government users, professional private users, public operator and dealer-reseller sectors. Conventional analog, simulcast and MPT 1327 trunked PMR technologies remain in significant use, as does TETRA. To a lesser extent, Digital Mobile Radio (DMR), and digital Private Mobile Radio (dPMR) technologies have been deployed, with one user indicating a potential GSM-R deployment.

While the number of analog users exceeds the number of digital users, there is an increasing trend toward digital technologies across all market sectors. The benefits of digital technologies are well marketed by vendors, and technologies that facilitate a well-priced soft migration are garnering the most interest.

Chinese analog products dominate the price-sensitive dealer-reseller market, with low-cost digital products to follow. And push to talk (PTT) over GSM has captured some market share, mostly at the expense of public access mobile radio (PAMR) networks.

The market is regulated by the Independent Communications Authority of South Africa (ICASA). ICASA recently requested comments regarding the second frequency migration regulation and radio frequency migration plan, and is implementing frequency use audits that are yielding interesting results and comments.

ICASA is under continual pressure from industry to perform in terms of its mandate, which includes a responsibility to stimulate business. Many in the PMR sector hold the view that ICASA decision makers are not approachable, and some suggest that a form of self-regulation in terms of product type approvals, frequency license allocations and radio dealer/reseller standards should be considered.

The industry is experiencing single-digit growth in the turnkey solutions space, particularly when point-to-point and point-to-multipoint wireless technologies are included in addition to mobile radio.

Most integrator vendors are predicting double-digit growth as a result of user migration from analog to digital technologies during the next five years.

Integrator vendors that offer turnkey solutions including service level agreement (SLA)-based maintenance agreements are securing more profitable returns than the traditional "mom-n-pop-shop" integrators.

Managed services are being aggressively mooted by some integrators; however, large professional users such as South African state-owned companies (SOC) South African Police, Transnet, South African National Defense Force, and power utility ESKOM want to control and operate their own radio communications networks. In addition to their operational security requirements, SOCs have a mandate from government to create employment and develop skills as opposed to outsourcing services and using consultants.

Many established manufacturers distribute their products, technologies and systems solutions via exclusive distribution agreements or exclusive partnerships with South African companies. Others supply product and technologies directly or through multiple competing channels.

Significant growth is expected as a result of the migration to frequency efficient digital technologies. In the professional systems and solutions deployment space, current and emerging digital technologies facilitate integration of fixed wireless and mobile radio to the IP cloud where secure mobile data is the key driver, in addition to better quality secure voice communications. Opportunities for software application developers focusing on dispatch and security will create a demand for different skill sets to be employed by PMR integrator vendors.

Traditional two-way radio bench technicians who repair radios are no longer required, rather "hardware board swappers" with some IT skills and "installer field technicians" with an understanding of RF propagation and antenna systems are sought-after skills. Sales and marketing professionals are expected to understand sales, products, technologies and regulatory environments, and be knowledgeable about the customer-specific verticals to design fit-for-purpose turnkey solutions encompassing multiple technologies.

South Africa is seen as a challenging and risky, yet growing market. The lack of technical skills, limited access to finance and questionable regulation can be seen as offering opportunity for some firms.

African PMR companies that have the financial capacity and that invest in the people, skills and technologies required to provide users with integrated turnkey wireless solutions including SLA-based technical support and managed services will grow significantly, not only in South Africa, but across most of Africa. The credible African integrator vendor that understands the customer culture is the most sought-after partner for both product manufacturers and customers alike. ■

George Spencer has been active in African PMR for more than 20 years. He is the managing director of Emcom Wireless based in Durban and Johannesburg, South Africa, and vice chairman of the South African Professional Mobile Radio Association. Email comments to editor@RRMediaGroup.com.

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