**Executive Summary:**

At the end of 2018, with the progress of FirstNet (built by AT&T) and the public safety offerings Verizon has been working on, we're confident first responders (on either network) will have the necessary priority and features where soon the network will not be a concern.  The network will just be the transport – it will just be there and expected. The important work of the public safety community will occur with the applications and how they interact (interoperate) with those they need to during daily chores to the extreme emergencies in the most extreme conditions.

Throughout the FirstNet project many different meanings of interoperability have been used.  Some think that just because you are on a LTE wireless network you have interoperability. Indeed the capability is there but only after you have exchanged numbers (business cards) with the individual(s) you wish to be interoperable with.  Also, each of the device manufactures have created their own dialer(voice), message(text), mail(email) or similar common set of apps that interoperate with other manufacture devices on any of the wireless carriers available (national, or local).

These interoperability amenities are all great, for the business & personal worlds, but now think of the public safety industry.  When first responders show up for mutual aid they often do not know each other's phone numbers, etc. When this happens they do not have time to be handing out business cards, shake hands and say "call, text or email if you need more information." This is the misstep to true interoperability on mobile broadband networks for public safety.

> *All public safety personnel should be able to immediately communicate, yet today this is not available by default on any mobile broadband network.*
>
> *Right now in SD, because everybody has access to the LMR system, they show up on scene, call in on a policy-established talkgroup, get the communication assignment for their discipline, and go to work. Done.*

**Background:**

First responders can't let technology drive how they do their jobs. Rather, they need to have technology enhance the way they work. Public Safety has spent 30+ years working to solve communications issues mostly in the Land Mobile Radio (LMR) technologies. We don't want to carry over existing communication issues into the LTE mobile broadband world. We need interoperability to provide *"the ability of emergency responders to communicate among jurisdictions, disciplines, frequency bands, and levels of government as needed and as authorized."*

We understand operational interoperability whereas a specific discipline uses their specific applications installed by all members of the agency. Having commercial applications available and installed doesn't matter if everybody doesn't have those same applications installed. What application (by default) is used when they respond and need to communicate with others? They all should be able to immediately communicate, yet today this is not available. Even if all the first responders are on the same network (including FirstNet, Sprint, T-Mobile, AT&T or Verizon) they still can't immediately communicate by default.

It is as if we have a need for the device manufactures and wireless carriers to provide an "Interoperability App" (Whatever that app is) by default for any first responder on their network – i.e. like every phone has a dialer/text/email built in. The first responder might never use the app but if they show up to help with "any" emergency incident (anywhere in the nation) they can launch this app (on any device) and have immediate interoperability with the incident commander. Of course all the permissions, security, and credentialing will need to be part of the discussion. But simply, if an incident commander knows you are there – and we all agree – you can now immediately communicate.

As first responders we get together to do table top exercises, actual emergency trainings, etc. and a major part of these events is always communications. However, Fire, EMT's, and Law Enforcement all use their own applications. Typically first responders use the app/application that coincides with their dispatch/PSAP (911 center) Computer Aided Dispatch (CAD) system, and then law enforcement, fire and EMT's have their own specific needs. During these table top exercises they can have discussions to determine what app they will use during these incidents. Who has final say on what the application is and who pays for the application? The local first responder community works together to practice and work with a specific plan to create operability – but what about statewide or nationwide?

> *Immediate Interoperability = Any media, Any Device, Any Network, Anytime*
> *(Radio[LMR], LTE, Voice, Video, Text, Data)*

**Cooperation and the Costs of Interoperability:**

You might be able to get everyone in a small county (or same entities within a PSAP) to use the same app. The problem with "forced" solutions will be cooperation and the expense. Who pays for it? Does a county or municipality pay for the solution including individual licenses for each of the first responders who need it? We cannot force a volunteer to purchase an app. While most responders are passionate about what they do – they already donate enough time – to ask them for money directly out of their own pocket for an app is too much to ask. Especially when it is already hard to get responders to come into the public safety profession, we don't need to add expense as a barrier.

In South Dakota we need an enterprise solution (state-wide) that we can provide to all of our agencies and all responders at no cost or an extremely reasonable cost.  It will need to be available on any wireless carrier's network. Perhaps a solution paid for on the state level or some other economies of scale solution.  At this point we are first looking for the technical solution which does not seem to exist at this point – and if it does the expense is so out of line it quickly becomes a non-solution. **If it costs too much it is not a solution.** We appreciate the capabilities of some of the commercial applicaitons, but a free app with less capabilities (or single focused) and everyone on it would be far better than a great app with only a few on it.

**Overview of Existing Land Mobile Radio (LMR) Communications in South Dakota**
Right now every agency in the state has the capability to communicate on the statewide LMR system, immediately, without the need to deploy or set up anything. This system was put in place to provide capability in that Golden Hour (if you don't know what that is, you have no business in this discussion) to protect and provide for our citizens. Every PSAP has that capability, every state agency, most tribal governments use this system as primary, most federal agencies use the system as primary, this is the definition of "interoperability" in South Dakota.

Radio communications for public safety in South Dakota have been in use from the 1940's to present and is integral to the operations of those who protect and serve the public. During the 1970's to 1990's communication between state, local, tribal, and federal first responders had become fractured because of the lack of a modern infrastructure in the state. This lack of radio coordination resulted in interoperability issues between the different levels of first responders, becoming painfully apparent during disasters.

The Spencer tornado response of 1998 highlighted these communications difficulties, and eventually drove the introduction of HB1292 during the 1999 legislative session creating a single unified communications system for first responders.

In October of 2003 the system of 35 networked sites was made available for first responders. Over the past 14 years the system has grown to 54 sites utilized by around 20,000 state, local, tribal, and federal radios, with an average of over 2,000,000 calls per month. The technology underpinning the system is now 17 years old and components of the current operating platform will be out of support and will be updated by 2023. Our first responders and the industry in general agrees that first responders will continue to use voice delivered over an LMR system as the primary means of communication for that group for the foreseeable future.

A number of our class A cities have private LMR radio systems in place that are typically analog to help with local coverage in-buildings, etc.  Our larger cities have partnered with the state to expand the state radio capabilities within their city limits.  Typically during an event everyone utilizes the state radio system for interoperability with mutual aid agencies.

State technical staff has been engaged with bordering states for many years working on cross-border communications. State Radio technicians have been installing repeaters along the border which will enable at minimum dispatch to dispatch communications with the intent on improving unit to unit communications.

The States of Wyoming, Montana, North Dakota, Minnesota, and Iowa have all installed or are in the process of installing networks that would be compatible to the system upgrade being considered in South Dakota. Cross-border interaction of first responders in the Emergency Medical Service, fire, and law-enforcement disciplines is routine and better communications will only improve public safety. South Dakota currently has 281 ID's issued to border state first responders to improve interoperability.  We also have first responders from across the state participating in FEMA Region 8 working group on interoperable communications (RECCWG).

## Overview of Existing Wireless Data Networks Communications in South Dakota

Wireless data is becoming more commonplace across the state.  Mobile Data Terminals (MDT's) allow a statewide mobile data service that enables all law-enforcement field units to access data from the vehicle without interaction with a dispatch center.

Beyond the MDT's many other disciplines are utilizing mobile data networks including commercial carriers as well as FirstNet.  If they are not on FirstNet most are utilizing the priority services of the other commercial carrier, thus giving them the priority they need when responding.

Right now in South Dakota we know there are many mobile applications being used, tested and researched.  For example, many Public Safety Answering Points (PSAPS) are utilizing a mobile data app to dispatch for local fire departments, EMS and some Law Enforcement.  We would like to make sure we can standardize at least on a few of the applications so we do not have lack of communication from the use of so many disparate applications. *Not having that homogeneous approach to public safety applications will lead us down the same path with the same mistakes we have made with LMR over the past 40 years.* Solutions are out there but how do we pay for them and how do we get everyone using the same ones?  How do we get everyone to agree on "the" solution?  South Dakota is a home rule state and without incentives it might be difficult for the entire state (multiple jurisdictions – local/county/federal/tribal/state/etc.) to agree, purchase, and utilize the same applications.

## Making the connection between LMR and LTE:

We currently are running Motorola WAVE to a limited degree in conjunction with our LMR system. It is carrier neutral, frequency neutral, and has the ability to share resources and users independent of the LMR system. We have less than 300 users on the application mostly because of cost.  We recognize that it is a niche for some of our administrative staff, but don't see it ever being used wholesale because of that cost, not because folks don't realize the capabilities. We will continue to monitor and research the Mission Critical Push-to-Talk solutions as the industry proceeds.

> *LTE Networks alone will not instantly or magically create interoperability.  It will take apps, software, policies, and cooperation before an incident happens.*
>
> *Our main goal with the apps is to find a common app that everybody has, if we get 500 different apps, broadband is out the window as an interoperability tool..*
>
> *- Jeff Pierce, State of South Dakota SPOC,SWIC*

**Misc Items we Understand:**

Big picture we grasp the concepts and understand and have worked with interoperability for years. We are looking for the details and how applications or systems apply to us in South Dakota. We are looking for in-depth end-user capabilities discussion rather than an overview (sales pitch) of the products.

We will continue our efforts to identify and document best practices to implement technical and operational standards enabling interoperable and secure information to seamlessly flow between emergency communications systems in an Internet Protocol-connected environment.

**Key Points:**

- We know that governance and policies will need to be part of the discussion
- As more mobile broadband capabilities become available - response procedures will change
    - The Standard Operation Procedures (SOP) will need to be updated as this comes to fruition
- 80% of emergency incidents occur at the local level
- First responders should ideally be able to discover, access, and consume any relevant information on a need to know basis regardless of jurisdiction, affiliation, and location.
- **Interoperability will come down to people, technology, and agreed upon processes:**
    - **People** will need to agree to utilize a common application
        - **At least a "Base Level" application** – They can still utilize their own discipline specific applications
        - Be trained on the applications they know and trust
    - The **technology** will need to be trusted as a Mission Critical device – like first responders trust their radios today
        - The end goal is real-time situational awareness, integration must focus on improving discovery, access, and analytics, and the architecture must be scalable
        - Same technology must be used daily so muscle memory can kick in during the disaster response(s)
        - Data exists in every agency and jurisdiction
            - Typically it is behind a firewall maybe on a proprietary system, with limited accessibility
        - Secure movement of data from one point to another is critical
        - All part of the need to consume any relevant information on a need to know basis
    - **Processes** - how the end-user receives, uses, interacts and stores the data
        - User integration and interaction must be easy, fast, intuitive, and trusted
        - Must work on ALL/ANY device a first responder may use.
            - IOS, Android, tablet(s), Chromebook, PC, Mac, etc.
        - How to engage users – or new users who do not have the app
            - Does the license holder "invite" others as "guests" in an incident IF they have "guest licenses"
            - Then "Guests" once contacted could accept and bring their apps/systems/etc. into the mix.
            - What does the responder "accepting" an invite have to do?
                - Do they have to pull over, load something, figure out how to use it, or what?
                - Who has time during an incident to "invite" anyone? Again that golden hour, if spent trying to connect first responders rather than getting things done, what happens?
        - How would we ever have a current database of contact information to email or contact every potential responder coming in? Part of governance or what?
        - We will need to have the different applications set up prior to the incident?
            - How about if it is not pre-configured for something necessary at the time?

## Real-world use case examples:
Below you will find use cases of real-world examples of public safety events.  We are trying to find solutions to help us communicate in these situations utilizing wireless mobile broadband networks – specifically FirstNet.

## Tornado:
In 1998 we had an F4 Tornado hit the town of Spencer SD, a town of 320 people, 6 who did not survive the night. This was prior to our statewide system with common interoperability channels and talk groups, and we had agencies showing up with users on frequencies in the 39MHz band, the 150 MHz Band, and the 450 MHz Band. The image everyone remembers is the Governor looking at a number of radios (from different jurisdictions) on the hood of a suburban with No immediate "interoperability."  The Governor was directing responders with a bullhorn until the state brought in a portable system and handed out radios later the next day. If that was today the state radio system provides the needed interoperability for voice, however with FirstNet and mobile broadband it would not be any different than 1998.  If all of the responders had AT&T, Verizon, or FirstNet services/devices, most might have priority & preemption, but EMS are on their app, Law enforcement is on their app, Volunteer Fire Department's on their own app, each county on their own app, etc. Everyone has an app that meets their "diverse" needs, but how is anything to be coordinated or be interoperable between users for the greater good and overall response? How are we better off with mobile broadband and data services than we were with voice in 1998?

## Fire in the Black Hills or on tribal lands:
We have a fire in the Black Hills (or on tribal lands).  You have responders from the Federal Wildland fire, local sheriff, EMS, firefighters from Rapid City, and various cities across the Hills as well as the state, Tribal, etc.  Basically you'd have Federal/Tribal/state/county/local – cross discipline responders all of them have purchased the FirstNet plan on their smart phones.  So you have 6 people standing in a circle with their FirstNet smartphones in their hands – where is the interoperability?  How do they communicate?  If I know your phone number or email address we can be "interoperable" (I can then call/text/email you – with our phone's default/built-in dialer/messaging app), if I don't have your number/email (business card) we are not interoperable – it is that simple.
NOTE: LMR (Land Mobile Radio) has national interoperability channels that allow us to go anywhere in the nation and connect on a base level – Public Safety LTE/Mobile broadband networks do not.

## In-State Common App/Communication:
What would or could be a common app (or apps) that every first responder in South Dakota should have available – as a base level - to provide information and communications/interoperability.  Whether they ever use it daily or not – they have it and every first responder in SD knows they have it.  Initially it might just be for communications and then the app/program growing into a more inclusive system that can be future proofed.  For example it might also have access to the emergency equipment/resources database, or other features we have not imagined yet.

Then an Emergency Manager or Incident Commander would know the first responders (at least) have that app if they show up to an emergency and could communicate with that first responder.  Perhaps, a geo-fence app that when a first responder was "in the fenced area" the incident commander would know it – and would have a listing of the credentials, licenses, certificates, abilities of the individual – i.e. licensed to operate xyz type fire truck, is Law Enforcement certified, EMT, etc.  So the incident commander can start directing the resources – people or equipment.

This could be a web based system to be accessed from any web browser, but optimized for any mobile device. "Mobile First" must be the application development as first responders are mobile first.

**Here is a real world example that happened in South Dakota:**

We've had the Federal US Marshall's office come to one of our municipalities (Apparently bad actors come to SD too??). He walked in the office and told everyone (Local PD, Sheriff, Highway Patrol, DCI etc.) to download the app Zello if you want to communicate with me. If you don't use it – you will not communicate with me and I will not communicate with you. This is a great example of where we see the "convergence" years going – the wild west of apps. You can probably insert any app in the place of Zello, as the next person might use something completely different. We are trying to avoid the train wreck of needing 500 different apps out there – that is just not efficient nor practical.