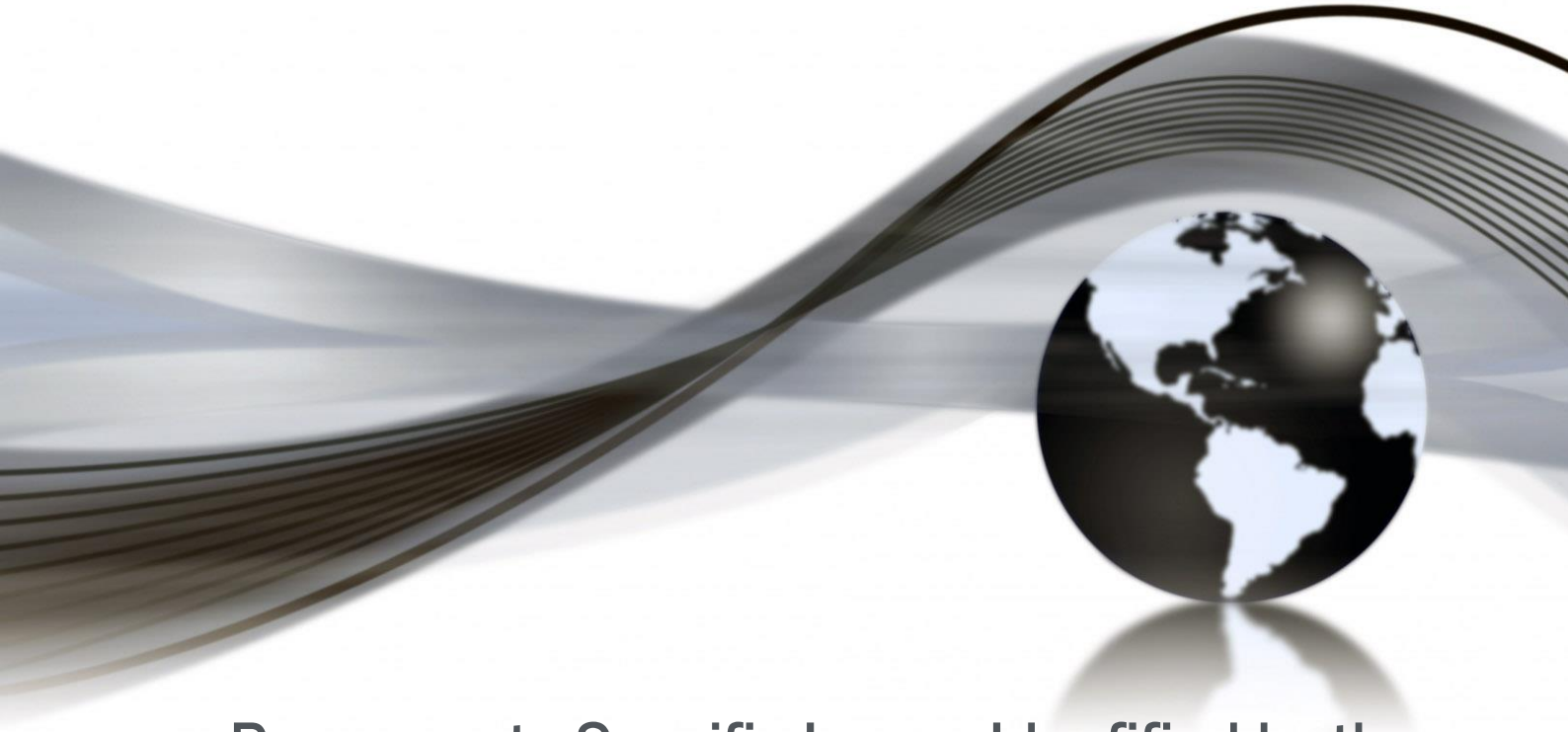

Response to Specific Issues Idenfified by the Productivity Commission Study Into Public Safety Mobile Broadband

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Introduction

In addition to our initial submission Selex ES is pleased to submit this response to some of the specific questions raised by Productivity Commission study into public safety mobile broadband. For consistency and easy of reference the original question number has been retained against each of the responses.

1. What is the merit (or otherwise) of the proposed approach to undertaking first principles analysis in this study?

In recent years, there has been increasing interest in radio access technologies for providing mobile and fixed services for voice, video, and data. The difference in design, implementation, and use between telecom and datacom technologies is also becoming more blurred. For example telecom cellular technologies being used for broadband data and wireless LAN being used for voice-over IP.

Today the most widespread radio access technology for mobile communication is digital cellular, with the number of users expected to exceed 5 billion in 2016, which is more than half of the world's population. Emerging from early deployments of an expensive voice service for a few car-borne users, today's widespread use of mobile-communication devices provide a range of mobile services that include camera, MP3 player and PDA functions. With this widespread use and increasing interest in mobile communication, the rapid evolution of this technology is set to continue.

The global Public Safety market is changing rapidly and aligning to a single bearer solution. This bearer will be LTE defined by the 3GPP standards, either used as a stand-alone dedicated network or through a mobile network operator (MNO). To date emergency services have primarily relied on TETRA or P25 for their communications in the field, with mobile data utilised to a significantly lower degree. We are now seeing a step change as austerity, combined with evolving national security requirements, drives the need for more affordable Public Safety solutions with enhanced data capabilities that must still provide mission critical voice services. Countries that engage early with industry to undertake an analysis of this sector will be much better informed of the potential benefits and risks associated with the adoption of these new emerging standards and technologies. This will ensure that only the most appropriate and cost effective solutions are procured for their Public Safety Agencies.

2. What domestic or international developments, reports or experiences in PSMB (or related matters) are relevant to consider in this study?

The UK Emergency Services Mobile Communications Programme (ESMCP) aims to provide an integrated critical voice and broadband data communications service for the three UK Emergency Services (3ES) and other User Organisations that meet the public safety requirements for coverage, functionality, availability and security. The chosen technology will be configured to give the 3ES priority over other Users. This new service called the

Emergency Service Network (ESN) will be a route to operational excellence for the 3ES and other User Organisations.

Selex ES has been engaging with the Home Office ESMCP team since the initial industry consultation in early 2012, including providing a number of formal demonstrations of our capabilities. These have been focused on;

- Air to Ground specialist services.
- Dual modes devices providing narrowband voice services through Tetra and Broadband services through LTE based service.
- Gateway solutions to enable bridged mission critical voice services between narrowband and broadband services.

Selex ES fully understands the need to provide an ESN communication solution, which is Affordable, Enhanced and Flexible and that, wherever possible, will use public LTE networks.

The Selex ES PERSEUS family of products, specifically the PERSEUS Communications Services Platform (CSP), provides a solution to meet this goal.

The CSP is a unified, integrated communications platform providing Professional, Public Safety functionality across and between a wide range of technologies including LTE, TETRA and Wi-Fi. It can potentially provide the key functional capabilities required by mission critical users including:

- Subscriber and SIM card Management
- Security Management
- Group and conference call management
- Call prioritisation and pre-emption
- Management of the PTT function
- Management of an approved and coordinated terminal 'App Store'
- A Service management platform

6. What is an appropriate definition of ‘mission critical’ communication systems and capability for the purposes of this study? What metrics should be used to assess whether capability is being delivered to adequate levels during mission critical circumstances? What evidence is there that existing capabilities are satisfactory or unsatisfactory?

Mission critical communications are those systems upon which the PSAs rely to achieve their mission. In other words the failure of these systems would result in the failure of the Agencies operations, potentially resulting in loss of life. In the Mission Critical Voice Communications Requirements for Public Safety study issued by NPSTC (http://www.npstc.org/download.jsp?tableId=37&column=217&id=2024&file=Functional%20Description%20MCV%20083011%20FINAL.pdf) the following characteristics were identified to define mission critical communications:

- **Direct or Talk Around: This mode of communications provides public safety with the ability to communicate unit to unit when out of range of a wireless network or when working in a confined area where direct unit to unit communications is required.**
- **Push to Talk (PTT): This is the standard form of public safety voice communications today the speaker pushes a button on the radio and transmits the voice message to other units. When they are done speaking they release the Push to Talk switch and return to the listen mode of operation.**
- **Full Duplex Voice Systems**: This form of voice communications mimics that in use today on cellular or commercial wireless networks where the networks are interconnected to the Public Switched Telephone Network (PSTN).
- **Group Call**: This method of voice communications provides communications from one to many members of a group and is of vital importance to the public safety community.
- **Talker Identification**: This provides the ability for a user to identify who is speaking a any given time and could be equated to caller ID available on most commercial cellular systems today.
- **Emergency Alerting**: This indicates that a user has encountered a life threatening condition and requires access to the system immediately and is, therefore, given the highest level or priority.
- **Audio Quality**: This is a vital ingredient for mission critical voice. The listener MUST be able to understand without repetition, and can identify the speaker, can detect stress in a speaker's voice, and be able to hear background sounds as well without interfering with the prime voice communications.

In addition an enhanced priority management schema could be added to the above in order to provide a more flexible approach to creating communication hierarchies and enable a deterministic means of handling network contentions.

10. How, and to what extent, are PSAs using mobile broadband capability provided over commercial networks, and related products and applications, to support their operational activities? Are there any lessons or insights from these experiences, including the benefits that are being realised?

According to TCCA (Selex ES is an active member of TCCA and contributor the CCBG Critical Communications Broadband group):

"Taking service from an existing commercial Mobile Network Operator (MNO) is the simplest and possibly the cheapest option for obtaining basic data services. Some organisations will already have a relationship with one or more commercial providers. For Mission Critical users it will be necessary to negotiate appropriate Service Level Agreements (SLAs) to ensure that minimum standards of coverage, capacity, availability and resilience are committed to. Commercial networks already exist in many countries and the user can take advantage of standard commercial terminals as well as some specialist devices. Users can now be provided with access to additional information that improves their effectiveness

whilst away from the office.

The primary disadvantages of this arrangement are that the user organisation has no real control over the coverage, availability or resilience of the network and performance will typically be on a 'best endeavours' basis. Standard commercial networks tend to have little resilience; with downtimes of several hours not uncommon. Outages of more than 24 hours have been reported."

Current networks do not offer Group Calls, Direct Mode capability (calls made without access to the infrastructure) or other PMR style functionality. The operator may or may not be prepared to commit to adding such functionality later.

13. Can commercial network solutions that involve dedicated spectrum for PSAs (and prioritised capacity in other spectrum bands during emergency incidents) allow for interoperability between networks operated by other mobile carriers and/or for end user to roam across multiple networks? Are there any technical, institutional or commercial barriers that would prevent this outcome?

Cellular network operators are commercial businesses that typically provide infrastructure and coverage only where there is an economic case, such as cities, roads and popular tourist locations. Redundant infrastructure and resilient power supplies are not a generally an accepted necessity for most commercial operators

16. How important are communications between PSAs and the community during emergency incidents?

The ability to interact with the local population during the management of emergencies is critical. The increasing use of volunteers and the need to establish and maintain an effective two way flow of information between the responder organisations and the affected communities require new and innovative approaches to communications.

The increased use of new technologies and social media as a primary means of communication presents both challenges and opportunities for the PSAs. A programme being trialled by the West Midlands Fire Service (WMFS) in the UK has identified that 65% of emergency calls in the UK are now made from mobile devices – the increasing majority of which are smart phones. 999Eye aims to provide a secure means for the public to report incidents utilising the enhanced capabilities offered by a smart phone device such as GPS coordinates and streaming video. The exploitation of such capabilities to provide enhanced situational awareness could greatly enhance both the PSAs initial assessments of incidents and subsequent responses.

The use of data from sources such as the internet and social media will require new information management approaches in order to ensure it is appropriately filtered, processed and protected. The integrity of the Public Safety network would have to be preserved through appropriate means to ensure a clear distinction between the public internet and the PSMB.

17. What PSMB capability characteristics should be considered in this study?

PSA users are facing many new challenges. The increasing importance of data communications highlights the limits of the current narrowband PMR networks. Whilst still essential in the provision of mission critical voice services, they are not able to meet the needs of data intensive applications such as real time video and data queries. Future emergency management applications will increasingly rely on multimedia communications and on the capability to handle large volumes of data transfers in a timely and efficient manner.

Characteristics that should be taken into account for future PSMB systems are:

- **Standards Adherence.** LTE technology would appear to be the most promising replacement for the existing narrowband mission critical services. Although, it currently lacks a number of the important public safety features, that are being addressed by 3GPP and other cooperating standard bodies, LTE can provide:
  - Interoperability.
  - QoS enforcement and priority and preemption.
  - Good performances and low latency.
  - Simplified network architecture based on IP services.
  - Economy of scale.
- **Support for Public Safety Services.** The new PSMB network must be able to support the key services required by PSAs including:
  - PTT Handling,
  - Group Speech Call,
  - Messaging,
  - Priority Individual & Group Speech Call,
  - Emergency Individual & Group Speech Call,
  - Pre-emptive Individual & Group Speech Call,
  - Video-Communication,
  - CLIP (Calling Line Identification Presentation),
  - DTMF,
  - Call Barring,
  - Call Forwarding,
  - DGNA (Dynamic Group Number Assignment),
  - TPI (Talking Party Identification),
  - Force Call Termination from Dispatcher,

- Group Attach,
- Group Patching (from Dispatcher).

- **Multimedia Group Communications.** The introduction of broadband services and efficient spectrum management enables a much richer, multimedia communications environment to be provided**.**
- **Interoperability with Existing Technologies**. The introduction of a new technology must not adversely impact on the normal daily operations of the PSAs. It is essential that there is a seamless transition between services. This will require complete interoperability between legacy and new systems in order to ensure continuity of services and minimal disruption to operations.
- **Security**. A new PSMB system should provide encryption and an authentication mechanism across all aspects of the system (network level, end-user device, control room infrastructure) with at least the same level of features that characterize the current state of the art professional systems such as TETRA.
- **Reliability**. Public Safety networks have more stringent requirements than the standards provided by 3GPP networks deployed by Public Operators. To improve network resilience and reliability, the 3GPP is taking into consideration Public safety requirements and is working to specify and develop the *3GPP Release 13 - Isolated E-UTRAN Operation for Public Safety (IOPS)* feature, which is similar to the "Fall Back" used in TETRA networks. The inherent flexibility of LTE technology enables the implementation of such features and distributed network architectures. In addition *3GPP Release 12 - Proximity-based Services (ProSe)* will provide the LTE equivalent of TETRA Direct enabling direct communication between devices (smart phones, vehicular terminals, etc.) when no LTE network is available,

25. What options are there for extending the mobile coverage of commercial networks?

With the appropriate support of the Telco operator LTE technology can enforce QoS and privacy across 3rd party infrastructures, something that was not possible in the previous generation of 3G networks. The limitation is that commercial coverage is typically based on population density, where return on investment is higher, and not geographic coverage. Therefore to ensure full availability of all services across an entire region network extension solutions would have to be deployed. This could be achieved in a number of ways utilising both new and legacy technologies.

When deploying an LTE network using Public Telcos' access infrastructures it is essential for the PSA to maintain full control of the network and of the subscribers, ideally building a whole controlled ecosystem that would also include application and device management. This is the typical function of a full MVNO (Mobile Virtual Network Operator) where all or part of the core network is owned by the PSAs enabling the ability to program USIMs for PSA users.

For areas not served by existing access networks the following coverage extensions options could be utilised:

- **Temporary Coverage:** Deployed in accordance to requirements a temporary coverage solution could consist of small, low-cost networks, using down-scaled equipment, both in terms of performance and capacity, to provide local connectivity. This solution can be very flexible and easy to deploy as in some countries military frequencies (not related to carrier Operators) are used to provide temporary coverage. National rules and laws normally allow the use of these frequencies for temporary use in emergency management situations.
- **Fixed Coverage:** In order to improve service in predefined areas this solution requires an LTE frequency band dedicated to PSAs. In this scenario, the PSAs would act as a Mobile Network Operator (MNO) owning both the Access and Core Networks.

29. The Commission understands that there is currently work underway to develop voice applications for 4G/LTE networks for use in mission critical circumstances. When are these applications likely to become available?

Government Organisations and standardisation bodies (including TCCA, NPTSC, FirstNet and Public Safety User Group Organisations) are working in cooperation to plan and specify new features suitable for the provision of Mission Critical services for Public Safety. In order to meet these requirements, 3GPP has developed two main releases: 3GPP R.12 – finalized between June and September 2014 - and 3GPP R.13 – to be released in 2016. They include the following features:

- **3GPP Release 12 - Group Communication System Enablers (GCSE-LT**E): this function provides the capability to create basic broadcast and multicast services for Group Calls and it includes performance requirements such as fast call setup.
- **3GPP Release 12 - Proximity-based Services (ProSe):** this feature will provide the devices (smart phones, vehicular terminals) with the capability to communicate in the event of the LTE network being unavailable – the equivalent of TETRA Direct mode service.
- **3GPP Release 13 - Isolated E-UTRAN Operation for Public Safety (IOPS):** this is a new architecture including features to improve the reliability of the Access Network, similar to CS Fallback in TETRA networks - local handling of communications after an interruption of communication between BTS and network.
- **3GPP release 13 - Mission Critical PTT over LTE (MCPTT)**: this feature includes the provision of support enhancements to improve the performance PTT applications.

It is possible that there will a 3GPP LTE specification for a complete substitution of legacy broadband systems starting in 2017. At the moment LTE is available and ready for the provision of broadband data services and Public Safety services (such as PTT applications) based on unicast services. Other standardisation organisations are working in cooperation with 3GPP to define the basic services and architecture to support Professional Services over LTE, in order to provide a complete solution able to support Mission Critical Organisations .

3GPP, TCCA (TETRA and Critical Communication Association), ETSI, OMA and other

contributors, are also involved in the specification process for requirements, architecture, protocols, QoS and security items for a new Application Framework called MCPTT (Mission Critical Push to Talk).

Contacts

We welcome the opportunity to discuss our ideas further. Should you have any questions or require any further information, please do not hesitate to contact:

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