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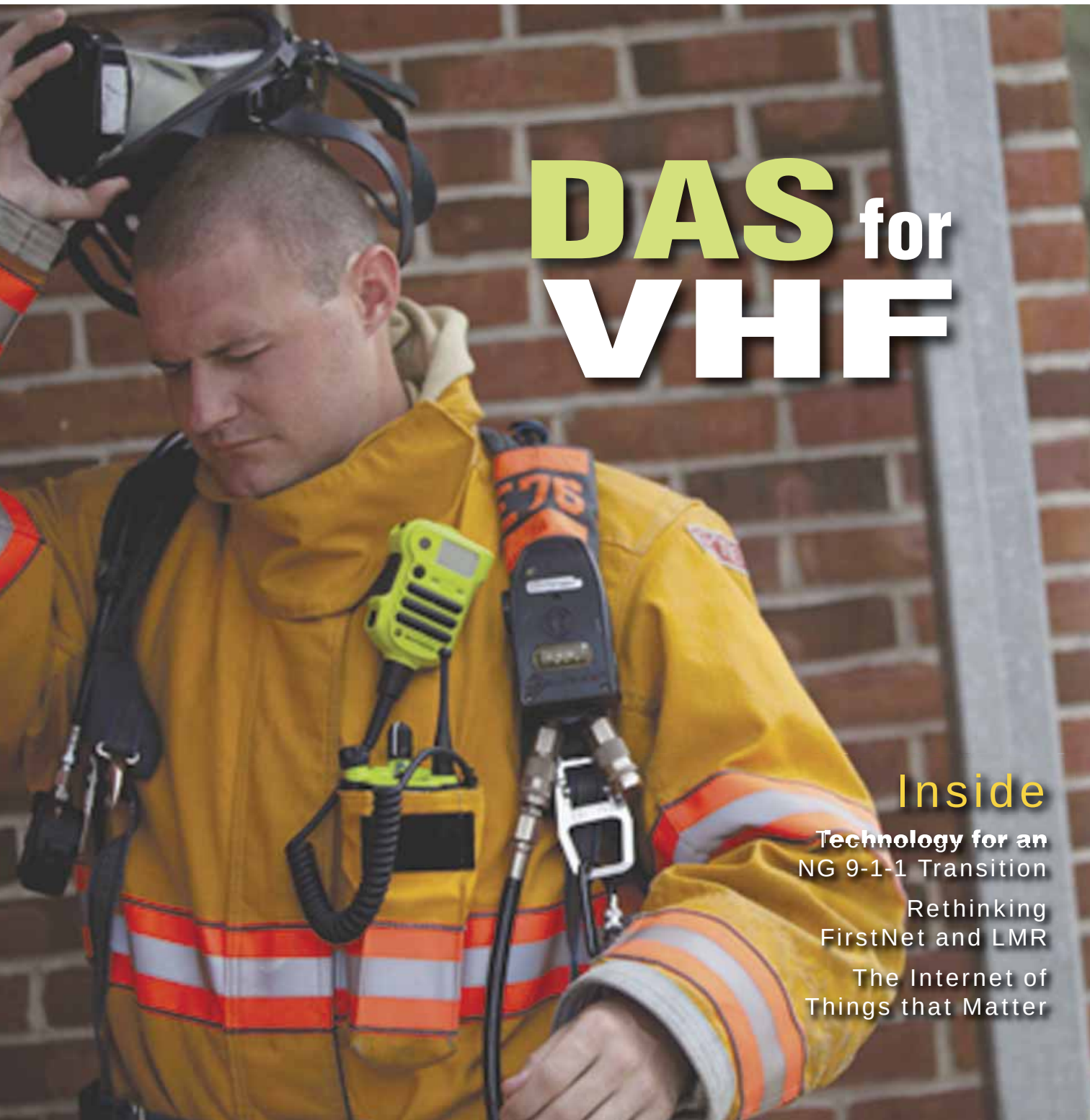

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Technology for an NG 9-1-1 Transition

Rethinking FirstNet and LMR

The Internet of Things that Matter


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READER SERVICES

Cover photo courtesy Motorola Solutions

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FCC Officials Put Weight Behind 9-1-1

In a positive development, 9-1-1 is beginning to see some much-needed support from leaders in Washington as the industry begins to slowly transition to next-generation 9-1-1 (NG 9-1-1) technology. Officials at the FCC specifically have embraced 9-1-1 issues.

FCC Chairman Tom Wheeler in March asked lawmakers on a House Energy and Communications subcommittee to take action to ensure public-safety answering points (PSAPs) have the tools and resources they need to accelerate the NG 9-1-1 transition.

FCC Commissioner Jessica Rosenworcel said in May that in addition to legislative help for NG 9-1-1, it's time to put the 9-1-1 grant funding included in the Middle Class Tax Relief and Job Creation Act of 2012 to work for 9-1-1 jurisdictions.

"It is time to get this program up and running," Rosenworcel said during a speech at an Association of Public-Safety Communications Officials (APCO) International event. "It is the best near-term resource we have to get going on NG 9-1-1. Plus, we are overdue."

This issue of the magazine has several NG 9-1-1 resources including an article beginning on Page 26 outlining the technology and architectures available for the transition. Laurie Flaherty details National 9-1-1 Program initiatives on Page 54 in our newly revamped "Outlook" department.

Email your feedback to swendelken@RRMediaGroup.com.

Ron Beck

Speaking of new, we are excited to welcome Ron Beck, a network engineer for Central Lincoln People's Utility District, as the newest member of our editorial advisory board. Beck is a past chairman of the Utilities Technology Council (UTC), is a member of the UTC Leadership Advisory Council and serves on the Smart Networks Council.

In addition to his critical infrastructure experience, Beck was a lieutenant with Newport (Oregon) Fire Department for 14 years and spent a great deal of time working with the local departments on communications and training.

We look forward to having Beck as an editorial adviser to *MissionCritical Communications*; his experience will enhance our coverage and knowledge base.

Sandra Wendelken, Editor
swendelken@RRMediaGroup.com

RadioResource MissionCritical COMMUNICATIONS

RadioResource *MissionCritical Communications* delivers wireless voice and data solutions for mobile and remote mission-critical operations. The magazine targets public safety, state/local/federal government, transportation, field service, business and industrial users; engineering and consulting firms; mobile communication dealers/resellers; service providers and other industry professionals in the United States and Canada. Editorial content includes business and regulatory news, in-depth features, product information and comparisons, industry reports and trends, innovative applications, emerging technologies, case studies and technical tips.

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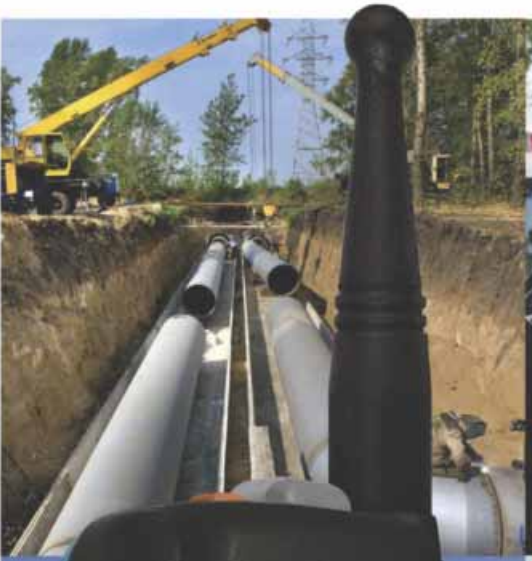

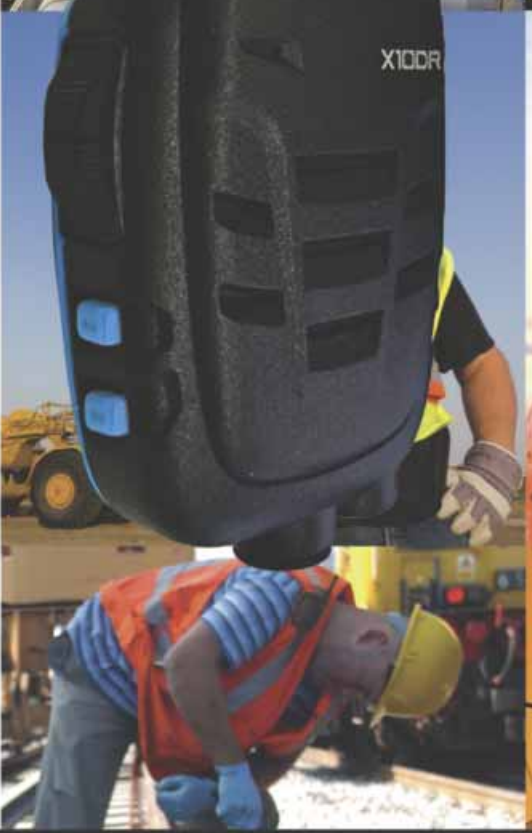

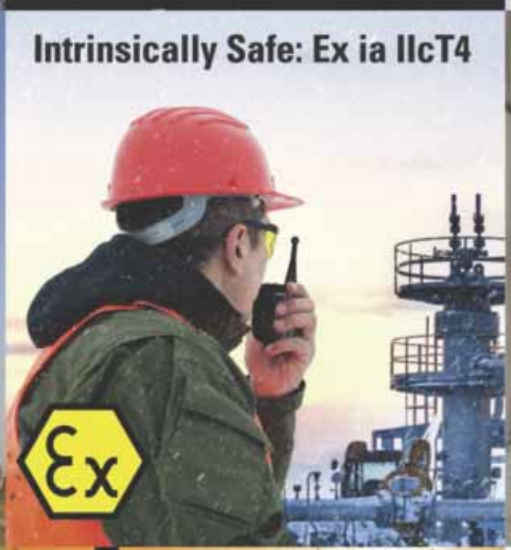

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Prioritize the Internet of Things that Matter

By F. H. (Rick) Smith

On March 1, the Senate introduced a bill, known as the Developing Innovation and Growing the Internet of Things (DIGIT) Act, which directs the FCC to complete a report assessing spectrum needs required to support the internet of things (IoT), in anticipation of fostering innovation, jobs and useful capabilities for all of us.

Although the concept of IoT is becoming a household phrase, the concept isn't new. It has been around for many decades, in what I term the "internet of things that matter," such as remote controlling compressors that deliver natural gas to New York City, analyzing pressures and flows on an oil pipeline in real time to detect even small leaks, inter-linking circuit breakers at various substations to react quickly to prevent a fault from escalating to a larger area and others.

Ironically, we now have the technology to tie virtually everything into the internet, but our toolset to properly serve the internet of things that matter (IoTtM) is increasingly at risk. How could this be when the bandwidth it takes to remote just one person's digital video recording (DVR) content to a cellphone is likely larger than a whole city's worth of IoTtM?

The key to understanding this dichotomy lies in understanding the cumulative impact of FCC policies dating back to the early 1990s where emphasis shifted in favor of consumers and away from business, industry, government and regulation. No one can deny there have been huge benefits from these policies, giving us the combined power of the internet and the cloud; yet, a few stress cracks are growing with respect to the IoTtM.

Telecommunications systems supporting the IoTtM within the energy industry, regardless of the technology deployed, are typically carefully monitored and attended to promptly when problems occur.

In the evolution of the telecommunications tools supporting the IoTtM, the broad categories haven't changed — do-it-yourself wireless, commercial wireless, commercial landline services, satellite services and a do-it-yourself landline. However, the story behind these broad categories has changed a lot.

Commercial Wireless

As long as the business model of commercial wireless remains linked in an 80/20 way with consumers over business and industrial customers, progress toward becoming an ideal strategic fit for supporting the IoTtM will be asymptotic at best. Here are some of the reasons why. Another generation (5G) doesn't always mean better. Long Term Evolution (LTE) is delivering more average bandwidth per square mile, but there is still a cost to speed.

Claude Shannon would remind us that with higher speeds comes a need to maintain higher RF signal quality, which is doable at cell centers, but still hard to maintain at cell edges. Consequently, towers still must be tweaked in favor of where people live and the roads they drive on. Engineering models continue to assume that the IoT is on a parallel track with people and roads, and such is often not the case with the IoTtM. Recent experience in some of our local oil field environments suggests service is degrading, not improving.

While most of the applications identified with the IoTtM require only modest bandwidth, they often require a steady, consistent flow of information, and in electric utility industry applications, very low latencies, as well. It is not hard to understand why maintaining steady information flow for customer data on commercial wireless networks is difficult. Consumers eat up bandwidth as fast as carriers can deliver it, and carriers are reluctant to deploy any quality of service (QoS) technology in the direction of offering a business/industrial class of service and agreeing to meaningful service-level agreements (SLAs).

Another systemic challenge with the strategic fit between commercial wireless and the IoTtM has to do with the pace of change. Consumers look toward the next generation with Christmas-morning anticipation. Business/industrial users often look at the next generation as, "Oh no, the stuff we just installed that we hoped to have quiet enjoyment with for 10 years will need to be replaced in three."

Commercial Landline Services

A significant portion of IoTtM applications ride legacy commercial wireline services provided by traditional wireline phone companies. While wireline services have been reliable, technological and market forces focused on the consumer, together with somewhat uneven regulation, are creating a landscape less aligned with serving the needs of IoTtM.

For example, much of the U.S. copper infrastructure and the equipment that uses copper infrastructure is aging and becoming increasingly expensive to repair. Meanwhile, local exchange carrier (LEC) economies of scale regarding the traditional uses of copper are dropping. The trend to

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bundle TV, internet, and phone service is driving data speeds up to the point where copper infrastructure is only useful across a short range, resulting in network designs where fiber gets pulled to the neighborhood, and the old copper is used just for those last few feet to the home. This hybrid bandwidth upgrade approach works in urban and suburban settings but does not work in rural environments, where the preferred solution is new, expensive fiber all the way to the home or an end-point location.

In the past, the LEC might pay the upgrade cost regardless of return on investment, but in the current environment, where does that line of responsibility get drawn? Expect this question to come up often with respect to servicing the IoTtM, as many are inexpensive to modernize and use in rural areas and sometimes require time division multiplexing (TDM) technologies, occasionally referred to as special access services, which most carriers are trying to get away from.

Reliability

Another dimension of the competitive consumer-centric environment has to do with reliability. Competitive winners are LECs, cable companies and wireless internet service providers (WISPs) that can snag customers without incurring much cost. Levels of service naturally drop to the lowest common denominator that consumers can tolerate, with service providers often choosing to skip things such as backup power for repeater locations. But the minimum level of service consumers tolerate is not always acceptable to support the IoTtM. Considering that consumer applications are the 80 of the 80/20 by volume, the IoTtM that underpins our nation's critical infrastructure will not drive this reliability gap to a natural resolution.

Private Wireless Systems

Most critical infrastructure industries (CII) have used private wireless systems successfully for years to underpin the automation of the things that matter, even before the internet. The core building blocks of this success have been licensed microwave and multiple address systems (MAS). In the early 1990s, the FCC realized the commercial value of spectrum and stopped granting exclusive, essentially free licenses to private companies and started auctioning spectrum in huge chunks, both in bandwidth and in geographic areas to support the cellular industry. The FCC has been busy with auctions ever since, trying to keep up with the demand for commercial wireless spectrum and raking in lots of money for the U.S. Treasury.

Although the concept of IoT is becoming a household phrase, the concept isn't new. It has been around for many decades, in what I will term the "internet of things that matter" (IoTtM).

The FCC also embraced spectrum as a resource that ideally belongs to everybody and created unlicensed allocations to foster innovation/commerce, ultimately benefiting consumers and businesses alike. During the same time, large chunks of spectrum were made available for unlicensed systems, with interference-free communications not guaranteed.

Being faced with no available licensed point-to-multipoint spectrum, CII cautiously waded into the waters of the unlicensed bands to support the IoTtM. Most experiences have been positive. Accordingly, CII use of the unlicensed bands has expanded.

In creating the rules for the unlicensed bands, the FCC built in technical flexibility. This allowed for many uses and helped speed investment in the new bands. This flexibility also increased interference between non-compatible technologies in the same geographic area.

Circumstances are converging to cause the rate of problems in unlicensed bands to increase exponentially. Rural WISPs use the unlicensed bands to deliver internet to rural homes in parallel with critical infrastructure systems, such as smart grid and oil and gas monitoring. These co-deployments are problematic both because of equipment incompatibilities and the sheer bandwidth the WISPs are consuming. As consumers draw more bandwidth, the WISPs draw more bandwidth and soon the band is used up in a particular area. A similar threat exists in urban and suburban settings with wireless carrier use of LTE unlicensed (LTE-U) to offload customer traffic from cellular networks into the unlicensed bands. This type of unprecedented demand could threaten the use of Wi-Fi in homes and businesses alike.

As we look toward making a quantum leap in IoT and possibly finding new spectrum to meet that need, we must ensure that we have the IoTtM covered first. Without solid telecommunications alternatives for the IoTtM, we risk building weakness into our nation's critical infrastructure.

The momentum of the free market and technology is focused on solving consumers' problems, not the needs of critical infrastructure and IoTtM. The first step in improving the landscape in support of the IoTtM is a recognition that new alternatives unrelated to consumers and maybe not even the public internet need to be developed. ■

F. H. (Rick) Smith is an IT infrastructure architect for Chevron. He has worked in the petroleum industry since 1976. Smith is a member of the American Petroleum Institute's (API) telecommunications committee and serves on the Enterprise Wireless Alliance (EWA) board of directors. He is an editorial adviser to *MissionCritical Communications*. Email feedback to editor@RRMediaGroup.com

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P25 CAP Advisory Panel Debates Next Steps with Vendors

In its second meeting in May, the Project 25 (P25) Compliance Assessment Program (CAP) advisory panel (AP) members outlined next steps for the P25 interoperability program, sometimes disagreeing with vendors about the best way to move forward.

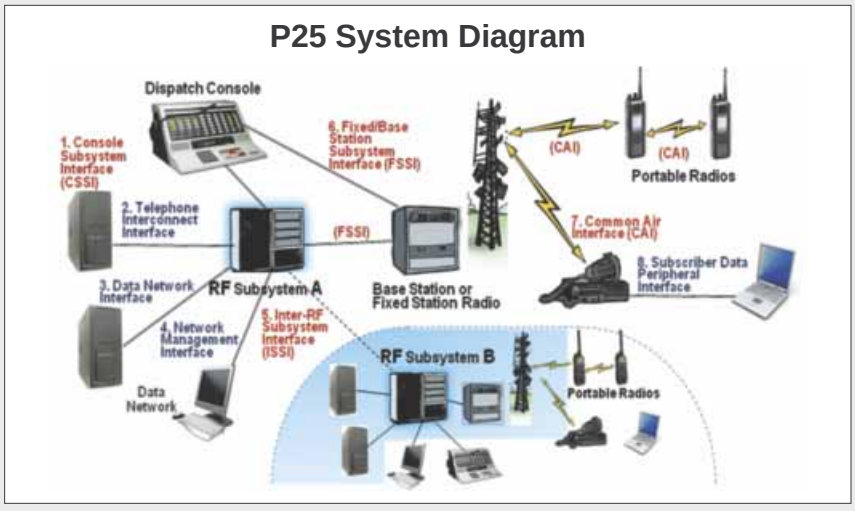
The AP, announced late last year, is set to release a new set of compliance assessment bulletins (CABs), which include instructions on how the testing should be implemented. Vendors use the CABs when they test P25 equipment within the P25 CAP process.

The new CABs add conventional interoperability to the program, which has only tested trunked equipment in the past, and update test standards to the latest drafts of the P25 standards. The bulletins were distributed for input several times during the past 18 months.

Once the CABs are released, the P25 CAP labs must be reaccredited and all products tested within a year. "One of our concerns with the one-year timetable is that it requires labs to be reaccredited, and then the vendor can test the products," said Steve Devine, P25 program manager for the Association of Public-Safety Communications Officials (APCO) International. "So if it takes three months to accredit, there is then only nine months to test.

"As a solution, vendors can still test to the old CABs after the new CABs are out. Eventually, however, vendors will have to test any new products to the new CABs, though within the 12-month time frame."

AP members discussed testing various models of a radio to make it less cumbersome for manufacturers. However, exactly how specific models and features would be identified and documented was debated during the meeting with no clear resolution. "We don't want the users going to 20 places," said Sridhar Kowdley, program manager, Department of Homeland Security (DHS) Office for Interoperability and Compatibility (OIC). "We tell them to go to the suppliers' declaration of compliance (SDoCs) documents, so it should be there."



Only performance testing has been conducted, and conventional interoperability testing is planned in the new CABs. Conformance is the third stool of complete compliance testing but is not yet included. Some vendor representatives expressed concern about having to retest all equipment previously tested.

"Performance testing is a considerable amount of time and money," said John Oblak with EF Johnson Technologies. "With all equipment in all bands, there are probably 12 or so products from EF Johnson, and it's a considerable amount of effort to test hardware that hasn't changed."

Officials discussed some options, such as referring back to the appropriate SDoC that showed the performance testing had been done and then performing the conventional interoperability under the new CAB.

Andy Davis from Motorola Solutions said there is market value in having SDoCs for trunking products; however, there is a different value assessment for the Inter RF Subsystem Interface (ISSI) and conventional equipment. "We're not selling that much of either, so getting the CAB documentation isn't going to affect the bottom line," he said. An independent lab might be used for some tests to reduce expenses, he said.

AP member Morton Leifer with the city of Clarkstown, New York, said the essence of interoperability on 700 MHz channels is P25 conventional but other frequencies use FM analog.

Some vendor officials said the program is voluntary, and the important thing is telling the user what was tested and whether the equipment passed. The SDoCs note whether a feature passed, failed or was unsupported with space for details related to an unsupported answer. Supplier executives also said there will be backups at the labs to retest all equipment.

TECHNOLOGY

PSCR Releases Analytics Road Map, Outlines Further Research

Public Safety Communications Research (PSCR) released the "Public Safety Analytics R&D Roadmap," the second in a series of technology road maps that PSCR will develop during the next few years to better inform the investment decisions of research and development (R&D) organizations supporting the public-safety community.

The first research road map was for public-safety location-based services (LBS).

The analytics document aims to help plan public-safety communications research and optimize the allocation of the $300 million apportioned to The National Institute of Standards and Technology (NIST) from the Middle Class Tax Relief and Job Creation Act of 2012. The NIST R&D funds were raised from the AWS-3 spectrum auction, which

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In March, Jeb Benson, with PSCR's Advanced Communications Research group, said PSCR is launching an innovation accelerator in five areas, including LBS, public-safety analytics, LMR and Long Term Evolution (LTE) interoperability, mission-critical voice over LTE and user interfaces/user experience (UI/UX). Work to develop the UI/UX roadmap will begin later this year.

The accelerator program will leverage cooperative agreements, grants, prize challenges and other contemporary contract mechanisms to spur innovation in public-safety technologies.

PSCR hosted a roundtable with representatives from public safety, federal partners and the First Responder Network Authority (FirstNet) to identify features, key performance indicators (KPIs) and challenges that define mission-critical voice. Input associated with each of the six capabilities — push to talk (PTT), direct mode, group communications, emergency alert, talker identification and audio quality — will be used to develop an applied R&D plan that will include test and evaluation, technology acceleration and support for standards development.

"Our goal is to accelerate the development and implementation of mission-critical voice over broadband networks, and we will use whatever means at our disposal to accomplish that," Benson said. "On the other hand, we must be measured in our approach to ensure we are in sync with both industry and our public-safety stakeholders to maximize our investments in both time and money."

The LMR-LTE work will focus on enabling parallel, but interoperable, network operations supporting mission-critical voice and data. Challenges include creating reliable interfaces for these networks; achieving parity in key, but not necessarily all, capabilities and performance; and addressing barriers to both the technology and adoption.

BUSINESS

Scott Buys JPS Assets

JPS Interoperability Solutions opened April 15. Don Scott, one of the three founders of JPS Communications, and a group of investors acquired the assets of the former JPS Communications and created the new company with about 20 former JPS employees. Raytheon JPS Communications closed its business operations Jan. 29.

Scott said he plans to send agreements to all the manufacturer's representatives and dealers who had agreements with the previous owner

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LMR to LTE Interworking Standard Study Item Moves Forward

An industry group is working to standardize two-way radio and Long Term Evolution (LTE) interworking capabilities and submitted a study item to the Third Generation Partnership Project (3GPP) SA6 for potential inclusion in LTE Release 14 or 15.

The study item is the first step in pushing the issue of interworking LMR and LTE networks higher on the priority list for 3GPP LTE public-safety requirements.

An Alliance for Telecommunications Industry Solutions (ATIS) ad hoc LMR/LTE interworking group, which submitted the study item, was formed last October and is discussing the transition of Project 25 (P25) and TETRA networks to LTE technology. The work on TETRA updates interworking requirements outlined in a European Telecommunications Standards Institute (ETSI) work item, said Malcolm Quelch, chairman of the ETSI working group on requirements for TETRA and critical communications evolution (TC TCCE).

In addition to the study item, the group will submit terminology and gap analysis documents providing insight into what interworking between the technologies is

needed, in addition to the 3GPP SA1 requirements already captured. The terminology document addresses differences among P25, TETRA and 3GPP mission-critical push to talk (MC PTT) "so when we talk about emergency calls and user IDs, we're all on the same page," Quelch said.

"In the United States and Europe, the need was recorded, but essential MC PTT functionality came first; now that is being addressed, and we wanted to push this up in priority," Quelch said.

The specifications work for MC PTT was completed at 3GPP meetings in March in Gothenburg, Sweden, and will be included in LTE Release 13.

Interworking requirements were included in the requirements written in 3GPP SA1 some time ago, but they hadn't found their way into standards released in SA6, the working group within 3GPP that defines specifications for critical communications. The gap analysis tracks updated requirements since the original SA1 document was developed.

Quelch said there is debate in the public-safety communications industry about whether interworking standards are necessary. "There's a view that legacy systems will stay in place for some time," Quelch said. "That would be sensible because putting a new technology in place isn't just about whether the technology is there and available — and it isn't there yet — but changing the working practices to use the new technology will take some time. It makes sense to standardize the interworking with as much functionality as we can put into 3GPP."

Quelch said there is an outside chance LMR/LTE interworking will be included in LTE Release 14, but it's more likely to be part of Release 15. He said even with a 3GPP standard, there will probably be local adaption for either TETRA or P25 standards.

under the same terms. The new JPS Interoperability Solutions will take over the warranty requirements in the market, Scott said.

The acquisition includes a large amount of inventory, "so we'll be able to satisfy a number of needs that are there very quickly," Scott said. The company aims to begin manufacturing additional products within its two product lines, the SNV-12 voters and ACU interoperability gateways.

After several months of market research, Scott determined there is still a strong demand for the interoperability products and future growth areas. He said voice interoperability needs will continue for 10 – 20 years and growth will come in the convergence of data, video and voice networks. He envisions at least four product lines in the future.

"The market now includes the international arena, which is huge and hungry for that technology, and individual gateways that all need to be netted together using software control packages like the state of Alabama uses so they have interoperability across the state for daily and emergency use," Scott said.

The new company will operate out of the same building in Raleigh, North Carolina, as the previous owner. JPS Investment Holdings is the funding vehicle with about 10 investors and funds the operating company, JPS Interoperability Solutions. The company's mission is to provide high-tech solutions for traditional communications problems.

Tom Jacks and Peter Pflasterer, who is deceased, are the other founders of JPS. They founded the company with Scott in 1988 and sold it to Raytheon in 2002.

Zuercher Buys Tri-Tech

Zuercher Technologies, a TriTech company, acquired EmergiTech for an undisclosed sum. The companies share a vision of a single public-safety software focus and customer satisfaction, a statement said.

EmergiTech has 9-1-1, dispatch, records, field reporting, crime analysis and jail software and has been in business for 30 years, serving more than 300 state and local government agencies. EmergiTech is based in Columbus, Ohio, and the Zuercher headquarters are located in Sioux Falls, South Dakota, where Zuercher founder Michael Zuercher will lead the combined team.

The transaction is Zuercher's second acquisition since TriTech Software Systems bought the company in August 2015. In November 2015, Zuercher purchased Law Enforcement Technology Group (LETG), which has a public-safety software customer base of more than 200 public-safety agencies.

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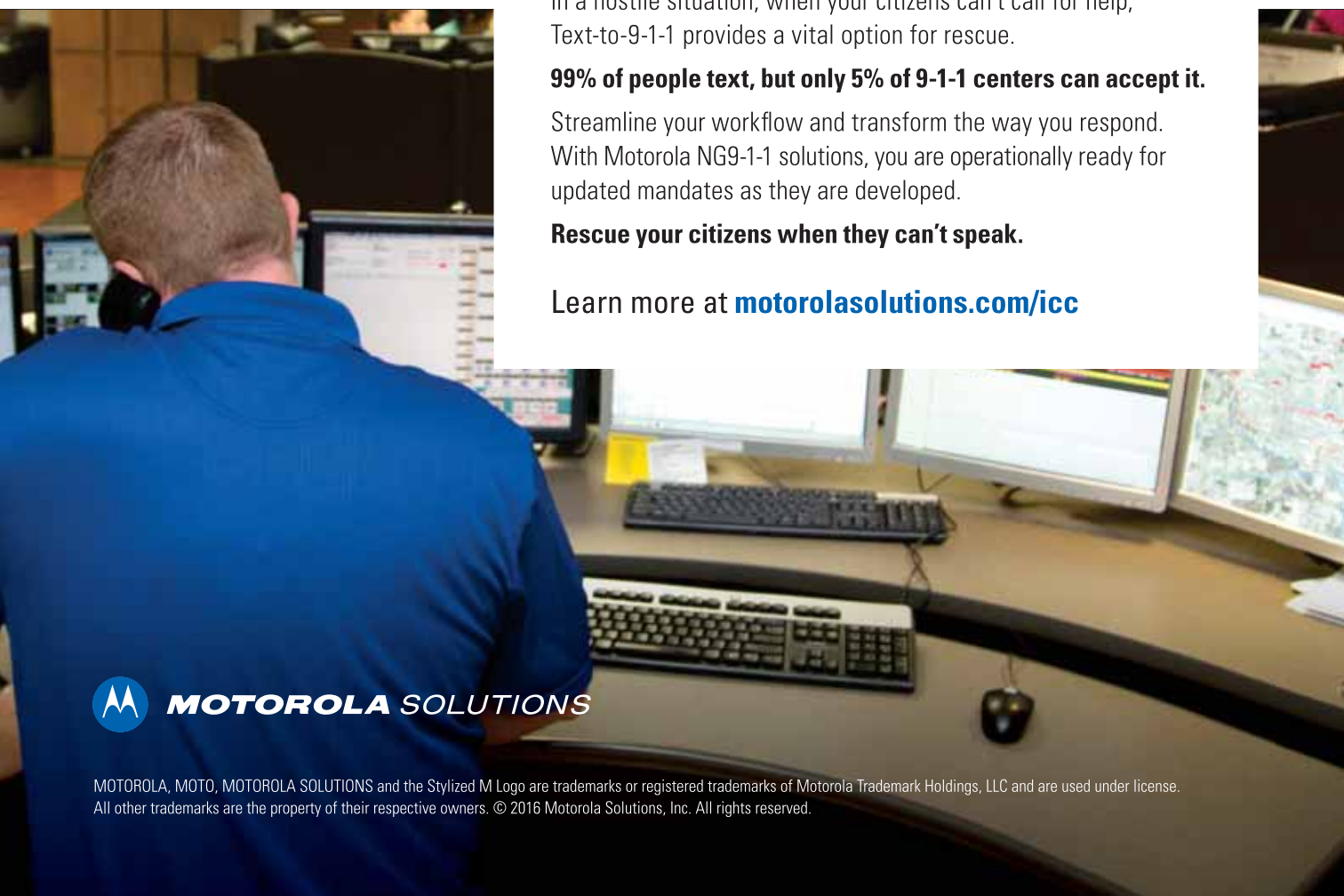

MOTOROLA SOLUTIONS

REGULATORY

H Mask Required in 800 MHz NPSPAC Band, Analog FM for Interop Channels

Following a 2012 petition from Harris, the FCC released rules that it said would guard against interference to public-safety communications in the 800 MHz National Public Safety Planning Advisory Committee (NPSPAC) band by confirming the emission mask applicable to digital transmissions in the band. The FCC also specified analog FM as the standard emission for use on all interoperability channels in the VHF, UHF and 800 MHz bands.

In 2012, the FCC sought comment on proposed rules requiring digital technologies to comply with emission mask H when operating in the 800 MHz NPSPAC band. An emission mask is a technical parameter that affects the efficient use of a frequency band by limiting emissions from one channel into adjacent channels.

Harris filed a petition asking for a rule-making on emissions mask requirements in the 800 MHz public-safety spectrum after New Jersey Transit's (NJ Transit) contract award to Alcatel-Lucent in 2012 for a system that included PowerTrunk's Digital Land Mobile Radio (D-LMR) equipment. Harris bid on the contract but wasn't selected, and NJ Transit rejected the company's' protest.

The D-LMR equipment, also called low-power TETRA, is a digital technology that meets the B-mask emissions certification, rather than the H mask. Harris argued that use of the lower classification could lead to harmful interference in the public-safety spectrum.

NJ Transit installed its communications system on non-NPSPAC 800 MHz channels and used traditional TETRA-standard technology, avoiding the regulatory issues for its TETRA network.

"The FCC's decision on this matter delivers an important victory for public safety, and Harris applauds the commission for taking swift action that will both protect public-safety communications from interference and promote interoperability," said Dr. Dennis Martinez, chief technology officer (CTO), Harris Public Safety and Professional Communications. "Upon observing the imminent risks posed by low-power TETRA technology in the NPSPAC band that would have subjected public-safety communications to interference, Harris brought its challenge to the commission. Harris engineers argued a strong case based on highly technical and practical merits and are pleased that the commission has sided with public safety."

"The NPSPAC 800 MHz controversy does not impact PowerTrunk deployments underway, including New York City Metropolitan Transportation Authority's bus radio system with TETRA technology through Parsons Transportation Group," said Jose Martin, PowerTrunk president and CEO.

The commission also requested comment on whether it should require all public-safety radios operating on the VHF, UHF and 800 MHz bands to use a common modulation for mutual aid and operation. The commission's order said requiring analog FM operation on the channels will "lessen the possibility that first responders will encounter harmful interference in the NPSPAC band and provide certainty to manufacturers concerning the capabilities required of radios used for interoperable communications."

However, FCC Commissioner Michael O'Rielly disagreed with the decision, saying the FCC should not mandate technology. "Once a technology is set in regulatory stone, innovation and investment may be deterred or, if a better technology is or becomes available, it could take years to update our rules to reflect such advancements," O'Rielly said in a statement. "And, frankly, it seems ridiculous in today's digital world to be requiring that devices have less efficient, analog technology."

PEOPLE

SAFECOM, NPSTC Honor McEwen

SAFECOM presented Harlin McEwen with the Marilyn J. Praisner leadership award. Department of Homeland Security (DHS) Office of Emergency Communications (OEC) Director Ron Hewitt and Deputy Director Chris Essid presented the award for the emergency communications space.

"DHS and the OEC appreciate all Harlin has done for us and the emergency communications industry," Essid said. "This is the first time the award has been given by SAFECOM."

The National Public Safety Telecommunications Council (NPSTC) governing board honored McEwen and David Buchanan with the NPSTC lifetime achievement award at its March meeting. The two men retired from their leadership roles in NPSTC.

UTC Selects Ditto as New President, CEO

The Utilities Telecom Council (UTC) selected Joy Ditto as the new president and CEO. Ditto has been working for the American Public Power Association (APPA) for the past 15 years, most recently as the senior vice president of legislative and political affairs.

Former CEO Connie Durcsak unexpectedly passed away last November.

Zetron Names Dippie President, CEO

Zetron appointed Brent Dippie president and CEO, replacing Ellen O'Hara, who will move to the position of chairman of the board of Zetron and board member of EF Johnson Technologies.

Dippie has been chief operating officer and senior vice president of Zetron for the past 10 years and been with the company since 1989.

IDA to Launch Coast-to-Coast IoT Network in June

IDA, which traditionally has manufactured products for radio control and location services, is preparing to launch an internet of things (IoT)/machine-to-machine (M2M) nationwide network focused on the LMR industry and powered by SNAPS, the parent company of IDA.

The company has access to spectrum in the VHF and licensed 900 MHz bands through an exclusive spectrum partner that Daivesh Sanghvi, IDA partner, declined to name. "We will provide seamless coverage from coast to coast, using all available spectrum to us through our exclusive spectrum partner," he said. "Interestingly, for the LMR market, we will be able to leverage LMR wireless spectrum and channels for data communications to save monthly recurring costs for the airtime to parse the data captured by our devices."

The company is conducting internal testing to prepare to launch the new IoT network in June.

IDA is a member of the Project 25 (P25) Technology Interest Group (PTIG) and is partnering with two-way radio vendors. New digital technologies provide many data options, but the developments are still voice or network-centric applications, Sanghvi said. "The data is still being used to supplement voice-based assets or data is served to manage the network-based assets."

He said one of the most progressive data-centric breakthroughs in the LMR industry was the introduction of GPS into mobile and portable radios, which catapulted the industry into mainstream data-intensive applications. This further led to the development of a tiered location services ecosystem. The next development was video cameras.

However, IoT is radically different because it uses sensors and devices generating data outside two-way mobile and portable radios. The data is generated from the targeted assets — a temperature sensor, humidity sensor or gyroscope, as examples — to provide actionable intelligence to mobile radio users.

"One interesting example we use to demonstrate the importance of IoT is about a sensor embedded inside a video camera, which can tell the remote side the video camera is malfunctioning or slowly degrading," Sanghvi said. "While knowing about a malfunctioning camera may not be important 99 percent of the time, it is highly important in that one incident that makes worldwide news."

IDA differentiates itself from other M2M networks for critical infrastructure, such as M2M Spectrum Networks and Infrastructure Networks, because the company has been engaged with the LMR world for nearly 40 years. Many competitors are systems integrators, while IDA is an OEM.

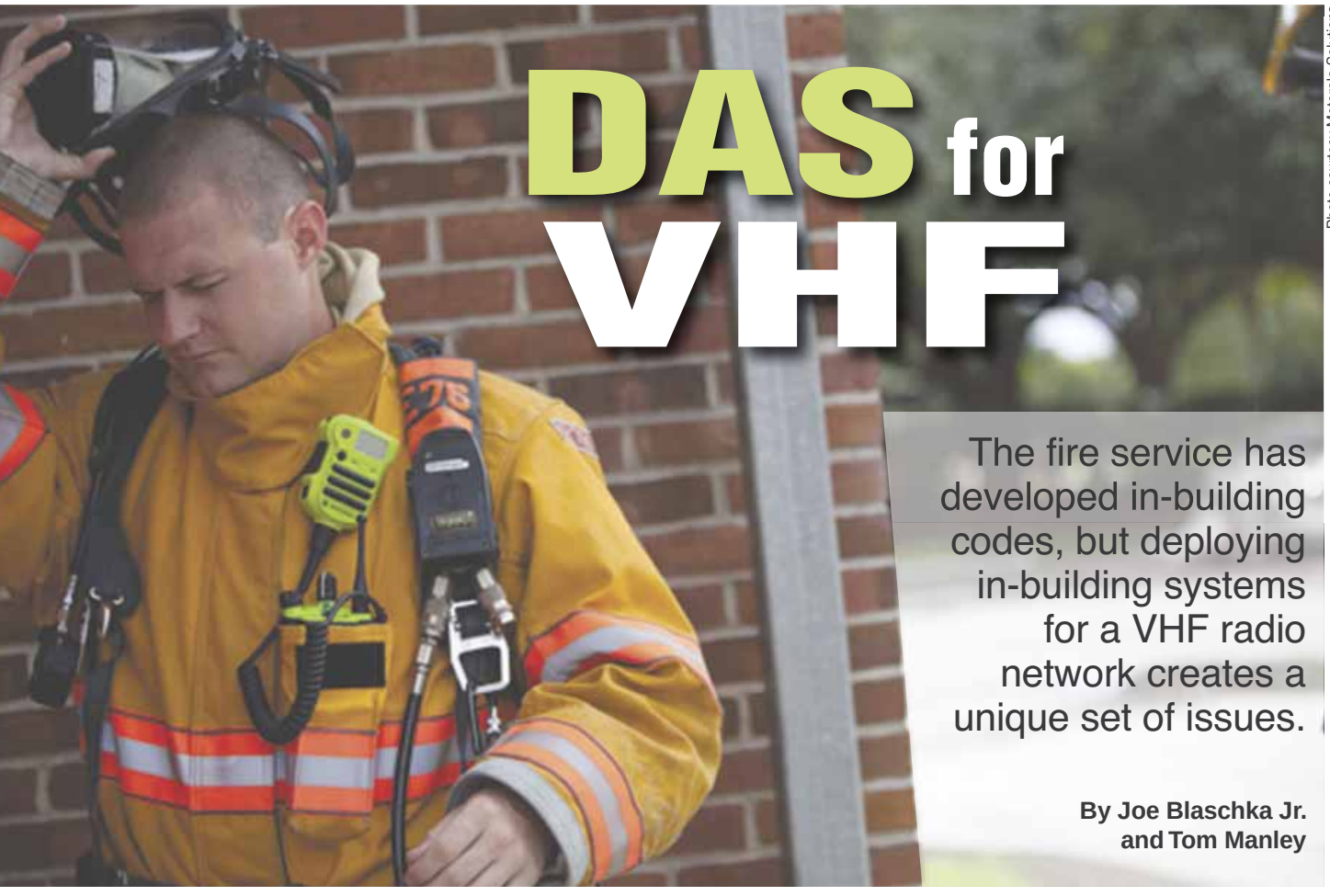

Photo courtesy Motorola Solutions

DAS for VHF

The fire service has developed in-building codes, but deploying in-building systems for a VHF radio network creates a unique set of issues.

By Joe Blaschka Jr. and Tom Manley

In-building coverage seems to be the bane of almost any wireless communications system from cellular to public safety. Operators of 700/800 MHz systems have often been able to ride the coattails of the cellular industry by being included in in-building systems provided for commercial wireless carriers. Often, this was done at little or no cost, because the frequencies and technologies used were usually compatible. Life was good. Unless, of course, you were operating in the UHF or VHF spectrum; then, there was no "free" commercial system to ride on nor were the technical solutions simple. Thank goodness there is not much VHF low band still in use.

However, a few years ago, the fire service, concerned about critical communications for firefighters inside buildings, started working with the building code standards bodies to incorporate critical communications requirements in building, fire and electrical codes. Through that process, standards were developed and incorporated into existing building codes. These standards are a combination of performance-based and specific requirements. They are also band agnostic so they apply to all frequency bands. This has created some significant issues for those using VHF and UHF frequencies.

The codes apply to building design and code compliance, not specifically to a radio system operator. However, at the lower frequencies, especially VHF, the technical solutions may be costly, and in some cases, result in more harm than good.

Codes and Spectrum

The primary code involved is the 2009 International Fire Code (IFC) 510 and subsequent revisions. Fire codes are being updated with suggested jurisdictional guidelines regarding emergency responder radio coverage. The IFC codes are often adopted by local municipalities, counties and states, usually with some local changes, essentially giving the codes the force of law. How well a local jurisdiction may actually enforce the codes is another matter often based on staff availability, knowledge of the codes and interest. The new in-building requirements are starting to get more visibility because of fire departments pushing the issue.

A few of the important IFC 510 requirements are:

- All new buildings should have approved radio coverage for emergency responders within the building.
- Signal strength requirements

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must be met in 95 percent of all areas on each floor of the building.

■ All existing buildings should have radio coverage throughout the building, and building owners are required to retrofit the building with radio coverage if the existing wired system is not able to be repaired or is being replaced, or per a timeline as identified by the jurisdiction.

Aside from these guidelines, implementing a distributed antenna system (DAS) is not a one-size-fits-all proposition, especially in the VHF spectrum. Specific codes are set by state, county and city requirements, and many jurisdictions are discovering that it is an evolutionary process that requires all players to contribute to the local solution.

The public-safety RF spectrum covers a wide range of frequencies from low band near 25 MHz through 800 MHz. And then there is broadband coming around 4.9 GHz. Many of these bands are logically

Photo courtesy Adcomm Engineering

A bidirectional amplifier (BDA) is used in a DAS deployment.

laid out, which helps in the application of the bi-directional amplifiers (BDAs) typically used in a DAS. In mostly large urban areas, the orderly 700 and 800 MHz spectrum (after rebanding) lends itself well to a BDA with widely spaced uplink (UL) and downlink (DL) channels, mitigating problems with filtering and potential oscillation in the BDA system.

Specific VHF Challenges

Logical and orderly spectrum is not found with the old and grizzled VHF frequencies. This spectrum grew up in the early days of LMR communications and primarily supported simplex communications. As time progressed, duplexed repeater-based operation increased, but the management of the spectrum was haphazard with frequencies getting little coordination. Frequencies for repeater UL and DL were often interleaved and some frequencies were tucked close together. This was

Although VHF has been supplanted by 700/800 MHz systems in many cases, a majority of jurisdictions still make use of VHF for public safety in general and fire in particular.

great for filter manufacturers. Additionally, VHF antennas are much bigger than typical antennas and are not hidden as well.

Radio waves have always had some difficulty penetrating buildings, perhaps more so with the use of newer materials like low-emissivity glazing, and that situation is now being addressed in building codes. Although VHF has been supplanted by 700/800 MHz systems in many cases, a majority of jurisdictions still make use of VHF for public safety in general and fire in particular. With the new codes, fire marshals, planning departments and building owners of both new and existing buildings are beginning to wrestle with the realities of implementing DAS in the VHF spectrum. Part of that reality is the difficult positioning of relevant frequencies as noted above. Another is the traditional practice of simplex communications on the fireground.

DAS systems are built around BDAs, meaning that UL and DL RF traffic share the same antenna and coax system, and the amplifiers are simultaneously amplifying both directions on that same antenna's system. It is not possible to amplify a simplex frequency in this manner. Attempts are sometimes made to physically split the UL and DL infrastructure. While this may be possible on paper, it introduces a number of opportunities for "Murphy" to set up residence. The likely result of a miscalculation or inadvertent change in the system that compromises the engineered isolation is that the system will oscillate and potentially disrupt communications across a wide area.

In addition, VHF site noise is often high and is compounded when inside buildings. Computers, electronic lighting, medical equipment and many other things generate noise that often masks VHF signals. This same noise can also be amplified by the DAS system and broadcasted to communications around the outside of the building and the nearby receiver site, raising the noise floor of the site and resulting in loss of communications across a wide area. This is a case where more

Photo courtesy Adcomm Engineering

A typical VHF antenna often used in VHF DAS systems

amplification is not better and may have wide-ranging effects.

Building owners are increasingly being required to provide DAS in new structures. Depending on the jurisdiction and how codes are written and enforced, existing structures may become subject to the requirements as well, leading to unexpected and unwelcome remodeling expenses. DAS to support cellular telephone service in a building is a fairly well-understood issue with a number of manufacturers providing equipment that can host a number of providers in different frequency bands over the same head-end and antenna infrastructure. The ability to include VHF in the mix is not as well supported, however. A building owner can easily find that two independent DAS systems become necessary.

Another factor is that a public-safety DAS, VHF or not, imposes additional requirements on the system. The electronic equipment must be housed in a National Electrical Manufacturers Association (NEMA) 4 enclosure so that it can survive fire suppression, and it must have standby power available to support 12- or 24-hour operation in the case of utility failure.

Finally, new FCC regulations for Class B amplifiers came into play in November 2014. Class B amplifiers are nonchannelized units that are likely to find use in the VHF spectrum. Note that there are channelized, Class A amplifiers available as well. Class B units amplify a wider bandwidth of the spectrum that can have implications for interference because of passing unintended frequencies and generally increasing the noise experienced by the

The ability to include VHF in the mix with commercial systems is not as well supported, and a building owner can easily find that two independent DAS systems become necessary.

intended radios. Consequently, the FCC now requires registration of any Class B systems, existing or new, with a substantial fine for non-compliance.

VHF brings some unique issues to public-safety DAS implementations. The first attempt at codes to address this need in a given jurisdiction may not take into account the difficulties imposed by the VHF frequency non-plan. Codes may also not account for the special requirements of fireground, simplex communications. Both of these issues call for a meeting of minds among fire marshals, planning departments, building owners, emergency communications organizations and firefighters.

In the past, it was easy for public-safety entities and building code agencies to work independently on this issue. Now, it takes close coordination between all of the players so the systems can be implemented in a manner that does not degrade critical public-safety communications outside the building and allows the building owner to operate and maintain the system.

In some cases, the local public-safety entity may come to the conclusion that implementing a voting receiver in the building will resolve the talk-in issue. In others, it may take a decision by the local fire department as to which channel it will agree to use in the building, because it may not be technically possible to implement all channels. There are many different solutions to this problem. The solution must involve resources from the local public-safety communications agency, fire and law-enforcement personnel, code-enforcement personnel and the building owner to come to a reasonable solution. ■

Joe Blaschka Jr. is principal of Adcomm Engineering and a registered professional engineer (PE) in eight states. He has been working in the communications field for 40 years. Email feedback to Blaschka at j.blaschka@adcomm911.com.

Tom Manley is a senior consultant for Adcomm Engineering. He has been working in the communications and electronics engineering field for 40 years, with more than 10 of those years with Adcomm Engineering.

Technology for an NG 9-1-1 Transition

Two defined transitional NG 9-1-1 architectures allow the movement of technology to next-generation 9-1-1 (NG 9-1-1) to begin.

By Mike Nelson

Next-generation 9-1-1 (NG 9-1-1) is a reality. Significant movement is underway throughout the emergency communications industry and the public-safety community to transition life-saving 9-1-1 systems from antiquated analog constructs to a modern IP-based network of interconnected networks.

The National Emergency Number Association (NENA) i3 vision document offers a detailed description of the final architecture and future view of NG 9-1-1. While the defined end-state remains out of reach for now, many practical and possible technologies are available to help public-safety agencies get started on the transition to fully operational NG 9-1-1.

NG9-1-1 Basics

The Emergency Services IP Network (ESInet) is the backbone of the IP-based next-generation system. An ESInet provides the interoperability and advanced routing needed for IP-capable call processing, routing and advanced data services.

IP capability is the core component of the i3 platform. Because of this, every public-safety answering point (PSAP) in the country will eventually implement IP capabilities to function within the nationwide emergency communications infrastructure. A completely integrated IP network will revolutionize the way 9-1-1 works. It will provide the functionality to improve response time, allow interoperability, answer PSAP challenges, increase response preparedness, better protect first responders and, ultimately, help save lives.

A key element of the transition to NG 9-1-1 is IP routing. IP routing allows data to travel across multiple networks from source to destination and can replace a legacy selective router. This paves the way for the ability to accept IP-based text-to-9-1-1 messaging.

IP-capable call-processing equipment (CPE) is designed to access new data types and then cleanly and simply display information, making it easy for call-takers to work quickly and efficiently. IP-capable CPE will help get a PSAP ready for advanced applications and data services.

Equally important is data preparation for modern updates and a transition to a geographic information system (GIS) orientation. A PSAP's data must be validated against the current master street address guide (MSAG) and compared with the automatic location identification (ALI) or telephone number (TN) databases. The inherent challenges of location validation, routing and service identification can all be addressed with proven, reliable data management methods. Millions of U.S. address points and hundreds of thousands of road centerlines for PSAPs have already been mapped to support accurate VoIP, wireless, telematics, femtocell and alarm calls and are ready for use.

When the data is ready, you can implement GIS-based

location data management. This will ensure all location data is validated, synchronized and current. When ALI data is validated and GIS-based location data management is in place, you're ready for GIS-based routing. GIS-based routing sends the caller to the correct PSAP, matching that person to the closest jurisdiction and emergency services. New tools use comprehensive, accurate, locally sourced GIS data layers in a spatial environment and satisfy the NENA i3 standard for the spatial information (SI) function.

Innovative new features give PSAPs the ability to accept new data types. Text to 9-1-1 allows people to send short message service (SMS) messages directly to 9-1-1. This is the best option if they are unable to talk or are hard of hearing. Advanced data services will add major operational enhancements for first responders. With the ability to view blueprints and security cameras and receive video and photos from people at the incident, dispatchers can help first responders assess situations better than ever before.

The legacy architecture is common and more or less consistent across the United States. The transitional architectures are intermediate steps that replace the legacy architecture with an IP technology foundation. The NENA i3 vision architecture requires fundamental changes in roles and responsibilities, the underlying data and the steps to process calls. Fundamentally, the way origination service providers (OSPs) prepare data and delivery calls to regional 9-1-1 service providers changes from legacy approaches to NG 9-1-1.

Pre-call data preparation creates a necessary foundation for each call-processing scenario. The legacy architecture established predetermined static data relationships required to successfully route a 9-1-1 call. The NG 9-1-1 architecture determines call routing dynamically based on the caller's location and jurisdictional service boundaries.

Legacy 9-1-1

Legacy 9-1-1 uses the MSAG to determine whether an address is acceptable to the 9-1-1 service provider. If an address passes MSAG validation, the address is determined to be "dispatchable," meaning an emergency services first responder should recognize the address unambiguously. These dispatchable addresses help determine the exact location to send emergency services.

The MSAG also creates a relationship between addresses and emergency services numbers (ESNs). Addresses or address ranges are assigned an ESN, which designates the primary and alternate destinations that should receive the 9-1-1 call for the corresponding set of TNs assigned with that ESN. The ESN destination is usually a PSAP, but could also be a public switched telephone network (PSTN) phone number. The ESN may also designate the emergency service providers — police, fire, medical — for the specific area if the given

Photo courtesy Huntsville-Madison County 9-1-1

The Huntsville-Madison County 9-1-1 center in Alabama is the largest of its kind in the state with 36 operating positions. The state has pioneered NG 9-1-1 through its Alabama Next Generation Emergency Network (ANGEN), created to install a statewide IP broadband digital network to handle 9-1-1 calls.

regional 9-1-1 service provider uses selective transfer features.

Legacy 9-1-1 architecture is based on OSPs providing subscriber service order (SO) records to each regional 9-1-1 service provider. The OSP subscriber records include the subscriber's address, class of service and telephone number. These SO records are MSAG validated and assigned an ESN. After this process is completed, the addresses are posted in the ALI database and the TN ESN relationship is posted in the selective routing database (SRDB).

Wireline calls are the most straightforward legacy call-processing scenario, because the legacy 9-1-1 solution was designed for fixed location or the wireline telephone service model. Wireless, VoIP and text messaging all have workarounds because of the limitations of the legacy 9-1-1 operating environment. These workarounds have allowed the legacy architecture to adequately process wireless and VoIP 9-1-1 calls. However, the legacy operating environment has become complicated because of these workarounds and is not extensible to support new features or new forms of calls for help.

IP routing allows data to travel across multiple networks from source to destination and can replace a legacy selective router, paving the way for text-to-9-1-1 messaging.

NENA i3 Vision

The NENA i3 vision architecture changes the processing model for 9-1-1 calls and defines different responsibilities for both the 9-1-1 service provider and OSPs. The biggest changes evolve around establishing IP technology, use of GIS technology and OSPs providing a caller's location information during call setup.

An i3 vision architecture call begins with the OSP accessing the caller's location information and signaling the 9-1-1 service provider that a 9-1-1 call is available. These messages pass through the 9-1-1 service providers' border control functions. The 9-1-1 service provider obtains the caller's location information and, combined with jurisdictional boundaries from a GIS database, determines the serving PSAP. Any special conditions the PSAP may have set are checked in the policy routing function (PRF), and the call is delivered to the designated PSAP. If the call was delivered with a "location by reference" approach, the PSAP can use the reference information to retrieve updates of the caller's location information.

The 9-1-1 Transition

OSPs are not prepared to deliver 9-1-1 calls via IP technology with location information to 9-1-1 service providers. Defined transitional NG 9-1-1 architectures allow the movement to NG 9-1-1 to begin. Two basic forms of transitional architectures exist — IP selective router (IPSR) and NENA i3 transitional architecture.

IPSR transition architecture replaces the legacy SR with an IP infrastructure, which allows for the replacement of legacy selective routers with an IP infrastructure that is programmable and expandable to support i3 requirements. This approach uses several gateway elements.

The NENA i3 transitional architecture introduces functions to map legacy interfaces to NENA i3-defined interfaces, including obtaining and inserting the caller's location information during call setup. Calls from OSPs can be delivered via legacy time division multiplexing (TDM) circuits into gateway devices. These gateways, or

Wireless, VoIP and text messaging all have workarounds because of the limitations of the legacy 9-1-1 operating environment to process wireless and VoIP 9-1-1 calls, but the workarounds do not support new features or new forms of calls for help.

legacy network gateways (LNGs), are the defined functional element to retrieve the caller's location information and send it through the other i3 processing elements to complete call processing. Note that the NENA i3 document defines these as functions and as "logical" and not necessarily "physical" real-world devices.

An additional gateway element, the legacy selective router gateway (LSRG), is defined for interacting with legacy SRs, and the legacy PSAP gateway (LPG) is defined for interacting with legacy PSAP call-handling equipment. These additional elements allow NENA i3 functions to interact with legacy 9-1-1 equipment and interfaces.

Call processing is accomplished as defined by the NENA i3 vision with the exception that the gateways provide protocol conversion, and the caller's location information is retrieved from some source that is not necessarily the OSP. The caller's location is often retrieved from the legacy ALI database.

The conversion to a standards-compliant, NG 9-1-1 environment is an attainable goal. Transitioning from the existing legacy analog 9-1-1 system to the future IP-based solution will require significant changes to process and technology. The benefits of an NG 9-1-1 system justify the efforts — a fresh new operational environment that will significantly enhance public-safety agencies' abilities to communicate with each other and with the public to effectively respond to emergency situations. ■

Michael Nelson is the vice president, senior technical officer of West Safety Services. Nelson has been active with industry organizations including the National Emergency Number Association (NENA) and American National Standards efforts with the Alliance for Telecommunications Industry Solutions (ATIS). He has more than 40 years of experience in software engineering, telecommunications and information technology. Nelson holds several patents related to emergency call services. Email feedback to editor@RRMediaGroup.com.

Rethinking FirstNet and LMR

Photo courtesy Crown Castle

The concept of FirstNet has evolved to a mission-critical voice and data network, but the focus should return to a mission-critical data-only network.

By John Facella

It has been four years since the First Responder Network Authority (FirstNet) began operations and many more since the industry realized a need for public-safety broadband. The 1996 Public Safety Wireless Advisory Committee (PSWAC) report on spectrum stated "Broadband data systems, for example, offer greater access to databases and information that can save lives and contribute to keeping criminals 'off the street.' " Since the public-safety industry began efforts to obtain the 700 MHz D block spectrum and funding, the concept of what we are trying to accomplish has evolved along the way. It is time for a rethink of public safety's objectives and goals for communications.

When first conceived, the nationwide broadband public-safety network, which we now call FirstNet, was supposed to be a high-speed data network. The idea was to ensure that public safety had access to the same high-speed data that the public used every day on their newly evolving 4G Long Term Evolution (LTE) cellular networks.

Three factors helped support this view for a high-speed data network:

- The software applications in use required larger amounts of data than could be carried on narrowband 12.5- and 25-kilohertz LMR systems;
- Public-safety data and software applications were no longer "nice to have" — what we said 10 – 15 years ago — they had become daily mission critical; and
- Some large urban LMR systems, because of increasing call volumes and improved CAD systems, dispatched first responders with little or no voice traffic.

During the past four years, the purpose of FirstNet has evolved from a mission-critical data only network to a mission-critical voice and data network. Exactly how this change in purpose took place is less important than the result of this change. My intent is to ask us all to rethink this revised purpose and consider discarding it. We need to return FirstNet to the concept of a mission-critical data-only network and focus on getting that part right.

In the meantime, we should continue to use and maintain our mission-critical voice and slow-speed data LMR systems and stop telling elected officials and budget folks that LMR will go away. Public safety's mission is too important to depend on only one network for the foreseeable future.

Complexity

There is an old adage, "simple is better." LMR systems across the country, perhaps as many as 50,000, are generally hardened and work well under stress. They have been refined for more than 50 years to the point that most have two or three levels of failover, and this has been codified in standards such as National Fire Protection Association (NFPA) 1221 and others. By contrast, many links, servers and gateways — all connected by IP technology— are needed for an LTE system to work. Fail-soft features are not particularly inherent in LTE systems. Comparing the core architecture of a traditional LMR trunked system (red circle in diagram 1) with the core of an LTE system (red circle in diagram 2) makes the point obvious. There are more boxes and connections in diagram 2. In addition, updating the many software packages in an LTE system will not be as simple as in an LMR trunking system.

Centralization

Some see the thousands of discrete LMR systems across the country as a problem, but every sword has two edges. In a world increasingly threatened by hackers, criminals and activists, putting all of the nation's 3 million first responders on a single network is to invite disaster. Not a day goes by that we don't read about a

New P25 E-Book

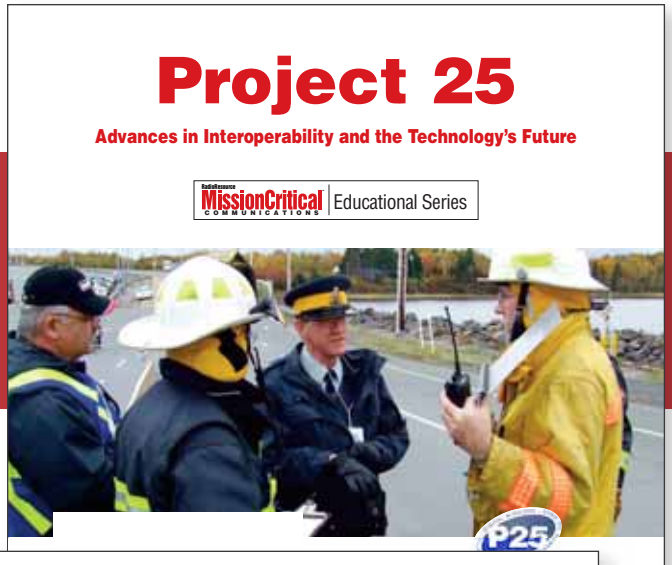

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Diagram 1: LMR Network

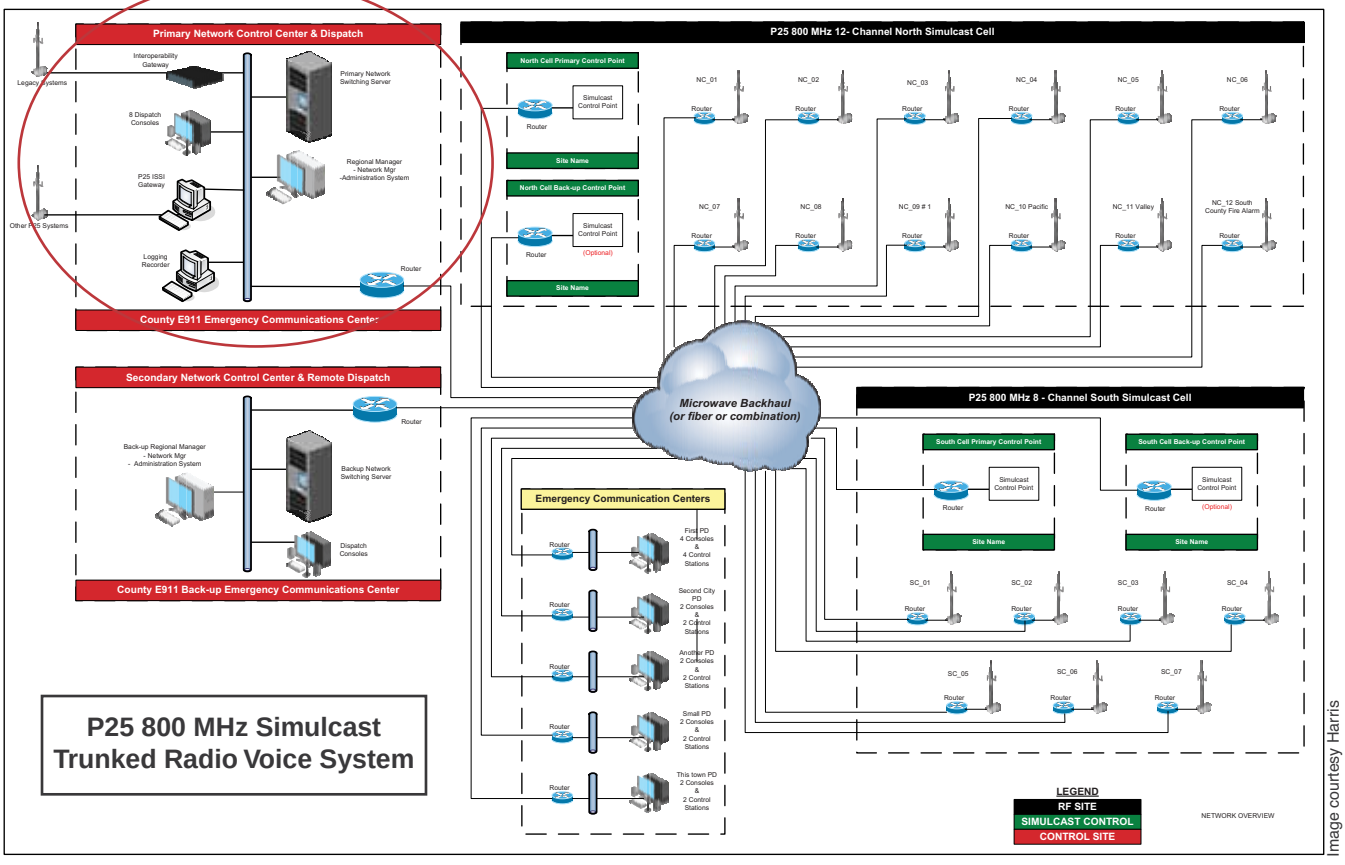


Image courtesy Harris

government agency, police department, bank or utility, whose IP computer networks have been hacked, and information is held for ransom or the system is taken down. Our decentralized LMR systems, many of which are not IP based, and their layers of fail-soft provide an alternative to the IP-based FirstNet, should FirstNet be taken down locally, regionally or nationally. Nor should we assume that FirstNet will be "hack proof," because so far no other government network has proven itself to be so, including defense networks.

We have a tremendous asset already in place with our existing LMR systems. They are reliable, and in many cases hardened, delivering mission-critical voice and low-speed data — identification (ID), emergency and status messages. The tens of thousands of silos represented by these systems are a huge advantage, because it makes it more difficult for bad actors to bring down all the communications resources in an area. For example, many city systems have surrounding suburbs with their own communications systems that provide at least some coverage at the periphery of urban areas. State and federal systems exist separate from city systems, yet often have some limited city coverage and capacity. So, if the urban LMR system is taken down, limited operations in the city could still be handled by neighboring systems or federal or state systems.

Timing

The successful vendor to the FirstNet request for proposals (RFP) has a massive task ahead: Build a nationwide network for public safety, train public safety to use it, manage the applications that are allowed access and monitor/maintain the network across as many as 56 states and territories. The public carriers have had decades to build and improve their networks in stages, yet they don't even cover all of the geography that FirstNet needs to. Initially, FirstNet was conceived as an "independent entity" so that it could function like an aggressive startup; now, it appears that its work will be guided by federal accounting regulations, adding red tape and time.

The RFP has 460 work tasks identified; the amount of project coordination needed to guide such an endeavor is large. An analogy to what has to be done might be found in the U.K. Airwave nationwide public-safety system. It has about 600 employees, but that system is much smaller than FirstNet will be.

The current $7 billion allocated to FirstNet is probably one-tenth to 1/30th of the total that will be required to build the network. Macquarie bought the U.K. Airwave nationwide public-safety network for $3.2 billion in 2007, and that system uses UHF, not 700 MHz spectrum. The United Kingdom is 1/40th of the area and one-tenth of the population of the U.S. So a simplistic scaling results in $120 billion to build FirstNet. Other cost estimates range from $30 billion to $330 billion. The business models that some have suggested to deal with the funds' shortfall are unproven. We all ultimately expect that funds will be found, but it will take time. Finally, once the winner of the FirstNet RFP is announced, we can expect a protest, and more time lost.

Standards

LTE systems were designed to provide high-speed data to consumer cellular devices; they were not initially deployed to support public safety. Public safety requires functions not commonly found in public carrier systems, such as one to many push-to-talk (PTT) group voice communications and direct mode communications or radio to radio with no infrastructure, but with sufficient transmit power to support work groups within a half-mile radius. While much work is being done on this front in the Third Generation Partnership Project (3GPP) standards community, those standards will take several years to be realized. (see "The Timeline for Public Safety LTE Standards," by Emil Olbrich, *Mission-Critical Communications*, March 2016.)

For example, there is a 3GPP initiative to create high-power user equipment (HPUE) devices with power at 1.2 watts instead of 200 milliwatts. However, almost all 700 MHz LMR portable radios have transmitters capable of 3 watts output; the difference between 1.2 and 3 watts is 4 decibels (dB). While this is not huge in terms of link budget, it is not insignificant.

Radios and Coverage

Public safety has said loud and clear, "We can't carry two radios." The vendors listened, and at least two major manufacturers have portable radios that can operate on both traditional LMR systems and LTE systems on 700 MHz band 14, the spectrum allocated to FirstNet. The trend is to make these radios software upgradable, so that an agency only has to buy the bands and features it needs now, but upgrade the radio when FirstNet is built in their areas. This requirement has been met.

LMR systems generally cover the geography needed by the public-safety agencies they serve. In-building coverage has become an increasingly important issue. Spurred by the ability of many cellular carriers to offer in-building phone service, many authorities mandate the use of in-building communications enhancement systems for public-safety two-way radio systems as well. However, providing in-building coverage for FirstNet will be expensive, and it is not budgeted for. For some time to come, LMR systems will be better able to provide in-building coverage than FirstNet will.

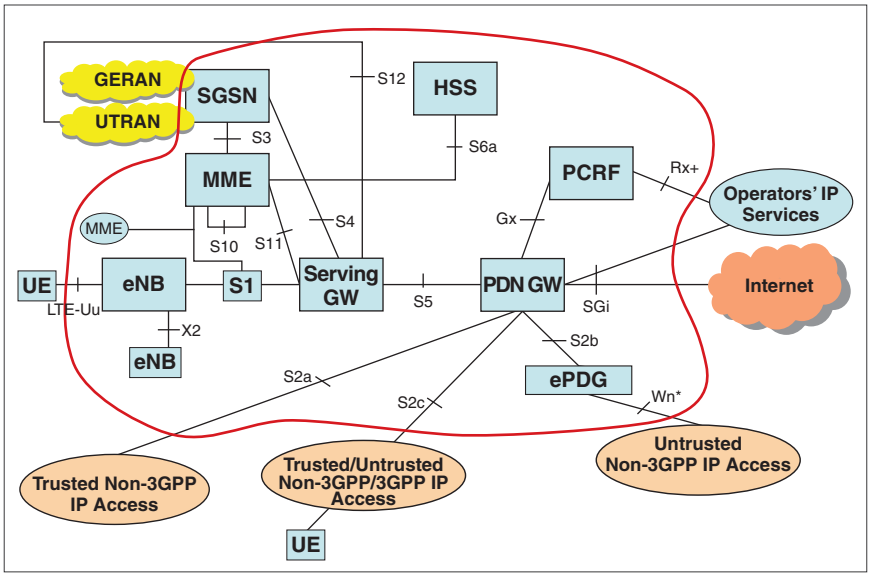
In conclusion, FirstNet has daunting economic, technical, political and execution tasks ahead. FirstNet deserves all of our support as it proceeds down the complex path that lies before it. First responders need an advanced, high-speed, hardened, cyber secure, ubiquitous, national data network, and that will be FirstNet. Building such a network will take more time and funds than many have envisioned.

But we need to discard the idea that LMR will go away. In fact, LMR needs to be continually maintained, because it represents our voice and low-speed data lifeline. The independent silo architectures of LMR are not an Achilles' heel, but rather an inherent strength in a world of rogue terrorists and hacktivists who like to break things and watch the headlines. It works and has for decades. It already exists, and the politicians and budget holders need to be convinced to reassess their thinking on funding capital improvements on LMR systems. Finally, we need to discard the notion that public-safety spectrum at VHF, UHF, 700 and 800 MHz will be freed for auctions so that cellular carriers can feed the insatiable desire of the public to walk down streets watching videos or playing games. Our need is more important, and our use is fairly spectrally efficient; we can carry a life-saving voice message in a 12.5- or 25-kilohertz channel.

Let's change our thinking and messaging now. ■

Public safety's mission is too important to depend on only one network for the foreseeable future.

Diagram 2: LTE Network



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WHAT'S NEW: CONSOLES AND CONSOLE FURNITURE

AFC Industries

AFC's command center dispatch console uses state-of the-art ergonomic design techniques and features electronic height adjustment for its work surface and independent monitor platform adjustment. The monitor platform can be set for both sit and stand work positions, while changing the focal lengths to ease eye strain to optimize the performance of security personnel. The product is available in a range of colors and widths and has additional accessories, including pop-up data, power ports, a wire management system and 4-inch casters for stability and mobility.

www.controlandcommand.com

Catalyst Communications Technologies

The Propulsion console supports the Digital Mobile Radio (DMR) wireline interface using the Applications Interface Specification (AIS). The AIS standard connects trunking infrastructure to the dispatch console and other products, allowing consoles to monitor multiple talk groups without relying on control stations. The wireline interface is robust, frequency efficient and supports capabilities such as console pre-emption, as well as unit ID and emergency. The console also supports the wireless interface for DMR using control stations.

www.catcomtec.com

CSS-Mindshare

CSS-Mindshare's direct interface to NXDN systems supports both conventional and trunking modes of operation. The interface supports full NXDN feature sets including automatic number identification (ANI), selective calling, stun, revive, status message, emergency decode and termination. No limits are placed on the number of consoles in simultaneous operation, and there are no additional charges per console for IP-based NXDN functionality.

www.css-mindshare.com

Elcomplus

SmartPTT PLUS is a Motorola Solutions sold and supported voice and data dispatch software for use with MOTOTRBO digital two-way radio systems. Core features include voice dispatch, text messaging, job ticketing, telemetry and event logging. Optional features include location tracking (GPS and indoor), web client, telephone interconnect and interoperability. SmartPTT PLUS uses a wireline connection for the voice and data to all MOTOTRBO system topologies including conventional, IP Site Connect, Capacity Plus, Linked Capacity Plus, Connect Plus and Capacity Max.

www.smartptt.com

GAI-Tronics

The CommandPLUS dispatch console is available in four-, eight- or 12-channel packages and is ideal for smaller system applications used by the government, transportation, security, forestry and utility industries. The console offers an analog solution for conventional radio operation using tone, direct current (DC), or ear and mouth (E&M) control, resulting in a reliable and easy-to-maintain product that will last for many years, company officials said.

www.gai-tronics.com

Genesis Group

Genesis-Aided Dispatch Interface (GADI) builds upon the standard features in the Motorola Solutions MCC 7500 dispatch console to improve dispatcher efficiency and officer safety, company officials said. The interface helps existing dispatch centers meet functional requirements during the design phase of ASTRO 25 or Dimetra systems. The product monitors emergency calls, including those on a talk group not monitored by a console position. The console allows users to create up to 16 predefined, permanent patches on a centralized patch server for fast access.

www.genesisworld.com

Harris

The Symphony dispatch console was designed to improve dispatcher workflows. A customizable user interface integrates numerous capabilities into a single, public-safety-grade console and allows individual dispatchers to work in a manner that makes sense to them, company officials said. Features include more than 1,000 communications modules, 16 user setups, 32 predefined simulselects, trunking talk groups, paging, access to auxiliary I/O, 24-hour instant recall and more. The system reduces the number of monitors, mice and keyboards required by displaying everything on one screen. The console was built on a next-generation hardware platform that is compact, rugged, and easy to install and maintain.

www.pspc.harris.com

IDA

IDA's Model 24-69 has IP radio remote control technology engineered to manage analog and digital infrastructures. The product's Project 25 (P25) Digital Fixed Station Interface (DFSI)-based remote control implementation provides advanced, yet easy-to-use IP integration and radio control functionality for mission-critical applications. Leveraging embedded GPS in digital radios and P25/OEM-specific network protocols, the company's NextGen location services use native Trak-it-Data Engine (TiDE) technology. The product offers subscription-based

asset tracking and situational awareness management solutions, company officials said.
www.idaco.com

Omnitronics

Omnitronics' Advanced Location Services (ALS) adds GPS features to the company's dispatch solutions. The product operates from a

centralized platform, giving operators the tools to monitor operations and ensure workforce safety. Features include state-of-the-art tracking technology, multiple geofence types, customizable events and actions, historic route tracking and playback, enhanced emergency management and support for multiple mapping providers. The product is interfaced directly into RediTALK or Alto consoles, meaning the dispatcher can conduct most duties with one platform.
www.omnitronicsworld.com

Penta

Penta Media eXchange (PMx) is a next-generation IP-based digital communications system built around open standards IP telephony. The highly scalable voice system has redundant servers that use host media processing (HMP) for all core switching and processing. High-powered redundant commercial off-the-shelf (COTS) servers

running Linux OS digital are used for circuit connections, conferencing or processing instead of digital bus or digital signal processing (DSP) cards. The platform is ready to interface and control IP, time division multiplexing (TDM) and analog networks including legacy radios, intercom circuits, radio over IP (RoIP), radio and telephone using session initiation protocol (SIP), and other interfaces.
www.penta-corp.com

Zetron

The IP-based MAX Dispatch integrates a full range of tools and

resources into a single console system, company officials said. The product gives dispatchers instant access to information needed from a single, centralized user interface and can be set up to display information pertinent to an incident only when needed. The console supports mobile, remote and geographically diverse operations and is built to not only support current operations but to also adapt as operations change over time. The product is compatible with most radio interfaces and major radio manufacturer equipment.
www.zetron.com

SPECS SURVEY: VOICE LOGGING RECORDERS

MANUFACTURER→	ASC Americas	ASC Americas	Atis	CVDS	CVDS
PRODUCT NAME→	EVOLUTIONneo	EVOIPneo	Phoenix Pro	ComLog IP	ComLog NP8C
↓SPECS					
Suggested list price	Varies by configuration	Varies by configuration	Varies by configuration	Varies by configuration	Varies by configuration
Recording medium: secondary (archival)	DVD, RAID array, NAS, RDX, SAN, USB, more	DVD, RAID array, NAS, RDX, SAN, USB, more	DVD, RAID, NAS, RDX, USB, more	RAID 5, network	Network
Media storage capacity	Unlimited w/ RAID, NAS or user-defined file servers	Customer server; unlimited w/ RAID, NAS, other servers	Varies per media	RAID/Net: unlimited	Varies per media
Max. online storage capacity (hrs. per GB)	Unlimited	Unlimited	Unlimited	8 TB	50,000 hours
VOX start time	0 ms/10-100 ms	N/A	0 ms pre-triggered recording/ selectable	8 ms	8 ms
Channel capacity (per syst.)	4-1,560 per server, unlimited	4-2,000 per server, unlimited	VoIP: 512; other: 192	8-240 (depending on model)	4 or 8 analog, plus VoIP
Operating system	Pre-installed Windows	Windows Server 2012 R2	Windows 7 embedded	Windows	Windows
Interfaces with …	LAN/WAN, PBXs, ACDs, IVRs, predictive dialers, ANI/ALI controllers, T1, E1, more	LAN/WAN, PBXs, ACDs, IVRs, predictive dialers, VoIP switches, CTI interfaces	Analog (PSTN), Radio/RoIP, VoIP, digital (phones, trunk extensions), E1, ISDN, BRI, T1-hybrid channel mixing	Analog, digital, VoIP, RoIP, P25; NEXEDGE, POTS, ISDN, E1/T1, PBX; phones, radios, consoles	Analog, VoIP: phones, radios, consoles
Type of front-panel display	Widescreen LCD monitor	Widescreen LCD monitor	External: LCD; Internal: 6.4 TFT	LED, LCD monitor (opt.)	7-in. LCD touchscreen
Panel controls	GUI	GUI	GUI, keyboard, mouse	Touchscreen, GUI	Touchscreen, GUI
Data displayed on readouts	GUI	GUI	All call-related data listed	Status, alarms	Status, alarms, playback, more
Expandable to … (units)	Unlimited	Unlimited	Practical limit	Unlimited	Unlimited
Power requirements	90-132/180-250 VAC, 47-63 Hz	N/A (depends on server)	110/220 VAC or 12, 24 VDC	110/220 VAC, 50/60 Hz	110/220 VAC
Power consumption	300 W/2 x 460 W active PFC 100-240 V	N/A (depends on server)	<100 VA	125-400 W	36 W
Frequency response	300 Hz to 3.4 kHz	N/A	300 Hz to 3.4 kHz	300 Hz to 3.4 kHz	300 Hz to 3.4 kHz
Input impedance	-50 dB (min.) w/ 600 Ω term.	N/A	1,000 kΩ	600 Ω, >15 kΩ	600 Ω, >15 kΩ
Input sensitivity	>22 kΩ or 600 Ω	N/A	-50 dB	-10 to +20 dB	0 to 38 dB
Radio interface (analog, digital, or both)	Both	VoIP	Both	Both	Analog
Record Radio over IP (RoIP)	Std.	Std.	Yes	Yes	Yes
Diagnostics/self repair	Yes/Yes	Yes/Yes	Yes/Yes (auto database repair)	Yes/Yes	Yes/Yes
AGC range/attack time	<20 ms	N/A	40 dB/15 ms	-70 to 0 dB	-70 to 0 dB
Simul. record/playback	Yes	Yes	Yes	Yes	Yes
Type of alarms	Audible, visual, SNMP, email	Audible, visual, SNMP, email	System events, warnings, failures	Audio, visual, external, email notification	Audio, visual, external
Type of security	User, PIN, system ID, encryption	User, PIN, system ID, encryption	Multilevel passwords, system lock, encrypted file structure	Multiuser passwords, secure recording	Multiuser passwords, secure recording
Disk mirroring	Opt.	Opt.	Hardware std.	Std.	Opt.
Instant message retrieval	Yes	Yes	Yes	Yes	Yes
Multimedia message retrieval recording	Yes	Yes	Yes, software package	Yes	Yes
Software package fee	Yes	Yes	No	Yes	Yes
Licensing fees (per seat, per site, none)	Per channel, per seat, per site	Per channel, per seat, per site	None	Concurrent login	Concurrent login
Record analog radio	Std.	N/A (VoIP only)	Std.	Std.	Std.
Radio data links for digital trunked radio	Std.	Std.	Yes through API	Yes	Yes
Event-driven record	Yes	Yes	Yes	Yes	Yes
Caller ID and DTMF recording/decoding	Opt.	Std.	Std.	Std.	Std.
Recording redundancy	Yes	Yes	Yes, opt.	Yes	Yes
Recording initiated via …	VOX, off hook, switch, continuous, event driven, current/voltage sensing, more	Protocol decoding, VOX, CTI events	Yes	VOX, hook sense, closure	VOX, hook sense, closure
Ch. settable beeptones	Yes	No	Yes	Yes	Yes
Live monitoring capability	Std.	Std.	Std.	Std.	Std.
Channel mixing	Yes	Yes	Yes	Yes	Yes
If yes, how many ch.	Unlimited	Unlimited	8	20	4
Playback features	Simultaneous record & play, FF, RW, silence reconstruction, loop, speed control, more	Simultaneous, record & play, FF, RW, silence reconstruction, loop speed control, more	Playback recorded portion of call in progress, export playback of designated call portions, jump in intervals within recording, all std. playback options (play, stop, more)	Voice over LAN, up to 20-channel simultaneous playback, incident re-creation, .MP3/.WAV copies, loop, variable speed, more	Voice over LAN, up to 20-channel simultaneous playback, incident re-creation, .MP3/.WAV copies, loop, variable speed, more
Remote access	Std.	Std.	Std.	Std.	Std.
Multiuser simul. access	Std.	Std.	Std.	Std.	Std.
Media library database	Std.	Std.	Std.	Std.	Std.
Search criteria	Date, time, channels, DTMF, custom fields, extension, user ID, ANI, more	Date, time, channels, DTMF, custom fields, extension, user ID, ANI, more	Date, time, channel number/name, agent, start/stop time, duration, caller ID, more	Date/time, channels, duration, DTMF, CLID, ANI/ALI	Date/time, channels, duration, DTMF, CLID, ANI/ALI
Reports	Yes	Yes	Yes	Yes	Yes
Channel inactivity alert	Std.	Std.	Std.	Std.	Std.
Internal battery backup for orderly shutdown	N/A (UPS integration)	N/A (depends on server)	Opt.	Opt.	Opt.
Ext. time synchronization	Std.	Std.	NTP, GPS std.; IRIG-E/B opt.	Std.	Std.
Text to 9-1-1 ready	No	No	Yes, software package	Yes	Yes
Quality assurance module	Yes	Yes	Yes	Yes	Yes
Screen capture	Yes	Yes	Yes, software package	No	No
Deployed on virtual servers	No	Yes	Yes, VoIP only	Yes	No
Compliant w/ NENA 08-003 IETF documents	Yes	Yes	All relevant	All	All
Idle channel noise	<35 dBrnc	N/A	>-55 dB	<69 dB	<69 dB
Weight	50, 80 lbs. (approx.)	N/A (depends on server)	35-55 lbs.	34-52 lbs.	8 lbs.
Agency approvals	UL, FCC, CE, CSA	N/A (depends on server)	Part 68, Part 15, all relevant	FCC, CSA, ISO 9001	FCC, CSA, ISO 9001

Key: N/A means not applicable. -- means information was not supplied. Dimensions may be rounded off.

VOICE LOGGING RECORDERS

MANUFACTURER→	Damm Cellular Systems	Damm Cellular Systems	DSS	Eventide	Eventide
PRODUCT NAME→	TetraFlex External Log Server 105639	TetraFlex External Log Workstation 105638	Equature	NexLog 740	NexLog 840
↓SPECS					
Suggested list price	--	--	Configuration dependent	Varies by configuration	Varies by configuration
Recording medium: secondary (archival)	SSD RAID 1	SSD	HD, NAS, SAN, RAID	Geodiverse NAS, Blu-ray, DVD, USB, SAN	Geodiverse NAS, Blu-ray, DVD, USB, SAN
Media storage capacity	Simplex: 8,000 hours; duplex: 4,000 hours	Simplex: 8,000 hours; duplex: 4,000 hours	Varies per media	Varies per media	Varies per media
Max. online storage capacity (hrs. per GB)	Simplex: 312 hours; duplex: 156 hours	Simplex: 312 hours; duplex: 156 hours	Unlimited	12 TB for up to 2 million hours	12 TB for up to 2 million hours
VOX start time	N/A	N/A	Selectable	<80 ms	<80 ms
Channel capacity (per syst.)	255	255	Varies depending on server hardware	P25/DMR/VoIP: 240; analog/ digital: 96; T1/E1: 192+	P25/DMR/VoIP: 240; analog/ digital: 240; T1/E1: 240
Operating system	Windows Server 2012	Windows 7	Windows	High-reliability embedded Linux	High-reliability embedded Linux
Interfaces with …	TetraFlex	TetraFlex	Analog, digital, T1/E1, VoIP, RoIP, NG 9-1-1 data, email, chat, SMS, P25 radio, ISSI, Bosch/Telex, EF Johnson, Motorola MCC7500/ASTRO 25, IP video, computer screens, Exchange email, SIPRec, SMS/MMS, off-air radio, more	P25 (Motorola, Harris, Tait, EF Johnson, ISSI, CSSI), DMR, MOTOTRBO, NXDN, Zetron, Avtec, dispatch, NG 9-1-1, VoIP/analog/digital	P25 (Motorola, Harris, Tait, EF Johnson, ISSI, CSSI), DMR, MOTOTRBO, NXDN, Zetron, Avtec, dispatch, NG 9-1-1, VoIP/analog/digital
Type of front-panel display	None	None	Flat screen	7-in. color LCD touchscreen	7-in. color LCD touchscreen
Panel controls	GUI, keyboard, mouse	GUI, keyboard, mouse	UI	GUI w/ system setup, live monitoring, replay, alarms, more	GUI w/ system setup, live monitoring, replay, alarms, more
Data displayed on readouts	None	None	Configurable	System control, date/time, alarms, alerts, setup, more	System control, date/time, alarms, alerts, setup, more
Expandable to … (units)	20	20	Unlimited	Unlimited	Unlimited
Power requirements	100-240 VAC, 7-3.5 A	100-240 VAC, 6-3 A	110/220 VAC, 50-60 Hz	120/240 VAC or 48 VDC	120/240 VAC
Power consumption	840 W	720 W	Configuration dependent	350 W	400 W
Frequency response	--	--	300 Hz to 3.4 kHz	200 Hz to 3.4 kHz	200 Hz to 3.4 kHz
Input impedance	--	--	>600 kΩ	>10 kΩ	>10 kΩ
Input sensitivity	--	--	Adjustable	-40 to +20 dBm	-40 to +20 dBm
Radio interface (analog, digital, or both)	TETRA, analog, DMR	TETRA, analog, DMR	Both	Both	Both
Record Radio over IP (RoIP)	Yes	Yes	Yes	Yes, all types of RoIP	Yes, all types of RoIP
Diagnostics/self repair	Yes	No	Yes/Yes	Yes/Yes	Yes/Yes
AGC range/attack time	N/A	N/A	Adjustable	25 dB/<20 ms	25 dB/<20 ms
Simul. record/playback	255	255	Yes	Yes	Yes
Type of alarms	TetraFlex alarm system	TetraFlex alarm system	Proactive/live alarming, SMS, email, Equature Pulse	SNMP, audible, visual, email	SNMP, audible, visual, email
Type of security	Dongle	Dongle	LDAP (Active Directory), SSL, single sign on, encryption	User ID, auto-expiring passwords, active directory, LDAP	User ID, auto-expiring passwords, active directory, LDAP
Disk mirroring	Std., RAID 1	No	Std., central arch./capture avail.	Std.	Std.
Instant message retrieval	--	--	Yes	Yes	Yes
Multimedia message retrieval recording	--	--	Yes	Yes (NG 9-1-1)	Yes (NG 9-1-1)
Software package fee	No	No	No	--	--
Licensing fees (per seat, per site, none)	Yes	Yes	None	Concurrent license	Concurrent license
Record analog radio	Opt.	Opt.	Std.	Std.	Std.
Radio data links for digital trunked radio	Yes	Yes	Yes	Yes: P25, DMR, MOTOTRBO, NXDN	Yes: P25, DMR, MOTOTRBO, NXDN
Event-driven record	Yes	Yes	Yes	Yes	Yes
Caller ID and DTMF recording/decoding	Std.	Std.	Std.	Std.	Std.
Recording redundancy	Yes	Yes	Yes	Yes	Yes
Recording initiated via …	TetraFlex protocol	TetraFlex protocol	VOX, VoIP triggers, CTI, D-channel, contact closure, ROD	VOX, line sense, contact closure, network, D channel, VoIP signaling, RoIP, API, more	VOX, line sense, contact closure, network, D channel, VoIP signaling, RoIP, API, more
Ch. settable beeptones	No	No	Yes	Yes	Yes
Live monitoring capability	Opt.	Opt.	Std.	Std.	Std.
Channel mixing	No	No	Yes	Yes	Yes
If yes, how many ch.	--	--	--	Unlimited	Unlimited
Playback features	Yes	Yes	Volume, speed, full-screen video, redaction, crop, play, pause, loop, more	View location on map, play, pause, FF, RW, loop, save, sequential, mixed, more	View location on map, play, pause, FF, RW, loop, save, sequential, mixed, more
Remote access	Std.	Std.	Std.	Std.	Std.
Multiuser simul. access	Std.	Std.	Std.	Std.	Std.
Media library database	--	--	Std.	Std.	Std.
Search criteria	Date, time, channel, caller, called party, more	Date, time, channel, caller, called party, more	Audio, full text, speech, time/ date, CLID, DTMF, ANI/ALI, CAD incident #, duration, radio ID, talk group, tags, text for NG 9-1-1, more	Geofence on map, date/time, channel, talk group, PTT-ID, DTMF, CLID, ANI/ALI, more	Geofence on map, date/time, channel, talk group, PTT-ID, DTMF, CLID, ANI/ALI, more
Reports	Yes	Yes	Yes	Yes	Yes
Channel inactivity alert	Std.	Std.	Std.	Std.	Std.
Internal battery backup for orderly shutdown	Opt.	Opt.	External to recorder	UPS integration	UPS integration
Ext. time synchronization	Opt.	Opt.	Std.	NTP std.; IRIG-B opt.	NTP (std.); IRIG-B (opt.)
Text to 9-1-1 ready	No	No	Yes	Yes	Yes
Quality assurance module	No	No	Yes	Yes	Yes
Screen capture	No	No	Yes	Yes	Yes
Deployed on virtual servers	No	No	Yes	No	No
Compliant w/ NENA 08-003 IETF documents	No	No	Yes	All applicable	All applicable
Idle channel noise	None	None	<20 dBmc	-60 dB	-60 dB
Weight	41.9 lbs.	36.4 lbs.	70 lbs.	50-60 lbs.	50-60 lbs.
Agency approvals	--	--	UL, FCC	All applicable approvals	All applicable approvals

MANUFACTURER→	Exacom	Exacom
PRODUCT NAME→	Hindsight MicroNet G2+	Hindsight-G2+
↓SPECS		
Suggested list price	Configuration dependent	Configuration dependent
Recording medium: secondary (archival)	HD, RAID, NAS, SAN	HD, RAID, NAS, SAN
Media storage capacity	Varies per media	Varies per media
Max. online storage capacity (hrs. per GB)	980,000 hours/8 TB	3.92 million hours/28 TB
VOX start time	Selectable	Selectable
Channel capacity (per syst.)	8-48+	16-360+
Operating system	Windows 7	Windows Server 2012
Interfaces with …	P25, VoIP, RoIP radio, trunked radio, networks, analog/digital phones	P25, VoIP, RoIP/trunked radio, networks, analog/digital phones
Type of front-panel display	19-in. LCD	19-in. LCD
Panel controls	GUI	GUI
Data displayed on readouts	Configuration dependent	Configuration dependent
Expandable to … (units)	--	8 units = 2,880 channels
Power requirements	110/220 VAC, 50/60 Hz	110/220 VAC, 50/60 Hz
Power consumption	1.1 kW	750 W
Frequency response	300 Hz to 3.4 kHz	300 Hz to 3.4 kHz
Input impedance	Bridging/terminate	Bridging/terminate
Input sensitivity	Adjustable	Adjustable
Radio interface (analog, digital, or both)	Both	Both
Record Radio over IP (RoIP)	Yes, certified	Yes, certified
Diagnostics/self repair	Yes/Yes	Yes/Yes
AGC range/attack time	Adjustable	Adjustable
Simul. record/playback	Yes	Yes
Type of alarms	Standard system alarms, user-definable alarms	Std. system alarms/user-definable alarms
Type of security	Multiuser password, DIACAP (opt.)	Multiuser password, DIACAP (opt.)
Disk mirroring	Opt.	Opt.
Instant message retrieval	Yes	Yes
Multimedia message retrieval recording	Yes	Yes
Software package fee	No (included)	No (included)
Licensing fees (per seat, per site, none)	Per concurrent access	Per concurrent access

MANUFACTURER→	Exacom	Exacom
PRODUCT NAME→	Hindsight MicroNet G2+	Hindsight-G2+
↓SPECS		
Record analog radio	Std.	Std.
Radio data links for digital trunked radio	Yes, certified for most major radio system manufacturers	Yes, certified for most major radio system manufacturers
Event-driven record	Yes	Yes
Caller ID and DTMF recording/decoding	Std.	Std.
Recording redundancy	Opt.	Opt.
Recording initiated via …	VOX, line sense, contact closure, RS-232, network, digital phone, D channel	VOX, line sense, contact closure, RS-232, network, digital phone, D ch.
Ch. settable beeptones	Yes	Yes
Live monitoring capability	Std.	Std.
Channel mixing	Yes	Yes
If yes, how many ch.	Full range of licensed channels	Full range of licensed channels
Playback features	FW, RW, play, pause, stop, loop, chain, time stamp, variable speed	FW, RW, play, pause, stop, loop, chain, time stamp, variable speed
Remote access	Std.	Std.
Multiuser simul. access	Std.	Std.
Media library database	Std.	Std.
Search criteria	Date/time, channel, ANI, caller ID, DTMF, marked call, user ID, alias, talk group, incident number, all fields	Date/time, channel, ANI, caller ID, DTMF, marked call, user ID, more
Reports	Yes	Yes
Channel inactivity alert	Opt.	Opt.
Internal battery backup for orderly shutdown	Opt.	Opt.
Ext. time synchronization	Std.	Std.
Text to 9-1-1 ready	Yes	Yes
Quality assurance module	No	Opt.
Screen capture	No	Opt.
Deployed on virtual servers	Yes	Yes
Compliant w/ NENA 08-003 IETF documents	Yes	Yes
Idle channel noise	Ch. interface dependent	Ch. interface dependent
Weight	20-30 lbs. (hardware dep.)	40-70 lbs. (hardware dep.)
Agency approvals	All applicable approvals	All applicable approvals

VOICE LOGGING RECORDERS

MANUFACTURER→	HigherGround	NICE Systems	Pantel International	Record Play Tek (RPT)	Stancil
PRODUCT NAME→	Capture911	NRX	InterTalk Transcript	Simple Computer Logger SCL 8900	SLR
↓SPECS					
Suggested list price	Varies by configuration	$4,000-$100,000	--	$6,000-$13,000	From $6,000
Recording medium: secondary (archival)	RAID, USB drive, LAN, NAS	HDD, HP-RDX, network drive/NAS	Primary: RAID 6; secondary: RAID 6, SAN, storage appliance	DAT, CDR, DVD-D	DVD RAM/Blu-ray, CD, USB, SD, NAS, RAID
Media storage capacity	Varies per media	Unlimited, w/ network storage; RDX 1 TB 15,000 hours	Scalable, 1-5 years (typ.)	1,700; 300; 1,700 hours	Unlimited w/ network storage
Max. online storage capacity (hrs. per GB)	180 hours/GB; unlimited based on available storage	160 hours/GB, 245 hours/GB (expand.)	34-200, depending on vocoder	+4 GB	2T (std.)
VOX start time	Configurable	Configurable	1-10 ms (adj.)	Continuous record	50 ms
Channel capacity (per syst.)	240+	Up to 200	Scalable, essentially unlimited	27	196 channels
Operating system	Windows 2012 Server	Windows Server 2012, 2008 R2	Red Hat Enterprise Linux	Windows	Windows 7, Server 2012 (64-bit)
Interfaces with …	Analog, digital, VoIP, RoIP radio, P25, DMR, NG 9-1-1 SIP	Analog, digital phone and radio systems, VoIP, P25, TETRA	InterTalk radio-telephone console system; analog, digital interfaces	Phones, radio, mic	Analog, digital, T1, E1, Centrex, VoIP, RoIP, P25, more
Type of front-panel display	None, needs keyboard, monitor & mouse	None, needs keyboard, monitor & mouse	Web browser	CRT/computer	SVGA display (not included)
Panel controls	Web, mobile, PC GUI	Client access via PC, LAN, Web access	Load multiple tracks, select tracks for playback, play, pause, stop, RW, FF, slow/fast play, annotate, more	Few; simple	GUI
Data displayed on readouts	Configurable	Status, alarms listed on administration client	Visual representation of all playback tracks showing activity, time, PTT-ID, emergency calls, call ID, dialed #, annotation marks, more	All functions; simple cont.	Full-featured GUI
Expandable to … (units)	Unlimited	10,000 channels/50 servers	Scalable by track, user, agency	Unlimited	Unlimited
Power requirements	110/220 VAC	100-240 VAC (typ.)	90-250 VAC, -48 VDC (opt.)	110/220/50/60 W	120/240 VAC, -48 VDC
Power consumption	Configuration dependent	460/750 W (typ.)	750 W dual redundant supply (std.); 1.5 kW expansion (opt.)	300 W	300-450 W
Frequency response	300 Hz to 3.4 kHz	220 Hz to 3.15 kHz ±3 dB	300 Hz to 3 kHz +1/-3 dB	100 Hz to 3 kHz	300 Hz to 3.4 kHz
Input impedance	>6 kΩ	>10 kΩ	600 Ω or bridge mode >10 kΩ (software selectable)	20 kΩ telco bridge; DC prot.	>10 kΩ
Input sensitivity	-68 to +3 dBm	-25 dBm to +6 dBm	-60 to +10 dBm	-40 to +15 dBm	-50 to +10 dB
Radio interface (analog, digital, or both)	Both	Both	Both	Simplex/duplex; mix. T/R	Analog/digital/RoIP
Record Radio over IP (RoIP)	Yes	Yes	Yes	Yes	Yes
Diagnostics/self repair	Yes/Yes	Yes/failed services auto restart	Yes/Yes	Yes/Yes	Yes/Yes
AGC range/attack time	Adjustable	Maximum dynamic range: 0-30 dB; recovery speed: 7-60 dB/s	1 dB/ms (adj.)	Full input level/0.1 ms	Adjustable
Simul. record/playback	Yes	Yes	Yes	Yes (all channels)	Yes
Type of alarms	350 software/hardware alarms	Full status monitoring at supervision app., SNMP, more	Fan failure, power supply module, NIC card, RAID drive, more	Tape/Windows	Audio, visual, remote, SNMP, contact closure, LEDs
Type of security	Multilevel user security; voice, data encryption; audit logs; channel, talk group permissions	Multilevel account name w/ password protection, more	Full credentials based on login, password-protected archive, intruder, challenge/response (opt.)	Access/channel	Role-based login, active directory, encryption, file watermarking, more
Disk mirroring	Std.	Std. (supp. by COTS hardware)	Std.	Opt.	RAID 1, RAID 10
Instant message retrieval	Yes	Yes	Yes	Yes	Yes
Multimedia message retrieval recording	Yes	Yes	Yes	No	Yes
Software package fee	No (included)	Yes	Yes	No	No
Licensing fees (per seat, per site, none)	None	Per site, concurrent user	Per seat, per site	None	Concurrent
Record analog radio	Std.	Std.	Std., w/ InterTalk	Yes (Smart DAA)	Std.
Radio data links for digital trunked radio	Yes	Yes	Yes	Yes	Yes
Event-driven record	Yes	Yes	Yes	Yes (Smart DAA)	Yes
Caller ID and DTMF recording/decoding	Std.	Std. for analog lines, D channel support (opt.)	Std.	Opt.	Std.
Recording redundancy	Yes	Yes	Yes	Opt. HD tape	Yes
Recording initiated via …	VOX, CTI, hook, D channel, RS-232, network, digital phone, more	VOX, hook, contact closure, VoIP, T1/E1, ROD, more	VOX, hook sense, PTT, COR, ISDN data, SIP data	Continuous record; no VOX	VOX, hook sense, VoIP session, RTP stream, E1/T1 D channel, software/API control, more
Ch. settable beeptones	Yes	Yes, settable per board	Yes	Yes, w/ level adj.	Yes
Live monitoring capability	Std.	Std.	Std. (via web browser)	Yes; 1/all simultaneous	Std. (unlimited channels)
Channel mixing	Yes	Yes	Yes	Yes	Yes
If yes, how many ch.	Unlimited	32	Up to 10	1/all	Unlimited
Playback features	Pause, play, save, signature, skip, speed, tags, time stamp, volume, loop, w/ or w/o silence, more	Play, pause, FF, RW, skip, stop, save to .wav/.wma, tags, volume, loop, time stamp announcement, more	Play, pause, stop, RW, FF, jump/nudge back/forward, playback slow/fast, drag cursor to audio, more	Spoken date/time; continuous play; audio CD, more	Call control, play, FF, RW, speed change w/ pitch control, redaction, burn to CD/DVD, call analyzer, more
Remote access	Std.	Std.	Std., Web browser	RS-232; DB25; DAA	Std.
Multiuser simul. access	Std.	Std. (max. 100 for replay)	Std.	Std., over custom network	Std.
Media library database	Std.	Std. (for RDX)	Std.	100 ms time markers; ANSI	Std.
Search criteria	ANI/ALI/CTI data, channel, date, duration, position or alias, time, more	Channel/position, date/time, duration, ANI/ALI/CTI/CAD data, more	Time, date, console position, channel, PTT-ID, call types, more	Date, time, channel, DTMF, ANI, ACD	Date/time, channel, caller ID, ANI/ALI, dialed digits, call tags, more
Reports	Yes, incl. dispatcher eval.	Yes (ch. and user activity)	Yes	Keystrokes; activity	Yes
Channel inactivity alert	Std.	Std.	Opt.	Continuous; not needed	Std.
Internal battery backup for orderly shutdown	Opt.	Depends on COTS hardware	N/A, runs on server	UPS; RS-232; supplied internally	Opt.
Ext. time synchronization	Std.	Std.	Std.	Std.	Std.
Text to 9-1-1 ready	Yes	Yes	Yes	No	Yes
Quality assurance module	Yes	Yes	Yes	Yes	Yes
Screen capture	Yes	Yes	Yes	Yes	Yes
Deployed on virtual servers	Yes	Yes, VoIP only	Yes	Yes	Yes
Compliant w/ NENA 08-003 IETF documents	All	Through software	All, USPTO 8254529, CIPO 2712420A1	Some	All
Idle channel noise	<20 dBrnc	40 dB ref. to -15 dBm	Noise gate (adj.)	-50 dB	<20 dBm
Weight	Hardware dependent	Depends on COTS hardware	N/A, runs on server	25 lbs.	30-70 lbs.
Agency approvals	All applicable approvals	CE, EN, UL IEC60950, more	UL, CSA	Various	UL, FCC

MANUFACTURER→	Synergon Solutions	Total Recall VR
PRODUCT NAME→	Vault Logging Recorder	LinX Neos
↓SPECS		
Suggested list price	From $2,500	From $5,000
Recording medium: secondary (archival)	DVD, SD, NAS	SATA HDD: CD, DVD, Blu-ray, NAS, USB
Media storage capacity	8,000 hours to unlimited	HDD: 600,000 hours; Blu-ray: 6,000 hours; DVD: 1,000 hours
Max. online storage capacity (hrs. per GB)	400,000 hours	256 hours/GB
VOX start time	8 ms	50 ms
Channel capacity (per syst.)	Varies by configuration	24 analog; 30 VoIP/DMR
Operating system	Windows 7, Server 2012 (64-bit)	Linux
Interfaces with …	P25, VoIP, SIP REC, i3, analog, digital, T1	Analog, VoIP, DMR
Type of front-panel display	N/A	Color TFT LCD (7-in. widescreen)
Panel controls	N/A	Full system configuration; call monitoring, search, playback & archiving, alarms
Data displayed on readouts	N/A	Status, time, CLI, DTMF, call length, channel activity, more
Expandable to … (units)	Unlimited	Unlimited
Power requirements	110/200 VAC	90-260 VAC, 50-75 Hz
Power consumption	Configuration dependent	100 W (max.)
Frequency response	300 Hz to 3.4 kHz	300 Hz to 3.4 kHz, ±0.5 dBm
Input impedance	10 kΩ	>10 kΩ DC; >10 mΩ DC
Input sensitivity	-40 to +20 dBm	-20 to -40 dBm, VOX or DC start/stop
Radio interface (analog, digital, or both)	Both	Both
Record Radio over IP (RoIP)	Yes	Yes
Diagnostics/self repair	Yes/Yes	Yes/Yes
AGC range/attack time	Adjustable	N/A
Simul. record/playback	Yes	Yes
Type of alarms	Heartbeat, events, errors	Audio, visual, built-in LCD control panel, PC client sw, SNMP alarm interface
Type of security	Multiuser password	Multilevel passwords (onboard control panel); username, password, admin.-defined control
Disk mirroring	Opt.	N/A
Instant message retrieval	Yes	Yes
Multimedia message retrieval recording	Yes	No
Software package fee	No	No
Licensing fees (per seat, per site, none)	None	No
Record analog radio	Std.	Std.
Radio data links for digital trunked radio	Motorola ASTRO AIS	Yes
Event-driven record	Yes	Yes
Caller ID and DTMF recording/decoding	Opt.	Std.
Recording redundancy	Yes	Yes
Recording initiated via …	VOX, voltage, hook sense, D-channel, external event	VOX, hook sense, VoIP session, DMR transmission
Ch. settable beeptones	Yes	Yes
Live monitoring capability	Std.	Std.
Channel mixing	Yes	Yes (opt. event player app)
If yes, how many ch.	Unlimited	15
Playback features	Play, stop, pause, FF, RW, next, previous, speed control	Search, play, pause, FF, RW, add note, tag, copy, email, more
Remote access	Std.	Std.
Multiuser simul. access	Std.	Std.
Media library database	Std.	Std.
Search criteria	Any data field stored	Time/date, channel, extension, caller ID, DTMF digits, call length, incoming/outgoing/internal, added note, tagged, more
Reports	Yes	Yes
Channel inactivity alert	Std.	Std.
Internal battery backup for orderly shutdown	N/A	N/A
Ext. time synchronization	Std.	Std.
Text to 9-1-1 ready	Yes	No
Quality assurance module	Yes	Yes
Screen capture	Yes	No
Deployed on virtual servers	Yes	No
Compliant w/ NENA 08-003 IETF documents	All	Some
Idle channel noise	-60 dB	N/A
Weight	50-60 lbs.	22 lbs.
Agency approvals	FCC, UL, CSA	FCC, CE, UL, more

MANUFACTURER→	Total Recall VR	Verint Systems	Verint Systems	Versadial Solutions	Voice Print International (VPI)
PRODUCT NAME→	LinX Omnia	Audiolog 6000 series	Audiolog 6000 series MAX	AdutanteH5 call recording	VPI CAPTURE Essential
↓SPECS					
Suggested list price	From $10,000	--	--	From $220/channel	From $280/channel
Recording medium: secondary (archival)	RAID 1 SATA HDD: CD, DVD, Blu-ray, NAS, USB	Blu-ray	Blu-ray	HD (NAS, FTP, site, CD, DVD), cloud	DVD, NAS, SAN, cloud storage
Media storage capacity	HDD: 700,000 hours; Blu-ray: 6,000 hours; DVD: 1,000 hours	20,000 hours/50 GB Blu-ray @ 5.3 kbps	20,000 hours/50 GB Blu-ray @ 5.3 kbps	148,000 hours/800 GB	Internal: from 80,000 hours; LAN: unlimited
Max. online storage capacity (hrs. per GB)	256 hours/GB	367 ch. hours/GB; 734,000 hours/2 TB	367 ch. hours/GB; 734,000 hours/2 TB	2 TB/360,000 hours internal; unlimited via external	Internal: up to 3 TB; LAN/cloud: unlimited
VOX start time	50 ms	Instantaneous	Instantaneous	0 ms (prebuffered)	<40 ms
Channel capacity (per syst.)	60 analog; 120 VoIP/DMR/ISDN	4-48	8-240	Up to 256 channels/server	Up to 384 channels/server
Operating system	Linux	Windows 2008/2012	Windows 2008/2012	Windows 7 preferred	Windows
Interfaces with …	Analog, VoIP, DMR, ISDN	Analog, digital, E1, ISDN, T1, PRI, VoIP	Analog, digital, E1, ISDN, T1, PRI, VoIP, trunked/conventional	Analog; CO/station, analog radio; digital; T1/E1, ISDN, ISDN PRI; VoIP; more	Analog/digital/VoIP PBX,trunked, P25 radio, 9-1-1 stations, T1/E1, more
Type of front-panel display	Color TFT LCD (7-in. widescreen)	Standard monitor (not included)	Standard monitor (not included)	Standard PC monitor	Any 17-in. LCD monitor (std.); selected interfaces w/ smartphones/tablets
Panel controls	Full system configuration; call monitoring, search, playback & archiving, alarms	GUI	GUI	Browser-based GUI	Browser-based GUI, keyboard/mouse control or touchscreen
Data displayed on readouts	Status, time, CLI, DTMF, call length, channel activity, more	Full-featured GUI	Full-featured GUI	Start time, duration, channel, caller ID, dialed number, more	All relevant call, radio data; custom flags, icons, comments; CAD, QA data (opt.)
Expandable to … (units)	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Power requirements	90-260 VAC, 50-75 Hz	100-240 VAC, 50-60 Hz	100-240 VAC, 50-60 Hz	100-240 VAC, 50-60 Hz	800 W max-rated output
Power consumption	300 W (max.)	750 W (max.)	750 W (max.)	500 W failover	1,056 max-rated volt amp
Frequency response	300 Hz to 3.4 kHz, ±0.5 dBm	300 Hz to 3.4 kHz	300 Hz to 3.4 kHz	300 Hz to 3.4 kHz	300 Hz to 3.4 kHz
Input impedance	>10 kΩ DC; >10 mΩ DC	>18 kΩ	>18 kΩ	Analog: >6 kΩ; digital: 33 kΩ	18 kΩ
Input sensitivity	20 to -40 dBm, VOX or DC start/stop	-50 to +10 dBm	-50 to +10 dBm	-35 to +20 dB	35 dB to -15 dBm
Radio interface (analog, digital, or both)	Both	Both	Both	Both	Both
Record Radio over IP (RoIP)	Yes	Yes	Yes	Yes	Yes
Diagnostics/self repair	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
AGC range/attack time	N/A	Adjustable	Adjustable	Software programmable	<20 ms
Simul. record/playback	Yes	Yes	Yes	Yes	Yes
Type of alarms	Audio, visual, built-in LCD control panel, PC client sw, SNMP alarm interface, warning LEDs	Talking, visual, dial out, email, SNMP	Talking, visual, dial out, email, SNMP	Audio, visual, email	Local audio/visual, dial out, phone, email, MIB/SNMP
Type of security	Multilevel passwords (onboard control panel); username, password, admin.-defined control	AES-256 encrypted	AES-256 encrypted	Role-based access control, active directory integration, encryption, Checksum	Role-based login, active directory integration, encryption, file watermarking, more
Disk mirroring	Std.	Std.	Std.	Std. (RAID 1/RAID 10)	Std.
Instant message retrieval	Yes	Yes	Yes	Yes	Yes
Multimedia message retrieval recording	No	Yes	Yes	Yes	Yes
Software package fee	No	Yes	Yes	No (included)	Yes
Licensing fees (per seat, per site, none)	No	Per seat, per site	Per seat, per site	Per recorded channel/unlimited seats	Per seat
Record analog radio	Std.	Std.	Std.	Std.	Std.
Radio data links for digital trunked radio	Yes	Yes	Yes	Std.	Opt.
Event-driven record	Yes	Yes	Yes	Yes	Yes
Caller ID and DTMF recording/decoding	Std.	Std.	Std.	Std.	Std.
Recording redundancy	Yes	Yes	Yes	Yes	Yes
Recording initiated via …	VOX, hook sense, VoIP session, DMR transmission, more	VOX, DC voltage, CTI, hook status, API, contact closure, E1/T1	VOX, DC voltage, CTI, hook status, API, contact closure, more	VOX, voltage sense, off hook, D channel, more	VOX, hook sense, voltage detect, CTI, D-channel, more
Ch. settable beeptones	Yes	Yes (analog CO lines)	Yes (analog CO lines)	Yes (analog lines only)	Yes
Live monitoring capability	Std.	Std.	Std.	Std.	Std.
Channel mixing	Yes (opt. event player app.)	Yes	Yes	Yes	Yes
If yes, how many ch.	15	Up to 16	Up to 16	Up to 8	Unlimited
Playback features	Search, play, pause, FF, RW, add note, tag, copy, email, more	Play, pause, stop, RW, FF, mute, volume, date/time, more	Play, pause, stop, RW, FF, mute, volume, select multiple channels, date/time	Single/multichannel, back to back, pitch control, variable speed, FF, replay	Single/multichannel, real-time, chain/loop, variable speed, pitch control, notes, tags, redact, email
Remote access	Std.	Std.	Std.	Std.	Std.
Multiuser simul. access	Std.	Std.	Std.	Std.	Std.
Media library database	Std.	Std.	Std.	Std.	Std.
Search criteria	Time/date, channel, extension, caller ID, DTMF digits, call length, incoming/outgoing/internal, added note, tagged, more	Channel, agent, date/time, duration, ANI/ALI, reference, talk group, radio ID	Channel, agent, date/time, duration, ANI/ALI, reference, talk group, radio ID	Date/time, channel, agent, SMDR criteria, user notes, CID/DTMF, direction, more	Auto. or manual data, incl. call type, channel/user, time, date, ANI/ALI, radio ID; CAD, QA data (opt.)
Reports	Yes	Yes	Yes	Yes	Std.
Channel inactivity alert	Std.	Std.	Std.	Std.	Std.
Internal battery backup for orderly shutdown	N/A	N/A	N/A	Opt. (ext. UPS)	UPS (opt.)
Ext. time synchronization	Std.	Std.	Std.	Std.	Std.
Text to 9-1-1 ready	No	Yes	Yes	No	Yes
Quality assurance module	Yes	Yes	Yes	Yes	Yes
Screen capture	No	Yes	Yes	Yes	Yes
Deployed on virtual servers	No	Yes	Yes	Yes	Yes (opt.)
Compliant w/ NENA 08-003 IETF documents	Some	All	All	All	All
Idle channel noise	N/A	N/A	N/A	<20 dBmc	<20 dBrnc
Weight	40 lbs.	65 lbs.	65 lbs.	From 40 lbs.	From 40 lbs.
Agency approvals	FCC, CE, UL, more	UL, FCC, CUL, TUV, more	UL, FCC, CUL, TUV, more	FCC, UL	UL, FCC, Ulo, RCC, more

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RF Connectors

Radio Frequency Systems (RFS) introduced 4.3-10 field-installable connectors that feature optimized low passive intermodulation (PIM) stability. The connectors' two-piece design inhibits loose parts and simplifies installation in the field, supporting mobile operators that use Long Term Evolution (LTE), 5G and small-cell networks. The connectors have a five-point watertight interface, support up to 500 watts (W) at 2 GHz and a multithread tri-start design. The design is made with a molded polymer claw and has a dual grip on the corrugated outer conductor, providing flexibility, lightweight design and enhanced stability.

www.rfsworld.com

Public-Safety Smartphone

Harris unveiled the LMC-1000, a Long Term Evolution (LTE)-enabled smart device that combines the latest information security and commercial device technologies in a practical, secure and durable Android-based device, company officials said. The device is lightweight, supports domestic and international commercial carrier bands, and is ready for the First Responder Network Authority (FirstNet) nationwide public-safety broadband network (NPSBN) as it becomes available. The product has a glove-usable 5-inch full high-definition (HD) touchscreen and features a dedicated push-to-talk (PTT) button for the company's BeOn integrated PTT application. The device has multiple layers of security, is compliant with Mil-Std-810G for shock resistance and IP67 for water and dust protection, and has high-performance speakers and multiple microphones with active noise cancellation.

www.harris.com

DMR Telemetry

Simoco introduced Pulse suite, a portfolio of products that enables organizations, including utilities and public service operators, to manage and control smart grids and networks across vast operational areas. The products allow supervisory control and data acquisition (SCADA) telemetry applications to be quickly deployed over Digital Mobile Radio (DMR) Tier 3 trunked networks. The fully integrated IP network connects information sent from data modems or remote telemetry units (RTUs) to SCADA masters and is effective in remote areas where cellular coverage is intermittent, company officials said.

www.simocogroup.com

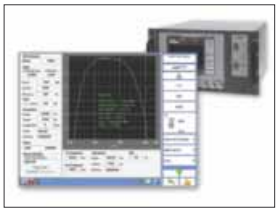
Radio Remote Receiver

LocusUSA released the DiagnostX NX-200 series of remote receivers that extends the DiagnostX coverage of radio systems. Up to four NX-200 remote receivers may be added to a single DX-2002 radio analyzer unit. All results are forwarded across the Ethernet LAN back to the DX-2002 unit and presented in a single consolidated view. The product offers customers a smaller, more economical DiagnostX unit to analyze the radio performance of multiple agency systems and larger geographical coverage areas, company officials said. The company has a trade-in program for current customers through end-2016.

www.locususa.com

DME Test Option

Cobham AvComm announced a distance measuring equipment (DME) test option for its ATC-5000NG next-generation transponder test set. Fielded units can be upgraded with the new option. DME determines distance, or slant range, from an aircraft to a ground station. With the DME option, the device can test DME airborne systems by emulating a ground station. According to company officials, the software-defined radio (SDR) architecture supports more transponder Radio Technical Commission for Aeronautics (RTCA) DO-181E test capability than legacy products and supports the Federal Aviation Administration's (FAA) NextGen test requirements.



www.aeroflex.com

RF Signal Mapping

Anritsu and **TRX Systems** integrated Anritsu's handheld analyzers with TRX's 3D indoor location and mapping solution. The MA8100A series TRX NEON signal mapper simplifies and reduces time required for indoor signal testing, ideal for professionals who conduct in-building testing of public-safety and commercial networks, including public-safety organizations, network operators and distributed antenna system (DAS) installers. The software can be configured with any Anritsu handheld instrument that features a spectrum analyzer. The signal mapper series also features an automatic indoor location and path estimation feature, as well as an Android user interface and tracking unit and software that delivers real-time 3D location information.

www.anritsu.com

RF Monitoring

Narda Safety Test Solutions announced the AMS-8065, the first solar-powered and wireless communicating area monitor selective (AMS). The monitor can detect range frequencies between 9 kHz and 6 GHz, as well as a special requirement of 30 – 31 GHz. Area monitors detect and alert the user to the presence of electromagnetic (EM) radiation generated by wireless, broadcast, radar and other RF and microwave emitters at levels above the designated set points. The monitors use wireless communications networks to transmit information to anywhere in the world about the frequencies and levels present at their particular location. Other versions set to be

introduced will monitor RF levels on rooftops with higher-power antennas.
www.narda-sts.us

Fuel Cell Battery Chargers

Sirius Integrator introduced the Horizon reformed methanol fuel cell battery chargers that are available in 50-, 100-, 150- and 200-watt (W) models. The products are

small, quiet and environmentally friendly, using locally available International Methanol Producers and Consumers Association (IMPCA) methanol fuel, company officials said. Accessories include a fuel sensor, empty fuel cartridge (10 or 25 liters) and battery cables. Outdoor enclosures for stationary and mobile applications are available.
www.siriusintegrator.com

Mini-DIN Connectors

Times Microwave Systems introduced 4.3/10 mini-DIN connectors for 50-Ohm low passive intermodulation (PIM) plenum-rated coaxial cable assemblies. Connectors for the SPP250, SPP500, TFT402 and TFT401

cable assemblies are for use in distributed antenna system (DAS) applications. All cables meet or exceed UL 910 requirements for plenum applications and are UL listed and printed. Cable assemblies are suitable for in-building jumpers and interconnects up to 6 GHz. The factory installable connectors attach via soldering and provide VSWR performance and PIM performance better than -160 decibels relative to the carrier (dBc). All connectors have reliable mechanical performance, company officials said.
www.timesmicrowave.com

Aircraft Antenna

Globalstar's Part 23 light aviation aircraft antenna received a supplemental type certificate (STC) from the Federal Aviation Administration (FAA). The antenna allows general aviation pilots to make calls, send emails and text messages, and browse the internet from the cockpit, without cellular access. The antenna pairs with the company's cradle and comes with devices such as the GSP-1700 mobile satellite phone and Sat-Fi satellite hot spot. The voice and data package comes with the cradle, SPOT Trace tracking device — which tracks a plane's location every 2.5 minutes — and its 9600 data interface. The Sat-Fi voice and

data package includes the antenna and SPOT Trace. Both packages allow pilots and passengers to communicate via voice, text, email and tracking, company officials said.
www.globalstar.com

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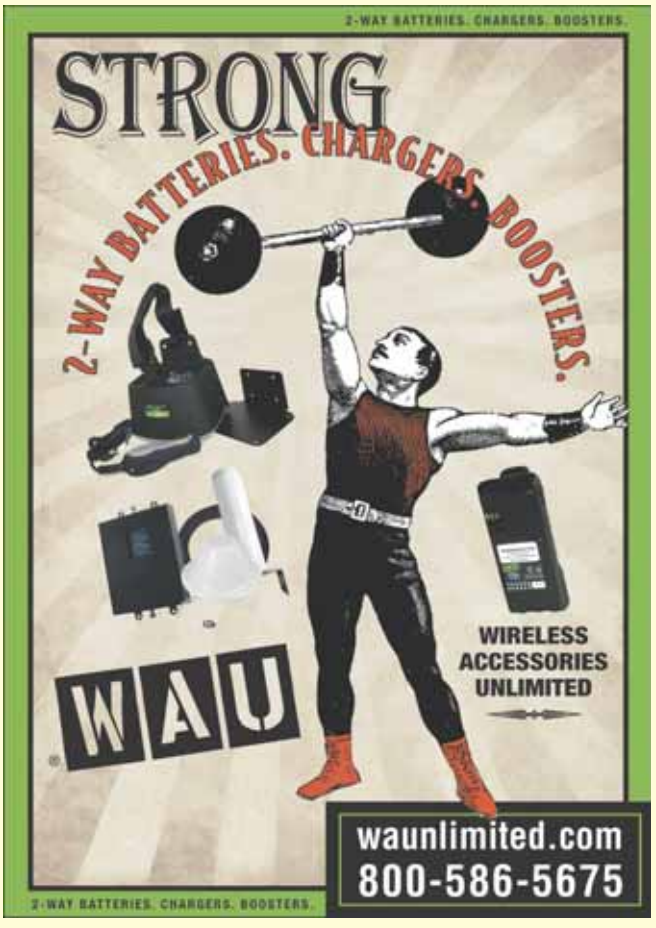

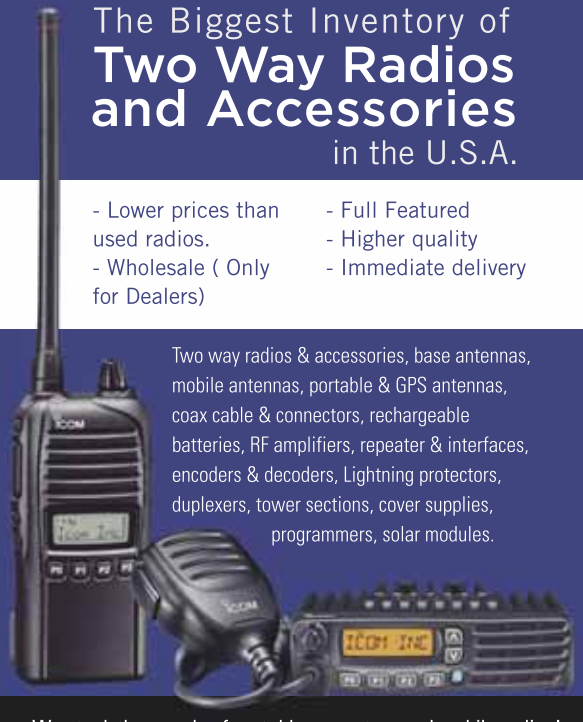

Licensing

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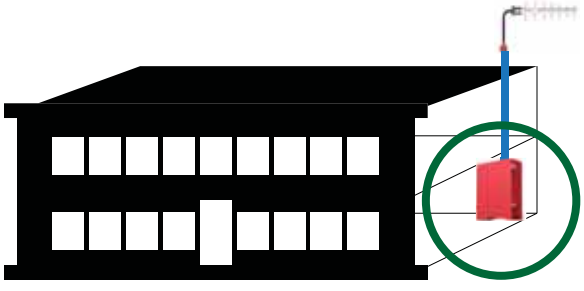

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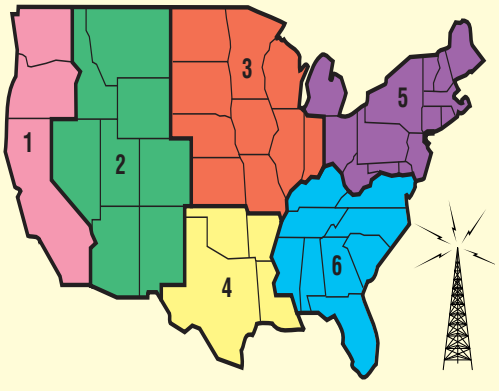

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Laurie Flaherty, **National 9-1-1 Program coordinator, highlights the federal program's goals and initiatives.**

Congress passed a law forming the National 9-1-1 Program in 2005 as the industry began to understand how much next-generation 9-1-1 (NG 9-1-1) would change the technologies and culture of 9-1-1. Until then, every public-safety answering point (PSAP) was an independent operation, because aside from a backup facility, there was no way to connect with each other. Transferring calls between states caused issues of consistency and conformity. State and local districts are not crazy about the federal government coming in, but there is recognition that without some kind of national coordination, they probably can't pull off NG 9-1-1. The program has three jobs: provide a point of coordination among all stakeholders, create resources that local and state folks can use, and administer a grant program specifically for PSAPs. The authority for the program was recently renewed.

The program has three jobs: provide a point of coordination among all stakeholders, create resources that local and state folks can use, and administer a grant program specifically for PSAPs.

What are the biggest accomplishments? 911.gov is the best source of information about what we have done. Our projects are of national significance or things that can be reproduced — templates and models — that state and local governments can use. We've worked with stakeholders on legislative language. We did a three-minute video on what NG 9-1-1 is, which anyone can download and use. We do a bimonthly webinar series for stakeholders because they want to share experiences, but they can't always get to Washington. When we hear that something is needed, and it is at the national level and reproducible, then that's usually where we come in. We closely coordinate efforts with public-safety associations. If they are already doing it, we probably won't. We make sure we are filling a gap.

We've been collecting data, which is the 9-1-1 community's first foray into any data collection. The National Association of State 911 Administrators (NASNA) decides which data elements are feasible to collect, and they came up with 50 data elements. We don't have the authority to mandate data submission, but by pestering and cajoling, we've received submissions from 41 states. We plan to collect the data annually, assuming we have the resources. The data has been useful to a number of folks at the federal and state levels.

What are your goals for 2016? The first is a grant program. We will receive $115 million from the Advanced Wireless Service (AWS-3) auction, and once those funds are received, we will begin writing regulations and putting a structure in place. We can't start working on grant regulations until we receive funds, which we anticipate this calendar year. For the last grant program, it took us about a year to write regulations and set up the infrastructure. A 60-day comment period is required by statute.

We also started a cost study on NG 9-1-1 implementation nationwide. The study was requested in 2012 legislation, which is comprehensive and detailed in what Congress asked for. The statute asked for seven things, any of which could be its own report. We awarded a contract for a cost study team and will take the next two years to put the cost study together.

How will you work with FirstNet? We've worked hard to make sure the state 9-1-1 folks know when the state consultations are happening and who the state single point of contact (SPOC) is. It's important for 9-1-1 officials to be at the table when the plans are made at the state level. The right people have to talk to make things happen. The First Responder Network Authority (FirstNet) is top down; 9-1-1 has always been bottom up because of a history of being decentralized. NG 9-1-1 is focusing on replacing voice and text to 9-1-1 largely because of the FCC's emphasis. FirstNet is leaving voice until later and focusing on data. It will be interesting to see how it all fits together. ■

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