Response to NTIA Notice of Inquiry On Requirements On Behalf of the First Responder Network Authority

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Table of Contents

1 Executive Summary .................................................................................................................. 4
2 Commercial wireless operators as catalysts ........................................................................... 5
3 Key Requirements for Mission Critical Push-to-talk ............................................................. 6
   3.1 Call Setup times .................................................................................................................. 6
   3.2 Reliability .......................................................................................................................... 6
   3.3 Quality of Service .............................................................................................................. 7
   3.4 Spectrum efficiency .......................................................................................................... 8
   3.5 Standards, Interoperability ............................................................................................... 9
4 3rd Party API .......................................................................................................................... 12
5 Summary: PoC Solution for Public Safety ............................................................................ 13
List of Figures

Figure 1 – Multi-Connectivity Approach .............................................. 7
Figure 2 – QoS for PoC ........................................................................ 8
Figure 3 – Multicast scenario ................................................................. 9
Figure 4 – PoC NNI ............................................................................ 10
Figure 5 – LMR Interworking ................................................................. 11
Figure 6 – P25 Interworking ................................................................. 11
Figure 7 – 3rd Party API support for PoC .............................................. 12
Figure 8 – PoC Solution ....................................................................... 13
1 Executive Summary

Kodiak Networks appreciates First Responder Network Authority (FirstNet) Board’s seeking the public comment on the FirstNet Nationwide Network (FNN) Proposal to establish the Nationwide Public Safety Broadband Network (NPSBN).

This document provides comments from Kodiak Networks to the Notice of Inquiry (NOI) by the National Telecommunications and Information Administration (NTIA) on behalf of FirstNet.

As a leader in the Push-to-Talk (PTT) industry delivering comprehensive PTT solutions for the last 10 years, our comments address architecture and solutions to deliver both a cost-effective and scalable PTT service for public safety users as well as a reliable Mission Critical PTT service for first responders on the NPSBN while providing interoperability with the existing systems.

We fully subscribe to FirstNet’s proposal of deploying a diverse nationwide network with multiple wireless networks and systems and to leverage the infrastructure of commercial wireless operators to help support public safety requirements.

Commercial wireless operators have been at the forefront of defining and implementing the standards for 4G networks and for crucial applications such as PTT (OMA PoC). Their efforts over the last several years in both standardization and implementation can be immediately applied and extended for public safety.

Another notable FNN concept that Kodiak supports is the involvement of the application development community to address specific Public safety requirements. By providing controlled access to Network services APIs and Application level APIs, one can envision a large number of innovative apps that further enhance the service offered by the public safety organizations.
2 Commercial wireless operators as catalysts

It was certainly gratifying to hear Chairman Ginn talk about the leaders of major US mobile operators pledging their cooperation and support to public safety.

While the economic benefits of leveraging the infrastructure of commercial operator networks are clear, including commercial network operators in the realm of Public Safety immediately brings to fore LTE, one of the latest steps in an advancing series of mobile telecommunications. Wireless operators, along with network vendors and device manufacturers have been instrumental in pushing advances in this area with their active involvement in 3GPP and other standards organizations and through their collaborative efforts create a large body of complex system specifications.

Network infrastructures and devices based on these standards are in operation and being deployed at a furious pace, proving their maturity and allowing the participants to reap the benefits economies of scale of the standards.

By partnering them in the solution for public safety, FirstNet will have the advantage of commercial operators paying attention to the requirements of the public safety industry and accelerating the implementation and deployment of features that specifically address these requirements.

Push-to-talk Standardization efforts

While commercial push-to-talk services have been in existence for many years, they have been non-standard, proprietary implementations that confined the service to a closed group of users of that proprietary technology. It was evident to wireless operators that in order for mass adoption of a group communication service such as PoC, it was important to ensure interoperability across networks and devices. This was going to be achieved through the development of a rigorous body of standards.

As members of the Open Mobile Alliance (OMA), wireless operators, device manufacturers and infrastructure vendors from around the world started standardization of PoC (Push-to-Talk over Cellular) in 2003. Again, the catalysts in this standardization effort were wireless operators who prioritized the list of features that should be covered by these standards to meet the market requirements.

This resulted in the specification of OMA PoC standards along with other enabler specifications such as OMA Presence and OMA XDM (XML Document Management Service). These standards covered both Client and Server specifications. After a series of testfests organized by OMA and the execution of many interoperability testcases, these specifications were ratified by the OMA in 2011.

OMA PoC standards are the result of many man-years of effort from all key stakeholders.

We believe that Mission Critical Push-to-Talk for Public Safety (for voice and multimedia communication) can be achieved using:

- OMA PoC standards
- Key LTE features such as QoS, enhanced Multimedia Broadcast Multicast Services (eMBMS)
- Redundancy
  - Multi-network redundancy
  - Geographic redundancy
- PoC to P25/LMR bridging
- Diverse range of ruggedized, semi-ruggedized devices
3 Key Requirements for Mission Critical Push-to-talk

In this section we identify and expand upon some of the key requirements for mission critical push-to-talk service. These include:

- "Immediate" communications with low call setup times
- Reliability
- Quality of Service
- Spectrum Efficiency
- Standards, Interoperability

3.1 Call Setup times

Providing sub-second call setup times and meeting sub-second media latency requirements is of crucial importance to public safety personnel.

Kodiak’s patent-pending InstaPoC technology achieves sub-second call setup times and media latency requirements, while achieving very high MOS scores. InstaPoC achieves these requirements without requiring any special ‘application-specific’ changes to radio networks.

3.2 Reliability

Reliability requirements of 99.999% for PoC service is achieved using a redundancy approach that includes two levels of redundancy:

- Site-level In-chassis redundancy
- Geographic site redundancy

All servers in the PoC system complex (such as PoC Servers, Media Servers, Presence Server and XDM Servers, Element Management System servers) support both types of redundancy.

In addition to PoC System redundancy, multi-connectivity approach to access the PoC system services improves the resiliency of the service in the event of network failures. Alternate paths of connectivity using a multi-SIM based solution provide devices connectivity to the PoC system.

Figure below depicts the multi-connectivity approach.

Selection order of access networks can be configured in clients. In addition to network provided QoS, PoC Clients may apply dynamic end-to-end quality reports to assess the networks ability to support the PoC service.

In the event of catastrophic failures involving complete isolation from networks, PoC Clients can engage in direct mode operation with peer PoC Clients.
3.3 Quality of Service

LTE provided Quality of service mechanisms will be used for PoC services. By supporting standard interfaces from the Application function to the LTE Core network (shown below), the PoC system can dynamically establish the right QoS profile.

These mechanisms will be particularly required when access to the PoC system is through one of the partner commercial wireless operator networks.
3.4 Spectrum efficiency

OMA PoCv2.1 introduced PoC Multicast capability which assumes underlying support of eMBMS from the network. When eMBMS is implemented in the network, a standards-based PoC system can take advantage of these capabilities to achieve spectral efficiency where a large group of users are concentrated in a geographical area.

In the figure shown below, the PoC Server performing the Participating PoC Function is using a Multicast PoC Channel towards a group of PoC Clients in the PoC Session. Two of the PoC Clients in the session are connected via a unicast connection. The decision to use a Multicast PoC Channel can be based on local dynamic configuration of the PoC server.

The PoC Server acting the role of BM-SC will interface to the MBMS Gateway over Sgi-mb and SGmb interfaces.
3.5 Standards, Interoperability

PoC systems based on standard OMA PoC protocols achieve interoperability with other systems in one of two ways:

- PoC NNI Interface
- P25/LMR Gateways

Standards based OMA PoC system deployed in the FirstNet’s service layer can interface with another standards based PoC system using the PoC NNI interface. This would enable a FirstNet hosted PoC application to interface with another operator’s PoC system using the PoC NNI and allow interactions between PoC users of these systems.

Figure 3 – Multicast scenario
Interoperability between OMA PoC and P25/LMR systems is achieved using interworking gateways. Figure below shows the interworking between PoC and LMR using Bridging System Interface (BSI) to an interoperability gateway which in turn supports access to the various LMR technologies.
Interoperability between PoC and P25 is again achieved using P25 Gateways as shown below:
4 3rd Party API

In support of FirstNet’s concept to involve application developers, the PoC system hosted by FirstNet can allow applications to interact with the PoC system and provide PoC capabilities. These in conjunction with network services APIs will allow application developers to bring innovative applications to the public safety market e.g. Dispatch, Surveillance, and Patient data sharing.

PoC API’s allow complicated protocols to be abstracted to simple operations leading to faster development and integration.

Figure below shows the high-level architecture of the API framework support by Kodiak PoC system:

![Diagram of 3rd Party API support for PoC](image)

**Figure 7 – 3rd Party API support for PoC**
5 Summary: PoC Solution for Public Safety

Kodiak PoC solution meets the requirements for public safety by providing a standards based, highly reliable, high performance offering with a rich feature set along with an ecosystem of ruggedized and semi-ruggedized handsets (embedded and downloadable) & PTT accessories. The solution includes a comprehensive Dispatch console and an integrated contact/group management administration tool.

Solution Highlights:
- OMA PoCv2 standards based solution
- Fully redundant solution providing 99.999% availability
- Network Redundancy for fail-safe operation
  - Multi-SIM
  - WiFi support
  - LMR/P25 Interoperability
- QoS Support
- FIPS 140-2 Encryption
• InstaPoC sub-second call setup
• MOS Score higher than Cellular Calls
• PoC Multicast (when eMBMS is ready)
• Key Features
  o Large Group support
  o Broadcast Calling/Messaging
  o Push-to-text, Image, Video
  o Push to streaming video
  o Integrated Presence support (OMA Presence)
  o Comprehensive Dispatch Solution
  o Contact/Group Administration Tool
    ▪ Including inter-agency communication
• Embedded ruggedized clients
• Downloadable PoC Clients (Android, RIM, iOS, Windows)
• PTT Accessories