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Use of FirstNet Broadband Devices to Interoperate with ALMR

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Alaska, like the other states and territories, is in the early stages of access for public safety agencies to the National Public Safety Broadband Network (NPSBN), known as the First Responder Network Authority (FirstNet). Numerous vendors are, or soon will be, offering solutions to Alaska public safety agencies to include purpose-built, ruggedized, broadband devices and/or push-to-talk (PTT) apps that enable broadband (cell) phones on FirstNet to interoperate with land mobile radio systems, such as the Alaska Land Mobile Radio (ALMR) Communication System.

Although technically feasible, the impact of allowing cell phones on FirstNet to interoperate with ALMR is unknown and is the subject of research and discussion by the ALMR System Management Office (SMO) and Operations Management Office (OMO) with the System owners. Without a doubt, the availability of FirstNet technology to ALMR agencies for data, real-time video, etc., will be very beneficial. However, we first need to understand the

system impacts and operational implications that the use of the voice PTT capabilities could have on both the System infrastructure and on user operations to ensure a successful implementation of this capability without causing detrimental impacts.

There are currently efforts underway to test and evaluate PTT services integrated into ALMR radio communications. Due to the unknown impact of PTT capabilities on the System, any ALMR member agency contemplating the implementation of broadband PTT devices/applications **must** coordinate with the SMO and/or OMO **prior** to any effort to utilize PTT to interoperate with ALMR.

Please contact our offices if you have any questions, interests or concerns about this PTT capability and how it can be integrated into our ALMR system.

(Article by Mr. Del Smith, ALMR Operations Manager)

Land Mobile Radio and FirstNet

Unfortunately, there is still a lot of confusion out in public safety and elected-official land about the future of land mobile radio (LMR) as FirstNet is deployed. It seems there is an issue of spreading the word, not so much to the public safety community, but to IT departments and elected and appointed officials responsible for the budgets, both capital expenditures and operational expenditures, that fund LMR systems.

It is no wonder some people are confused, since we keep seeing comments, press releases and experts talking about how soon mission-critical push-to-talk (MCPTT) is coming to FirstNet. The more the experts talk about the technology issues with MCPTT, the more they seem to be losing sight of the fact that the technology over the network is only part of the issue. If the network itself is not mission critical, then PTT over the network cannot be mis-

sion-critical, even if it is called "Mission Critical PTT."

In reality, the terms "mission-critical" or "public safety grade" are misnomers since, with LMR systems, this refers to the ability for the LMR system to degrade from its fully operational status to several levels of fallback during major storms. Therefore, it is vitally important that those in government, who make decisions about funding LMR radio systems, upgrading them and keeping them running and operational, understand the dilemma the standards body, labs and pro-MCPTT folks have created for the public safety community. There have been instances where public safety officials are presenting their next year's budget and they are questioned by the budget committee about why public safety still needs to invest in LMR technology. (continued on page 2)

Land Mobile Radio and FirstNet (continued from page 1)

They simply do not seem to understand that public safety responders bet their lives every day on their communications systems.

Differences between LMR and Cellular

LMR radios have been used in public safety since the 1930s. They started out as one-way to the vehicle and then two-way. Simplex (off-network) was the first type of push-to-talk used and as LMR advanced, the premise of simplex was always a part of radio system designs.

When handhelds were first deployed they did not have the same range as high-power mobiles, so we started using multiple receivers spread out in the repeaters' coverage areas. Next up was transmitter steering or the use of multiple transmitters to increase coverage and they were "voted" on depending on where the user was located.

Through all this, simplex or off-network was always part of the design. After that, we went to simulcast systems where multiple transmitters were turned on at the same time to cover broader areas without having to change transmitters.

The current state of the art for LMR is similar to cellular systems and is called "trunked radio." These are multiple radio sites with multiple channels all controlled by a back-end smart system. Some of these systems are analog and some are like ALMR digital P25 systems. There are various types of trunked systems today, but the most common use 5, 10, 15, or 20 channels at a site. This technology has enabled a much larger number of field units to share the same radio system and since the groups are defined and independent from each other, some systems include police, fire, EMS, public works, and other city or county agencies. ALMR and AWARN, for example, have Department of Defense, Federal Non-DOD, State of Alaska, local government, volunteer public safety and tribal agencies on them. These networks were designed with degradation capabilities, moving them from trunked systems to repeaters, if the system back-end fails. Push-to-talk off-network is still a vital part of these systems because it is used heavily between units at a scene to penetrate buildings, and because when a system fails completely, simplex communication survives.

Cellular and Broadband

Cellular systems were first deployed in the United States in 1973. They were analog and channelized. The difference with cellular is that each site had many channels and other sites surrounding a site were on different channels. Once we reached third-generation cellular, the idea of individual channels went away, and in fourth-generation technology the competing 2G and 3G technologies were replaced with a common worldwide standard known as Long-Term Evolution (LTE).

LTE can make use of a host of different amounts of frequencies, and even frequencies in different bands can now be aggregated to provide more bandwidth. Making use of LTE for voice meant voice had to be converted from analog to digital IP packets. However, unlike data packets that can arrive at the receiving end in a different

order and be shuffled into the right order, voice LTE packets must arrive in an ordered sequence. Therefore, LTE gives voice over LTE a priority status on the network. Adding PTT over LTE is, again, the art of converting the spoken audio to digital IP packets and sending them to the receiving end or ends, since PTT can be sent one-on-one the same as dial-up voice, or it can also be sent to groups of users, so they all hear the transmission at one time.

The takeaway here should be that from the beginning, simplex was what enabled LMR systems to operate, and it is still a vital part of the architecture, while PTT over LTE is a bolt-on, packet-based technology that is treated as simply more packets over the network. It's important to understand the difference in the way PTT is handled over LTE, versus LMR and how off-network PTT can be implemented, if ever. The glaring issue with LTE is that the transmit and receive side are so far from each other that you would have to add a second receiver or transmitter to the device and then increase the power to a few watts, which would drain a handheld's battery in hours.

Conclusion

FirstNet may not ever become the only public safety network. It is possible because technologies are moving at a faster and faster pace, but there is a lot of work to do and it is not at all helpful for the technical folks to make blanket claims about technologies that are not proven, or for which the standard has not been finalized and then extensively tested in the field. PTT over FirstNet will be used when the public safety community has tested it and trusts it - not when technologists say it is ready.

There are several reasons some are not convinced FirstNet should become the only public safety network. The first is the PTT issue, second is the current lack of redundancy and finally, having a single network means the network might be more vulnerable to interruptions, either by nature or malice. Let's move slowly with "mission-critical" PTT over LTE and get the appropriate applications and video services up and running. Let's make use of the various PTT over LTE systems already in the market and proven, tying them together for inoperability and connection to LMR systems. Let's get a handle on the training and day-to-day use issues, because they will change from what we now believe to be the case.

FirstNet is real. It is exciting to see it come to life, but we cannot afford to get ahead of ourselves from a technological point of view. Public safety needs to be 100 percent on board and comfortable with FirstNet. Even with users' smartphone experiences, FirstNet will still work differently and will require specialized training to be successful, and not simply tried and declared a failure because the public safety community's expectations were set too high in the beginning.

(Article taken from Public Safety Advocate: Public Safety Networks LMR and FirstNet Working Together, Andrew Seybold, December 7, 2017)

On-going Radio Problems Associated with Cloning and Setting Site Preferences

The January *Insider* included an article of a real-world incident and stressed the importance of subscriber maintenance by ALMR user agencies. At the time of that article, the System Management Office (SMO) staff had only been able to review the codeplug contained in one radio belonging to this particular agency. The review of that radio revealed substantial issues with the codeplug and frequency alignment. The radio was properly aligned by the System Manager and the agency was offered assistance in updating their codeplug. It was also discovered during the review of this particular incident, that the dispatch center and responders were on different incident command (IC) talkgroups and different Regional IC Zones for at least some of the transmissions.

The same agency contacted the SMO again in late February and reported they were still having issues with their radios. The ALMR SMO and State of Alaska personnel arranged to travel to the agency on February 27 to determine what the issues were with their radios, as the System appeared to be functioning correctly. Upon arrival, the agency had 12 of their radios available to be examined. Codeplugs for the radios were reviewed and each radio was connected to a service monitor to perform an "auto-tune" to ensure they were properly aligned for appropriate performance.

During the inspection and testing, it was discovered all of the radios were out of alignment and all but one was able to be realigned during the visit. The agency was advised the radio that would not align would need to be sent in for repair. Of those radios available for examination, one was configured as a conventional radio and not

capable of operating on the ALMR trunked system at all. During the subsequent review of the radios' codeplug programming, it was discovered that seven of the radios had the same ID. Multiple radios with the same ID cause confusion within the ALMR System when the ID affiliates on multiple sites. This results in missed and dropped calls, which is the exact issue the agency was reporting to the SMO. Programming for one of the radios also included a site preference for a site in Zone 2, although the agency is located in Zone 1. It is recommended agencies not select preferred sites as the System will automatically affiliate the radio to the closest site without user intervention.

A request was made to the agency to make their remaining radios available to be examined to ensure they are properly aligned and there are no additional duplicate IDs.

A continuing concern, on the part of the Operations Management Office (OMO) and SMO is that there are other agencies operating on the System with similar errors in their codeplugs, which happens most often when radios are cloned. Some agencies, due to cost concerns, are also less likely to have their radios aligned annually, as recommended not only by manufacturers, but also by the OMO and the SMO.

The SMO staff is available to review codeplugs for any agency on the System to help avoid these common errors. There are also multiple vendors listed on the ALMR website who can develop and install codeplugs, service agency radios and conduct alignment tests.

(Article by Mr. Del Smith, ALMR Operations Manager)

Replacement of Gold Elite Consoles Nears Completion

Projects involving the replacement of the 30-year old technology utilized in Gold Elite (GE) dispatch consoles by the State of Alaska (SOA) and several local agency dispatch centers, which was initiated in 2017, will be completed this year.

The current Alaska Land Mobile Radio (ALMR) System software platform is Motorola version 7.13. GE consoles directly connected to ALMR will not be able to operate on Motorola operating system software versions 7.14 and beyond. Continued use of GE consoles prevents ALMR from updating its software in order to take advantage of increased capabilities provided by advancing technology.

Agencies connecting to ALMR over the airwaves (RF) will continue to be able to utilize their GEs, but need to be aware that support and parts for the consoles will likely be difficult to find, or not available at all starting in 2018. A direct connection (IP) to the System, which MCC7100/7500 consoles provide, is required to take advantage of the many capabilities available from the

ALMR SmartZone P25 digital, wide area network.

A project is currently underway to remodel the Alaska State Troopers' (AST) Fairbanks Dispatch and replace the GE consoles with MCC7500 consoles. The SOA has previously completed installations of new MCC consoles at Goose Creek Correctional Center, Ketchikan AST Dispatch, the Department of Military and Veteran Affairs Emergency Operations Center and the Tudor Road Master site.

Under separate local government contracts, the City of Wasilla recently installed MCC7500 consoles in the MATCOM Dispatch Center. The City of Palmer and the City of Valdez will also be installing MCC7500s in their dispatch centers. Previously, MCC7500 consoles were installed by the City of Fairbanks and by the Kenai Peninsula Borough.

(Article by Mr. Del Smith, ALMR Operations Manager)

Broadband Complements ALMR System

ALMR was designed and implemented to establish and maintain communications connectivity for interoperable, secure, on-demand and in-real-time communications supporting the National Incident Management System (NIMS). This designed protocol uses trunked radio technology and employs a gateway approach for the integration of conventional and other disparate voice and data systems, including broadband.

Since System implementation, technologies to enhance and extend the reach and capabilities of ALMR have become available and may help improve day-to-day and emergency communications in Alaska.

There are several options currently available to agencies for broadband voice and data, which can complement the ALMR System. They include the NPSBN (FirstNet by AT&T) and push-to-talk (PTT) applications such as Motorola's WAVE radio over internet protocol (ROIP), Kodiak Broadband

and ESCHAT, which are available now, and more applications will likely become available in the future.

As new capabilities are implemented, with the goal of enhancing and supplementing the System, all agencies need to be mindful of the possible impact to the System and to other users and any requirements to get approval ahead of time.

It is also important to keep in mind, as these additional technologies are employed, that ALMR Incident Command System (ICS) communications protocols, which are critical to any incident response success, must be adhered to and support the exact composition of a unified command organizational structure, when needed. Therefore, any broadband use by agencies must be implemented in a way that does not negatively impact ALMR System performance.

(Article by Mr. Del Smith, Operations Manager)

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Did You Know?

Radios should be programmed with all interoperable zones, if capacity supports it. Interoperable zones include Statewide Incident Command (IC), Regional IC (A-F) and the OP Zone. The Statewide IC Zone and agency's Regional IC Zone should be programmed, at a minimum. During specific events, responders can go to the Regional HAIL channel and request the monitoring dispatch center direct them to the appropriate channel for the event. (Radio Usage and Transmission Protocols Procedure 300-6)

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