

Before FirstNet: Federal/State Collaborative Vision Tested On The First 700MHz LTE BC14 Network

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FirstNet, a dedicated nationwide high-speed network for public safety and first responders, will become one of the largest networks in the world. The organization overseeing the project, the National Telecommunications and Information Administration (NTIA), is collaborating with all 50 states and six US territories. FirstNet will cover 3.8 million square miles and be larger than Verizon, AT&T and Sprint's coverage combined.

Unsurprisingly, for a project this large and with so many different players, approaches to the challenge have varied considerably. A June 2014 report by the National Association of State Chief Information Officers (NASCIO) showed states are at widely differing stages of development. For example, almost a quarter of states have not gotten involved in active planning, while more than half the states are already collecting data they plan to use in their planning efforts.

The \$7 billion dollar initiative has reached a critical juncture in its development with the formal in-person state consultation meetings beginning July 31. These meetings will involve and shape what the FirstNet network will look like within each state.

While there remain some issues to resolve, such as local control and hosted applications, there are several best practices state and local governments should consider when it comes to FirstNet.

While FirstNet is largely unprecedented in scope, it won't be the first government 4G LTE BC14 network built for federal personnel and state first responders. In 2011, The US Department of Agriculture (USDA), the County of Hawaii, the State of Hawaii, Alcatel-Lucent and LGS Innovations launched a LTE pilot in Hilo and Keaau designed to test the ability of federal, state and local governments to share spectrum while providing modern broadband capabilities. This pilot leveraged the same 700 MHz LTE band 14 spectrum currently set aside for FirstNet.

The pilot's success not only validated the concept and value of a dedicated public safety network, but it also highlighted several lessons states can apply when taking on one of the biggest infrastructure projects since the modern highway system.

Pilot kickoff

The Hawaii LTE pilot program was championed by the USDA's Office of the Chief Information Officer, who had an understanding of recent advancements in wireless networks and the power of public/private partnerships. The vision was for a system that would ensure federal and public safety communications would be unencumbered by emergencies or external events. For example, during the Boston Marathon bombing, one large commercial carrier reported there was a nearly 70 percent blockage of their network, making emergency communications difficult.

Hawaii was selected as the location of the pilot project for its unique geographic elements. Since it is isolated as an island, overlapping frequencies weren't a challenge for the network.

Right now, many states are considering how much information they need to prepare for FirstNet consultations. For the Hawaii pilot program team, it was critical to get a detailed assessment of the existing infrastructure and policies. First responders have very detailed requirements, and adding "patch solutions" midway through a project is not a cost effective strategy.

Prior to implementation, the Hawaii LTE pilot team had a large amount of information at their disposal. For example, they knew that on the Big Island there were 23 existing federal and state owned towers, a backhaul network of both microwave and fiber, 1,504 first responder radios and that it was a requirement to operate the Department of Water Supply SCADA system remotely.

In many ways, the main challenge for the Hawaii initiative and FirstNet is organizational rather than technical. For the pilot, a memorandum of understanding (MOU) between the USDA, Department of Interior, State of Hawaii and County of Hawaii formalized each partner's contribution, role and responsibilities.

Best Practice: *Gather as much information as possible on the existing network as well as requirements prior to implementation. In general, very thorough documentation is already available and it can be a matter of knowing where to look or who to ask.*

Best Practice: *Formalize agreements and understanding between relevant partners, first responders and institutions across government jurisdictions*

Pilot execution

The Hawaii LTE network solution was comprised of an Evolved Packet Core (EPC) and a Radio Access Network (RAN). Security was of the utmost importance and the vendor solution selected was due to the manufacturer being the only provider with a band-14 certification from the National Institute of Standards and Technology (NIST) at the time of deployment.

Protecting sensitive data across federal, state and local levels may prove particularly challenging for FirstNet. While it wasn't an issue that arose during the duration of the Hawaii LTE pilot, that experience demonstrated the potential value in a FirstNet architecture with multiple network cores to manage data sessions and security at the federal as well as state and

local levels.

Hawaii's topography also presented an obstacle during development. The island features incredibly dense, jungle-like vegetation and signal propagation was an issue. Even LMR radios had trouble picking up a signal in particular areas. The final network infrastructure's design, which involved RF towers and a robust fiber network, helped solve these challenges.

Best Practice: *Consider if a multi-core architecture will better achieve local as well as federal security standards and requirements.*

Best Practice: *Place particular emphasis on RF studies that will uncover potential trouble areas resulting from the area's unique geography. Not all areas will feature dense vegetation. However, mountainous areas could experience similar issues. Fiber cable, while more expensive than other options, will often be key to solving connectivity issues and worth the investment in select areas*

Pilot conclusion

The Hawaii pilot was a tremendous success and validated support for multiple IP applications and capabilities in a first responder network including mobile video, video surveillance backhaul, video conferencing, county applications such as record management systems, web access, email and other various high-bandwidth applications.

The LTE network provided simplified functionality, high bandwidth and low latency along with a highly scalable core.

Once the network was operational, the team took buses of local public safety and first responder representatives to key facilities to familiarize them with the network. They also had laptops and could download information and applications, which helped obtain additional buy-in and understanding.

It's exciting to consider the applications that FirstNet will be able to support from license plate recognition to GIS applications for fires and disasters. There should also be plenty of excess bandwidth, which can potentially be monetized by hosting other non-priority users and applications.

Best Practice: *FirstNet will provide excellent support for real-time and mobile applications. States should begin considering mission needs and how new applications can take advantage of this bandwidth boost.*

Best Practice: *Don't take first responder and public safety personnel support for granted. Familiarize them with the network and its benefits*

Analysis

FirstNet is a transformational and ambitious undertaking. Done right, first responders will enjoy

the advantages of a single IP-based network approach, resulting in improved operational efficiencies, more informed decision making, and reduced costs. Considering what's at stake, state and local governments should prepare adequately and ensure first responder communications is one of their highest priorities.

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