Request for Information on the Topic of How Software Defined Radio Technology Can Meet the Communications and Interoperability Requirements of Public Safety

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I. Overview

The Software Defined Radio (SDR) Forum (www.sdrforum.org) is seeking information on how SDR technologies can address communications and interoperability requirements for public safety. Within the Forum, the Public Safety Special Interest Group (PS SIG) is coordinating the activities that relate to public safety, and will use the results of these activities to help define priorities for the SDR Forum as well as the public safety community.

Ongoing initiatives within the public safety community have led to increasingly detailed documentation of communications and interoperability requirements. For example, within the United States, the Department of Homeland Security's Project SAFECOM has recently published an initial detailed Statement of Requirements[1]. Project MESA (Mobility for Emergency and Safety Applications) is an international initiative focusing on broadband applications for public safety that has also generated a Statement of Requirements[2]. Such programs address the transfer of voice, text, image, video, and location (and other data types) among public safety and related personnel and agencies. These requirements documents outline numerous applications and requirements for public safety related communications and interoperability.

It has long been assumed that SDR technology will be instrumental in meeting the needs of future public safety communication systems. As requirements are being documented in increasing detail, the next step is to document with more precision how SDR technology can address specific needs. The SDR Forum will compile the results of the responses to this RFI (Request For Information) into a report documenting the applicability of SDR technology to public safety communications based on a technology perspective.

The resulting report will serve a number of purposes:

- By matching specific technology development with requirements, the report will serve as a focus for the future direction of the PS SIG within the Forum in identifying critical issues, structuring test and evaluation activities, interfacing with other Forum Working Groups, and working with other technology development and standards development organizations.
- The report will also provide valuable input to the public safety community and government departments and ministries responsible for public safety. This information will assist them to better understand the potential value of SDR technology for public safety, the key cost drivers and design tradeoffs to balance

[1] *Statement of Requirements for Public Safety Wireless Communications and Interoperability (v1.0)*, The SAFECOM Program, Department of Homeland Security, March 10, 2004, available at www.safecomprogram.gov.
[2] *Project MESA; Service Specification Group Services and Applications;Statement of Requirements*; MESA TS 70.001 V3.1.1 (2002-10), available at http://www.projectmesa.org/ftp/Specifications/ .

advanced functionality and affordability, and identify technology gaps in meeting public safety communications and interoperability requirements

- It is anticipated that the resulting report based on the responses to this RFI will be provided to and incorporated in appropriate efforts of governmental department, ministries, and agencies including the U.S. Project SAFECOM Office.

This RFI has both a set of general questions and issues, and an Annex with a detailed listing of individual requirements. The purpose of the general questions is to encourage discussion and solicit responses on broad aspects of the application of SDR technology to public safety. The responders are encouraged to not limit thinking to only application within the bounds of traditional public safety land mobile radio systems, but instead to consider innovative concepts for public safety communications. The Annex provides the responder with the opportunity to understand and comment on the specific application of SDR technology to detailed requirements. Responses that address either the general questions, the detailed requirements in the Annex, or both will provide important input and will be incorporated into the resulting report.

II. Glossary

The following abbreviations are used in this document:

CORBA	Common Object Request Broker Architecture
JTRS	Joint Tactical Radio System
MESA	Mobility for Emergency and Safety Applications
OMG	Object Management Group
PIM	Platform Independent Model
POSIX	Portable Operating System Interface
PSM	Platform Specific Model
PS SIG	Public Safety Special Interest Group
RFI	Request For Information
SCA	Software Communications Architecture
SDR	Software Defined Radio
XML	eXtensible Markup Language

III. What is the Public Safety Special Interest Group?

The PS SIG is an organization within the SDR Forum that provides a focus for activities in which the public safety community has an interest. Goals of the PS SIG are to interface to the public safety community (including both users and vendors) to raise awareness of SDR issues, publicize the activities of the Forum in addressing those issues, and increase participation of the public safety community in the SDR Forum. The PS SIG also interacts with other Committees and Working Groups within the Forum to provide the public safety community's inputs into the publications and initiatives undertaken by the Forum.

The public safety community defined by the PS SIG includes first responders (e.g., emergency medical services, fire services, police/law enforcement), secondary responders (e.g., civil government, emergency management, environment health personnel, civil protection/homeland security/homeland defense units, search and rescue units, hospitals, relief organizations, public utilities, transportation), and other elements of the criminal justice system.

IV. Key Concepts/Issues for Public Safety Communications

Public safety communications today is characterized by a patchwork of separate, often incompatible systems with widely varying capabilities in communicating between and among systems. At the same time there continues to be increasing demand for public safety agencies to work in concert to react to both daily challenges, as well as major disasters and events. Thus discussions of public safety communications quickly focus on interoperability. In many situations, public safety radio systems operate on different frequency bands and/or air interface protocols (e.g., in the U.S. there are ten separate bands for public safety communications), and current radio systems do not operate effectively across multiple bands or accommodate multiple protocols. Thus a common occurrence is for responders to arrive at an incident with radios that cannot communicate with each other. Interoperability is a critical issue for day-to-day operations, pre-planned responses, as well as responses to unplanned major incidents. However, it is equally important that communications capabilities be managed, as to avoid the chaos inherent in allowing everyone to communicate with everyone.

There are other challenges facing public safety communications as well. Spectrum is limited, especially considering that technology advances provide a wealth of information (e.g., the ability to download security video to a police car, devices that monitor firefighter biometrics and equipment status, real-time access to hazardous material information). These capabilities result in new types of information that must be transmitted to the right place at the right time. Additional potential challenges include graceful upgrades of products, graceful migration of technologies, simplification of logistics and provisioning support, leveraged commercial hardware and software development, improved ease of use, and reduced life cycle costs. Costs and affordability have traditionally been a limiting factor in what the public safety community has been able to deploy.

Future public safety communications will likely be deployed in (or addressed by) a system of systems, which rely on a variety of networks, standards, protocols, and frequency bands. They must support environments ranging from short-range communications such as personal area networks to long haul communications at a national or international level.

V. Related Efforts

The there are several ongoing efforts, which are currently focused on the communications needs of public safety personnel and agencies:

- Project SAFECOM

  The flagship program for public safety communications in the U.S. is Project SAFECOM, managed by the U.S. Department of Homeland Security. SAFECOM's mission is to serve as the umbrella program within the Federal Government to help local, tribal, state, and federal public safety agencies improve public safety response through more effective and efficient interoperable wireless communications. One of the first items developed under Project SAFECOM is a comprehensive analysis of public safety communications requirements. The results of this analysis were documented in a Statement of Requirements, which is available at www.safecomprogram.gov.

- Project MESA

The Public Safety Partnership Project (PSPP), Project MESA (Mobility Emergency Safety Applications), is a collaborative recommendation effort for the next generation of high mobility wireless data standards. These new standards are envisioned to cover the transfer of digital voice, data, video and infrared video and other digital data applications at high data rates, between and among MESA user devices and external network components. Project MESA's activities are intended, among other objectives, to support the efforts of the member countries in meeting their own public safety and public service wireless data telecommunications requirements. The Project MESA Statement of Requirements is available at www.projectmesa.org.

We encourage responders to this RFI to review the above-mentioned documents as detailed and comprehensive perspectives of public safety requirements.

VI. Instructions

For inquires about the RFI, please contact the Chair of the Public Safety Special Interest Group, Fred Frantz, at +1 315-339-6184, or via email at fred.frantz@L-3com.com.

For inquiries about the Software Defined Radio Forum, please contact Alan Margulies, Chief Operating Office, SDR Forum, at +1 303-628-5461, or via email at asm@sdrforum.org.

To respond to the RFI, please fill out the attached response template, which may also be downloaded from
http://www.sdrforum.org/public/approved/04_a_0008_1_v0_00_response_template_10_13_04.doc

Email and postal addresses are given in the template. We additionally encourage the submission of any relevant white papers or product brochures. The responses to this RFI will be reviewed by members of the PS SIG, which include industry representatives; therefore do not include proprietary information. The SDR Forum intends to use the information it receives in response to this RFI (the "Contributions") to draft reports containing summaries, aggregate data and, in some instances, quotations from the Contributions it has received (with proper attributions of authorship). By submitting your response to this request for information, you acknowledge and agree that SDR Forum may, without charge and without further permission, use your Contribution in whole or in part for the purposes described above, as well as copy, reproduce, distribute and publish part or all of your Contribution, both internally and by incorporating it into future SDR Forum publications. Any information that you do not want attributed to your organization should be so indicated.

VII. Areas of RFI Interest

The key question addressed in this RFI is the potential for SDR technology to address public safety communications and interoperability requirements. There are several general topic areas and questions that are of interest:

1. One of the major anticipated benefits of SDR technology to public safety is facilitating interoperability. Currently public safety radio systems operate different frequency bands and with different protocols. How can SDR technology allow communications across multiple frequency bands, multiple protocols, and other unique aspects of systems? How can SDR technology facilitate interoperability with legacy systems?

2. To meet public safety requirements, does SDR technology need to be implemented in both the infrastructure and the terminal devices? Are there advantages or disadvantages (technically, operationally, and/or financially) to focusing the technology in one of these areas? Which SDR capabilities are best suited for the infrastructure, and which are best suited for the terminal?

3. How can SDR technology reduce costs to a public safety agency? Costs here include both specific equipment acquisition costs as well as the overall cost of deployment, operations, maintenance, and decommissioning (e.g., life cycle costs, total cost of ownership). How can SDR technology address graceful upgrades of products, graceful migration of technologies, simplification of logistics and provisioning support, leveraged commercial hardware and software development, and improved ease of use? With SDR technology what are the cost drivers and cost/functionality tradeoffs for public safety applications?

4. How can SDR technology facilitate interoperability between public safety radio systems and other domains (e.g., transportation, telematics, utilities, etc.)? How can SDR technology facilitate multi-modal devices that provide the user access to land mobile radio networks, commercial cellular system, paging systems, and wireless data systems? Which other domains have overlapping requirements that could expand the size of the market base? What complications (e.g. technical, operational, and/or regulatory) arise when interfacing to commercial, private, public, and military domains? What are the practical limitations of SDR technology in implementing such capabilities?

5. For an SDR-based communications capability, what interfaces should be standardized to achieve maximum portability among hardware and software components, reduce cost, and provide other benefits to the public safety community?

6. Future public safety communications will likely be deployed in (or addressed by) a system of systems, which rely on a variety of networks, standards, protocols, and frequency bands. They must support environments ranging from short-range communications such as personal area networks to long haul communications at a national or international level. How does SDR technology support this concept? What are the limitations in SDR's ability to support this concept?

7. What are the advantages and disadvantages of adopting the Software Common Architecture (SCA) currently in use by the Joint Tactical Radio System (JTRS) program (http://jtrs.army.mil/sections/technicalinformation/fset_technical_sca.html) for public safety communications systems? If there are significant disadvantages of adopting the SCA as currently defined, what advantages would a variant/version/subset of the SCA provide and what disadvantages would it mitigate? What would the characteristics of such an architecture be?

8. What are the advantages and disadvantages of adopting the Specification for PIM and PSM for SWRADIO Components currently submitted to the OMG (http://www.omg.org/docs/swradio/04-01-01.pdf) as a standard for public safety communications systems? If there are significant disadvantages of adopting this specification as currently defined, what advantages would a variant/version/subset of

the specification provide and what disadvantages would it mitigate? What would the characteristics of such a specification be?

9. What is the value of the following in meeting public safety communications requirements: CORBA, POSIX-compliance, use of XML to describe components of a software application, and use of a Core Framework?

10. How can cognitive radio technology meet public safety communications requirements?

11. What enabling technologies are also required (e.g., antenna technology) to realize SDR benefits?

12. The SAFECOM Statement of Requirements Section 3 and Appendix C (http://www.safecomprogram.gov/files/PSCI_Statement_of_Requirements_v1_0.pdf), and the Project MESA Annex C and Annex D (http://www.projectmesa.org/ftp/Specifications/MESA_70.001_v3.1.1_SoR.doc), include scenarios that describe ideal communications capabilities for both day-to-day activities and major events. In addition to your responses to the above questions, what other ways can SDR technology meet the communications capabilities postulated in those scenarios?

In addition to the above general topic areas and questions, there are several specific topic areas and questions that may be addressed:

13. This RFI invites responses on how SDR technology can address specific functional requirements outlined in the SAFECOM Statement of Requirements. The complete set of functional requirements is included as an Annex to this RFI in a separate file http://www.sdrforum.org/public/approved/04_a_0008_1_v0_00_rfi_func_req_10_13_04.doc

14. This RFI also invites responses on how SDR technology can address specific functional requirements outlined in the MESA Statement of Requirements (http://www.projectmesa.org/ftp/Specifications/MESA_70.001_v3.1.1_SoR.doc). The requirements are not duplicated in an Annex to this document due to copyright restrictions.