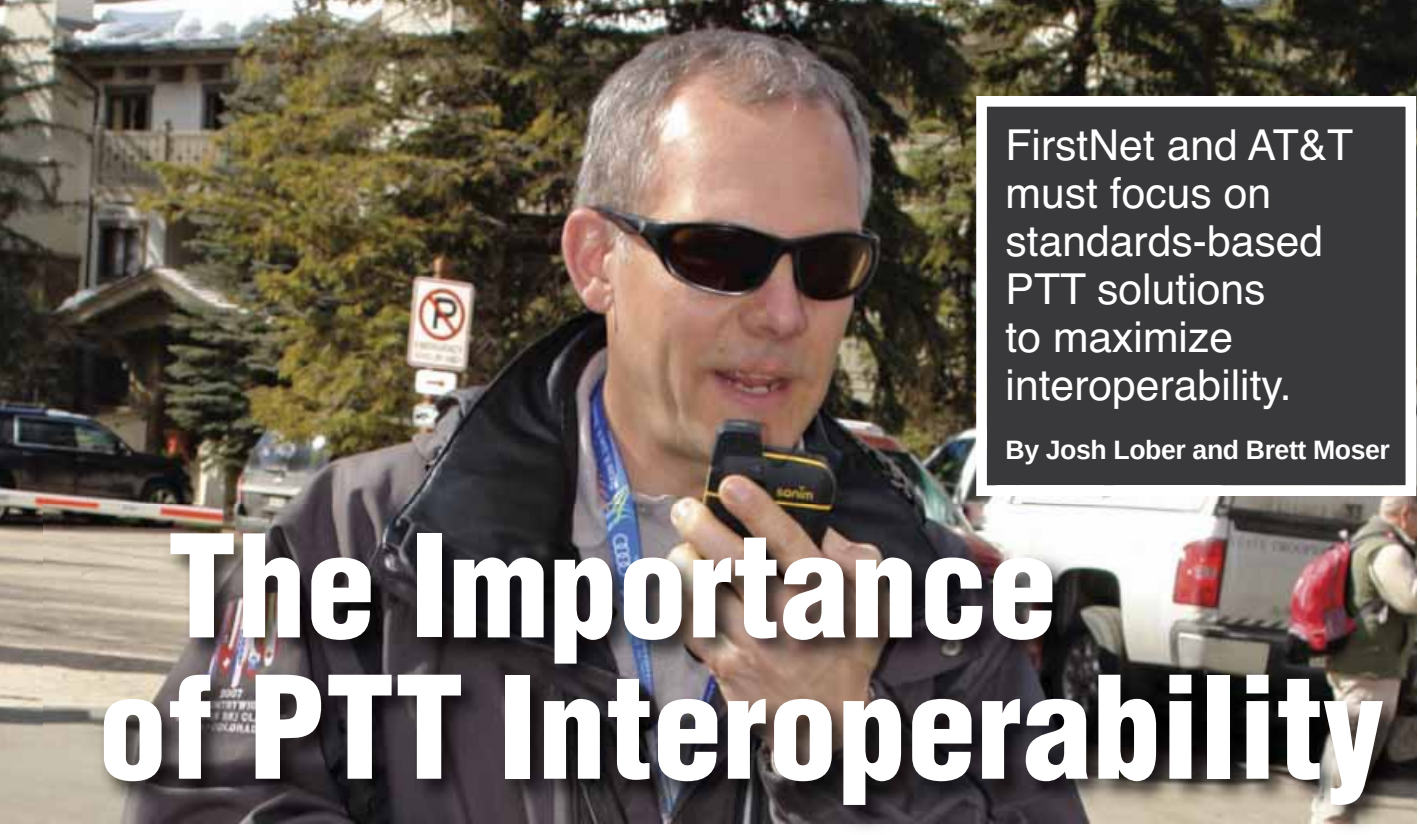


FirstNet and AT&T must focus on standards-based PTT solutions to maximize interoperability.

By Josh Lober and Brett Moser

The Importance of PTT Interoperability

Photo courtesy Josh Lober

In this post-award era of the First Responder Network Authority (FirstNet), the objective has switched from selling the concept to selling the product. AT&T's quick-to-market approach offers advantages over waiting to build a band 14 network. FirstNet service will be available in early 2018 using AT&T's modified commercial network. Quality of service, priority and pre-emption (QPP) will be available to public safety with all applications on FirstNet subscriber devices.

Push to talk (PTT) over cellular (PoC) is likely the greatest benefactor of indiscriminate QPP. However, what will happen when PoC vendors deploy their solutions on FirstNet? Will this create new interoperability issues, or can existing technology provide interoperability across all PoC solutions?

The Third Generation Partnership Project (3GPP) developed a specification for mission-critical push to talk (MCPTT) over LTE as a migration path for public-safety LMR users that transition to FirstNet. 3GPP developed the specification to ensure that performance and features would meet the needs of first responders and to provide open standards that prevent a single vendor from monopolizing the MCPTT market.

FirstNet's approach to PoC is that "public safety will rely on LMR for mission-critical voice until LTE capabilities exceed current functionality," FirstNet President T.J. Kennedy said in 2014. In practice, however, public safety has found great value in carrier-integrated and over-the-top PoC solutions because it has a broad range of missions. Mission support, undercover, LMR capacity reduction and LMR coverage extension are a few of the reasons that public safety uses PoC. People continue to advocate the use of traditional LMR for mission-critical communications. MCPTT will become a viable alternative when the LTE networks, MCPTT service and PTT devices provide the features and reliability of LMR solutions.

After years of planning and expectations that FirstNet would operate across a nationwide, dedicated and contiguous block of band 14 LTE spectrum, the industry is now refactoring as AT&T and FirstNet release each new piece of information. The pillars that differentiate MCPTT from PoC offerings will likely be multicast, direct mode and intervendor interoperability. AT&T's new deployment model provides the benefit of bringing FirstNet service to market quickly; however, features are lost in the exchange.

Multicast. AT&T's commercial LTE network, similar to all commercial cellular networks, is tuned to provide the best service for all subscribers, from near cell to cell edge. This tuning is in contrast to that required for multicast, one of the differentiating pillars of MCPTT. It was understood that the band 14 network would be tuned for multicast; otherwise, MCPTT could never support the user capacity to replace LMR. AT&T will likely overlay band 14 in urban areas to provide the necessary capacity for MCPTT.

Direct Mode. Proximity services (ProSe) is MCPTT's specified direct-mode architecture. As MCPTT relates to the front-line first responder, direct mode is the single most critical piece to protect life safety. Based on published reports, ProSe will not fulfill the direct-mode requirement of the first responder community. Some

vendors are planning the use of LMR technologies as a hybrid direct-mode solution. However, without standardization of direct mode, there is a risk of new incompatibilities.

QPP. AT&T's initial offering will include indiscriminate QPP, fulfilling one of FirstNet's key objectives in providing public-safety users the ability to use their applications of choice. This initial rollout will benefit all applications, including PoC, video streaming, location, database services and others.

Without multicast and direct mode, and with QPP available to all applications, public-safety agencies are likely to increase their use of PoC until the LTE network is hardened and all the features defined in the MCPTT specification become available.

The Business Case for MCPTT

The 3GPP MCPTT specification defines a common air interface (CAI), a move that ensures public safety will not be locked into a single vendor solution, even if AT&T standardizes on a single MCPTT application server (AS). The CAI provides the blueprint for third-party vendors to create alternative MCPTT-compliant applications. These applications could include enhanced vertical features such as location and messaging, new user interface alternatives and workflow management.

What AT&T has not shared with the PoC community is the business case for accessing the MCPTT AS. A best-case scenario would allow third-party MCPTT vendors access to the MCPTT AS as part of the base FirstNet service offering. A worst case scenario would view third-party MCPTT products as additions to AT&T's primary MCPTT solution. Financial barriers from this approach would discourage market competition and increase costs to the first responder community.

Interoperability Applied to PoC

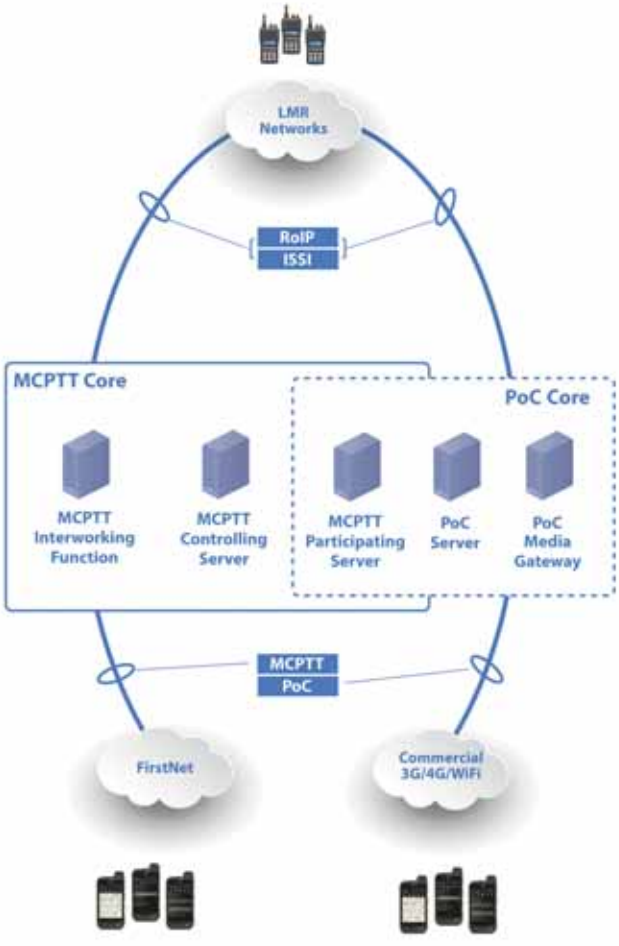
Technologies created to facilitate

The pillars that differentiate MCPTT from PoC offerings will likely be multicast, direct mode and intervendor interoperability.

LMR-to-LMR interoperability have also been used to provide PoC-to-LMR interoperability. The lineage of interoperability started with radio over IP (RoIP) and was augmented by the bridging system interface (BSI). Today, the Project 25 (P25) Inter RF Subsystem Interface (ISSI) provides the best option for multisystem interoperability.

RoIP. RoIP solutions have been successfully deployed throughout the

PTT Interoperability



world, interconnecting remote and disparate LMR radio networks. PoC vendors have integrated with RoIP systems to bridge their cellular and Wi-Fi PoC systems to the LMR world. RoIP provides a low-cost and highly reliable solution that meets the basic needs for PoC-to-LMR interoperability. RoIP gateways can be connected to PoC servers that are hosted locally or in the cloud. Gateway configuration is simple and a primary reason RoIP has found long-term market success. With a handful of RoIP gateways to choose from, the installed base is dominated by JPS Interoperability Solutions. It's difficult to find a public-safety agency that does not have JPS ACU gateways. Other manufacturers offer a new twist on RoIP. For example, Mutualink recently demonstrated multivendor PoC interoperability using its Interoperable Response and Preparedness (IRAPP) platform.

BSI. The BSI includes incremental functionality over RoIP. The specification includes two sets of requirements identified as core and enhanced. The core requirements provide for common methods of initiation and setup interoperability between legacy and proprietary LMR systems, while the enhanced requirements bridge the gap between simple RoIP and enhanced PTT systems integration offered by P25 ISSI. While a lot of effort went into the study of the requirements, the standard was never fully realized. Fortunately, knowledge gleaned from that work is being incorporated in requirements work being undertaken by the National Public Safety Telecommunications Council (NPSTC). Two key goals of the protocol are notable: Make use of existing standards and avoid any proprietary extensions to these standards.

ISSI. The simplicity of RoIP and BSI make them ideal for basic PoC and LMR interoperability. However, they are limited in features as they only support group calling and without the capability to pass device IDs across the networks. Advanced protocols are available for full-featured interoperability. These protocols also support group calling, as well as provide additional support for private calling, emergency group calling and passing device IDs across networks. For P25 trunking systems, ISSI is the internetworking protocol. Originally created to provide interoperability across multivendor P25 networks, a number of PoC vendors have adopted the ISSI interface. PoC solutions that use ISSI include Motorola Solutions' Kodiak PTT, Harris' BeOn, ESChat and their licensees. A PoC network connected to P25 via ISSI simply appears as if it were another P25 network. Device IDs and talkgroups are assigned from the P25 RF Subsystem (RFSS). The PoC devices are subordinate to the P25 RFSS and adhere to all priority and pre-emption rules. Additionally, all communications between a PoC device and a Console Subsystem Interface (CSSI)-connected console is fully transparent to the dispatcher.

Though vendors added ISSI to connect PoC products to P25 networks, ISSI can also be used to interconnect PoC networks. In this model, existing PoC solutions, whether carrier integrated or over the top, are capable of full-featured interoperability using standards-based protocols.

MCPTT as an Open Standard

The MCPTT specification was written to provide open and interoperable interfaces at various levels of functionality. Open interfaces that define the communications between MCPTT clients and MCPTT servers, between multiple MCPTT servers, and between MCPTT servers and existing LMR systems exist in the standard or are actively being worked on. To foster innovation and prevent public safety from being locked into a single vendor, all three of these interface points must remain open and accessible to vendors.

MCPTT Server Functions. The MCPTT server functions identified by the specification have well-defined interface boundaries. These boundaries allow for scalability, redundancy and vendor diversity inside the MCPTT solution

ecosystem. Not all MCPTT server functions must be provided by the same vendor, nor must they all be controlled by the same entity. The split between these MCPTT server functions allows for existing PoC vendors to implement MCPTT server interfaces to allow interoperability directly between MCPTT and existing PoC solutions. This option provides for interoperability not only between different forms of PoC but also allows agencies to operate on other LTE networks in addition to FirstNet.

MCPTT Interworking Function. As part of the development of the MCPTT specification, 3GPP identified key requirements for interoperability with existing LMR systems. The focus of these requirements is based on the P25 and TETRA standards but are not necessarily limited to those. In general, PTT interoperability standards look similar whether applied to traditional LMR or PoC systems. It should be a straightforward modification to make an existing PoC system that interfaces with P25 via ISSI interface with MCPTT over the MCPTT interworking function being developed by 3GPP. The MCPTT interworking function, though intended for LTE to non-LTE network interoperability, provides yet another avenue to interface existing PoC systems into the MCPTT ecosystem.

A best-case scenario would allow third-party MCPTT vendors access to the MCPTT application server as part of the base FirstNet service offering.

The wisdom of implementing standards-based MCPTT and interoperability solutions goes without question. What remains are questions of whether FirstNet's solution will adhere to the MCPTT specification and whether all interfaces will be both compliant and exposed for access by all solution vendors.

Public-safety agencies select communications products that best suit their needs. It is the responsibility of FirstNet, AT&T and vendors to guarantee that interoperability exists between MCPTT and PoC products. The public-safety community must remain vigilant and be the driving force to ensure the standards define solutions that meet all of their needs. ■

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