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Tues May 13, 2014
The Politics of Mission-Critical Voice

When I left FirstNet in December of 2013, the general manager and others had agreed with me that voice on the Nationwide Public Safety Broadband Network (NPSBN) would have to wait until it was a proven technology and until data/video broadband capabilities had been implemented. I was happy with this approach. It meant that investment in LMR voice systems would continue and FirstNet would have an opportunity to determine system loading for data and video, and how much capacity might be available on the spectrum to share with partners and to add Voice over LTE (VoLTE).

The Public Safety Communications Research (PSCR) folks in Boulder, Colo. are working with the LTE standards body (3GPP), which has been working on the addition of a specification to the 3GPP LTE standard to support Mission-Critical Voice (MCV) over LTE, and to come up with a standard for off-network voice and data communications (simplex, tactical, peer-to-peer communications). But the Public Safety community agreed that the most important function of the new LTE network would be to provide access to data and video and VoLTE would be added at some point. They also agreed that LMR voice systems, which are the lifeline of the first responder community, would be around for a long time to come.

Now it seems Voice over LTE hype is back in full swing. At the recent APCO event, apparently the word was that the 3GPP will add mission-critical voice to the standards by 2018, so 2018 is when it will be available for FirstNet. I have several problems with this, and that is why I am writing this article.

Looking at the non-political aspects of mission-critical voice over LTE, there are a number of issues:

1) Before we can deploy mission-critical voice there must be administrative voice services available in order to test the network and make sure voice works when it is needed.

2) Mission-critical voice is just that, mission-critical or Public Safety grade. Voice is the first and last lifeline for Public Safety and it MUST work all of the time, every time. Once it does become available on the LTE network, devices must be enabled and there must be extensive testing and verification before it is deemed ready for full-scale deployment.

3) To provide mission-critical voice, the FirstNet network MUST provide the same or better
coverage than the existing Land Mobile Radio (LMR) systems today. This is a tall order, especially
given the fact that FirstNet only has $7 billion and no partners to date, and the cost of a network
to match the coverage of today’s Public Safety LMR voice systems could cost upwards of $15
billion to $25 billion or more.

4) Mission-critical voice must provide inbuilding coverage and there must be a fallback in case
of network failure. Today LTE has no fallback mode. If a cell site or a group of cell sites are out of
service, the LTE devices cannot communicate. With today’s LMR systems there is at least one
fallback mode—simplex or device-to-device communications—and many LMR networks offer
several levels of what I call graceful degradation. Until LTE can provide truly robust off-network
voice it cannot be considered as mission-critical in any sense of the word.

5) I am told by some very talented LTE vendor engineers and engineers at the major
commercial networks that adding voice to an LTE network requires additional resources to be
deployed within the network in terms of back-end infrastructure and additional cell sites. This all
comes at a cost and needs to be weighed against the anticipated benefits.

6) There must be a common air interface standard. Today, Push-To-Talk (PTT) over LTE is
available from the three largest U.S. network operators and a score of other players that offer
cross-network PTT services. Some of these systems work pretty well and are being used today
for non-mission-critical PTT. Further, many of these PTT solutions are being deployed with an IP
bridge between the commercial network and LMR systems in order to provide communications to
and from the LMR systems. However, no one standard has emerged and, in fact, none of the
solutions I have tested and used are compatible with PTT services offered by others. It would
create severe interoperability issues if either administrative or mission-critical PTT were
permitted on the NPSBN before there is a fully defined, approved, and well tested industry
standard for PTT. This is what the 3GPP is working on but there could be significant differences
between the vision of a standards organization made up of commercial vendors and network
operators and the actual requirements of the Public Safety community.

7) Mission-critical voice must be able to support true dispatch capability, in many cases, with
multiple zones to mimic the LMR systems in major cities that are broken into zones or districts,
usually with one of more citywide voice capabilities. Today this is accomplished using different
LMR channels or with different talk groups in an LMR trunked radio system but this capability
needs to be built into any LTE mission-critical voice system.

8) Other capabilities that must be provided for include talk groups that can be pre-defined or
defined on the fly and multiple talk groups made up of different members. Finally, off-network
voice, which is critical for Public Safety, must be robust, easy-to-use, and capable of being used
while units are still within network coverage as well as when they are outside the LTE coverage
area.

9) There are more capabilities that are required but to me the final test for any PTT
technology or system is how quickly a user can talk on the system after pushing a PTT button,
and how soon the others listening to that “channel” receive that transmission. My test for a PTT
system is still the same one I have been using for years—push the button and say, “Don’t
shoot,” and make sure the first word is not lost due to system timing.

10) Public Safety cannot tolerate any delay in voice communications. The idea of pushing the
PTT button and waiting for a “beep” in order to talk is probably okay since that is how many of
today’s LMR trunked systems operate. However, what is NOT acceptable is hearing a system
busy tone—EVER!

11) PTT MUST be a one-handed operation. Today on many of the commercial PTT systems if
you are using a smartphone you have to hold the phone in one hand and “push” a button on the touchscreen. This is totally unacceptable for Public Safety.

I am sure that given time each and every one of these issues can be successfully addressed for voice over LTE—but in what timeframe? If a standard is developed by 3GPP or some other standards body it must be vetted by both the Public Safety community and equipment vendors, then it must be tested, tested, and tested again. Then beta testing must be performed on the live network not for a few days but for months to ensure that all of the required features and functions are included and do, in fact, operate as intended. My guess is that the entire process from release of a version of LTE that supports mission-critical voice to initial beta deployment will take several years, which means the 2018 date being bandied around the Public Safety community is not realistic.

Leaving the Technology for the Politics

My other concerns are that while the technologists and the standards bodies work toward the goal of mission-critical voice over LTE, they must keep in mind the political ramifications of any statements about the date this technology will be ready. I am reminded of the long road that was taken in bringing P25 digital voice to market and then standardized across networks. P25 was years in the making, taking more than 10 years to bring really robust P25 systems and equipment to market. Deadline after deadline was missed, time and time again. The technologists and standards group were far too optimistic about timing and as a result, many analog systems were left in place years longer than they should have been with few if any upgrades.

We cannot let the same thing happen with mission-critical voice over LTE. Not only is the Public Safety community watching, elected officials on a local level are watching. When they hear a date such as 2018, which is only 4 years away, they are less inclined than ever to approve needed funding for upgrading or building LMR systems. When I talk with Public Safety communications people and law, fire, and EMS responders I am hearing that it is becoming more and more difficult to convince the non-technology savvy elected officials that LMR systems are not antiquated and no longer need to be supported to optimum levels.

This also goes beyond the local level. When the Public Safety Alliance (PSA) walked the halls of Congress to seek the 700-MHz D Block for Public Safety broadband, they soon found that in order to convince Congress to move forward Public Safety would have to give back something in return. This turned out to be the T-Band or the 470-512 MHz spectrum used heavily in eleven major cities and their surrounding areas. This giveback is scheduled for 2022. NPSTC filed a great document with the FCC last year on what it would cost to replace the T-Band in these eleven metro areas and found the cost is huge AND there may not be any other spectrum available for use.

I believe the Public Safety community will launch a campaign to try to reverse the T-Band giveback. The timing will probably be after the November elections and at the start of the year when the new Congress is seated. The NPSTC report will go a long way toward helping this cause but if the Congressional staffers have heard that by 2018 mission-critical voice will be available over FirstNet, they will be much less inclined to listen to the pleas of the Public Safety community regarding the T-Band.

Taking this to the next level, Congress is focused on auctioning spectrum and paying off the national debt. The biggest obstacle faced by the PSA while working with Congress was that auctioning the D Block would have resulted in the reduction of the national debt by almost $3 billion. Never mind that at that point the national debt was growing at $4.5 billion per day! So spectrum to Congress is about money, plain and simple. They do not know what portion of the
spectrum might or might not be good for broadband services, they only know two things: Spectrum can be easily turned into cash and broadband is the only way to move forward.

These beliefs put all of Public Safety’s existing LMR spectrum at risk. If FirstNet does not deliver, that could mean the Public Safety broadband spectrum is also at risk. Let’s do some math. The D Block, which is 5 MHz by 5 MHz, has been paired with the 5X5 Public Safety spectrum for a 10X10 nationwide footprint. Verizon paid well over $10 billion for its 11X11 allocation next to FirstNet. With the demand for broadband services, my guess is that the Public Safety spectrum is now worth $12 billion at auction. Now add to that the $7 billion from the auctions that has been allocated to fund FirstNet and you are looking at a total of $19 billion to $20 billion that could be put into the U.S. Treasury.

Depending on how the elections in November turn out, the Public Safety community could find the eyes of Congress upon it. Many within Congress don’t understand why Public Safety cannot simply make use of the commercial networks that are already built out and ready. Therefore, the most significant issue I have with throwing a date out for when mission-critical voice will be ready for FirstNet adoption is that technologists are oftentimes too optimistic about when a technology will be ready for prime time. Since spectrum is not about technology for Congress and is about money, putting a 2018 date out there is dangerous to the Public Safety community.

Let’s try to be realistic. Commercial dial-up voice over LTE has been delayed for more than two years and is still not a reality. Mission-critical voice is a lot tougher than simple dial-up voice over LTE. Delays are a way of life in the world of wireless. All of the pieces have to fit together and come together. Voice is the MOST important communications tool for first responders. Data and video will certainly be welcomed and will augment voice but at the end of the day, voice will continue to be the communications workhorse of Public Safety. If we don’t get it right and make sure it is right it will cost lives. Let’s get the data and video portion of the network in place and THEN revisit the issue of voice. Dates are certain in only one way: They will certainly come back to haunt us all.

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