



Thales USA, Inc.
2733 South Crystal Drive, Suite 1200
Arlington, VA 22202

Jim Fraser
Vice President, Government Relations
jim.fraser@us.thalesgroup.com
(703) 838-5661 (office phone)
(571) 383-8289 (mobile phone)

**DEVELOPMENT OF THE NATIONWIDE INTEROPERABLE
PUBLIC SAFETY BROADBAND NETWORK**

NOTICE OF INQUIRY: DOCKET # 120928505-2505-01

The National Telecommunications and Information Administration (NTIA) has issued a Notice of Inquiry (NOI) on behalf of the First Responder Network Authority (FirstNet) to seek public comments on the conceptual network architecture presentation made at the FirstNet Board of Directors' meeting held on September 25, 2012, as well as to invite inputs on other network design and business plan considerations. They are also seeking comments on the general concept of how to develop applications for public safety users as discussed at the FirstNet Board meeting. The inputs received from this process will shape the Board's efforts to establish the interoperable public safety broadband network based on a single, nationwide network architecture called for under the Middle Class Tax Relief and Job Creation Act of 2012. Thales USA, Inc. appreciates the work of the FirstNet Board and the challenges that they are facing and is pleased to provide the following comments.

THE THALES GROUP

Thales is a globally recognized provider of integrated solutions and equipment to meet the requirements of its government and private sector customers in the telecommunications, security, transportation, defense and aerospace markets. With 2011 revenues of \$17.4 Billion and 68,000



employees, Thales maintains operations in 50 countries, including a workforce of nearly 3,000 in the United States. The company leverages synergies between military and civil applications and technologies, drawing on a cross-functional research and development capability and an engineering and technical staff of 22,500 to maintain and further develop our core competencies. As an industry leader in interoperable communications, Thales has been fielding Land Mobile Radio (LMR) and related mission-critical communications systems around the world since 1997. The company is continuing to invest in the development of innovative solutions that meet their customers' secure communications challenges and support their evolving operational needs. Thales has extensive experience in LMR, public safety and other secure, private networks over Internet Protocol (IP), including applications more recently focused on Broadband network domains. The company has developed a flat, distributed core network; one that can be ideally scaled and configured for public safety applications, including secure, real-time data and mission-critical native voice. Thales is actively participating in PSCR/NIST working groups (push-to-comm over LTE and off-network communications) that are contributing to technical recommendations for the proposed FNN. In addition, as a member of the 3rd Generation Partnership Project (3GPP), the company is promoting public safety requirements into the 3GPP specifications. Finally, working with government, intelligence, finance, and military organizations, Thales has a heritage of over 40 years in the delivery of cybersecurity solutions from stand-alone encryption products to fully integrated systems of systems. Information assurance and network reliability/safety will be critical elements in the deployment of the nationwide Public Safety Broadband Network.



COMMENTS ON THE FIRSTNET FUTURE VISION/NETWORK ARCHITECTURE

(RAN, BACKHAUL/LONGHAUL CONNECTIVITY AND NETWORK CORE)

Leveraging the existing commercial telecommunications infrastructure is important in managing the overall costs of deploying the FirstNet Nationwide Network (FNN). This is especially true for towers and site locations of FNN Radio Access Network (RAN) base stations. It appeared from the architecture that the backhaul from the FNN 700 MHz RAN would largely be serviced by in-place commercial telecommunications backhaul infrastructure. This is an important aspect of the design that should be afforded careful consideration, given that the backhaul to/from tower sites and the Evolved (Enhanced) Packet Cores (EPC) may travel long distances (longhaul). As experienced with prolonged outages of existing cellular and internet service (for example, during natural disasters), the corresponding service availability could be affected. At the same time, it's recognized that a secure, dedicated, high bandwidth backhaul/longhaul to all tower sites would be very expensive. The FirstNet goal is to provide coverage/service with higher availability at each cell site regardless of the geographic location. A possible architectural option for FirstNet to consider in mitigating this concern would be incorporation of 3GPP compliant "Lite" distributed EPCs (Edge-Centric Core) within the FNN (close to the RAN tower, where appropriate). The Edge-Centric Core would consist of EPC components and a localized service delivery platform and can be either fully distributed (one at a tower RAN site; the highest possible level of resiliency) or semi-distributed with perhaps 20 RAN sites managed within one Edge-Centric Core. These 3GPP compliant Edge-Centric Lite Cores would be ideally scaled for public safety user requirements and would cost-effectively enhance network operational capability and resiliency at the edge while interoperating



within and under the FirstNet scheme. The following are examples of practical scenarios benefitted by an Edge-Centric solution:

- Resiliency and hardening: Edge-Centric Cores would allow for continued local network operation. In situations where backhaul/connectivity is cut off from the main EPC, services would still be fully operational with the local EPC servicing the first responders in that community.
- For public safety user organizations, most call traffic is in fact local. An Edge-Centric Lite Core would allow local traffic to remain local and minimize the demand onto the backhaul.
- For deployment and operations in remote and sparsely populated locations, this connectivity could allow for optimized satellite or microwave link bandwidth for areas with no or limited infrastructure (for example, national parks and the southern border area).

An interesting attribute of the Edge-Centric Core architecture is the natural support of LMR applications over the LTE network, where the application controller can co-locate or reside as software within the Core. Voice calls over the FNN with fast call setup times and the ability to provide group calls will be important to the user community. LMR applications such as push-to-comm (fast setup with one-to-many voice or data calls) have already been developed for public safety networks with digital technology. There is a near-term roadmap to port these applications into LTE. Of course, it is understood that Edge-Centric technology and any element of the FNN must be standards based and interoperable. Towards this goal, interoperability testing (IOT) of an Edge-Centric EPC will soon begin at the NIST/PSCR Public Safety 700 MHz Demonstration Network in Boulder, CO.



ROAMING TO COMMERCIAL SERVICE PROVIDERS

With an estimated 44,000 dedicated base stations to be deployed across the USA, it is expected that there will be coverage gaps in the FNN 700 MHz RAN. In these cases, a public safety user could maintain a level of connectivity through roaming over a commercial service provider network. It's expected that these calls would be predominantly over unsecured commercial networks with a resulting impact on quality of service (QoS) and concerns over the integrity of the network access for secure and mission critical communications. The FNN must be resilient and provide high availability to ensure the network functions during emergencies. Coverage will have to include operation in remote rural areas as well as inside buildings, tunnels and public venues. LTE standards allow for some hierarchy of QoS which could favor the Public Safety User (through negotiations with the carrier) but 3G cellular networks do not have such QoS provisions. The specific roaming frequencies would need to be well known as user devices would also have to be configured to support these frequencies.

APPLICATIONS

Applications will need to be delivered to first responders quickly and securely to provide an efficient tool for the execution of their duties. The user equipment (UE) will have to offer different applications for first responders according to their organizations and their current missions. Different public safety agencies will have different demands for services and network capabilities; infrastructure and device suppliers will need to take this into consideration when designing applications. LMR-type and SMS call capability will need to be available over the FNN, with fast call setup times and the ability to provide group calls. Capability for high bandwidth data calls containing video, photos, and maps will be important to the user



community. This traffic will need to respect the mission critical nature of the data and again support fast set up, one-to-many calls and similar needs (referred to as push-to-comm). In addition, the Application Programming Interface (API) would provide the connection for 3rd party applications to ease integration of numerous applications to the benefit of the first responder community. Users would be able to download FNN approved applications from the FNN application store website with local IT manager's approval.

PUBLIC SAFETY SERVICES

Public safety services are categorized into Service Delivery Platforms (SDP) and provide components that may be offered either at a central or local level. This would facilitate the development and delivery of public safety services components as well as the integration of these services components over 4G-LTE networks. These services typically include voice, PTT and all other mission critical voice requirements (for example, group call, broadcast call, and external PSTN/P25 call). In addition to typical voice, LTE provides broadband data services like push-to-data, push-to-video, push-to-picture, and short data service. These services provide efficient tools to the first responder community, to include capabilities like emergency call, call priority, call pre-emption, call retention (to protect communications) and supplementary services like calling line presentation, talking party ID and call authorize by dispatcher (CAD).

ADDRESSING THE NEED TO REACH OPERATIONAL CAPABILITY AS QUICKLY AS POSSIBLE

To reach operational capability as quickly as possible, it's important that the FNN utilizes the existing network infrastructure, network elements and services to the extent possible. Given the fact that many in the public safety community are already using commercial devices and networks for



broadband data access, it makes sense to move forward with some urgency on a reliable and secure FNN. In addition, the FirstNet Board should consider allowing the Broadband Technology Opportunities Program (BTOP) projects to continue, along with certain other early trials with public safety LTE deployments in more rural and sparsely populated areas. This will bring enhanced operational capabilities into these agencies/regions while at the same time providing critically important near-term “lessons learned” into the development of the FNN. It will help both vendors and users gain necessary expertise.

ENABLING VOICE SERVICES

One of the key tasks here is to enable voice services (cellular telephony and PTT) both within the FirstNet Nationwide Network as well as to/from other commercial networks, including the public switched telephone network (PSTN). The intended purpose of the proposed FirstNet architecture is to provide the public safety community with key capabilities, to include mission critical voice (MCV), push-to-talk (PTT), and video transmission. It would be premature to assume that the proposed FirstNet network will be able to provide mission critical voice services over the LTE broadband network and replace existing Land Mobile Radio – Project 25 (LMR-P25) systems in the near-term. In fact, it may take several years or more to fully develop MCV application services over LTE broadband. This capability is one of the critical elements of the Public Safety Communications Research (PSCR-NIST) recommendations. Providing MCV and video applications using LMR-P25 technology over the 4G-LTE infrastructure and integrating existing systems will be the key to adaptation. It’s possible that with an operational FNN, users will gravitate to the network for voice as well as data calls. It’s important to recognize that the utilization of Edge-Centric Cores would actually support localized voice and other applications traditionally found in LMR networks.

EXISTING CHALLENGES AND OBSTACLES

Once operational, the FNN will be serving first responders with various organizations at the federal, state, and local levels along with secondary users. Each of these organizations will have existing user databases and authentication requirements. In the design of the FNN architecture, it will be important to address the challenge of reducing user management complexity while allowing for a greater degree of secure methodology across these existing authentication systems. Interoperability is also a significant challenge in a multi-vendor/service provider network infrastructure. For example, MCV services that require fast set up, group calling and end-to-end quality of service need to be maintained consistently across various network operators. The network must be resilient and provide high availability to ensure the network functions during emergencies. Coverage will have to be greater than with commercial mobile networks, including operation in remote rural areas as well as inside buildings, tunnels and public venues.

FURTHER RESEARCH AND DEVELOPMENT

An essential focus of near-term research and development is to enable MCV over the FNN and the need for user devices to have talk around and direct mode functionality. Another priority would be prototype development for deployable systems to include a “Cell on Wheels” and a “System on Wheels.” Given that RAN devices are now commercially available and Edge-Centric EPCs are undergoing interoperability testing at NIST/PSCR, this development should be possible with a modest budget and schedule. A number of these deployable systems should be developed through multiple vendors for practical evaluation, demonstration and lessons learned across many users. Opportunities may also emerge for creative cost-saving technologies. Research that



will improve coverage in remote/rural areas as well as in buildings/public venues is critically important. Dedicated research and development efforts should be focused on interoperable solutions for these network areas. Finally, the FirstNet Board needs to research service sharing/roaming methodologies based on existing 3GPP RAN sharing specifications and develop an architecture and implementation plan with these capabilities.

CONCLUSION

Thales recognizes that there are numerous challenges ahead in making the Public Safety Broadband Network a reality. We look forward to working with the FirstNet Board and other federal government agencies as well as state and local entities and others in the private sector as we collectively address the development and deployment of the FNN. The comments we've provided just touch the surface of the depth needed to address the technical issues and concerns that the FirstNet Board will be facing and we would welcome the near-term opportunity to provide a more detailed presentation of our thoughts to the Board whenever the opportunity is there. We're all reminded daily of the critical importance of interoperable communications and the sharing of vital information for our first responder community and we're very pleased to see the imperative that has been placed on this priority by the FirstNet Board and others in government and industry.