Interoperability and FirstNet

What interoperability means

The definition of interoperability in the FirstNet era is difficult to nail down. To start with, it helps to first answer the question: Why was FirstNet created?

(1) To provide interoperable communications between first responders, *no matter what wireless system they are using or will use*. This answer describes a preference.

(2) To provide interoperable communications between first responders, *on a single nationwide system*. This answer describes the law.

The 2012 law that created FirstNet included only a few requirements for interoperability. The law required the FCC to appoint an Interoperability Board and directed that Board to define a minimum set of technical requirements for interoperability. These requirements would serve two purposes. First, they were required to be included in the RFP, which FirstNet did do. Second, they would be used by the FCC in fulfilling its requirement to approve/disapprove State opt-out plans. No state or territory opted out of the FirstNet/AT&T network.

In establishing the law, Congress operated under the premise that one of the key reasons first responders had inadequate interoperability was that they operated different radio systems on different frequency bands: land mobile radio (LMR) systems operated as islands. Congress wanted something better, more consistent and connected.

The logical conclusion was that a single network on a single frequency band (Band 14) dedicated to a single community would address this key problem. This did not happen. We still have first responder agencies planning to continue using different LMR systems on different frequency bands, primarily for voice communications. Technical advances, such as multi-band radios and network-interconnect capabilities, have begun to make LMR systems more interoperable with each other and with broadband Long Term Evolution (LTE) networks. In additional, multiple wireless broadband service providers are used by public safety entities. These broadband networks operate in different frequency bands and the future prospect for interoperating across these networks remains unclear.

What FirstNet is supposed to do

FirstNet must build and operate the Nationwide Public Safety Broadband Network (NPSBN). The objectives in the RFP were written to "ensure that the NPSBN operates as a nationwide interoperable network, guaranteeing seamless interoperability for each of the 56 states and territories." When FirstNet partnered with AT&T, and AT&T offered their nationwide LTE system to implement the NPSBN, they solved the nationwide interoperability issue. As soon as a subscriber device is approved by FirstNet, it is interoperable with every other FirstNet subscriber device anywhere in the AT&T service footprint.

Today, however, the word "interoperability" is used to describe a variety of technologies and services, including voice, data, applications, and systems. For example, interoperability among CAD/RMS vendor solutions only exists to a limited degree. On the other hand, a PSE or PSAP can deploy an application that works perfectly fine across FirstNet/AT&T and other carriers, with users accessing the application from either network.

What AT&T is supposed to do

AT&T must meet the terms of its FirstNet contract, which is not public. It should be safe to assume that requirements for interoperability are, at a minimum, the requirements in the law and in the RFP.

The RFP, Section J-3, describes requirements and recommendations for interoperability:

- <u>Requirements</u> for interoperability are specified in terms of the need to maintain compliance with evolving 3GPP standards, i.e., LTE.

- <u>Recommendations</u> for interoperability with LMR systems are specified in terms of the need to make IP-based voice services on the NPSBN interoperable with LMR voice services, especially with dispatch agencies; bidders were told that they may consider this a "future requirement".

- <u>Recommendations</u> for interoperability with other commercial LTE networks are specified in terms of the need to support roaming when and if IMS (IP Multimedia Subsystem) is used.

In other sections of the RFP, it is made clear: the NPSBN contractor has the requirement to have a <u>process</u> in place for any vendor, including itself, to demonstrate that the LTE side of any device, including an LMR/LTE device, is interoperable with the NPSBN.

The contract in its entirety may never become public. However, AT&T has disclosed much of the key elements of the contract. As they progress through the IOC milestones, we will learn more about the services they committed to offering. To date we have not seen any material departures from the RFP.

What AT&T is doing

It is important to understand that interoperability is not a "has it" or "doesn't have it" thing. It is a continuum across technologies and systems. AT&T will implement interoperability with LMR systems, starting with a P25 ISSI interconnect technology solution. In the future, it will offer Mission Critical Push To Talk (MCPTT) services based on 3GPP standards (as opposed to their proprietary Enhanced PTT service) that will move FirstNet services up the interoperability continuum. However, there are some functions/features that will interoperate between the NPSBN and LMR systems, and others that will not. First responder agencies will need to ask detailed questions to understand the full picture.

Note: It is important to understand that the phrase "mission critical" in LTE standards is <u>not</u> the same thing as "public-safety-grade." It's like the difference between "farm fresh" and "certified organic." One is a reassuring title, the other is a regulated certitude.

What about voice?

The reality in our FirstNet era is that there is no longer a single definition of voice. We might as well admit this and define voice in two ways. First, *incident voice* is a service with extremely high availability, delivered today by local, hardened, public-safety-grade LMR systems. Second, *admin voice* is a service with pretty good availability, delivered today by nationwide, respectably reliable LTE systems.

If the entire AT&T network were to be hardened to the same level as public-safety grade LMR networks, FirstNet voice service could be considered *incident voice.* But to date, FirstNet plans have not mentioned upgrading all the AT&T network to a public-safety-grade network.

Currently, for *admin voice*, subscribers to AT&T/FirstNet have several different voice services. First is standard telephone service, which does not differentiate between commercial and public safety users (other than WPS). Second is a PTT service via AT&T's EPTT offering. The EPTT service uses standardized network functions to optimize the user experience through appropriate GoS/QoS mechanisms. It can interoperate with basic functionality with LMR systems.

The arrival of LMR-LTE connections complicates things. It does allow local LMR users to communicate with people anywhere in the AT&T network, which greatly extends the range of communications, even during incidents. This begins to blur the distinction between *incident voice* capabilities and *admin voice* capabilities. Fast-moving technology from one industry is catching up with the tried-and-true technology of another industry.

What about data and apps?

It's easy to be confused by the industry squabbling about who is responsible for doing what. Much of the public contention has to do with key issues in public pronouncements:

1. *Priority and preemption should be available end to end, between any networks.*

2. *Any public safety application should be usable by any first responder on any network.*

3. *Apps and mission-critical services shall be as interoperable as 3GPP standards allow.*

To put it simply, (1) and (2) are Verizon's ideal preferences, and (3) is AT&T's actual responsibility.

In 2018, a FirstNet senior advisor, Bill Schrier, stated that most apps will be interoperable on any carrier, although "there will be some apps that won't work as well on other carriers. AT&T will make available APIs to interact with the network."

What should we do?

Focus on what is needed at your agency, not on what requirements or capabilities are being championed by various carriers.

1. Identify and quantify what your first responders need.

2. Talk to FirstNet/AT&T about what they can make happen now, and what they can make happen in the near future, to meet those needs.

What happened: interoperability and FirstNet

Year	Event	Note
2004	**9/11 Report**	Pointed out a variety of interoperability problems.
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2005	One nationwide LMR network or technology could make all voice interoperable.	industry view
2011	LTE is exploding: let's take advantage of that. And it will give us broadband data, too.	legislative view
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2012	**Middle Class Tax Relief and Job Creation Act**	Interoperability defined primarily as a requirement for opt-out state networks.
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2013	FirstNet is created.	
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2016	**FirstNet RFP**	Interoperability with LMR mentioned in requirement to list planned devices.
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	Winner gets 20 MHz of in-building spectrum nationwide, as well as $7 billion to spend.	huge opportunity
	↓	
2017	**FirstNet award to AT&T**	Contract is not public, so changes to requirements for interoperability are unknown.
	↓	
	The winning solution was not a new standalone LTE system for use only by public safety.	surprising result
	First responders are granted priority access to AT&T's augmented Radio Access Network, which interfaces with a standalone Core Network dedicated to FirstNet users.	External interoperability developed by AT&T appears to be mostly market based.