Members of the National Telecommunications and Information Administration,

Please review and consider North Dakota's comments in response to Docket No: 120928505-2505-01. Our comments were developed with the input of members of our state's Public Safety community and private industry.

Regards,

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Introduction

After reviewing the FNN conceptual network deign model (FNNC), as presented to the FirstNet Board of Directors, North Dakota would like to provide the following input. In general, the ideas presented provide a vision that has several attractive elements. Understanding that this is the earliest stage of the proposed architecture, there are several issues that do not appear to be addressed.

North Dakota's response is focused on the FNNC, and does not address the questions relating to application development for use on the NPSBN.

Assumptions and Challenges

The FNNC proposal would require several items to be accomplished for it to be successful. North Dakota sees these assumptions as the primary challenges facing the success of the FNNC architecture.

Given the multi-carrier approach to the FNNC architecture, a basic assumption required for success is that **each carrier involved will be willing to make several accommodations that have not currently been done on a large scale**. This includes:

- Preemption for of public safety use. This is stated on slide 21 as a benefit of the FNNC, but there is no supporting explanation of how this is accomplished.
- Complete, inter-carrier roaming of devices. Observation of today's commercial cellular devices demonstrates the lack of this ability.
- Commercial LTE service will be deployed as widespread as today's 3-3.5G technologies. North Dakota only has one carrier actively deploying LTE within the state at this time, so expectations of a multi-carrier approach are currently tough to imagine.
- Local input would need to be heard and acted on. There are significant shortcomings in the cellular networks currently available within North Dakota. Recent surveys and large scale field measurement efforts have been undertaken to demonstrate these issues. Up to this point, input from the public safety community regarding coverage has been largely ignored. Carriers and/or FirstNet must be willing to address shortcomings identified by local users.

This plan would also require significant achievements in hardware and software development:

- Device manufacturers must be able to produce cost effective devices that support all participating carriers' commercial LTE bands, the public safety LTE bands, and devices that also support 3G and/or satellite technologies as well.

- Advanced routing and connection selection algorithms would need to be able to manage the variety of possible connection sources, their quality, and relative cost. It is foreseeable that Wi-Fi and other technologies could be included in the mix of available connections.
- Improvements in handheld and portable antenna design would also need to be accomplished. Connecting to a wide variety of frequencies and MIMO based technologies requires a significant number of antennas, which greatly complicates the form factor of handheld devices and installation (cost) of portable devices.

The final, and most important assumption required for the proposed architecture to be a success is that this design would provide a significantly greater value proposition than the commercial wireless data networks of today. Today, adoption of cellular broadband in the public safety sector varies greatly within North Dakota. **Benefits such as preemption and quality of service are quite important for critical incident response, but those features may not generate the volume of day to day users required to make this network a success**. Understanding that it is impossible to create a network that has better coverage, performance, availability, and features cannot cost less than current commercial networks, there must be flexibility in the pricing models to allow users with lower day to day requirements to access the network at rates that reflect their utilization of resources and features.

Benefits

Provided key assumptions are realized, there are many benefits to the proposed FNNC architecture. **North Dakota strongly believes in avoiding duplication of and competition with the private sector**. In any case that the private sector can meet the needs of Government in a reasonable and efficient manner, the state prefers to pursue these solutions. This proposal appears to uphold this belief. If regional players are able to participate in areas that make sense – either with existing wireless and wireline assets or with mutually beneficial new construction, this is likely to provide our state with the best possible solution for all parties involved.

Leveraging existing and future infrastructure also stands to serve large rural areas such as North Dakota very well. Providing coverage to these areas is inherently more costly than areas with high user densities. By taking advantage of resources already in place, and by sharing the costs of mutually beneficial new infrastructure where needed, we believe that funds can be most efficiently used to address areas needing improvement, vs. trying to duplicate assets that are able to provide valuable service. Again, this rides on the assumption that local input would be acted on to prioritize improvements in areas based on our user's needs.

Speed of deployment is also a likely benefit of the proposed FNNC architecture. It is difficult to imagine that integration of existing commercial RANs and core services would not be achieved more quickly than deploying of duplicate infrastructure.

However, this integration effort must be carefully analyzed in great detail before commitments are made to any particular partner.

Other Needs

The proposed FNNC architecture does not address a few highly desirable elements. Some of these items appear to fall outside of the motivations of the current commercial carriers, and thus will require significant innovation to integrate into the NPSBN. Others fall in line with carrier roadmaps, but will require significant additional investment to achieve.

To create a truly resilient public safety communications network, there must be an assumption that circumstances could result in the destruction of local network infrastructure. The inclusion of deployable systems in the FNNC is acknowledged and supported, but without peer-to-peer communications capabilities, there likely will be a failure to perform timely if at all in the most needed situations. This method of communication could be quite challenging to accomplish through a commercially dominated standards body. Alternative local area networking technologies could be utilized with or even in place of the LTE network to serve these needs. Particularly, there are a variety of Wi-Fi standards that could be expanded for peer-to-peer and rapid deploy networks in the NPSBN. Wi-Fi also could relieve potential overloading of the LTE RAN for public safety incidents that often require temporarily intense levels of communications in a small geographic area, just as commercial networks are beginning to employ it today to relieve capacity constraints in dense user environments.

Voice is another topic with many challenges. Obviously, it is technically possible to carry voice over current 3G and 4G networks, and it will also be true with the NPSBN. However, it will be quite difficult for Voice over LTE (VoLTE) to deliver an experience that matches and exceeds today's LMR networks. There will need to be advances in air interface technologies, as well as further investment in RAN infrastructure to provide the widespread geographic and in-building coverage currently available via LMR.

Summary

Overall, North Dakota is very optimistic about the direction proposed by the FNNC architecture. If key challenges and assumptions can be met, FirstNet could be an extremely valuable asset to our state's and nation's Public Safety community.