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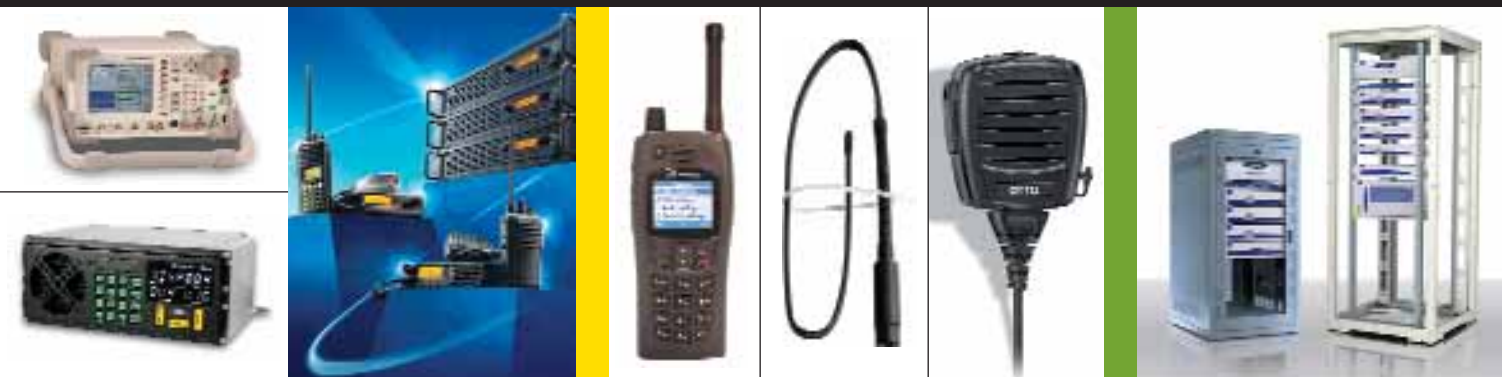


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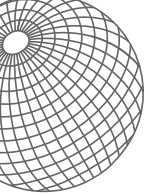
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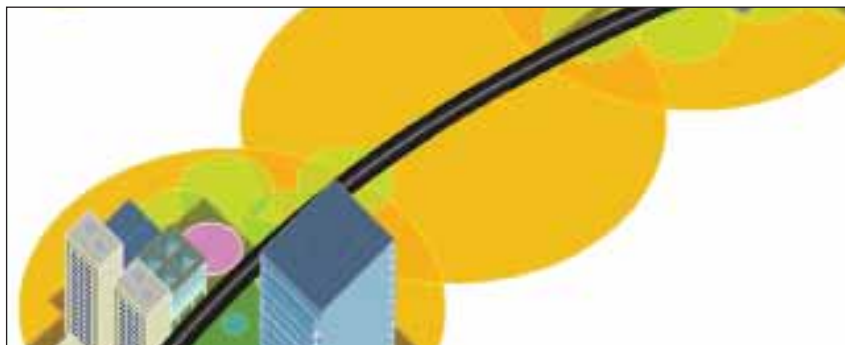
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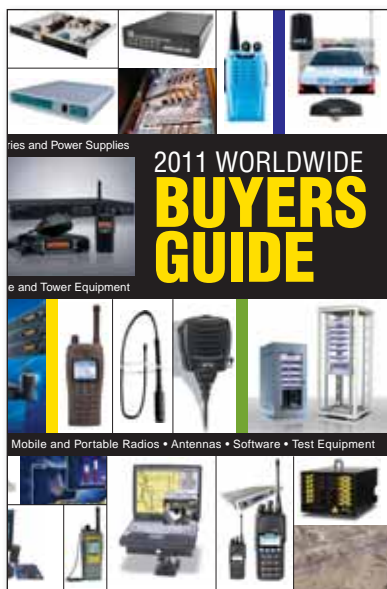


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LTE's Future in Public Safety

A year ago, I wrote that the United States was a final frontier for the TETRA standard, with several roadblocks hindering its deployment. A few days before we went to press with this issue, the U.S. Federal Communications Commission (FCC) approved TETRA technology for use by



U.S. business and industry users in the UHF band. Utilities, transportation agencies and other mission-critical communications users can now deploy the standard, eliminating one roadblock.

However, the FCC did not approve the technology for use in U.S. public-safety spectrum, and the commission initiated a rulemaking to study its use for public-safety agencies. Project 25 (P25) is the dominant standard used by U.S. public-safety agencies, and

the U.S. telecom regulator is seeking comment on whether and how TETRA and P25 could co-exist in the U.S. public-safety market.

Looking forward, Long Term Evolution (LTE) could be the standard that brings together various public-safety communications networks. An in-depth article on Page 12 discusses the technical migration of TETRA networks to LTE.

Representatives from Europe, North America and Asia/Pacific for the Association of Public-Safety Communications Officials (APCO) International Global Alliance recently endorsed LTE as capable for emergency service agencies for broadband communications. Broadband is also on the TETRA Association roadmap, with four alternatives outlined in a 2010 white paper from Analysys Mason.

The main question in the Analysys Mason report was whether to make use of upgraded commercial networks with modifications to meet public-safety requirements or to develop dedicated next-generation public-safety mobile broadband networks. The author of "Global Forum" on Page 54 offers several considerations for that decision between public or private

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

broadband networks. Funding and spectrum are also important factors that will affect broadband rollout.

The reality is broadband is years away, and in the meantime, mission-critical voice networks are essential to daily operations in our industry. You'll find this issue invaluable for helping you find the companies that offer the products and services you need. Check out all the listings and data to help make informed purchasing decisions beginning on Page 16.

Sandra Wendelken, Editor
swendelken@RRMediaGroup.com

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

APCO Global Alliance Endorses LTE

Public-safety communications professionals from Europe, North America and Asia/Pacific 11 April passed a formal policy statement that recognizes Long Term Evolution (LTE) as capable for emergency service agencies for broadband communications.

The statement, titled "4G Broadband Technologies for Emergency Services," passed unanimously at a meeting of the Association of Public-Safety Communications Officials (APCO) International's Global Alliance.

"The partner associations of the APCO Global Alliance recognize that LTE is emerging as the leading standard in 4G technology being adopted worldwide by the largest mobile communications service

providers. Because LTE is a global standard, it's capable of providing emergency service agencies and governmental organizations with a cost-effective way to meet their broadband communications needs and one that gives them a greater selection of devices and applications — a capability that has been sought for years," the statement said.

"The Global Alliance's actions today will further attract, stabilize and accelerate commercial development and investment in public-safety broadband markets worldwide," said APCO International Executive Director George Rice. "The benefits of global standardization for emergency broadband networks will create a rich ecosystem of devices spurred by the

standards-based designs, open intellectual property environments, commitments from chipset manufacturers, large communities of developers and interest from consumer electronics manufacturers."

"The TETRA Association recognizes that mobile broadband will be required to meet the future requirements of public-safety users around the world and has for some time been working with the European Telecommunications Standards Institute (ETSI) to make this a reality for TETRA users who will continue to enjoy their existing functionality for many years to come," said Phil Kidner, CEO of the TETRA Association. "It welcomes such a positive steer from the global user community."

PISCATAWAY, New Jersey,

USA — The IEEE Standards Association (IEEE-SA) standards board approved IEEE 802.16m, the next-generation WiMAX standard approved last year by the International Telecommunication Union (ITU) as one of two 4G standards. Long Term Evolution (LTE) Advanced is the second 4G ITU standard.

IEEE 802.16m's enhancements support future advanced services and applications for next-generation broadband mobile communications, an IEEE statement said. In October 2010, ITU-R agreed to incorporate 802.16m into its IMT-Advanced Recommendation specifying systems that support low- to high-mobility applications, a wide range of data rates in multiple user environments, high-quality multimedia applications, and significant improvements in performance and quality of service. Current versions of WiMAX are not officially 4G standards.

The standard incorporates communications technologies such as multi-user multiple input multiple output (MIMO), multicarrier operation and cooperative communications, along

with femtocells, self-organizing networks and relays.

SOPHIA ANTIPOLIS, France —

The first European Telecommunications Systems Institute (ETSI) smart grid workshop, held in Sophia Antipolis in April, attracted more than 250 participants from Europe, China, Japan, South Korea and North America. Representatives of the power and information communications technology (ICT) industries came together to address the challenges they face in standardizing smart grid technology.

Understanding the challenge of smart grid standardization was the key theme at the workshop. There was a strong international presence at the workshop, which considered proposals for architectures, communications technologies, data and information management, privacy and security, integration of the smart grid into homes, and collected feedback from a number of pilot projects.

Developing and deploying the smart grid requires close collaboration between the power industry and the ICT industry. The European Commission established a smart grids task

force and issued a mandate to develop standards for smart grid. ETSI and T&D Europe, the European association of the electricity transmission and distribution industry, also signed a memorandum of understanding to collaborate on standards for smart grid.

CHICAGO, USA — **Motorola Solutions and Huawei Technologies** agreed to settle all litigation between the parties pending satisfaction of certain conditions. In January, Huawei received a restraining order preventing Motorola from providing any Huawei proprietary information to Nokia Siemens Networks (NSN) a part of NSN's planned acquisition of Motorola infrastructure business.

The companies entered into an agreement that allows Motorola Solutions to transfer its commercial agreements with Huawei to NSN for a fee, and allows NSN to receive and use Huawei confidential information to service the networks Motorola deployed worldwide using Huawei's products and technologies.

In 2000, Motorola and Huawei entered into a commercial agreement during which Motorola resold certain

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World News

Huawei products under the Motorola name. Motorola purchased \$880 million in technology from Huawei that covered core networks and radio access networks.

CHESTERFIELD, Missouri, USA — Laird Technologies acquired **Klüver Aggregatebau**. The purchase expands the scope of Laird Technologies' thermal management business into compressor-based temperature control systems for use in medical, telecommunications and other end-user markets. Klüver will become part of Laird's thermal materials and systems business.

ASIA/PACIFIC
REDMOND, Washington, USA — Zetron implemented a 25-position dispatch system at Chevron's Gorgon Project in Australia. The system will provide dispatch communications over TETRA and conventional radio systems, as well as emergency call handling for the project.

The Gorgon Project is one of the largest natural gas projects in the world and the largest single-resource natural gas project ever undertaken in Australia. **Damm Cellular Systems** is providing infrastructure for the network, and **Sepura** is supplying subscriber units.

NEW DELHI — Sepura signed a new channel partnership agreement with Raxa Security Services, a subsidiary of Indian infrastructure and services operator GMR Group.

GMR Group's core business is the delivery and operation of infrastructure projects, including both Delhi and Hyderabad airports, together with numerous road, power generation and special economic zone scheme.

The agreements reflects the potential for the technology in India, company executives said. "Demand for TETRA systems and terminals will rise dramatically over the next few years," said M. R. Reddy, managing director of Raxa Security Services.

SOUTH MELBOURNE, Victoria, Australia — C4i announced more than \$2.7 million in contracts for its public-safety applications in Vietnam and the United States, along with additions to pre-existing contracts in Australia.

The new contracts include systems in California and Chicago. "In addition, we won a major police dispatch system in Vietnam, so we have a national project there that will actually link multiple dispatch centers together and provide access to radios over quite a wide area... It is very much an inter-operable configuration," said Brad Kay, president of C4i.

C4i also received \$1.3 million of new orders from existing customers in Australia.

CAMBRIDGE, United Kingdom — Fortescue Metals Group, an Australian-based producer of iron ore, selected TETRA for its Pilbara mines in Western Australia. The new system comprises **Damm Cellular Systems** infrastructure and **Sepura** handheld and mobile terminals.

Sepura has delivered more than 800 mobiles and 500 handheld terminals to Fortescue for use at its Christmas Creek and Solomon mines and port facility. Fortescue was founded in 2003 and is one of the world's largest producers of iron ore.

EUROPE
HALLE AN DER SAALE, Germany — Motorola Solutions will build a TETRA digital two-way radio network for the local public transport services in Halle an der Saale. The framework contract with the Hallesche Verkehrs-AG (HAVAG) includes TETRA infrastructure and about 350 TETRA radios.

The TETRA solution will enable HAVAG to offer its passengers an enhanced service through real-time information about timetable changes at bus and tram stops. The system will be integrated into HAVAG's new



The Nordic World Ski Championships in Oslo, Norway, in February and March were accompanied by a TETRA system based on Cassidian technology.

intermodal transport control system (ITCS), replacing the company's existing computerized operational control system. Rollout will take place in the second quarter, with full operation by the end of the year.

MUNICH, Germany — Sepura was awarded a tender for more than 17,000 TETRA radios to the Bavarian Police in Germany. This contract comprises 8,000 hand portables and more than 9,000 mobile radios. To date, Sepura has secured BOS-net contracts in 10 of the 16 German federal states.

AFRICA
PRETORIA, South Africa — Cassidian agreed to acquire the majority shareholding in South African company **Grintek Ewation** (GEW) in Pretoria. The transaction is valued at a two-digit million euro sum and is subject to formal approval from South African competition authorities.

Cassidian will increase its 45 percent share in GEW to 87.4 percent by acquiring the 42.4 percent share of SAAB South Africa. Kunene Finance holds a 12.6 percent share.

BRUSSELS, Belgium — The Ghana Grid Co. joined the European Utilities Telecom Council (EUTC) as a charter member. Georg Nipah, manager of systems communications, will represent the Ghana Grid Co. at the EUTC board of directors.

"We find tremendous synergies between our European and African members to tackle today's utilities telecommunications challenges," said Peter Moray, director of EUTC.

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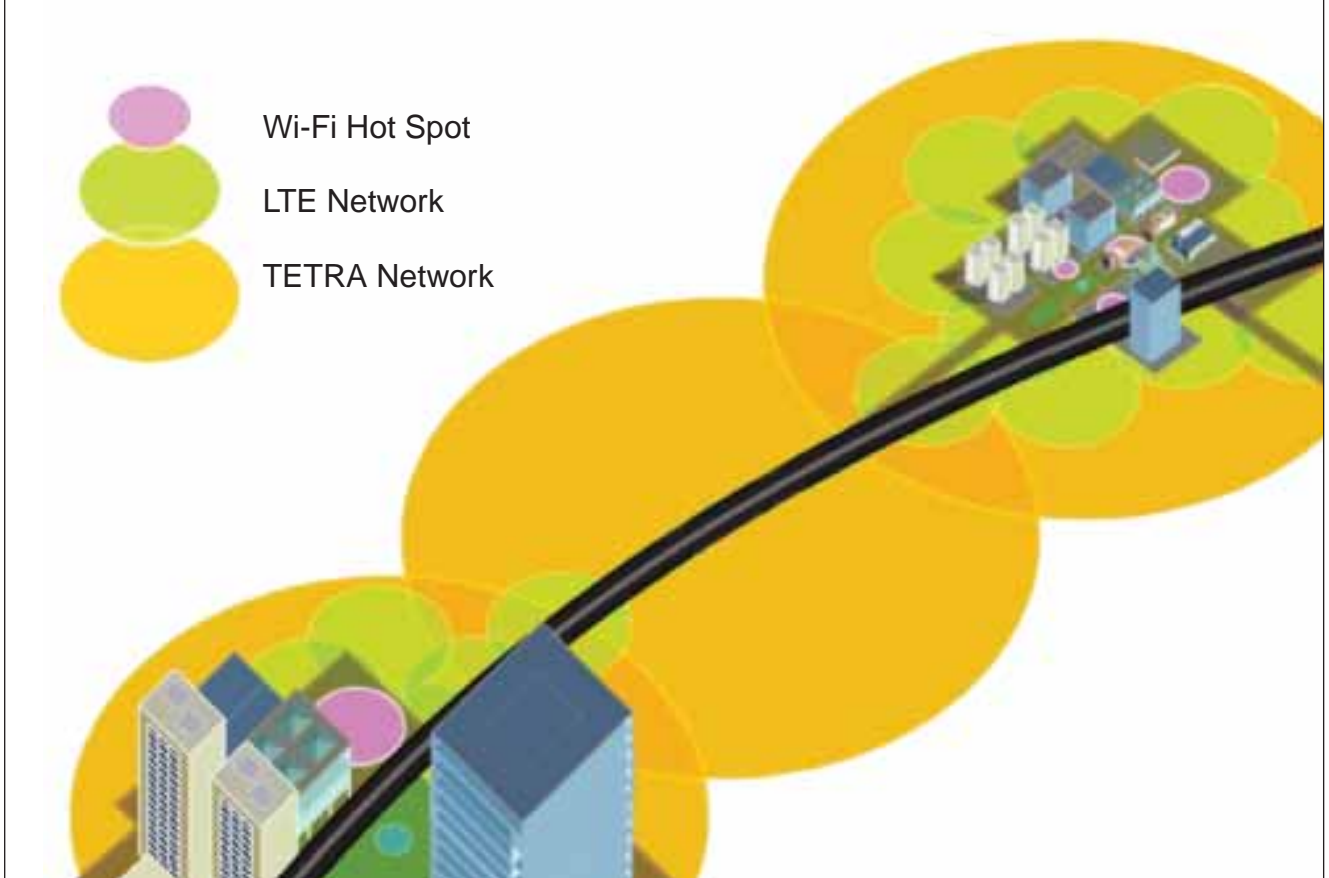


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LTE and TETRA coverage

The Migration to LTE

Many TETRA network operators are moving to TETRA Enhanced Data Service (TEDS). Over time, the public-safety communications industry will likely opt for Long Term Evolution (LTE). The question is whether TEDS is necessary as an in-between step before migrating to LTE, say industry insiders.

Police officers have their own cell phones, usually smartphones. They can stream video on their iPhones or Android mobiles. Police officers want and expect their smartphone features to be available via TETRA too. According to a roadmap drawn up by the TETRA Association in 1995, the technology path will meet user expectations.

This roadmap indicates that TEDS is step two of three. TEDS is an extension of the TETRA standard to allow for higher data speeds. TETRA TEDS can be integrated with a standard

Although TETRA is invaluable for public-safety communications and TEDS improves on data speeds, a migration to LTE technology is under way.

By Henk van Beek

TETRA network using a common control channel. This way, a network can be built for both speech and higher speed data communications. However, a TEDS extension usually involves a separate overlay network because TEDS requires a different frequency range. The TETRA TEDS standard is based on the combination of one to six channels of 25 kilohertz width. By simultaneously using a higher order modulation, data speeds of 30 – 240 kilobits per second (kbps) can be achieved. Although the higher order modulation methods offer higher data speeds, they won't be able to reach the edge of the cell.

Data Speeds

The public-safety sector needs broadband communications, says Bert Bouwers, chief technology officer (CTO) of Rohill. "But right now, TETRA offers a maximum of 14 kbps. TEDS is an improvement, but achieves 80 kbps at best when using a bandwidth of 50 kilohertz. That is not enough." Therefore, LTE will become the standard for mission-critical mobile broadband communications, Bouwers says.

After TETRA 2, an attempt was made to continue working on TETRA 3, also called Digital Advanced Wireless Services (DAWS) and Project

MESA, but the development of this standard was officially cancelled. Meanwhile, a new European Telecommunications Standards Institute (ETSI) working group started the standardization of mission-critical broadband communications, and LTE was chosen as the basis for this standard. "LTE is simple, flexible and robust," Bouwers says. "The entire market expects a lot from LTE."

Existing communications networks can be interconnected via open interfaces or via gateways. Eventually, an IP network will comprise all IP-based IT middleware. The idea is to create open interfaces on existing network architectures to interconnect radio and fixed networks, share information, run new services, and use quality of service (QoS) solutions such as differentiated services code point/type of service (DSCP/TOS) and Multi Protocol Label Switching (MPLS). TETRA offers a stable bit rate of 14 kbps and a latency of 250 milliseconds (ms). The

The ideal situation would be a combination of TETRA and LTE — a good range with a high bit rate in areas where there is LTE coverage.

coverage range of TETRA is wide. In a rural area, users achieve a range of 15 kilometers; in an urban area, users achieve a range of 5 kilometers. A big disadvantage is the limited possibility for file, video and other large data transfers. TEDS is an improvement compared with TETRA. The bit rate is between 80 kbps (optimal) and 20 kbps. The latency is 200 ms. Even though the range of TEDS is lower than that of TETRA, it is still considerable: 7 kilometers in rural areas and 2 kilometers in urban areas.

"In 2010, Rohill invested in a new generation TEDS-ready TETRA base station and ODINI," Bouwers says. "In 2011, we will continue working on an

Intersystem Interface (ISI) gateway. We are not averse to TEDS at all. We frequently receive tenders for which we have to be able to deliver TEDS."

However, TEDS' file and video transfer possibilities are still limited, and this limitation is the crux. LTE offers opportunities, but also has its limitations. In rural areas, LTE's range is 800 meters; in the city, the range is no more than 300 meters. This can be increased considerably using smart antennas, but it is not optimal.

On the other hand, the advantages of LTE are many. For instance, the bit rate is between 10 Megabits per second (Mbps) and 50 Mbps (optimal situation), and the latency is 10 ms,



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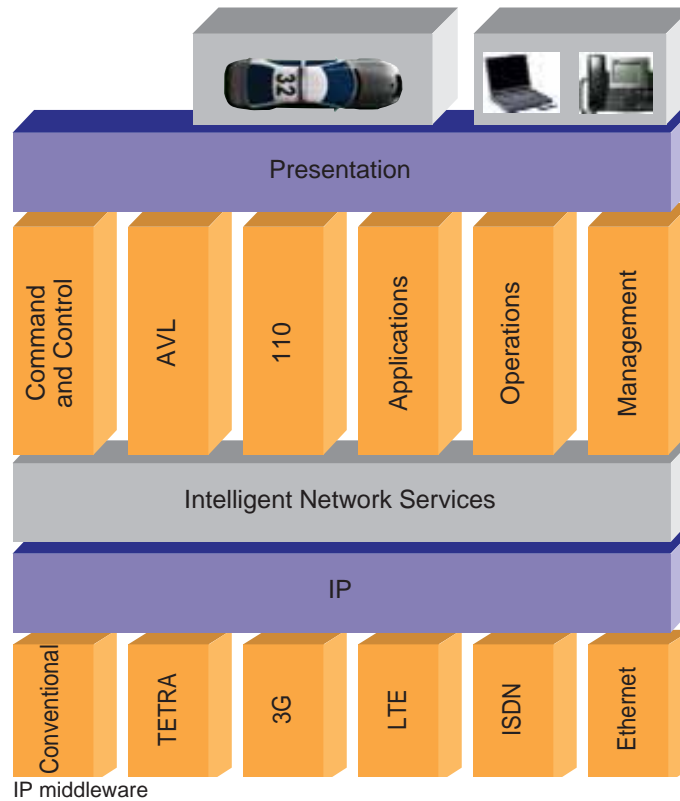
enabling broadband data and new applications requiring a low latency.

Technology Combination

The ideal situation would be a combination of TETRA and LTE: a good range with a high bit rate in areas where there is LTE coverage. What are the opportunities and challenges? TETRA combined with LTE with Session Initiation Protocol (SIP) will go a long way. Features such as individual call, group call, push to talk (PTT) and emergency call are available in TETRA technology. Intranet and video, on the other hand, still lag behind. LTE's strength is applications such as intranet and video, and the standard offers individual calls with SIP. The typical professional mobile radio (PMR) functions — group call, PTT and emergency call — are not available in LTE or do not function properly when PTT over cellular (PoC) is used. SIP enables multimedia communications (audio, video and other data communications) and is, for instance, used for VoIP.

"It is possible to use On-Demand Intelligent Network Interface (ODINI) as an alternative to SIP," Bouwers says. "The ODINI enables interconnection of mobile and fixed networks for mission-critical communications. ODINI supports PTT-operated group calls, the most important way of communicating for these user groups. TETRA is the standard of choice for the definition of ODINI, although each PMR network can be made interoperable with ODINI."

Rohill's ODINI technology works on the basis of an IP-based network architecture, which enables integration of legacy, current and future radio networks; telephony; and data-centric applications to support interconnection of speech and data calls.



LTE's IMS Core

What would the roadmap for integration of LTE look like? In phase one, there would be three elements, enabling broadband data. Initially, there is TETRA for narrowband data, but with a wide range, basically enabling communications anywhere. In urban areas, there is an overlap via LTE, making broadband available. To enable updates of software and maps, a connection could be made via Wi-Fi at car parks in the vicinity of the office. In this phase, there is a multibearer data service, whereby the fastest available connection is automatically selected. "LTE then serves as an extension of TETRA. It is an overlay network, with a possibility to fall back on TETRA. Amsterdam, for instance, could have an LTE network," Bouwers says.

In the second phase, PMR functionality is added. PMR is a system for mobile communications using private infrastructure operated by a company or agency. Communications usually takes place between a fixed base station, the central base station and the mobile radio users.

"This way, we can route TETRA

over IP," Bouwers says. "This may soon become available, within a year and a half. Not surprisingly, it works on every smartphone, also in the existing 3G, WiMAX and Wi-Fi networks. Communications thus becomes a kind of application for an Android, iPhone or Windows phone."

The third phase is the integration with IP Multimedia Services (IMS), part of the Universal Mobile Telecommunications System (UMTS) specification from Release 5 that enables IP transport in the core network and the radio access network (RAN). IMS makes it possible to deliver end-to-end IP

services. This makes it easier to integrate services with other networks, such as the Internet.

"IMS is the core of LTE," he says. "It serves to make speech calls. Actually, LTE is the data connection, while IMS is needed for speech. The ETSI standardization groups are working on this to enable the smooth operation of text, speech call and video applications on your smartphone."

The TetraNode systems of Rohill can be combined with LTE networks, Bouwers says. The systems include a variety of modules, such as base stations, soft switches and interfaces with telephone exchanges. The hardware consists of standard CompactPCI and AdvancedTCA systems with Linux of MontaVista for mission- or business-critical applications and commercial Linux for less demanding communications. The company develops its own software and RF technology for these systems, which have a modular structure and scalability from light, embedded computer platforms to AdvancedTCA. This enables customers to build their own

communications systems, node for node. The TetraNode soft switch technology also forms the basis for a compact, fast-deployable LTE solution, which is under development.

"A standard LTE network for mobile operators is designed with 500 to 5,000 sites," Bouwers says. "Such a basic infrastructure involves an investment of 2 million to 5 million euros. A fixed LTE network for public safety in urban areas, or a fast-deployable LTE network that can be deployed for large-scale events and incidents requires a totally different architecture where simplicity and robustness are of the highest importance."

The migration to mobile broadband also involves another form of terminals. TETRA-based handhelds are most widely used by public-safety officials. Last year, the first public-safety communications iPhone application offering interoperability between TETRA handsets and

"LTE then serves as an extension of TETRA. It is an overlay network, with a possibility to fall back on TETRA."

— Bert Bouwers, Rohill

iPhones was launched. The application offers PTT-style communications within talk groups. This year, the first Android app with full PMR functionality will be ready. Expectations are that a multimode TETRA and LTE terminal with a touchscreen will become available within the next few years.

The biggest challenge is securing frequency spectrum for private LTE networks for the public-safety sector. In the United States, part of the 700 MHz frequency band, which has become available as a result of the migration to digital TV, has been reserved for LTE for public-safety applications.

"In Europe we are not yet that far," he says. "There is quite some lobbying going on by the public-safety sector and the industry to ensure that the 700 MHz spectrum is not completely sold to the mobile operators, but a part is reserved for public-safety applications. This may prove to have been successful in a few years only when spectrum will be redivided in a next phase of the migration toward digital TV." ■

Henk van Beek is editor-in-chief of *Verbinding*, a Dutch magazine. An original version of this article ran in the February 2011 issue of *Verbinding*. Email comments to editor@RRMediaGroup.com.

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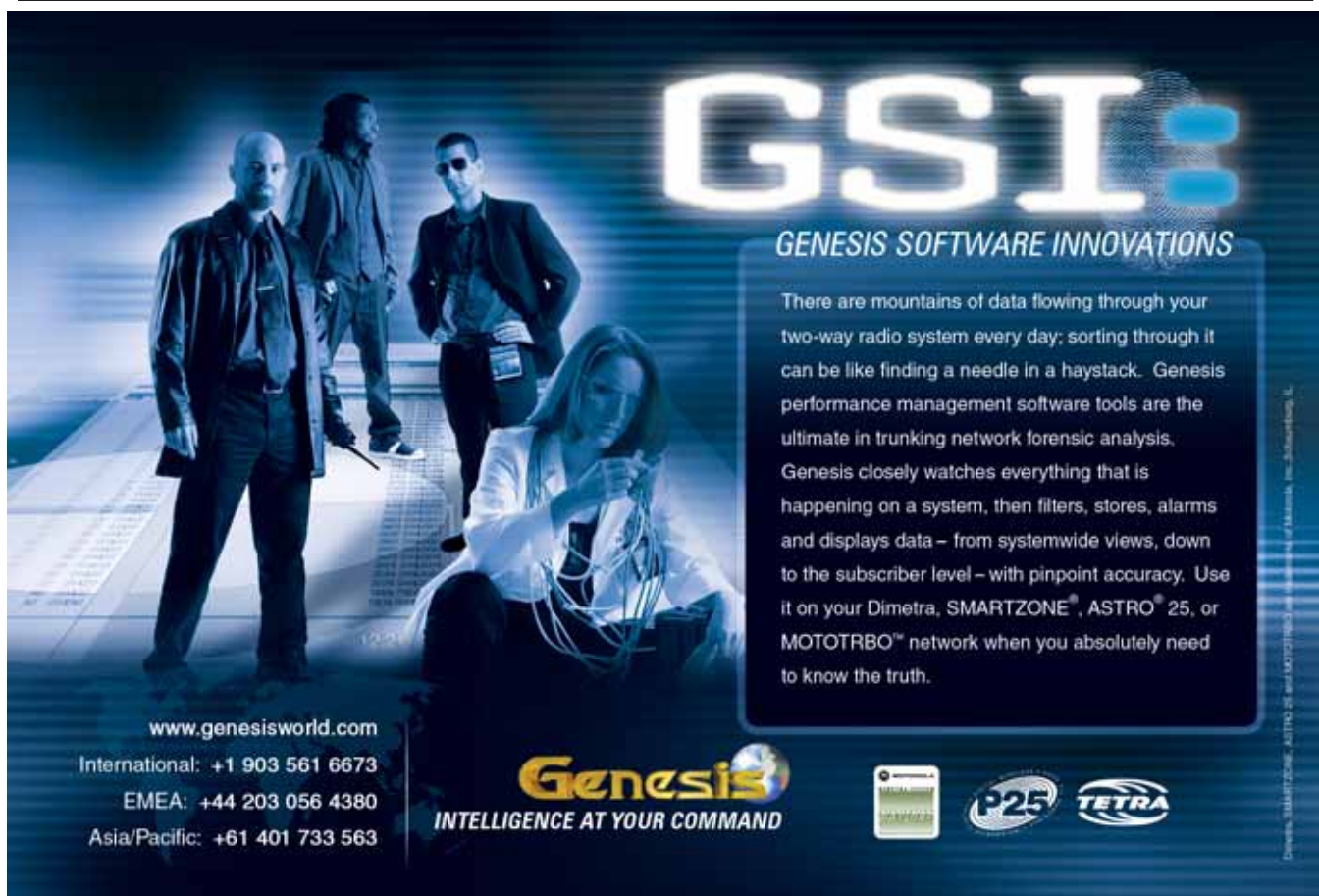
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Make sure they're covered

Maximize your coverage with Auto-Test II



Radio coverage is critical when lives are on the line. Over time, the coverage area of your digital and analog radio system can degrade as radio parameters change and fall out of alignment.

They need to know they have radio coverage. With Aeroflex's Auto-Test II, you can have that assurance.

Automatically get your radios back into specification

In as little as 6 minutes, Aeroflex's 3920 with Auto-Test II can automatically perform radio alignment and verification to ensure optimal radio performance. With a simple cable connection, and a push of a button, you can ensure that the radio will properly transmit and receive within the entire coverage area.

Make sure your radios are aligned and verified to specification. Contact Aeroflex today to receive a data sheet, request a quote or arrange a product demo on the Aeroflex 3920.

www.aeroflex.com/RRBG



AEROFLEX
A passion for performance.

www.aeroflex.com

Product Category Index

AMPLIFIERS

(B=bidirectional, L=line driver, RF=RF power, S=signal boosters, T=lower top)

Ace Technologies (B)
Advanced Communication (RF)
Agilent Technologies (B)
Air802 (B, S)
Albrecht Telecommunications (RF, S)
American Wireless (RF)
Anritsu (T)
Antcom (RF)
AR RF/Microwave Instrumentation (RF, S)
Austriamicrosystems (B, RF)
Axell Wireless (B)
Barrett Communications (RF)
BHE Bonn Hungary Electronics (B, RF)
Bird Technologies Group (B, S, T)
Broadcast Microwave Services (RF)
Cellular Specialties Inc. (CSI) (B, S)
Center Systems (RF)
CML Microcircuits (RF)
Codan (RF)
CommScope (B, RF, S, T)
Comprod Communications (B, RF, S, T)
Creowave (B, T)
Crescent Technologies (RF)
Cubic Defense Applications (RF, S)
Datron World Communications (RF)
dbSpectra (B, T)
DX Radio Systems (RF)
EMR (B, RF, S, T)
Etherstack (RF)
Fiber-Span (B, S)
Fiplex Communications (B, RF, S, T)
FreeWave Technologies (B, S)
Futurecom Systems Group (B, RF)
GE MDS (RF)
IPMobileNet (RF)
JEI Communication Recorders (S)
Kathrein, Scala div. (T)
Kathrein Werke KG (B, L, RF, T)
Lone Star Aviation (RF, S)
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Mimix Broadband (RF, S, T)
Mobat USA (RF)
Mobile Communications (B, S)
Motorola Solutions (RF)
Narda Microwave West (L-3 Communications) (RF)
Narda Safety Test Solutions (RF)
Powerwave Technologies (RF, S, T)
Praxsym (B, RF)
Radio Frequency Systems (RFS) (B, T)
RFI Antennas (B, RF, S, T)
RFI EMEA (B, RF, S, T)
RF Technology (RF)
Rojone (B, L, RF, S, T)
Sinclair Technologies (B, L, RF, S, T)
Skymasts Antennas (B)

Sonic Communications International (RF)
Sonik Messaging Systems (RF)
Spectra Engineering (RF)
Spectrum Communications (RF)
Telewave (T)
Telsate Telecomunicações (B, RF, S)
TPL Communications (RF)
Trilliant (B, RF)
Tunnel Radio of America (B, S)
TX RX Systems Bird Technologies Group (B, S, T)
Vislink (RF)
Webb Industries (RF, T)
Wilson Electronics (B, RF, S)

ANTENNAS

(B=base station, E=embedded, G=GPS, I=in-building, MW=microwave, M=mobile, MB=multiband portable, P=portable, S=satellite, SA=smart/adaptive, W=wireless and mobile data)

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Airaya (B, E, W)
Air802 (B, G, I, MW, M, SA, W)
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Antcom (B, E, G, I, MW, M, P, S, SA, W)
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EMS Technologies (MW, M, MB, P, S, SA, W)
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ESE (G, S)
4RF Communications (MW)
FreeWave Technologies (B, E, G, I, W)
GC Protronics (E, G, I, MW, M, P, S, SA, W)
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GRE America (M, P)
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Harris RF Communications (B, M, P)
Hughes Network Systems (S)
I.D. Systems (G, W)
Imark Communications (B, M, P)
Infinity Gear and Technology (G, P)
IPWireless (W)
Jaybeam Wireless (B, E, I, M, P, SA, W)
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Kendoo Technology (P)
Kycocera Solar (B, S, W)
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Lea Antenne & Progetti Spa (B, G, I, M, P, W)
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Narda Safety Test Solutions (S)
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Pendulum Instruments (B, MW, W)
Powerwave Technologies (B, I, SA)
Procom (B, E, G, I, MW, M, P, S, SA, W)
Quantum Electronics (B, M, P)
Radial Firm (B, I, W)
Radio Frequency Systems (RFS) (B, I, MW)
Radio Hardware Supplies and PJ International (P)
RadioMobile, div. of RF Industries (B, G, M, W)
Radio Waves (MW)
Radixon (B, M, P, S)
Raveon Technologies (G)
Renair Antennae (B, E, G, M, P, S, W)
RFI Antennas (B, E, G, I, M, W)
RFI EMEA (B, E, G, I, M, W)
Rojone (B, E, G, I, MW, M, P, S, SA, W)
Ross Associates/Covert Systems (MW)
Samco Antennas (B, S, W)
Sam Woo Electronics (B, M)
Shenglu Telecom Tech (B, I, MW, M, P, W)
Sinclair Technologies (B, E, G, I, MW, M, P, S, SA, W)
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SmarTrunk Systems (G)
Sonik Messaging Systems (B)
South Midlands Communications (B, M, P)
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Swissphone Telecom (B)
Tallysman Wireless (E, G, S)
Team Simoco (B, MW, M)
Tekk (P)
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Telsate Telecomunicações (B, G, I, MW, M, P, W)
Thales Communications (P)
TP Radio (E, G, M)
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Trilliant (E, G, W)
Trimble (G)
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Tunnel Radio of America (B, I)
TX RX Systems Bird Technologies Group (B)
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Vislink (G, MW, M, P, S, SA, W)
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Webb Industries (B, G, I, MW, M, P, W)
WEH Manufacturing (M)
Wilson Electronics (I, W)

BASE STATIONS/REPEATERS

(I=in-building, M=mobile radio, P=paging)
Ace Technologies (M)
Airaya (I, M)
Alcatel-Lucent (I, M, P)
Alligator Communications (M)
ARC Wireless Solutions (M)

Avcom International (M)
Avulan (I)
Axell Wireless (I, M)
Barrett Communications (M)
Benelec (M)
BHE Bonn Hungary Electronics (I, M, P)
BridgeCom Systems (I, M)
CalAmp (M)
Cassidian (M)
Cellular Specialties Inc. (CSI) (I, M, P)
Center Systems (I, M, P)
Codan (M)
CommScope (I, M)
Comsystems (I, M)
Connect Systems (M)
CPI Communications (M)
Creowave (I)
Damm Cellular Systems (I, M)
Daniels Electronics (M, P)
dbSpectra (I)
DX Radio Systems (M, P)
EF Johnson Technologies (M)
Elektronika Naglic in Drugi dno Domzale (I, M)
EMR (I, P)
EMS Sky Connect (I)
Encom Wireless Data Solutions (I, M)
Etherstack (I, M)
Fiplex Communications (I)
Futurecom Systems Group (I, M)
GE MDS (M)
Global Mesh Technologies Service (M)
GRE America (M)
Harris Public Safety and Professional Communications (PSPC) (M)
Hytera Communications (M)
I.D. Systems (M)
IHM P/S (M, P)
Imark Communications (M)
Innovative Circuit Technology (ICT) (M)
Intuicom (M)
IPMobileNet (M)
Jaybeam Wireless (I, M)
Kenwood (M)
Kenwood USA — Communications Sector (I, M)
Laird Technologies (I, M)
Lyrtech (M)
Maxon (M)
Midian Electronics (M, P)
Midland Radio (I, M)
Mobat USA (M)
Motorola Solutions (M)
Niros Communications (M)
Pacific Crest (M)
Polycorn (I)
Quantum Electronics (I, M)
Radio Frequency Systems (RFS) (M)
RadioMobile, div. of RF Industries (I, M)
Relm Wireless (I, M)
Renair Antennae (I, M, P)
RFI Antennas (I, M, P)
RFI EMEA (I, M, P)
RF Technology (M, P)
Ritron (I)
Rohde & Schwarz Professional Mobile Radio (I, M)
Rohill Engineering BV (M)
Rojone (I, M, P)
Runcom Technologies (M)

Schnoor Industrielektronik (M)
Selex Communications — Prod-EI SPA (I, M)
SmarTrunk Systems (I)
Sonik Messaging Systems (M, P)
South Midlands Communications (M)
Spectra Engineering (I, M, P)
Spectrum Communications (M)
ST Electronics (Info-Comm Systems) (I)
Sti-Co Industries (M)
Strix Systems (I, M)
Swissphone Telecom (P)
Tait Electronics (M)
Team Simoco (M)
TecNet International (M)
Tekk (M, P)
Telsate Telecomunicações (I, M)
Teltronic S.A. Unipersonal (M)
Thales Communications (M)
TP Radio (M, P)
Tunnel Radio of America (I)
USAlert (I)
Vertex Standard (M)
Vertex Standard/Yaesu UK (M)
Westel Wireless Systems (M)
WiPath Communications (M, P)
Wireless Pacific (M)
Xiamen Puxing Electronics Science and Technology (I, M, P)

BATTERY EQUIPMENT (Portable Radio) Analyzers/Conditioners

Access Battery, div. of Alpha Source
Advanced Charger Technology
AdvanceTec Industries
Agilent Technologies
Antcom
Axtech Batteries
BatteryJack
BatteryZone
Cadex Electronics
Cut-Rate Batteries
Emerging Power
Energy Power Solutions
Harris RF Communications
Honeywell Batteries/Global Technology Systems
iTech — Intelligent Technologies
Kendoo Technology
Maha Energy
MarathonNorco Aerospace, Christie div.
Motorola Solutions
Niros Communications
Radio Hardware Supplies and PJ International
RFI Antennas
Team Simoco
TP Radio
Valeco Battery Charger Systems
W&W Manufacturing
Batteries
Abell Industries
Access Battery, div. of Alpha Source
Addvantech
Alpha Industrial Power
Ampergen

Aria Industrial
Axtch Batteries
BatteryJack
BatteryZone
Benelec
Bomar Crystal
CAPE
Cut-Rate Batteries
EF Johnson Technologies
Emerging Power
Energy Power Solutions
GRE America
Harris Public Safety
and Professional
Communications (PSPC)
Honeywell Batteries/Global
Technology Systems
Imark Communications
Infinity Gear and Technology
Kendoo Technology
Kenwood
Kenwood USA —
Communications Sector
Laird Technologies
Maha Energy
Maxon
Midland Radio
Motorola Solutions
Niros Communications
Power Products
Quantun Electronics
Radio Hardware Supplies
and PJ International
Relm Wireless
RFI Antennas
Sonic Communications
International
Spectrum Communications
Tait Electronics
Team Simoco
TecNet International
Telsate Telecomunicacões
Thales Communications
TP Radio
Ultralife
Unimo Technology
Valeco Battery Charger
Systems
Vertex Standard/Yaesu UK
W&W Manufacturing
Wireless Pacific
Xiamen Puxing Electronics
Science and Technology

Battery Chargers

Abell Industries
Absopulse Electronics
Access Battery,
div. of Alpha Source
Advantech
Advanced Charger
Technology
AdvanceTec Industries
Alpha Industrial Power
Ampergen
Analytic Systems
Aria Industrial
Astron
Austriamicrosystems
Axtch Batteries
BatteryJack
BatteryZone
Benelec
Cadex Electronics
CAPE
CeoTronics
Cut-Rate Batteries
EF Johnson Technologies
Emerging Power
Energy Power Solutions
GRE America
Harris Public Safety
and Professional
Communications (PSPC)

Harris RF Communications
Honeywell Batteries/Global
Technology Systems
IdaTech
Imark Communications
Impact Radio Accessories
Infinity Gear and Technology
Innovative Circuit
Technology (ICT)
iTech — Intelligent
Technologies
Kendoo Technology
Kenwood
Klein Electronics
Lind Electronics
Lone Star Aviation
Maha Energy
MarathonNorco Aerospace,
Christie div.
Maxon
Midland Radio
Motorola Solutions
Niros Communications
Power Products
Quantun Electronics
Radio Hardware Supplies
and PJ International
RFI Antennas
Samlex America
SmarTrunk Systems
Spectrum Communications
Team Simoco
TecNet International
Telsate Telecomunicacões
Thales Communications
TP Radio
Ultralife
Unimo Technology
Valeco Battery Charger
Systems
W&W Manufacturing
WaveKorea
Wireless Pacific
Xantrex Technology
Xiamen Puxing Electronics
Science and Technology

CRYSTALS/CHANNEL ELEMENTS

Accute Micro Electronics
Bomar Crystal
Frequency Management
International

DISPATCH EQUIPMENT

Automatic Call Distributor (ACD)

Avaya
CrisSys
Motorola Solutions
Nortel
Positron Public Safety
Systems
ST Electronics
(Info-Comm Systems)
Teltronics
TP Radio
Zetron

Dispatch Furniture

AFC Industries
American Wireless
Cassidian
Center Systems
Concept Seating
Elma Electronic
Ergotron
Evans Consoles
Motorola Solutions
South Midlands
Communications
Watson Dispatch
Winsted

Wright Line
Zetron

Graphics-Imaging

Equipment
C4i
Matrox Graphics
Raveon Technologies
Tech Global

Interconnect

American Wireless
Artevea Digital
Avcomm International
CES Wireless

C4i
Communications-Applied
Technology
Compuquest
Connect Systems
DX Radio Systems
Elma Electronic
GAI-Tronics
Hoag Electronics
Kolibri Systems
Lyrtech
Midian Electronics
MoniVox — Control Service
Motorola Solutions
Omnitronics

Pantel International
Penta
Selex Communications —
Prod-EI SPA
SmarTrunk Systems
ST Electronics
(Info-Comm Systems)
Strix Systems
TP Radio
VoiceInterop
Zetron

Radio Consoles

Albrecht Telecommunications
American Wireless

APD Communications
Artevea Digital
Avcomm International
Avtec
BridgeCom Systems
Catalyst Communications
Technologies
C4i
Cimarron Technologies
Communication Plus
CPI Communications
Etherstack
GAI-Tronics
Harris Public Safety
Communications

iOPT

Digital Interoperability Solutions

**Mission Critical Communications
Across All Platforms.**



Features:

- Routine or Emergency Connectivity
- All Radio Bands Accepted
- Local Mic, Speaker or Headset Compatible
- Immediate On-scene Interoperability

Think
outside
the box.

It's
where
we find
success.

PASSPORT

2-Way Networked Trunking System

Dispatch Networking And
A Whole Lot More



Features:

- Efficient Dispatch
- Automatic Call
- Wide Area Network Positioning
- Priority Access
- Mobile-Centric Features
- Full 4-Party Trunking
- Customizable, Flexible

DVU-2

**Analog Gateway
to MOTOTRBO™ Connect Plus**

Your Analog Communications Portal
Connect Plus and IP-Side Connect Talk Groups



Features:

- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom

RAIDER

**High Performance
LTR Trunking Controllers**



Features:

- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom
- 2-Way Intercom



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828-684-7474 • 800-798-7881
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Product Category Index

<p>IDA IHM Jotto Desk Midian Electronics MoniVox – Control Service Motorola Solutions New Communications Solutions (NCS) Omnitronics Pantel International Penta Raytheon JPS Communications South Midlands Communications ST Electronics (Info-Comm Systems) Team Simoco Telex Radio Dispatch Telsate Telecomunicações TP Radio Zetron</p> <p>Turnkey Systems (business/industry) Artevea Digital BridgeCom Systems Cassidian Cellxion, div. of Sabre Industries C4i Compuquest DX Radio Systems EF Johnson Technologies Etherstack Frequentis GE MDS IHM InterAct Public Safety Systems Intergraph Lyrtech Motorola Solutions Nortel Penta Positron Public Safety Systems RadioMobile, div. of RF Industries Raytheon JPS Communications Rescom Sales Rohde & Schwarz Professional Mobile Radio Selex Communications – Prod-EI SPA Send Word Now SmarTrunk Systems SolaCom Technologies Special Electronics and Designs ST Electronics (Info-Comm Systems) Swissphone Telecom Tait Electronics Telex Radio Dispatch 3T Communications TP Radio Trilogy USA USAlert Zetron</p> <p>Voice Logging Recorders ASC Telecom Atis Systems Center Systems CML Microcircuits CriSys CVDS CyberTech Dees Communications Dynamic Instruments Etherstack Eventide</p>	<p>Exacom Frequentis HigherGround JEL Communication Recorders Kolibri Systems MoniVox – Control Service Motorola Solutions Multisuns Nice Systems Omnicon Electronics OrecX Pantel International Positron Public Safety Systems Recollect Recording Record/Play Tek (RPT) Red Box Recorders Rohill Engineering Send Word Now Signal Intelligence South Midlands Communications Spescom Stancil Stancil Solutions ST Electronics (Info-Comm Systems) Telex Radio Dispatch Telsate Telecomunicações Verint Systems Versadial Solutions Voice Print International (VPI)</p> <p>DISTRIBUTORS/REPS <i>(See Distributors/Reps Index, Page 27)</i></p> <p>ENCRYPTION/SCRAMBLING Albrecht Telecommunications Cimarron Technologies Codan Communications Specialists Comsystems Cromack Industries Encore Networks Harris Public Safety and Professional Communications (PSPC) Harris RF Communications HV Sistemas Imark Communications Kantronics Kavit Electronics Industries Lyrtech Maxon Midian Electronics Mobat USA Niros Communications NorComm Nortel Nucomm, RF Extreme div. Radio IP Software Sectra South Midlands Communications Team Simoco Tekk Teletec Telsate Telecomunicações Teltronic S.A. Unipersonal Thales Communications TP Radio Vertex Standard/Yaesu UK Westel Wireless Systems</p> <p>INDUSTRY SERVICES <i>(See Pages 25-27)</i></p> <p>LOCATION SYSTEMS EQUIPMENT ANI/ALI APD Communications</p>	<p>Benelec CES Wireless Cimarron Technologies Cobham Surveillance EMS Sky Connect Exacom Hoag Electronics HV Sistemas InterAct Public Safety Systems Intergraph Location Technologies Midian Electronics Motorola Solutions Penta Positron Public Safety Systems Raveon Technologies SmarTrunk Systems South Midlands Communications ST Electronics (Info-Comm Systems) TeleCommunication Systems (TCS) Telsate Telecomunicações Teltronic TP Radio TruePosition Zetron</p> <p>Asset Tracking/RFID Alcatel-Lucent APD Communications Astron Wireless Technologies Benelec CES Wireless Cobham Surveillance Comm-Net 2000 Manufacturing Computer Resources EMS Sky Connect EMS Technologies Global Mesh Technologies Service I.D. 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Systems In Motion Technology Intergraph Location Technologies Locus Location Systems Mentor Engineering NeoTerra Systems Raveon Technologies Rojone Selex Communications – Prod-EI SPA Send Word Now Syntech Systems WiPath Communications</p> <p>Modems/Transmitters Alcatel-Lucent Antenna Factor Antenna Plus Pantel International Austriamicrosystems CalAmp CES Wireless CML Microcircuits Comm-Net 2000 Manufacturing Compuquest Elektronika Naglic in Drugi dno Domzale EMS SATCOM EMS Sky Connect EMS Technologies FreeWave Technologies</p>	<p>GE MDS HAL Communications HV Sistemas IDA I.D. Systems Impact Radio Accessories In Motion Technology Intuicom Kantronics Kenwood Location Technologies Maxon Mentor Engineering Midian Electronics Midland Radio Mobile Expertise Nucomm, RF Extreme div. Positron Public Safety Systems RAD Data Communications Radiocrafts RadioMobile, div. of RF Industries Raveon Technologies Sierra Wireless SmarTrunk Systems Spectra Engineering Strix Systems TecNet International Tekk Telsate Telecomunicações Teltronic S.A. Unipersonal TP Radio Trident Micro Systems Vecima Networks Vislink</p> <p>MOBILE COMPUTING DEVICES Handheld/Tablet Computers APD Communications Austriamicrosystems BatteryJack CAD North Clearstone Telecom Comsystems CriSys Dell EMS Technologies General Dynamics Itronix Getac IHM Mentor Engineering Microbus Motorola Solutions Panasonic Solutions QSI RadioMobile, div. of RF Industries RAM Mounting Systems Rugged Notebooks</p> <p>MDCs/Ruggedized Laptops APD Communications CAD North Clearstone Telecom Comsystems CriSys Data911 Mobile Computer Systems Datron World Communications Dell EMS Technologies General Dynamics Itronix Getac JEL Communication Recorders Location Technologies Logistic Systems Mentor Engineering Motorola Solutions Panasonic Solutions</p>
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Positron Public Safety Systems
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RadioMobile,
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RAM Mounting Systems
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ST Electronics
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TP Radio

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Tunnel Radio of America
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Zetron

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Austriamicrosystems
BatteryJack
Cleartone Telecom
CML Microcircuits
CriSys
Critical Response Systems
DX Radio Systems
Fylde Micro Systems
General Dynamics Itronix
Getac
Hark Systems
Location Technologies
Motorola Solutions
Panasonic Solutions
RAM Mounting Systems
Rugged Notebooks
Teltronic S.A. Unipersonal
Thales Communications
TP Radio
USAlert
Zetron

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Elma Electronic
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Rojone
Safety Vision

Mesh Networks

Airaya
Air802
Alcatel-Lucent
Applied Global Technologies (AGT)
Carlson Wireless Technologies (CWT)
CelPlan Technologies
C4i
CoCo Communications
CommScope
Data-Linc Group
Elektronika Naglic in Drugi dno Domzale
Elma Electronic
Encom Wireless Data Solutions
Federal Signal
Firetide
Flash Technology, SPX div.
GE MDS
Global Mesh Technologies Service
I.D. Systems
Intuicom
IPMobileNet
Location Technologies
Motorola Solutions
Nortel
Radiocrafts
Radio IP Software
RFI Antennas
RFI EMEA
Rohde & Schwarz
Professional Mobile Radio
Runcom Technologies
Safety Vision
Selex Communications — Prod-EI SPA
Solectek
ST Electronics (Info-Comm Systems)
Strix Systems
TracStar Systems
Trilliant

Mobile Printers

CES Wireless
Data911 Mobile Computer Systems
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Packet-Radio Systems

Alcatel-Lucent
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C4i
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CML Microcircuits
Elektronika Naglic in Drugi dno Domzale
Elma Electronic
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Etherstack
4RF Communications
GE MDS
Harris Public Safety and Professional Communications (PSPC)
HV Sistemas
I.D. Systems
Intuicom
IPMobileNet
Kantronics
Location Technologies
Maxon
Mobile Expertise
Motorola Solutions
Nortel
Radio IP Software

RadioMobile,
div. of RF Industries
Raveon Technologies
RF Neulink,
div. of RF Industries
TecNet International
Tekk
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Telsate Telecomunicações
Teltronic S.A. Unipersonal
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WiPath Communications

Peripherals

Air802
Albrecht Telecommunications
CES Wireless
C4i
Compuquest
Data911 Mobile Computer Systems
Gamber-Johnson
iKey
Location Technologies
Motorola Solutions
Panasonic Solutions
Plantronics
Racom Products
Renair Antennae
Rojone
TP Radio

Repeaters/Bridges

Airaya
Air802
Alligator Communications
Avulan
Bayly/Coastcom
BridgeCom Systems
CalAmp
CelPlan Technologies
Cobalt AV/Comtronics
CoCo Communications
Comm-Net 2000
Manufacturing
Data-Linc Group
DX Radio Systems
EF Johnson Technologies
Elektronika Naglic in Drugi dno Domzale
Encom Wireless Data Solutions
Etherstack
Futurecom Systems Group
GE MDS
Harris Public Safety and Professional Communications (PSPC)
Harris RF Communications
HV Sistemas
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RadioMobile,
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Raveon Technologies
RF Neulink,
div. of RF Industries
RF Technology
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Wireless Broadband

Airaya
Air802
Alcatel-Lucent
ARC Wireless Solutions
Astron Wireless Technologies
Avulan
Bayly/Coastcom
C4i
CalAmp
Carlson Wireless Technologies (CWT)
CelPlan Technologies
Cleartone Telecom
CoCo Communications
CommScope
Data-Linc Group
Data911 Mobile Computer Systems
EMS SATCOM
Encom Wireless Data Solutions
Etherstack
Exalt Communications
Firetide
4RF Communications
Flash Technology, SPX div.
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Global Mesh Technologies Service
Harris Public Safety and Professional Communications (PSPC)
Hughes Network Systems
Intuicom
IPWireless
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Radio IP Software
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Solectek
Strix Systems
TracStar Systems
Trilliant
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Cisco Systems
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Motorola Solutions
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Safety Vision
Sierra Wireless

Wireless LANs

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Encom Wireless Data Solutions
Firetide
4RF Communications
GE MDS
In Motion Technology
Kaltman Creations
Location Technologies
Motorola Solutions
Nortel
Panorama Antennas
Radio IP Software
RadioMobile,
div. of RF Industries
Rojone
Runcom Technologies
Safety Vision



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- Solectek
South Midlands Communications
Strix Systems
Telepoint
Telsate Telecomunicações
TP Radio
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Albrecht Telecommunications
Alligator Communications
Avulan
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Cellular Specialties Inc. (CSI)
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CES Wireless
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Codan
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TP Radio
Tunnel Radio of America
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Comsystems
Concept Seating
Data911 Mobile Computer Systems
Ergotron
Gamber-Johnson
Havis
Jotto Desk
Location Technologies
Mentor Engineering
Mobile Communications
MotoSAT
NCG Companies
Nucomm, RF Extreme div.
PanaVise Products
Precision Mounting Technologies
RadioMobile, div. of RF Industries
RAM Mounting Systems
Renair Antennae
RFI Antennas
Signal Measurement
Sinclair Technologies
Wade Antenna/Taco Antennas
- PAGING/MESSAGING EQUIPMENT**
Pager Receivers
CML Microcircuits
Critical Response Systems
Digital Paging Co./Golden Sab Inc. (DPC/GSI)
DX Radio Systems
Funkwerk Security Communications
Motorola Solutions
Niros Communications
Radixon
SCA
Sonik Messaging Systems
Swissphone Telecom
Unimo Technology
USAlert
Veetronix
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Daniels Electronics
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Center Systems
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Funkwerk Security Communications
IHM
Midian Electronics
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NHRC Repeater Controllers
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VFP
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Tripp Lite
Winco
Wright Line
- Solar Power Equipment**
Alpha Industrial Power
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BatteryJack
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RFI Antennas
Solarcraft
Spectrum Communications
SunWize Technologies
Winco
Xantrex Technology

Uninterruptible Power Supplies

Active Power
Alpha Industrial Power
Carmanah Technologies
Comm-Net 2000
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DuraComm
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Eaton — Power Quality
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VFP

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Center Systems
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Communications-Applied
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TDD

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Motorola Solutions
Penta
Positron Public Safety
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CriSys
Dynamic Instruments
ESE
Eventide
FEI-Zyfer
Hitech Systems
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Motorola Solutions
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Artevea Digital
Benelec
Bosch Security Systems
Carlson Wireless
Technologies (CWT)
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CML Microcircuits
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Ritron

Safemobile
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Send Word Now
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Communications

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Spectrum Communications
ST Electronics
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WiPath Communications
XCell Tower Controls
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Automated Person Location

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Data911 Mobile Computer
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Mobility Sound Technology
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3T Communications
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Mobility Sound Technology
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NeoTerra Systems
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CAD Add-Ons/Enhancements

Albrecht Telecommunications
Bradshaw Consulting
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CAD North
CES Wireless
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CriSys
Data911 Mobile Computer
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Funkwerk Security Communications

Intergraph
Location Technologies
Mentor Engineering
Northrop Grumman
Information Systems
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Radar 911 Systems
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TriTech Software Systems

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American Wireless
CriSys
GAI-Tronics
IHM P/S
Lone Star Aviation
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Special Electronics and
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ST Electronics
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Tekk

Early Warning Systems

Alarmsoft T
American Wireless
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CML Microcircuits
Compuquest
Cromack Industries
Cubic Defense Applications
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Federal Signal
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Strix Systems
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Field Reporting

Bayly/Coastcom
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Funkwerk Security Communications
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Intelligent Traffic Systems

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Atlantic Scientific
Center Systems
CML Microcircuits
Data911 Mobile Computer
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Encom Wireless Data
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Trident Micro Systems

Interoperability Equipment/Systems

Aeroflex
Alcatel-Lucent
American Wireless
Applied Global Technologies
(AGT)

<p>Astron Wireless Technologies Avcomm International Benelec BridgeCom Systems CalAmp Catalyst Communications Technologies Cellular Specialties Inc. 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Peter Jones (ILG) Pouch Manufacturing Power Products</p>
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CD=conventional digital,
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Communications (PSPC)

Lyrtech
Mobat USA
Motorola Solutions
Multiple Access
Communications (MAC)
Pantel International
Positron Public Safety
Systems

Selex Communications –
Prod-EI SPA
Thales Communications
TP Radio
Vecima Networks
Westel Wireless Systems

Team Simoco
TP Radio

Software-Defined Radio
Alligator Communications
American Wireless
Axell Wireless
BHE Bonn Hungary
Electronics
CalAmp
CelPlan Technologies
CML Microcircuits
Communications Research
Centre (CRC)
Comsystems
Cubic Defense Applications
DragonWave
DX Radio Systems
EF Johnson Technologies
Elma Electronic
EMS Technologies
Encom Wireless Data
Solutions
Etherstack
GE MDS
Harris Public Safety
and Professional
Communications (PSPC)

Lyrtech
Mobat USA
Motorola Solutions
Multiple Access
Communications (MAC)
Pantel International
Positron Public Safety
Systems

Selex Communications –
Prod-EI SPA
Thales Communications
TP Radio
Vecima Networks
Westel Wireless Systems

Team Simoco
TP Radio

EMS Technologies
Encom Wireless Data Solutions
Flash Technology, SPX div.
FreeWave Technologies
GE MDS
Hark Systems
HV Sistemas
Location Technologies
Maxon
Midian Electronics
Mobile Expertise
Motorola Solutions
RAD Data Communications
Radiocrafts
Radio IP Software
Raveon Technologies
Rojone
Satel
Sierra Wireless
SmarTrunk Systems
Tait Electronics
TC Communications
TecNet International
Telewave
TP Radio
Trident Micro Systems
Trio Datacom
Tunnel Radio of America
Unimo Technology
Vecima Networks
VoiceInterop

Remote Transmitter Units

Alligator Communications
American Wireless
Antenna Factor
Asentria
Astron Wireless Technologies
Barnett Engineering
Berkeley Varitronics Systems
Broadcast Microwave Services
CalAmp
CeoTronics
C4i
CML Microcircuits
Compuquest
CriSys
Dataprobe
DPS Telecom
DX Radio Systems
EMS Technologies
Encom Wireless Data Solutions
Flash Technology, SPX div.
4RF Communications
GE MDS
HV Sistemas
Intuicom
Keltron
Kyocera Solar
Location Technologies
Maxon
Midian Electronics
Midland Radio
MiMOMax Wireless
Mobility Sound Technology
Motorola Solutions
Pacific Crest
PageTek
Radiocrafts
Raveon Technologies
Rojone
Satel
Sentor Monitoring Systems and Services
Solarcraft
Spectra Engineering
TCC Industries
Team Simoco
Tekk
Telsate Telecomunicações

TP Radio
Trident Micro Systems
Tunnel Radio of America
Vecima Networks
Vislink
WaveKorea
Zetron

SCADA

Alligator Communications
American Wireless
Asentria
Astron Wireless Technologies
Bayly/Coastcom
CalAmp
Carlson Wireless Technologies (CWT)
Carmanah Technologies
Center Systems
CML Microcircuits
CriSys
Cromack Industries
CTI Products
Data-Linc Group
Dataprobe
DPS Telecom
Emerson Network Power
EMS Technologies
Encom Wireless Data Solutions
Encore Networks
Federal Signal
Fial
4RF Communications
FreeWave Technologies
GE MDS
Hughes Network Systems
HV Sistemas
Intuicom
Kantronics
Kyocera Solar
Location Technologies
Maxon
MiMOMax Wireless
Mobile Expertise
Motorola Solutions
PageTek
Pantel International
RAD Data Communications
Raveon Technologies
RF Neulink, div. of RF Industries
Satel
Selex Communications – Prod-EI SPA
Sentor Monitoring Systems and Services
Sinclair Technologies
Spectra Engineering
Spectrum Communications
Tait Electronics
TCC Industries
TecNet International
Tekk
Telepoint
TP Radio
Trident Micro Systems
Vecima Networks
Zetron

Software
Asentria
Astellia
BHE Bonn Hungary Electronics
CeoTronics
CoCo Communications
CommScope
Compuquest
CriSys
CTI Products
Data-Linc Group
DPS Telecom

Eaton – Power Quality
Elektronika Naglic in Drugi dno Domzale
Emerson Network Power
EMS Technologies
Encom Wireless Data Solutions
Federal Signal
Fial
Flash Technology, SPX div.
Funk-Electronic Piciorgros
HV Sistemas
I.D. Systems
In Motion Technology
Integrated Tracking Solutions
Intergraph
Kantronics
Location Technologies
Manning Navcomp
Mi-Jack Systems & Technology
MiMOMax Wireless
Motorola Solutions
NeoTerra Systems
OrecX
PageTek
Powerwave Technologies
Radio IP Software
Radixon
Raveon Technologies
RF Neulink, div. of RF Industries
Safemobile
Sentor Monitoring Systems and Services
Sierra Wireless
Signal Intelligence
SmarTrunk Systems
Solarcraft
Spectra Engineering
Team Simoco
Teltronics
Vecima Networks
VoiceInterop
XCell Tower Controls
Zetron

Telemetry

Alcatel-Lucent
Alligator Communications
American Wireless
ARC Wireless Solutions
Asentria
Astron Wireless Technologies
Benelec
BHE Bonn Hungary
CalAmp
Carlson Wireless Technologies (CWT)
Carmanah Technologies
Cellular Specialties Inc. (CSI)
CeoTronics
CML Microcircuits
Cobham Surveillance
Cromack Industries
Data-Linc Group
Dataprobe
Digital Paging Co./Golden Sab Inc. (DPC/GSI)
DPS Telecom
Elektronika Naglic in Drugi dno Domzale
EMS Technologies
Flash Technology, SPX div.
4RF Communications
FreeWave Technologies
GE MDS
Hark Systems
HV Sistemas
IDA
I.D. Systems
In Motion Technology

Intuicom
Kantronics
Kyocera Solar
Link Communications
Location Technologies
Manning Navcomp
Maxon
Midland Radio
MiMOMax Wireless
Mobile Expertise
Mobile Mark
Motorola Solutions
PageTek
Panorama Antennas
Positron Public Safety Systems
Radiocrafts
Radixon
Raveon Technologies
RF Neulink, div. of RF Industries
Rojone
Safemobile
Satel
Selex Communications – Prod-EI SPA
Sentor Monitoring Systems and Services
SmarTrunk Systems
Solarcraft
Sonik Messaging Systems
Spectra Engineering
Spectrum Communications
Tait Electronics
TCC Industries
TecNet International
Tekk
Telewave
Telsate Telecomunicações
TP Radio
Trident Micro Systems
Vecima Networks
WiPath Communications
Zetron

Transmitters

Alligator Communications
American Wireless
Antenna Factor
Asentria
Astron Wireless Technologies
Berkeley Varitronics Systems
Broadcast Microwave Services
CalAmp
CeoTronics
CML Microcircuits
Cobham Surveillance
CriSys
CTI Products
Cubic Defense Applications
Data-Linc Group
DPS Telecom
DX Radio Systems
EMS Technologies
Firetide
4RF Communications
GE MDS
Harris RF Communications
HV Sistemas
I.D. Systems
Intuicom
Location Technologies
Maxon
Midland Radio
MiMOMax Wireless
Mobile Expertise
Motorola Solutions
Radiocrafts
Raveon Technologies
RF Neulink, div. of RF Industries
RF Technology

Satel
Sinclair Technologies
Spectra Engineering
Spectrum Communications
Tait Electronics
Team Simoco
TecNet International
Tekk
Telepoint
Telsate Telecomunicações
TP Radio
Tunnel Radio of America
Vecima Networks
Vislink

Vendor-Specific Protocols

Asentria
Bayly/Coastcom
Carlson Wireless Technologies (CWT)
CoCo Communications
CommScope
Cromack Industries
CTI Products
Daniels Electronics
Dataprobe
DPS Telecom
Fial
HV Sistemas
I.D. Systems
Kathrein, Scala div.
Keltron
Lea Antenne & Progetti Spa
Location Technologies
Lyncole XIT Grounding
MiMOMax Wireless
Motorola Solutions
Radiocrafts
Radio IP Software
Raveon Technologies
SmarTrunk Systems
TP Radio
XCell Tower Controls

Video Surveillance

Airaya
Alcatel-Lucent
Atlantic Scientific
Bosch Security Systems
Broadcast Microwave Services
Carlson Wireless Technologies (CWT)
Center Systems
CeoTronics
Cobham Surveillance
CoCo Communications
CriSys
Data-Linc Group
EHS
Firetide
4RF Communications
GE MDS
Hark Systems
Harris Public Safety and Professional Communications (PSPC)
Intergraph
Intuicom
Matrox Graphics
Mi-Jack Systems & Technology
Motorola Solutions
Nice Systems
Nortel
Northrop Grumman Information Systems
RAD Data Communications
Raytheon JPS Communications
Ross Associates/Covert Systems
Selex Communications – Prod-EI SPA

Solarcraft
Strix Systems
Swann Communications
Technotrend
Telex Radio Dispatch
Telsate Telecomunicações
Vecima Networks
Verint Systems
Vislink

SATELLITE SYSTEMS

EQUIPMENT

Mobile Data/Voice
(MD=mobile data,
MV=mobile voice)

Astron Wireless Technologies (MD, MV)
CES Wireless (MD)
CML Microcircuits (MD)
Codan (MD, MV)
CPI Communications (MV)
Data911 Mobile Computer Systems (MD)
EMS SATCOM (MD, MV)
EMS Sky Connect (MD, MV)
EMS Technologies (MD)
Harris RF Communications (MD, MV)
Hughes Network Systems (MD, MV)
Mobile Expertise (MD)
Motorola Solutions (MD, MV)
MotoSAT (MD, MV)
Radio IP Software (MD)
RadioMobile, div. of RF Industries (MD, MV)
Satel (MD)
Strix Systems (MD, MV)
Tallysman Wireless (MD)
TeleCommunication Systems (TCS) (MD, MV)
TracStar Systems (MD, MV)
Trident Micro Systems (MD)
Vislink (MD, MV)
WiPath Communications (MD)

VSAT

Cepoint Networks
Encore Networks
Hughes Network Systems
Kyocera Solar
MotoSAT
Radio IP Software
Swissphone Telecom
TeleCommunication Systems (TCS)
TracStar Systems
Vislink

SITE/TOWER EQUIPMENT

Alarms/Access Devices

Asentria
Bosch Security Systems
CML Microcircuits
Compuquest
CTI Products
DPS Telecom
EMR
Fial
Flash Technology, SPX div.
Hark Systems
Location Technologies
Midian Electronics
Mi-Jack Systems & Technology
Motorola Solutions
PageTek
Quintron Systems
Racom Products
Rojone
XCell Tower Controls
Zetron

Product Category Index

Beacons

Carmanah Technologies
Citel
CML Microcircuits
Flash Technology, SPX div.
Funkwerk Security Communications
Nello
Sabre Site Solutions, div. of Sabre Industries
SoundOff Signal
Specialty Tower Lighting
TWR Lighting
Xcel Tower Controls

Cabinets

American Wireless
Atlantic Scientific
Cellxion, div. of Sabre Industries
CommScope
Comsystems
dbSpectra
Dupont Building
DX Radio Systems
Elma Electronic
Emerson Network Power
Imark Communications
iStar USA
Midland Radio
Oldcastle Precast
Pioneer Energy Products (PEPRO)
Powerwave Technologies
Sabre Towers and Poles, div. of Sabre Industries
Shelter One
Solarcraft
Telewave
Tripp Lite
Tunnel Radio of America
VFP
Winsted

Cable

Air802
Antcom
ARC Wireless Solutions
Astron Wireless Technologies
Benelec
BroadWave Technologies
Calearo Group
CommScope
Comtelco
Electro Standards Laboratories
Elma Electronic
Encom Wireless Data Solutions
4RF Communications
GE MDS
Harger Lightning and Grounding
Hus-Tsan Group
Mobat USA
Motorola Solutions
Pomona Electronics
Radio Frequency Systems (RFS)
Radio Waves
Renair Antennae
RFI Antennas
RFI EMEA
Rojone
Skymasts Antennas
Spinner
Telewave
Times Microwave Systems
Trilogy Communications
Tripp Lite
Webb Industries

Cable Fault Locators

Anritsu
Bird Technologies Group
Electro Standards Laboratories
Motorola Solutions
TX RX Systems Bird Technologies Group

Combiners/Duplexers/Duplexers/Filter/Isolators/Multicouplers/Multiplexers (C=combiners, DI=diplexers, DU=duplexers, F=filters, I=isolators, MC=multicouplers, MP=multiplexers)

Accute Micro Electronics (DI, F)
Ace Technologies (C, DI, DU, F, I, MC, MP)
Alcatel-Lucent (MP)
Antcom (C, F, I)
Axell Wireless (C, DI, DU, F, I, MC, MP)
Bayly/Coastcom (MP)
Benelec (C, DI, DU, F, MC, MP)
BHE Bonn Hungary Electronics (DI, DU, F, MP)
Bird Technologies Group (C, DI, DU, F, I, MC)
BroadWave Technologies (C)
Cellular Specialties Inc. (CSI) (C, DI, DU, F, MC)
Center Systems (C, DI, MC)
C4i (MP)
CommScope (C, DI, DU, F, MC)
Comprod Communications (C, DI, DU, F, I, MC, MP)
Comtelco (DI, DU, MC)
Creowave (C, DI, DU, F)
dbSpectra (C, DI, DU, F, I, MC, MP)
DX Radio Systems (C, DU, F, I, MC)
Emerson Network Power (F)
EMR (C, DI, DU, F, I, MC, MP)
Fiplex Communications (C, DI, DU, F, I, MC, MP)
4RF Communications (C)
GE MDS (F, MP)
Great Fortress (MP)
Harris RF Communications (MP)
Imark Communications (DU, MC)
Innovative Circuit Technology (ICT) (F)
InStock Wireless Components (C)
Jaybeam Wireless (C, DI, DU, F)
JFW Industries (C)
Kathrein, Scala div. (C, DI, DU, F, I, MC, MP)
Kathrein Werke (MC, MP)
Lea Antenne & Progetti Spa (DI, DU, F, MC, MP)
Lone Star Aviation (F)
L-3 Communications, Narda Microwave-East (C, DU, F, I, MC)
Midland Radio (DU)
Motorola Solutions (C, DU, F)
Narda Microwave West (L-3 Communications) (C, DI, DU, F, I, MP)
Nucomm, RF Extreme div. (MP)
Positron Public Safety Systems (I)

Powerwave Technologies (C, DI, DU, F)
Procom (C, DI, DU, F, I, MC, MP)
RAD Data Communications (MP)
Radial Firm (C, DI, DU, F, I, MC)
Radio Frequency Systems (RFS) (C, DI, DU, F, I, MC)
RFI Antennas (C, DI, DU, F, I, MC)
RFI EMEA (C, DI, DU, F, I, MC)
Rojone (C, DI, DU, F, I, MC, MP)
Sinclair Technologies (C, DI, DU, F, I, MC, MP)
Skymasts Antennas (C, DI, DU, F)
South Midlands Communications (DU)
Spectra Engineering (DI, DU)
Spinner (C, DI, DU, F, MP)
Sti-Co Industries (C, DU, F, MC)
TC Communications (MP)
Telewave (C, DU, F, I, MC)
Telsate Telecomunicacoes (C, DI, DU, F)
Temwell (C, DI, DU, F)
TP Radio (C, DI, DU, F, I)
Trak Microwave (C, DI, DU, F, I, MC, MP)
Tunnel Radio of America (MC, MP)
TX RX Systems Bird Technologies Group (C, DU, F, I, MC)
Webb Industries (C, DU, F, I, MC, MP)
Zetron (MP)

Connectors

Ace Technologies
Air802
Anritsu
Antcom
ARC Wireless Solutions
Astron Wireless Technologies
Benelec
Bird Technologies Group
Bomar Interconnect Products
BroadWave Technologies
Cellular Specialties Inc. (CSI)
CommScope
Comprod Communications
Comtelco
D.W. Electrochemicals
DX Radio Systems
Electric Railway
Improvement Co. (ERICO)
Electro Standards Laboratories
EMR
GE MDS
Harger Lightning and Grounding
Hus-Tsan Group
Nearson
Pomona Electronics
Procom
Radio Frequency Systems (RFS)
Renair Antennae
RF Connectors, div. of RF Industries
RFI Antennas
RFI EMEA
Rojone
Sabre Site Solutions, div. of Sabre Industries
Sinclair Technologies

Skymasts Antennas
Spinner
TCC Industries
Telewave
Times Microwave Systems
Trilogy Communications
Tripp Lite
TX RX Systems Bird Technologies Group
Webb Industries

HVAC Control Systems

Bard Manufacturing
Compuquest
Emerson Network Power
Jaybeam Wireless
Pioneer Energy Products (PEPRO)
VFP

Ice Bridges

CommScope
Fred A. Nudd
Nello
Rohn Products
Sabre Site Solutions, div. of Sabre Industries
VFP

Lightning-Protection Equipment

Ace Technologies
Air802
Alltec
Astron Wireless Technologies
Atlantic Scientific
Benelec
Cellular Specialties Inc. (CSI)
Citel
CommScope
Comprod Communications
Electric Railway Improvement Co. (ERICO)
Emerson Network Power
Encom Wireless Data Solutions
4RF Communications
GE MDS
Harger Lightning and Grounding
Hark Systems
Imark Communications
Jaybeam Wireless
Lightning Eliminators and Consultants
Lightning Prevention Systems
L-3 Communications, Narda Microwave-East
Lyncole XIT Grounding
Mobat USA
Pioneer Energy Products (PEPRO)
PolyPhaser
Powerwave Technologies
Radio Frequency Systems (RFS)
Raycap
Renair Antennae
RFI Antennas
RFI EMEA
Rojone
Sabre Site Solutions, div. of Sabre Industries
Skymasts Antennas
Transtector Systems
Tripp Lite
VFP
Webb Industries
Zetron

Microwave/MUX Equipment

Alcatel-Lucent
Antcom
Artevea Digital
Astron Wireless Technologies
Aviat Networks
Bayly/Coastcom
BHE Bonn Hungary Electronics
Broadcast Microwave Services
Cepoint Networks
Ceragon Networks
Codan
CommScope
DX Radio Systems
4RF Communications
GE MDS
Harris RF Communications
Mimix Broadband
Praxsym
Procom
RAD Data Communications
Rojone
Sinclair Technologies
Spectracom
Trak Microwave
Vislink
Zetron

Preamplifiers

Axell Wireless
BHE Bonn Hungary Electronics
Bird Technologies Group
Center Systems
Comprod Communications
dbSpectra
EMR
Fiplex Communications
Kathrein, Scala div.
Kathrein Werke
Mimix Broadband
Motorola Solutions
Praxsym
Procom
Radial Firm
Radio Frequency Systems (RFS)
Rojone
Sinclair Technologies
Telewave
Telsate Telecomunicacoes
TX RX Systems Bird Technologies Group

Racks

American Wireless
Comprod Communications
Comsystems
dbSpectra
DX Radio Systems
Elma Electronic
Emerson Network Power
EMR
Fylde Micro Systems
GE MDS
iKey
iStar USA
Kyocera Solar
Pioneer Energy Products (PEPRO)
Powerwave Technologies
Procom
Radio Frequency Systems (RFS)
Sinclair Technologies
Solarcraft
Spinner
Telewave
Tripp Lite
Tunnel Radio of America

VFP
Winsted

Shelters

Alltec
Aluma Tower
Atlantic Scientific
Cellxion, div. of Sabre Industries
Dupont Building
Enviro Buildings
FWT
GFRC Shelters
Imark Communications
Oldcastle Precast
Pioneer Energy Products (PEPRO)
Powerwave Technologies
Shelter One
Sinclair Technologies
TowerWorx
VFP
Webb Industries

Site-Management Software

Asentria
CelPlan Technologies
Center Systems
Codan
CommScope
Compuquest
Computer Resources
Comsystems
CriSys
DPS Telecom
Federal Signal
Fylde Micro Systems
Hark Systems
Kathrein Werke
Location Technologies
LS telcom
Midian Electronics
Mi-Jack Systems & Technology
Motorola Solutions
PageTek
Powerwave Technologies
Radio Frequency Systems (RFS)
Rohde & Schwarz Professional Mobile Radio
Selex Communications – Prod-EI SPA
Signal Intelligence
SmarTrunk Systems
SoftWright
Strix Systems
Survey Technologies Inc. (STI)
Trylon TSF

Surge Protectors

AC/DC Industries
Ace Technologies
Alltec
Atlantic Scientific
Citel
CommScope
DX Radio Systems
Eaton – Power Quality
Electric Railway Improvement Co. (ERICO)
Electro Standards Laboratories
Emerson Network Power
Encom Wireless Data Solutions
GE MDS
Harger Lightning and Grounding
Innovative Circuit Technology (ICT)
iStar USA

Lightning Eliminators and Consultants
Lone Star Aviation
Lyncole XIT Grounding
Positron Public Safety Systems
Radio Frequency Systems (RFS)
Raycap
RFI Antennas
RFI EMEA
Rojone
Signal Measurement
Sinclair Technologies
Skymasts Antennas
Solarcraft
Spinner
TCC Industries
Telsate Telecomunicações
Transtector Systems
Tripp Lite
VFP
Webb Industries

Switches

Ace Technologies
Center Systems
Cisco Systems
Dataprobe
Elma Electronic
Encom Wireless Data Solutions
Frequentis
Fylde Micro Systems
GE MDS
IHM
JFW Industries
Motorola Solutions
Omnitronics
Quintron Systems
RAD Data Communications
Rohde & Schwarz
Professional Mobile Radio
Rojone
Selex Communications – Prod-EI SPA
SmarTrunk Systems
SolaCom Technologies
Spinner
Strix Systems
Team Simoco
Technotrend
Teltronics
3T Communications
Trak Microwave
VFP
Zetron

Tower Obstruction

Carmanah Technologies
Flash Technology, SPX div.
Kyocera Solar
Rohn Products
Sam Woo Electronics
Sinclair Technologies
TWR Lighting
Webb Industries
XCell Tower Controls

Towers, Fixed/Mobile (F=fixed towers, M=mobile towers)

Aluma Tower (F, M)
American Tower (F)
Antenna Products (F)
Applied Global Technologies (AGT) (M)
ARC Wireless Solutions (F)
CommScope (F)
Comsystems (F, M)
Fred A. Nudd (F)
FWT (F, M)
Imark Communications (F)
Nello (F, M)

Pioneer Energy Products (PEPRO) (M)
Powerwave Technologies (M)
Rohn Products (F)
Sabre Site Solutions, div. of Sabre Industries (F)
Sabre Towers and Poles, div. of Sabre Industries (F, M)
Sam Woo Electronics (F, M)
Sinclair Technologies (F, M)
Skymasts Antennas (F, M)
South Midlands Communications (F, M)
Strix Systems (F, M)
Tower Innovations (F)
Tower Solutions (M)
TowerWorx (F, M)
Trylon TSF (F)
TWR Lighting (F)
Valmont Structures (F)
Wade Antenna/Taco Antennas (F)
Webb Industries (F, M)
Winco (M)
XCell Tower Controls (F)

Voting Products

Center Systems
CTI Products
DX Radio Systems
Midian Electronics
Motorola Solutions
RF Technology
Selex Communications – Prod-EI SPA
South Midlands Communications
Spectra Engineering
Team Simoco
TP Radio

Waveguide

Antcom
CommScope
Nello
Pioneer Energy Products (PEPRO)
Radio Frequency Systems (RFS)
RFI Antennas
RFI EMEA
Rohn Products
Rojone
Sabre Site Solutions, div. of Sabre Industries
Spinner
Trak Microwave
Trylon TSF
Valmont Structures
VFP

SOFTWARE

CAD Software/Systems
(See PSAP/E9-1-1 Equipment, Page 36)

Custom

Airbiquity
Albrecht Telecommunications
Antcom
Aplicom
Bradshaw Consulting Services (BCS)
BridgeCom Systems
Cadex Electronics
CAD North
Catalyst Communications Technologies
CelPlan Technologies
Center Systems
C4i
Cobham Surveillance
CoCo Communications

CommScope
Compuquest
Computer Resources
Comsystems
CTI Products
Data911 Mobile Computer Systems
Digital Voice Systems Inc. (DVS)
DPS Telecom
EMS Technologies
Fial
Fylde Micro Systems
Genesis Group
Global Mesh Technologies Service
Hoag Electronics
HV Sistemas
I.D. Systems
IHM
Integrated Tracking Solutions
InterAct Public Safety Systems
Location Technologies
Locus Location Systems
Lyrtch
Manning Navcomp
Maxon
Mentor Engineering
MiMoMax Wireless
MoniVox – Control Service
Multiple Access Communications (MAC)
NeoTerra Systems
Northrop Grumman Information Systems
PageTek
Penta
Portrait Software
Radar 911 Systems
RadioMobile, div. of RF Industries
RadioSoft
Radixon
Realtime North America
Recollect Recording
Safemobile
Selex Communications – Prod-EI SPA
Send Word Now

Signal Intelligence
SoftWright
Strix Systems
Team Simoco
TeleCommunication Systems (TCS)
Telesoft International
Tiburón
TP Radio
Ventyx
VoiceInterop
Winsted
Zetron

Dispatch
(business/industry)
Abell Industries
APD Communications
Artevea Digital
Bradshaw Consulting Services (BCS)
Catalyst Communications Technologies
Communication Plus
Compuquest
CriSys
Critical Response Systems
CTI Products
Data911 Mobile Computer Systems
EMS Technologies
Harris Public Safety and Professional Communications (PSPC)
HigherGround
IDA
IHM
InterAct Public Safety Systems
Intergraph
Keltron
Logistic Systems
Mentor Engineering
Midian Electronics
MoniVox – Control Service
Motorola Solutions
NeoTerra Systems
Omnitronics
Penta

Positron Public Safety Systems
Radar 911 Systems
RadioMobile, div. of RF Industries
Rohde & Schwarz
Professional Mobile Radio
Rohill Engineering
Safemobile
Selex Communications – Prod-EI SPA
Send Word Now
Signal Intelligence
SmarTrunk Systems
SolaCom Technologies
Swissphone Telecom
Tallysman Wireless
Team Simoco
Telex Radio Dispatch
Teltronic S.A. Unipersonal
TETRAsim
3T Communications
TP Radio
Trimble
TriTech Software Systems
Ventyx
VoiceInterop
Voice Print International (VPI)
WiPath Communications
Zetron
Zoll

Engineering
Abell Industries
Agilent Technologies
Airbiquity
Astron Wireless Technologies
Berkeley Varitronics Systems
BridgeCom Systems
CelPlan Technologies
C4i
CommScope
Comsearch
Comsystems
Cromack Industries
DPS Telecom
DX Radio Systems

EDX Wireless
Electro Standards Laboratories
Elektronika Naglic in Drugi dno Domzale
Hoag Electronics
Location Technologies
LS telcom
Lyrtch
Mentor Engineering
Motorola Solutions
RadioSoft
RCC Consultants
Signal Intelligence
SoftWright
Telesoft International
Teltronic S.A. Unipersonal
3T Communications
TP Radio
VoiceInterop

FCC Licensing
Abell Industries
CelPlan Technologies
CommScope
Comsearch
RadioSoft

Field Reporting
(business/industry)
Abell Industries
APD Communications
CriSys
Data911 Mobile Computer Systems
EMS Technologies
Integrated Tracking Solutions
InterAct Public Safety Systems
Intergraph
Location Technologies
Locus Location Systems
Mi-Jack Systems & Technology
NeoTerra Systems
Northrop Grumman Information Systems
Radar 911 Systems
Send Word Now
Syntech Systems



TAP™

Levels the terrain for

rf Design Professionals

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Multi-seat TAP Version
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- Software **used** by consultants, dealers, industrial, commercial, homeland security
- Software **for** land mobile coverage, SCADA, microwave, spread spectrum
- The **Wright** choice for complete control of your rf system design



**Terrain Analysis
Package (TAP)™**

www.softwright.com

+1-303-344-5486 sales@softwright.com

Product Category Index

Trancite Logic Systems
Trident Micro Systems
 Ventyx
Zetron
 Zoll

GIS Mapping

APD Communications
 Bradshaw Consulting
 Services (BCS)
 CAD North
 CelPlan Technologies
 CES Wireless
 Comsearch
 CriSys
 Data911 Mobile Computer
 Systems
 DX Radio Systems
 EMS Technologies
 Environmental Systems
 Research Institute (ESRI)
 Hitech Systems
 Infinity Gear and Technology
 Integrated Tracking Solutions
 InterAct Public Safety
 Systems
 Intergraph
 LocationNet Systems

Location Technologies
 Locus Location Systems
 Logistic Systems
 LS telcom
 Manning Navcomp
 Maxon
Mobility Sound Technology
 NeoTerra Systems
 Northrop Grumman
 Information Systems
 Positron Public Safety
 Systems
 Radar 911 Systems
 RadioMobile,
 div. of RF Industries
 Radixon
 Raveon Technologies
 Selex Communications –
 Prod-El SPA
 Send Word Now
SoftWright
 South Midlands
 Communications
Survey Technologies Inc.
 (STI)
 Swissphone Telecom
3T Communications
 Tiburon

TP Radio
 Trancite Logic Systems
Trident Micro Systems
 Trilliant
 Trimble
 TriTech Software Systems
 Ventyx

Middleware

APD Communications
 Apicom
 Avaya
 CalAmp
 CelPlan Technologies
 CES Wireless
 C4i
 Data911 Mobile Computer
 Systems
 GE MDS
 Integrated Tracking
 Solutions
 Intuicom
 LocationNet Systems
 Location Technologies
 Locus Location Systems
 Lyrtech
 Manning Navcomp
 Mentor Engineering

Motorola Solutions
 Portalify
 Positron Public Safety
 Systems
 Quintron Systems
 Radar 911 Systems
 Radio IP Software
 RadioMobile,
 div. of RF Industries
 Send Word Now
 TP Radio
Trident Micro Systems
 Twisted Pair Solutions
 Ventyx
 VoiceInterop

Mobile-Data Systems

Airbiquity
 Albrecht Telecommunications
 APD Communications
 Avaya
 Bradshaw Consulting
 Services (BCS)
 CalAmp
 CelPlan Technologies
 Center Systems
 CES Wireless
 Cleartone Telecom

CoCo Communications
 Communication Plus
 Compuquest
 CriSys
 Critical Response Systems
 Data911 Mobile Computer
 Systems
 EMS Technologies
 Fyde Micro Systems
 Global Mesh Technologies
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HAL Communications
 Harris RF Communications
 Hitech Systems
 HV Sistemas
 IDA
 I.D. Systems
 InterAct Public Safety
 Systems
 Intergraph
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 Kolibri Systems
 LocationNet Systems
 Location Technologies
 Logistic Systems
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 Radar 911 Systems
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 Send Word Now
 SkySweep Technologies
SoftWright
 Solarcraft
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 Spescom
 Tait Electronics
 Tallysman Wireless
 TeleCommunication
 Systems (TCS)
 Telesoft International
3T Communications
 Tiburon
 TP Radio
 Tripp Lite
 Twisted Pair Solutions
 Vecima Networks

Bayly/Coastcom
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 Cisco Systems
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Communications
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 TP Radio
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 Twisted Pair Solutions
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Motorola Solutions
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Sonik Messaging Systems
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Tallysman Wireless
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Zetron

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Mentor Engineering
MoniVox – Control Service
Motorola Solutions
Positron Public Safety Systems
Radar 911 Systems
RadioMobile, div. of RF Industries
Signal Intelligence
SmarTrunk Systems
SoftWright
Syntech Systems
TP Radio
Trimble
TriTech Software Systems
Zoll

RF Safety

Antenna Factor
Locus Location Systems
Narda Safety Test Solutions
RCC Consultants

Terrain Propagation

CelPlan Technologies
Comsearch
DX Radio Systems
EDX Wireless
Harris Public Safety and Professional Communications (PSPC)
LS telcom
Motorola Solutions
Multiple Access Communications (MAC)
NeoTerra Systems
RadioSoft
RCC Consultants
Selex Communications – Prod-EI SPA
SoftWright
Survey Technologies Inc. (STI)
Trilliant

Voice Recognition

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ASC Telecom
Avaya
Location Technologies
MoniVox – Control Service
Motorola Solutions
Nortel
OrecX
Raytheon JPS Communications
Send Word Now
Spescom
Voice Print International (VPI)

Wireless Internet Applications

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Catalyst Communications Technologies
Cellular Specialties Inc. (CSI)
CelPlan Technologies
Ceragon Networks
CES Wireless
Cisco Systems
CoCo Communications
Communication Plus
Compuquest
CriSys
Digital Voice Systems Inc. (DVS)
Electro Standards Laboratories
Encom Wireless Data Solutions
Hark Systems
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Telesoft International
Trimble
TriTech Software Systems
2ergo
Vecima Networks
Voicelinterop

TELEMATICS/ITS EQUIPMENT

Aplicom
Astron Wireless Technologies
Dataprobe
EMS Technologies
Harris Public Safety and Professional Communications (PSPC)
Hughes Telematics
Laird Technologies
Location Technologies
Mobile Mark
Radio IP Software
Rojone
Tallysman Wireless
Trimble
WiPath Communications

TEST EQUIPMENT

(D=direction finders, FS=field strength meters, FC=frequency counters, P=power monitors, RF=RF monitors, SM=service monitors, SA=spectrum analyzers, V=voltmeters/wattmeters)
Abell Industries (D, FC, P, SA, V)
Aeroflex (FC, P, RF, SM, SA)
Agilent Technologies (FC, SA, V)
Albrecht Telecommunications (SM)
Anritsu (D, FS, FC, P, RF, SM, SA, V)
Astellia (SM)
Berkeley Varitronics Systems (D, P, SA)
Bird Technologies Group (FS, P, RF, SM, SA, V)
Cobham Surveillance (D)
Communications Research Centre (CRC) (SA)
Comprod Communications (P, RF)
Cubic Defense Applications (D)
dbSpectra (P)
Doppler Systems (D)
EMR (P)
Etherstack (RF)
General Dynamics Satcom Technologies (P, SM, SA, V)
Kaltman Creations (D, FS, FC, RF, SA)
Link Communications (SM, SA)
Locus Location Systems (RF)
L-3 Communications, Narda Microwave-East (P, SA)
Lyncole XIT Grounding (P)
Motorola Solutions (SM, SA)
Multiple Access Communications (MAC) (FS, P, RF, SA)
Narda Safety Test Solutions (D, P, RF)
NCG Companies (V)
Optoelectronics (FC)
Pendulum Instruments (FC, RF, SA)
Praxsym (FS, P, RF, SM, V)
RadioMobile, div. of RF Industries (RF, SA)
Radixon (D, FS, RF, SA)
Rohde & Schwarz Professional Mobile Radio (D, FS, FC, P, RF, SM, SA, V)
Rojone (RF)
Sinclair Technologies (FC, P, RF)
Smith Myers Communications (SM)
Spectracom (FC)
Survey Technologies Inc. (STI) (FS, P, RF, SM, SA)
Telewave (P, V)
Telsate Telecomunicações (D, FS, RF)
Times Microwave Systems (RF, SM, SA)
TX RX Systems Bird Technologies Group (P, RF, SA, V)
Zetron (P)

TONE SIGNALING EQUIPMENT

Albrecht Telecommunications
American Wireless
Antenna Factor
Austriamicrosystems
Avtec
Benelec
CES Wireless
Cimarron Technologies
Communication Plus
Communications Specialists
Compuquest
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Critical Response Systems
Cromack Industries
DX Radio Systems
GAI-Tronics
Hark Systems
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New Products

P25 Radios

Kenwood announced new 10 series G-Model Project 25 (P25) mobiles and portables with expanded memory, improved digital voice performance and advancements in durability. The TK-5210G/5310G/5710G portables and TK-5810G mobile all feature memory expansion, making them



ideal for larger systems with up to 1,024 channels and 100 zones, and ensuring a 3-second micro boot time at power up. In addition to IP65 and IP67 ratings, the portables meet IP68 standard for maximum tightness against dust and water, as well as water immersion for up to 2 hours. The radios

feature Telecommunications Industry Association (TIA)-approved AMBE+2 vocoder for improved forward error correction (FEC) and noise reduction and allow interoperability with the capability to

designate up to 32 different radio systems per system.

www.kenwood.com

PTT Mobile Radio

The IPR5000 from **Link Communications** is a rugged, water-resistant mobile radio that provides secure push-to-talk (PTT) communications over an IP network. Features include a handheld microphone, internal and external speakers,



LCD display, a roof-mounted antenna, and a bracket for mounting the unit under the dash. The mobile automatically selects the lowest-cost IP network available and provides GPS-based AVL.

www.link-comm.com

Backhaul Antenna

Laird Technologies released the



enhanced HDDA5W HD series high-performance dish antenna. The point-to-point backhaul antenna now offers dual-slant construction to provide polarization diversity for maximal-ratio combining, which eases the impact of multipath interference that often results in poor coverage areas. The antenna is available in six new models that come in either 2- or 3-foot diameter sizes and operate in the 4.9 to 5.875 GHz bands. Options include configurations for two gains (29 dBi or 32 dBi) and three polarities. The rugged antenna was designed for 802.11 applications, orthogonal frequency division multiplexing (OFDM), cellular backhaul,

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point-to-point backhaul and public-safety communications systems.

www.lairdtech.com

Dual Frequency Antenna

The GPS-C TETRA-I groundplane independent half-wave antenna for GPS and



TETRA was presented by **Procom**. The unit was developed for installations on fiberglass surfaces and features 2 dB gain. The half-wave whip offers a built-in shock spring. The

GPS signal is secured through a high-gain, low-noise amplifier. The standing wave ratio (SWR) is optimized by tuning the Black Box Matching Unit.

www.procom.dk

Wireless Data Modem

CML Microcircuits launched the



CMX7164 multimode wireless data modem IC to aid in migrating legacy to

quadrature amplitude modulation (QAM). The chip provides 4-, 16- and 64-QAM and root raised cosine 2-/4-frequency shift keying (FSK) baseband modem functions, replacing the current need for user programmed digital signal processor (DSP) plus codec ICs. Features include digital intermediate frequency (IF) filters, auxiliary codecs, clock generators and input/output functions. The device is a baseband modem system delivering multiple modulations for narrowband applications, including machine-to-machine (M2M) systems over dedicated channels, digital software defined radio (SDR), high-speed wireless data and superviso-

ry control and data acquisition (SCADA) systems. The half-duplex device operates up to 96 kilobits per second (kbps) in 25 kilohertz and it supports 6.25-, 12.5- and 25-kilohertz bandwidths.

www.cmlmicro.com

Radio Adapters

Pryme Radio Products introduced several new adapters. The WTX-500 wire-



less push-to-talk (PTT) adapter for two-way radios features a Quick Disconnect (QD) jack, allowing the adapter to be used in conjunction with any Pryme QD audio accessory that is

not listen only. The PrymeBLU BT is a mobile adapter that is compatible with Bluetooth headsets or other audio accessories with a mobile two-way radio, and



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New Products

receives power by plugging it into any automotive lighter outlet. The PrymeBLU PTT allows users to activate a radio's PTT function wirelessly, when using a PrymeBLU Adapter (required to use the BT-PTT) and paired Bluetooth headset. The BT-500 series adapters use almost any wireless Bluetooth headset and now work with almost any major brand two-

way radio, company executives said.
www.pryme.com

Vehicle Location

The VLR200 from **Thorcom** combines positioning technology with high-performance quadband GSM radio communications in a compact and robust unit. Applications include real-time vehicle



location systems, vehicle telemetry and data recording,

and when combined with a supported satellite navigation system from Garmin, the unit provides mobile data and job dispatch facilities. The unit is compatible with the company's central gateway products. Markets include emergency services, public transport, local authorities, and fleet and logistic operations.

www.thorcom.co.uk

Vehicle Tracking

Geotab announced the GO5 ultra-small, next-generation vehicle tracking solution based on u-blox embedded NEO GPS and LEON GSM modules. The multitasking telematics platform continuously monitors, records and reports speed, mileage, harsh braking, acceleration, and vehicle data including engine health diagnostics based on user-defined specification. The unit works with the company's Checkmant 5.5 server-based and MyGeotab 5.5 free Web-based fleet management software. Additional features include a patented algorithm to record trip details while maintaining a high-resolution data log for accident reconstruction purposes, and supports firmware upgrades over the air.

www.geotab.com

Antenna Evaluation Kits

Antenna Factor's Connectorized Antenna Evaluation Kit (CAEK) and the Permanent Mount Antenna Evaluation Kit (PAEK)



offer a convenient way to evaluate the physical, electrical

and cosmetic properties of antennas. Kits are available with center frequencies of 418, 433, 868 and 916 MHz, as well as 2.4 GHz. The PAEK antennas attach directly to the device while the CAEK, which includes both antennas and connectors, is available in SMA and RP-SMA.

www.antennafactor.com



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6 – 7 June: International Software Radio Conference, London. SMi Group: +44 20 7827 6000, smiproduction@smi-online.co.uk, www.smi-online.co.uk/events

6 – 8 June: APCO Global Congress, Dubai, United Arab Emirates. APCO Global Alliance: +1 770 874 5830, jeffersond@apcointl.org, www.apcoworldcongress.org

14 – 16 June: Global Paging Convention, Nashville, Tennessee, USA. American Association of Paging Carriers (AAPC): info@pagingcarriers.org, www.globalpagingconvention.com

21 – 24 June: CommunicAsia, Singapore. CommunicAsia: +65 6233 6638, www.communicasia.com

22 – 24 June: European Conference on Communications Technologies and Software Defined Radio (SDR'11 – WInnComm), Brussels. Wireless Innovation Forum: karen.watkins@wirelessinnovation.org, http://europe.wirelessinnovation.org

22 – 24 June: General Police Equipment Exhibition and Conference (GPEC) Asia, Putrajaya, Malaysia. EWM Exhibition and Marketing: +49 34 743 62 092, info@gpec.de, www.gpecasia.com.my

7 – 10 August: APCO Conference and Exposition, Philadelphia, USA. Association of Public-Safety Communications Officials (APCO) International: www.apco2011.org

21 – 23 August: INTERSEG: International Law Enforcement Technology, Services and Product Expo, Rio de Janeiro. International Association of Chiefs of Police (IACP): +1 703 836 6767, www.interseg2011.com.br

1 September: TETRA Association Congress Brazil, Brasilia, Brazil. TETRA Association: nicole.morrison@tetra-association.com, www.tetra-applications.com

1 September: TETRA Association Congress Mexico, Mexico City. TETRA Association: nicole.morrison@tetra-association.com, www.tetra-applications.com

6 – 7 September: LTE Asia, Suntec, Singapore. Informa UK: +44 20 7017 4555, database@informa.com, http://asia.lteconference.com

14 – 16 September: VSAT2011

Conference, London. Communication Systems (Comsys): Rose Murphy, +44 1727 832288, rose@comsys.co.uk, www.comsys.co.uk/wvc_main.htm

19 – 21 September: Professional Mobile Radio (PMR) Summit, Barcelona, Spain. IIR Telecoms & Technology: +44 20 7017 7483, registrations@iir-telecoms.com, www.iir-telecoms.com/event/PMR

24 – 27 October: ITU Telecom World 2011, Geneva. ITU Telecom: +41 22 730 6161, itutelecom@itu.int, www.itu.int/world2011

26 – 28 October: EUTC Annual Conference, Madrid. European Utilities Telecom Council (EUTC): +32 2 645 26 77, www.eutc.org/eutc-annual-conference

1 November: TETRA Association Congress India, New Delhi. TETRA Association: nicole.morrison@tetra-association.com, www.tetra-applications.com

16 – 17 November: RadioComms Connect, Melbourne, Australia. WFEvents: lcrossley@westwick-farrow.com.au, www.radiocommsconnect.com.au

22 – 24 November: PMRExpo, Cologne, Germany. PMR Expo: pmr@wehrstedt.org, www.pmrexpo.com

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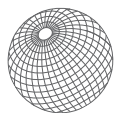
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2. Which of the following best describes your organization?

- ☐ A Mobile Communications Dealer/Reseller
☐ B Distributor, Agent, Importer, Exporter, Rep
☐ C Commercial Trunked Radio and Other Wireless Service Providers
☐ D Government/Public Safety/Military
☐ E Business/Industrial/Transportation User
☐ F Communications Manufacturer/OEM/Software Developer
☐ G Engineering and Consulting Firm
☐ Z Other—please specify _____

3. What is your function?

- ☐ A Corporate 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 area of the world do you do most of your business? (mark only one)

- ☐ A Western Europe ☐ F Africa
☐ B Eastern Europe ☐ G Mexico/Central and South America
☐ C Middle East ☐ H United States/Canada
☐ D Asia ☐ Z Other _____
☐ E Australia/New Zealand

7. What wireless technologies does your organization plan to use/buy over the next 2 years? (check all that apply)

- ☐ A Conventional Two-Way ☐ H Location Technologies
☐ B Cellular/Personal Communications ☐ I Tone Signaling (ANI, Encryption, etc.)
☐ C Paging/Messaging ☐ J Interconnect
☐ D Mobile Data ☐ K Satellite
☐ E SCADA/Telemetry ☐ L CAD
☐ F Microwave radio ☐ M Wireless Broadband
☐ G Trunking ☐ Z Other _____

The Case for Dedicated Public-Safety Broadband Spectrum

By Jeppe Jepsen

Mission-critical broadband could prove vital for public safety. But to be reliable, broadband networks must be secure and robust, and that calls for dedicated spectrum. A significant number of major disaster reports since the 1950s have highlighted the weakness of communications within public-safety organizations responding to emergencies.



The recent series of natural disasters in the Asia/Pacific region only serves to highlight the crucial importance of a robust communications network for the various emergency services, especially in times of crisis.

Although too early for conclusive results, anecdotal evidence from earthquakes in New Zealand and Japan reinforces the conclusions drawn from analyses of earlier disasters — public wireless networks can't be expected to adequately service the deluge of radio traffic that accompanies a major disaster. These communications problems make the case for governments to provide dedicated public-safety spectrum, not just for mission-critical voice, but for mission-critical broadband.

The advantages for public-safety organizations to have access to services such as real-time, high-quality video streaming coordinated with voice traffic are many. The question is how can it be delivered? The options are a dedicated public-safety service (PSS) network similar to current TETRA networks, a shared service run on public networks, or a mix of the two.

The problem with the last two

options is that public-safety communications have a variety of stringent requirements. Public networks are driven by different requirements. They are not optimized to meet the operational requirements of mission-critical data applications, including secure data transfer, nationwide coverage, guaranteed availability and control.

A shared network scenario would require pre-empting capacity, whereby the networks would guarantee to clear spectrum for emergency purposes on demand. A number of risks are associated with this in terms of making pre-emption failsafe, and it is debatable how willing mobile network operators will be able to provide such a service if it isn't part of the initial license agreements.

That leaves dedicated PSS networks. Voice capacity and spectrum for public-safety broadband was initially estimated in 1994. The dedicated narrowband and wideband 380 – 470 MHz network allocation of only two 5-megahertz-wide blocks for PSS in many countries is not sufficient to meet future needs. Public safety is limited in capacity and the volume of data, and congestion on a TETRA network may necessitate the use of insecure communications for data communications, a problem in a major emergency. Compounding this, the integrated broadband services now emerging require more bandwidth. Consequently, that means additional dedicated spectrum must be reserved.

In Asia/Pacific, different countries are at different levels of development in their exploration of the need for dedicated PSS networks. Asian authorities would do well to learn from the United States. President Barack Obama in February outlined an initiative to provide US\$7.5 billion in

federal funding to help pay for a nationwide public-safety broadband network for first responders in the 700 MHz D block — welcome progress to be sure, but an initiative first recommended by the 9/11 Commission in 2004. Congress has yet to approve any funding specific to a nationwide public-safety broadband network.

Harmonized spectrum planning takes many years to bring to fruition, but there is a pressing need to ensure that dedicated spectrum is allocated now. Spectrum is a precious commodity, but similar to all commodities, it is a limited resource. As policymakers investigate the best approach, they will find there is no easy answer as to where dedicated public-safety broadband spectrum can be found. In the end, it is a political question: What should the balance be among HDTV channels, military capability and the effectiveness of emergency services?

Spectrum can, and indeed must, be found. However, there is a lack of an effective voice from the public-safety user lobby. The lack of a clear voice could be mistaken for a lack of need. The opportunity needs to be seized now. If this window is missed, it could be 15 years or more before an effective PSS broadband provision is available. The case for dedicated PSS spectrum is compelling. ■

Jeppe Jepsen joined Motorola in 1979 and has been the director of international business relations at Motorola Brussels since September 1995. Jepsen has held several positions in the TETRA Association since its founding in 1995 and is a director in the TETRA Association and a member of the board. In addition, Jepsen is the elected chairman of Public Safety Communication Europe's (PSCE) spectrum group. Email comments to editor@RRMediaGroup.com.



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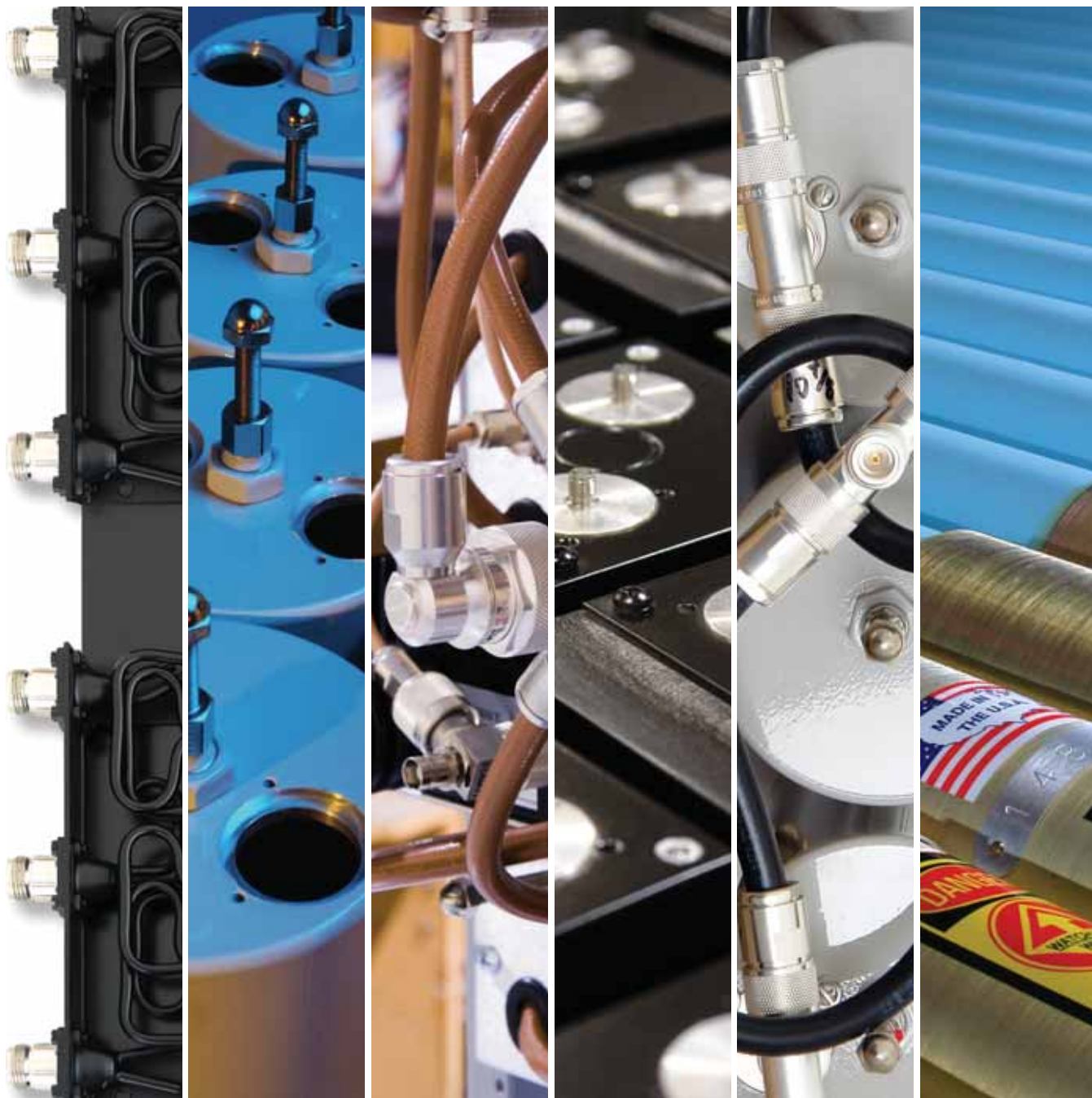
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