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By Charles Werner

Technology: Where We Are Now And Where We Are Going

How existing and emerging technologies benefit the emergency service community



Awareness of various technology opportunities can help you increase your organizational effectiveness and efficiency in the areas of administration/ planning, operations, response, mitigation, recovery and safety.

Technology is playing an ever-increasing role in today’s emergency service community by enhancing of roles and responsibilities in the areas of effectiveness, fiscal responsibility and safety. This supplement is designed to increase the awareness of various technology opportunities that can help to increase organizational effectiveness and efficiency in the areas of administration/planning, operations, response, mitigation, recovery and safety. We cover technology that is presently in use, technology that is being transitioned into the public safety environment and a glimpse into the future.

The technologies that are discussed in this supplement include land mobile radios/portables and associated accessories and peripheral technologies, and commercial wireless broadband and related apps, accessories and mobile devices. See examples of how commercial wireless broadband provides affordable services, mobile devices and exciting new apps that ultimately can save organizations and localities thousands of dollars. We also provide a glimpse into the development of the nationwide public safety wireless broadband network – First Responder Network Authority (FirstNet).

It is an exciting time and it is even more important, necessary and exciting to be aware of the newest developments in land mobile systems, radios and portables, broadband networks/technology and opportunities; how they work in concert to enhance firefighter safety through a more effective public safety communications environment.

The article, “Technology Today and Tomorrow,” describes how tablets, smartphones and other mobile devices are transforming public safety communications. In “LMR Versus Broadband,” we discuss each technology in light of future emergency communications requirements, noting that while mission-critical voice may be achieved for broadband, until that time land mobile radio “remains the solid solution.” Finally, the article titled “What’s Next?” notes, “This is an exciting time when technology continues to change dramatically and provide capabilities that we would only have dreamed of several years ago.” ■

CHARLES WERNER, EFO/CFD, a *Firehouse*® contributing editor, is a 39-year veteran of the fire service and chief of the Charlottesville, VA, Fire Department. He serves on the Charlottesville Regional Emergency Communications Management Board, Virginia Statewide Interoperability Executive Committee, Virginia Secure Commonwealth Panel, Department of Homeland Security (DHS) SAFECOM Executive Committee,

National Alliance for Public Safety GIS, National Information Sharing Consortium and International Association of Fire Chiefs (IAFC) Technology Council. He was recently appointed by DHS Secretary Janet Napolitano to the Homeland Security Information Network (HSIN) Advisory Committee. Werner is a past president of the Virginia Fire Chiefs Association.



Technology Today & Tomorrow

A time of convergence - mobile devices, connectivity and apps

Tablets, smartphones and other mobile devices are transforming public safety communications. The convergence of tablets/mobile devices, broadband connectivity and applications (“apps”) is transforming how success is achieved within the public safety environment.

The convergence of tablets/mobile devices, broadband connectivity and applications (“apps”) is transforming how success is achieved within the public safety environment.

Photo by Gene Blevins

In addition, the costs of these devices have dramatically dropped, allowing an improved work flow and simultaneously saving organizations thousands of dollars while significantly increasing functionality.

The increased use of smartphones and tablets by members of the public safety community can be attributed to a similar increase in use of these devices by the general population. According to Pew Internet Research (based on 2012 data), 91% of American adults have

a cell phone, 57% of American adults have a smartphone (28% Android; 25% iPhone; and 4% Blackberry). The research further finds that 59% of Americans over the age of 16 own a tablet or e-reader. It was also noted that 67% of mobile phone users routinely are checking for alerts and/or texts.

Invaluable tools

From a fire service point of view, smartphones and tablets have become invaluable tools. It is

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becoming commonplace that smartphones and tablets are loaded with many apps (free and/or very affordable). For example, a smartphone now uses apps to access weather/radar (MyRadar, Hurricane Tracker, Lightning Finder, Aviation Weather), text alerts, emergency dispatch information/automatic vehicle location (Active 911, iamresponding), live radio traffic (Active Scanner, Scanner911, FDNY Bravest, 5-0 Radio), hazardous materials information (WISER, HM Response Guide), traffic data/cameras (many local apps), local news/radio (TuneIn Radio), earthquake information (Quakes, Earthquakes), disaster response information (Disaster Alerts, FEMA app), electric vehicle extrication information, language translators (Voice Translator, Trans-



late, Google Translate), rope-rescue equipment and training (CMC Rescue, Ropes and Knots), search and rescue (GPS Tracker, SAR App), Firehouse.com (*Firehouse Magazine* online) and many additional miscellaneous apps. In addition, most of the apps can be in-

stalled on the smartphone and tablet. The smartphone with the plethora of apps has become a "Swiss Army Knife" of public safety communications; especially data.

Tablets are desired over smartphones in situations where viewing maps and other visual apps require a larger screen. Tablets are also more desired when there is a need for "instant on" or have no delay to access information such as incident dispatch and routing. Responding units must have the information instantaneously. Tablets respond at the touch of the screen and have a long battery life, making them more attractive and effective than traditional laptop computers. Choices as to the amount and type of memory/storage will be required as some tablets have a removable media for storage while others do



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not. This is especially important when addressing security of the information.

Commercial wireless broadband has also become more competitive and affordable and the coverage continues to expand throughout the United States. These commercial broadband services and choices are playing – and will continue to play for many years to come – an integral role in many public safety organizations. The choice and use of broadband by fire service organizations will be dependent on coverage in the respective response area and testing with smartphones and tablets is important before making large-scale purchases. Also, check with the broadband wireless carriers to see whether they offer any fire service discounts for firefighters and/or fire departments.

Additionally, smartphones and tablets currently use commercial wireless broadband to enhance fire, EMS, law enforcement and emergency management and serve as a great precursor to the FirstNet Nationwide Public Safety Broadband Network. The development, identification and use of current apps will provide an invaluable learning environment/experience for present-day public safety organizations. FirstNet can build and expand upon today's broadband best practices through the development of exciting new apps, mobile devices and a reliable, redundant and resilient network.

Easy interfacing

Current smartphone and tablet technology easily interfaces with other wireless technologies such as Apple TV and Bluetooth devices. This lets the smartphone and/or tablet content be broadcast over larger-screen TVs and monitors for viewing and training. These devices also include various apps like Skype and FaceTime that allow for a simple video teleconferencing capability which can be used for better information sharing and situational awareness.

Accessories such as ruggedized protective cases, extended battery packs and wireless headsets/microphones help to create a more effective and user-friendly experience. Ruggedized protective cases permit tablets and mobile devices to be used in a number of different ways while

also protecting the device. Extended battery cases have become a must for any public safety responder as it can double the life of the mobile device and becomes critical during situations involving significant power outages. Wireless headsets provide added communications clarity along with hands-free operation.

It is clear that commercial wireless

broadband services will play a critical role in the public safety world for many years to come and will continue to be used in localities even as FirstNet is rolled out. The convergence of mobile devices, apps and affordable broadband connectivity will continue to enhance public safety communications while also saving organizations and localities significant money. ■



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By Charles Werner



Presently and for a significant time into the future, LMR will remain the tool of necessity to achieve mission-critical voice communications. Photo by Mike Meadows

LMR Versus Broadband

The evolution of land mobile radio

For decades, land mobile radio (LMR) has been and continues to be known as the workhorse of public safety communications. Presently and for a significant time into the future, LMR will remain the tool of necessity to achieve mission-critical voice communications.

It is important to distinguish mission-critical voice from other forms of voice communications such as Voice over Internet Protocol (VoIP) or Radio over Internet Protocol (RoIP). Mission-critical voice is primarily different in that voice communications can operate from device to device, even in the absence of a network. And while many of our radio systems have transitioned to a trunked digital format, they still offer device-to-device communications (“talk-around” – typical of walkie-talkies) even when the main dispatch network may be not operating. This talk-around capability lets public safety tactical units continue to communicate even if a tower goes down or the network fails for other reasons. This is believed to be the single most important aspect of mission-critical voice and distinguishes itself from all other communications devices that require the presence of a network to operate.

Keeping LMR in place

Over the past five years, there was a misconception that LMR could be quickly replaced by broadband devices. The public safety community, however, working through many national organizations educated decision-makers on the need to maintain LMR systems, devices and funding until another solution could demon-

strate the ability to replace LMR. Organizations have started using broadband by linking their LMR system to a broadband network, thereby enhancing their footprint in RoIP. This essentially permits communications between broadband-capable devices (such as computers, smartphones and tablets) from wherever the Internet can be accessed. But again, RoIP is only an enhancement of LMR systems, not a replacement.

While it is true that LMR’s ability to work in the absence of a network is a key component of mission-critical voice communications, the SAFECOM Public Safety Communications Evolution Brochure outlines the requirements to achieve mission-critical voice communications regardless of the transmission method. These requirements are divided into two categories – general and technical. The technical category is more specific to the design/performance. Among those requirements are guaranteed access, quality of service, reliability, resiliency, roaming, spectrum efficiency/capacity, coverage, standards and Talk Around/Simplex.

In addition, many years of work have resulted in the P25 standard for public safety communications LMR. This standard was designed to ensure interoperability of radios nationwide. This standard achieves the ability of radios of differing

manufacturers to work on different LMR systems if they are P25 compliant and within the same frequency band. P25 will remain a strong and necessary component in the LMR space. At least one manufacturer plans next-generation (NG) P25 radios that will address dual-band requirements and is crucial to fire services nationally. Also look for the NG radios to have true narrowband technology operating at 6.25 kHz (not 6.25 kHz equivalent), which sets the stage to meet present and future FCC mandates.

LMR mobile and portable radios also are very much linked to other elements of fire service design. Presently, there is connectivity directly to the portable radios with self-contained breathing apparatus (SCBA) facepieces (wired and wireless) and apparatus intercom systems (wired and wireless), to name two. Remote microphones (wired and wireless) also have much improved the issues of radio/voice intelligibility in noise environments and better communications when operating in fully encapsulated hazmat suits. This provides more clarity when communicating over LMR systems.

LMR also interfaces directly with computer-aided dispatch (CAD) systems, fire station alerting systems and dispatch alerting consoles, devices and software. Several LMR manufacturers have been

working on this and some promising advances have been made in firefighter location technology incorporated into LMR radios/portables to help in the area of firefighter accountability and safety.

Over time, we tend to see what is considered old reinvented into a new and more powerful tool. That is also true with voice pager technology, which continues to be critical to alerting personnel and stations for response. Voice pagers are more ruggedized and now capable of being water and dust resistant. Water and dust are among the major causes of pager failure. There is also significantly more storage of voice/text messages. These new pagers also include more versatile programming and scanning than ever before.

Progress continues

While this device evolution is impressive, it does not stop there. This new-generation pager also interfaces with cellular network and can communicate as to response status. Bluetooth connectivity is also incorporated into this new and exciting design. As for the future of voice pagers, the planned evolution is to produce digital voice pagers that will include all of these functions and also operate on the 700- and 800-MHz frequency bands. This will likely be a game changer for many departments that have had to maintain analog voice paging and may be able to save significant funds because the duplicative system may be eliminated.

There are also radio gateways that enable patching disparate radio systems and channels to achieve effective communications. This is one cost-effective way to patch these networks and enhance mutual aid. It does, however, require the use of multiple talk groups on disparate radio systems to achieve this interoperability. Radio gateways are now capable of also interfacing data in the form of information, video streaming and working over commercial wireless networks.

Another element of LMR is that of multi-band radios that have been designed to be programmable on different radio spectrum bands (different frequencies). This programming feature adds a huge interoperability capability for many different radio systems. For agencies that do a great deal of interaction with different LMR systems, this is one affordable

solution and there are a number of manufacturers producing multi-band radios.

On the broadband front, there is a body called The 3rd Generation Partnership Project (3GPP), which unites six telecommunications standard development organizations and provides a stable environment to produce the highly successful reports and specifications that define global 3GPP technology standard. The 3GPP has set a priority to develop a

standard for Talk/Simplex functionality for 4G LTE broadband with hopes that one day there will be a Simplex capability on broadband devices.

In the future, the requirements for broadband mission-critical voice may be achieved, but until then LMR remains the solid solution. For this reason, localities must not only maintain their present LMR systems, but must plan to replace their LMR infrastructure and radios. ■



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What's Next?

The future of public safety communications

This is an exciting time, as technology continues to change dramatically and provide capabilities that we would only have dreamed of several years ago.

The most dramatic technology evolution that will unfold is in the area of wireless broadband. The fire service has already seen many exciting device technology advances, including a plethora of applications (apps) that are presently used over the commercial wireless networks.

In 2012, legislation established a Nationwide Public Safety Broadband Network (FirstNet). FirstNet is the promise toward the development and implementation of a broadband wireless network that will support mission critical data across the United States to include both rural and urban communities. This data will take the form of information, video, automatic vehicle location and routing (GPS), firefighter location and accountability, situational awareness, geospatial data and even Voice/Radio over Internet Protocol (VoIP and RoIP) and more.

The major difference between this future network and present commercial wireless networks is that it will be designed to meet public safety requirements. These requirements include coverage, priority, redundancy, reliability, resilience and capacity control.

As this public safety wireless Long Term Evolution (LTE) network is being built, device technology and public safety apps are also in development. Some manufacturers are already coming out with LTE prototype broadband devices. A network of this design will promote some of the most significant communications technology enhancements in decades.

This new expanse of broadband will create a "connected public safety environment" where people, vehicles, equipment, fire stations and a vast amount of

information and functionality will all be connected. Fire departments across the country will be able to change what information is accessed and shared. The ability to visualize where all personnel and vehicles are located will be a huge improvement for departments across the country.

The future communications network will be designed to meet public safety requirements, including coverage, priority, redundancy, reliability, resilience and capacity control.

Prior to broadband and GPS, the ability to implement automatic vehicle location (AVL) and response routing would have been cost prohibitive. Imagine information such as command and control that can be manipulated from a computer, tablet and/or smartphone that automatically inventories the units responding, units on scene along with personnel tactical assignments and accountability. Remote monitoring devices will be able to easily and quickly be set up for hazardous material incident monitoring and video streaming that can share information directly from facilities prior to arrival or upon arrival about conditions within the facility in real time.

Another high probability is a comprehensive monitoring capability that

views firefighter vital signs, self-contained breathing apparatus (SCBA) operation and air levels, apparatus operations and thermal imaging camera streaming video of firefighters operating in a hazardous environment in one central place or multiple locations simultaneously. The incident commander can "see" what an interior firefighter is seeing, which will help to understand the conditions, temperatures and hazards the firefighter is facing.

There are also ongoing discussions regarding Next-Generation 911 (NG911) with a vision toward links to FirstNet which may permit new ways to share information directly from the 911 caller to the responder in the form of images and videos. A dramatic difference is that this connectivity will create more collaborative opportunities with and between all public safety disciplines and the various levels of government. Information will be comprehensively available to the incident commander, emergency manager and emergency operations center.

Until FirstNet is operational, organizations can take steps to prepare:

- Visit the website <http://www.ntia.doc.gov/category/firstnet>
- Follow broadband network and device discussions at http://www.psc.gov/projects/broadband/700mhz/broadband_about.php
- Learn more about the broadband standards and requirements work being done by the National Public Safety Telecommunications Council (NPSTC) at the website http://www.psc.gov/projects/broadband/700mhz/broadband_about.php

To learn more about public safety apps that are already available, visit APCO International's App website at <http://appcomm.org>. You can also submit apps if you know of some that are not currently listed. ■

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