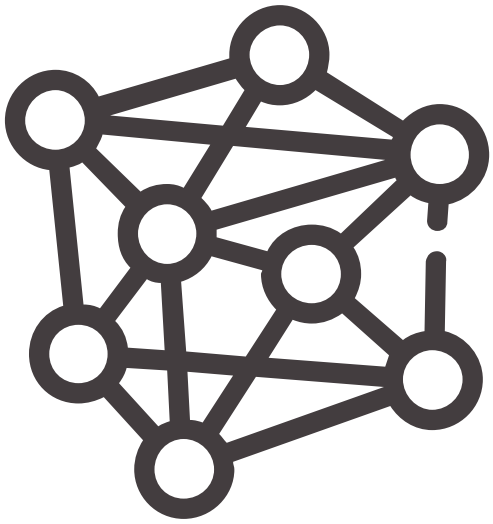
ERICSSON

Productivity Commission

Public Safety Mobile Broadband Consultation

Supplementary Submission - July 2015



Rev A

Public Safety Mobile Broadband
Productivity Commission
Locked Bag 2, Collins Street
Melbourne VIC 8003

psmb@pc.gov.au

cc: Brad.Ruting@pc.gov.au

Re: Public Safety Mobile Broadband – Productivity Commission Issues Paper – Supplementary Submission July 2015

Ericsson Australia welcomes the opportunity to respond to the Productivity Commission supplementary questions received 10 July 2015.

About Ericsson

Ericsson is the world's leading provider of technology and services to telecom operators, and is the global market leader in IPTV, satellite and contribution & distribution compression. Ericsson is the leader in 2G, 3G and 4G mobile technologies as well as a founding member and coordinator of the 5G standardization initiative *Mobile and wireless communications Enablers for the Twenty-twenty Information Society (M*ETIS). Further, Ericsson provides support for operators that collectively serve over 2.5 billion subscribers and has the leading position in the telecoms managed services business domain.

The company's portfolio comprises of mobile and fixed infrastructure, telecom services, software, broadband and multimedia solutions (including IPTV and Mobile TV) for operators, enterprises and the media and broadcasting industry. As the world's leading network infrastructure and managed services provider for mobile network operators, Ericsson plays a key role in the development of standards for mobile telephony and mobile broadband technologies.

Ericsson has one of the industry's strongest telecom technology portfolios, with around 35,000 granted patents worldwide and is the leading patent holder for 3GSM family of mobile network equipment standards: GSM (2G), UMTS / WCDMA (3G) / LTE (4G). Ericsson is the leading vendor in supplying LTE equipment to mobile operators around the world, and is a net receiver of licensing royalties with more than 90 patent-licensing agreements in place.

Ericsson is the fifth largest Information Technology Company by software revenues, following Microsoft, IBM, Oracle and SAP. Ericsson employs over 118,000 staff worldwide and over 25,000 of those are dedicated to research and development (R&D). Ericsson invested USD 5 billion in R&D in 2014.

Ericsson has been an active industry participant in Australia since the 1950s, and currently has a strong presence of around 1100 employees, delivering high-value professional services capability across Australia, New Zealand and the Asia Pacific region.

1 Ericsson Australia Responses

1.1 Priority and Access

Does technology exist for prioritising or pre-empting PSA access to LTE networks (pre-emption) when networks are already congested? Has such technology been deployed anywhere? Are 3GPP LTE standards for this likely to be developed and, if so, when could they be expected?

Yes, these technologies exist and Ericsson's Public Safety LTE offers Dynamic Prioritization and Pre-emption. Public Safety LTE systems immediately prioritize those users most critical to serving an incident, de-prioritize nonessential users and, when necessary, pre-empt.

3GPP support for this capability has been available for several years, and many of the solutions available for LTE are also available for GSM and WCDMA, although these earlier access technologies have limitations related to e.g. Latency, which render them less suited for Public Safety use compared to LTE. The main solutions offered for prioritization and pre-emption in LTE are based on

- Access Class Barring
- Resource reservation for "privileged access" users
- Allocation & retention priority (ARP)

Ericsson uses a combination of all of the above to secure the availability of public safety communication also in congested networks or cells. Although there are operators that have started to use prioritized access for "VIP customers", the matureness of the mobile broadband market is not yet on a level where this kind of prioritization for commercial users provides a good business case for the operators and/or end users. However, as Public Safety communication over LTE starts winning ground, this situation is changing and is commonly a mandatory requirement in PS LTE procurements. Just to highlight a few, some examples non exhaustive of where these features have been deployed include but are not limited to:

- Telstra LANES
- FirstNet Deployments
  - San Francisco
  - Harris County
  - LARICS

The 3GPP standard is a living standard in that it continues to develop. The Priority and Pre-emption capabilities exist already however it is always possible that these may be enhanced in future revisions of the standard as the need arises.

How costly, complex and/or time consuming would it be to implement prioritisation and preferential access solutions? What changes would be required to existing commercial networks to deliver this — could solutions be implemented only in the network core, or would changes need to be made to radio sites, backhaul, handsets or other equipment/infrastructure?

The cost and complexity can be quite objective as it will depend on the use cases to be implemented, In short there is a range of functions in the standard and solutions which can be utilised to fulfil the outcome. To provide a general understanding of requirements to deploy we have given an overview of network nodes and areas that would be affected.

The following are the 3GPP's view on end to end (E2E) Quality of Service (QoS). The end-to-end Bearer QoS Control is aligned with the 3GPP and IETF specifications and its implementation across the entire network.

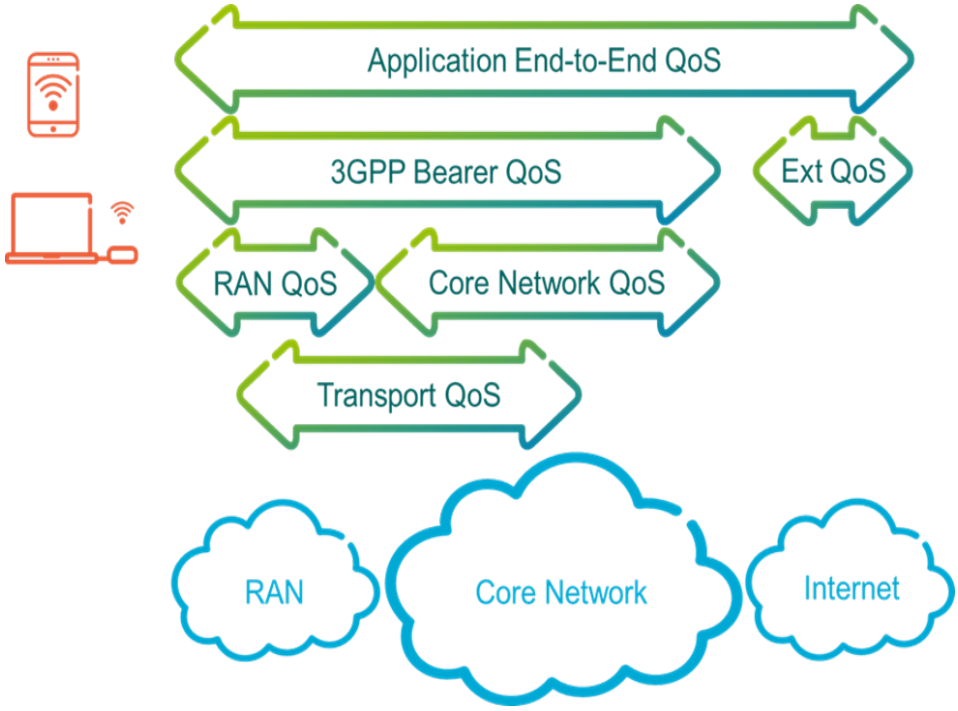


Figure 1: 3GPP QoS Overview

Figure 2 below shows how each network element is affected in End-to-End LTE QoS Control for prioritization and preferential access solutions.

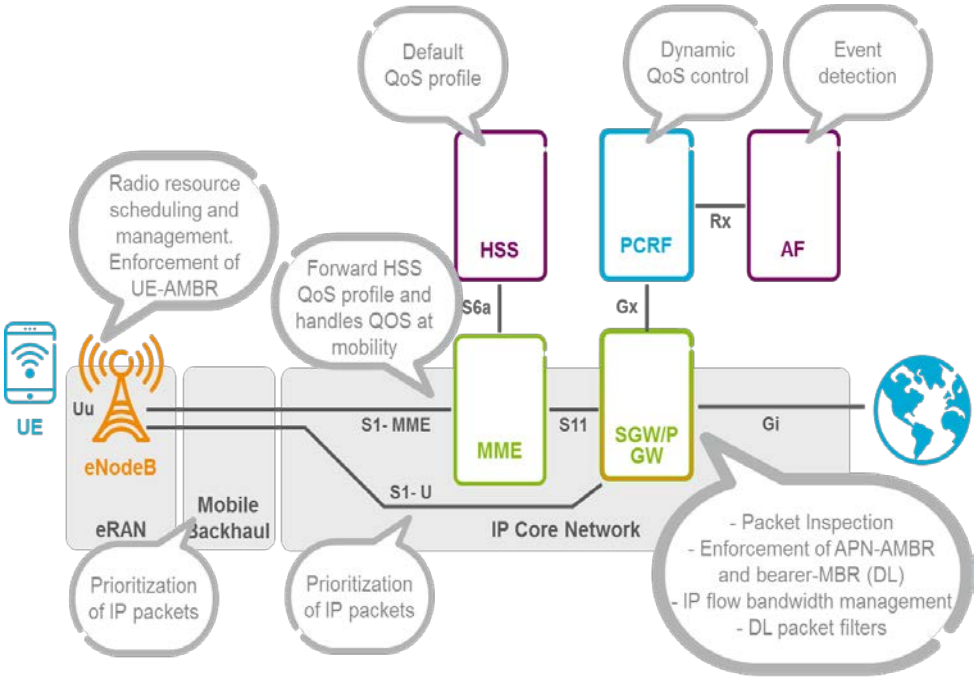


Figure 2: High Level End to End QoS Control Overview

The QoS capability in our architecture implements a full end-to-end strategy. The LTE RAN QoS capabilities allow differentiation of the priority handling, scheduling, and delay in resource limited scenarios on a per bearer basis. The Evolved Packet Core Networks have the possibility to detect that a service is used and provides the right QoS attributes and controls the QoS definition at establishment and modification of the radio connections through the Radio Access Network.

As a result from the QoS negotiation on the control plane level, the QoS to apply to the user plane is marked, with regards to priority handling of the packets, and delivered to the transport network,

The Evolved Packet Core Network can differentiate the QoS between types of services used within a bearer. Moving into a multi service offering requires that real time applications and premium services can be treated differently from an E2E QoS point of view. This can be realized through Dedicated Bearers.

As far as you are aware, have any commercial networks implemented preferential access features to date?

Yes, however this function is not widely used in commercial networks. One example of Commercial network deployment is Telstra's implementation of LANES which utilises these features to achieve the capabilities of this solution.

Generally commercial network operators typically move away from the 'reactive' approach of purely limiting heavy users and take a more proactive, marketing-led approach to subscriber and service differentiation where high usage is turned into a revenue opportunity rather than a problem.

1.2 Roaming

If public safety users were to be given the ability to roam from a dedicated network on to existing commercial networks (eg to boost coverage or capacity), what technical changes would be required on each network (eg hardware/software)? What are the associated challenges, complexities and costs?

3GPP generally supports roaming between networks, although there are normally operator imposed restriction to roaming between 3GPP networks within the same country (national roaming). To allow national roaming, Service Level Agreements between operators would be required in addition to network configurations (SW configurations) to enable roaming between specific networks. In addition to roaming, Public Safety users may also want service continuity when moving between different networks such as their own dedicated network and a commercial network. Service continuity is also supported by the 3GPP standard, and implemented in Ericsson's PS LTE network solution. Ericsson has, together with our partner Motorola Solutions Inc. (MSI), verified end-to-end service interruption depending on inter-connections used between the networks and the SW features used.

There are two Roaming Scenarios to consider: (1) LTE to LTE Roaming and (2) LTE to GERAN/UTRAN Roaming. Data Services could be Home Route or Local Break Out architecture but for Voice over LTE (VoLTE) it is preferable to use over Local Break Out.

The Roaming Agreement with SLA is the important key element to determine the solution and services quality. The technical impact then will depend on which above scenario is implemented, please refer to GSMA LTE and EPC Roaming Guidelines for detailed architecture.

1.3 Security

What new network core equipment (if any) or other equipment would be needed to deliver end to end security to PSA users? How would existing equipment or infrastructure need to be modified? Do 3GPP LTE standards incorporate security/encryption measures?

For an end to end explanation, we have detailed how this is provided by the combined Ericsson and MSI aligned Public Safety LTE (PS LTE) solution.

Ericsson and Motorola End to End Security Solution defend against threats and protect data resources for gap free security across the entire communications platform from IP transport, core, RAN, O&M, and Unified Services down to the data on the user's device. The Ericsson-MSI end-to-end solution for PS LTE uses both inherent LTE encryption and security solutions such as IPSec to protect the S1 interface, as well as specific encryption at the application level in the User Equipment (UE) and in the Application Server to enhance the security level for Public Safety users.

The Motorola Mobile Virtual Private Networks (MVPN) solution designed to work with Public Safety LTE systems provides end-to-end encryption, safeguarding sensitive information transmitted over the air in a wireless environment. Because it is designed to work with LTE QoS mechanisms, MVPN can safely protect the payload data while providing the necessary flags for QoS and prioritization handling.

Firewall and other standard carrier grade IT and IP security solutions provide additional network security protection for the entire Public Safety LTE system. All bearer and signalling plane traffic goes through the network firewall and is evaluated according to the specific security policy.

1.4 Mission critical voice

Have the proprietary solutions that exist for delivering push to talk voice services over LTE networks been trialled or deployed by PSAs anywhere in the world? Is there any information on these trials that you could point us to?

For non-mission critical PTT solutions, i.e. based on point-to-point connections rather than on point-to-multipoint, there are solutions today that can be offered to customers including the one offered by Ericsson and MSI. There is a number of these push to talk proprietary solutions trialled or deployed in the world however these are generally viewed as for non-mission critical use due to the limitations in being able to perform in direct mode. These instances are numerous but to name just one locally; the NSW Telco Authority (NSW-TA) has performed Proof of Concept (PoC) trials on a number of vendor solutions including their interoperability with an existing P25 network.

In regards to the road for these solutions to Mission Critical, Ericsson and MSI demonstrated a “Mission Critical Push-To-Talk (MC PTT)” solution at Mobile World Congress (MWC) in Barcelona 2015. The solution was based on 3GPP R12 of the standard and included a number of pre-standard solutions to enable PTT voice over an eMBMS broadcast bearer in the Downlink. This demo is able to be leveraged and would be able to be made available and negotiated as a customer trial during 2015 if and as required, but with network equipment and UE’s owned by Ericsson and MSI rather than by a PS LTE operator.

Ericsson and MSI continue to develop our MC PTT solution for the PS LTE community, and expect to have this commercially available by 2nd half of 2016 through incorporation of features being developed based on 3GPP R12 and R13..

1.5 Interoperability

Would current technology allow PSA staff to operate simultaneously across LTE and Land Mobile Radio (narrowband) networks? Has such interoperability been incorporated into 3GPP LTE standards yet? Are commercial solutions available?

As depicted in Figure 3, Public Safety LTE PTT is a solution that will continue to develop when it comes to features, services and the way it will be used.

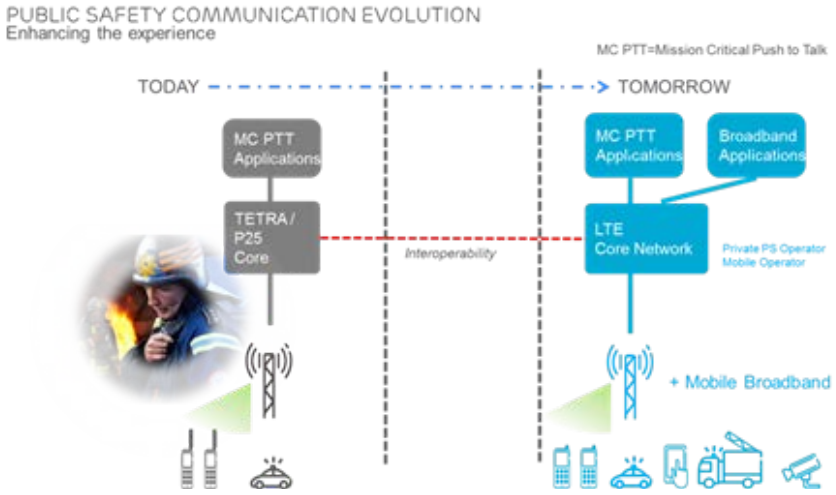


Figure 3: Mission Critical Voice and data migration path

Public Safety LTE PTT – First step available Today

The first step was to use LTE as a base for the additional broadband needs of Public Safety, complementing the existing narrowband systems. This step also adds interoperability between the two systems, sharing databases, status information and basic services. At this stage, basic push to talk capabilities and classical voice services may be provided also over the LTE network but mainly for backup purposes not considered mission critical.

The proprietary non mission critical solutions offered by vendors and commercially available today allow PSA staff to operate across LTE and Land Mobile Radio today through 2 methods.

1 Interoperability Gateways: At an application level many of the LTE PTT solutions provide for the option to connect the solution to a traditional P25 network and users. Depending on the vendor this can be utilising a proprietary interface or through the P25 Inter- Sub System Interface (ISSI)

2 Dual Mode Handsets: Many of the traditional LMR vendors have now developed or are in the process of releasing traditional LMR terminals which also have the capability to connect to LTE networks.

Going Mission Critical and Standardisation

As a world's first, Ericsson with MSI already today is able to demonstrate the next evolution of Mission Critical Push to talk solution of the future, based on standardised components as demonstrated at MWC 2015.

With the increasing understanding for the public safety and mission critical requirements, standardization bodies such as 3GPP have picked up on the needs and are developing standards for tools supporting Public Safety over LTE.

Some parts of the standards for public safety will be ready in 3GPP release 12 while more advanced functionality has been pushed to release 13. The 3GPP standardization of Public Safety will continue also in coming future releases, ensuring more advanced and well-tuned services to be enabled over time.

To move these solutions to be standardised on the road to MC PTT over LTE, the 3GPP SA6 work group is set up to define the Mission Critical PTT solution for LTE networks in release 13, where application layer solutions will be in focus, affecting specifications for both the UE and the Application Layer (MC PTT server). A part of the scope is to define interoperability solutions between PMR and LTE networks, but mainly in terms of solutions enabling e.g. talk-groups consisting of both LTE and LMR users. This means that a LMR user will be able to communicate with an LTE user, both in direct point-to-point calls and as part of the same PTT talk group. As discussed above this will be complimented by UE vendors continual development of dual mode (dual radio) handsets, capable of connecting to both LMR and LTE networks.

What infrastructure or equipment is needed to provide interoperability between LTE and LMR? Would it be sufficient to link network cores or would changes need to be made to radio sites? Are dual mode handsets currently available?

Interoperability between PS LTE and LMR networks, in the sense that a call can be set up between an LMR and an LTE network, generally requires an interface (P25 ISSI or Proprietary Interface Gateway Application Server) between the respective core networks. This interface already exists in the standards as well as in PTT over LTE vendor products, but may need updates when e.g. full MC PTT support in PS LTE is introduced in 3GPP R13 as described in the response immediately above.

As an example of one solution refer to Motorola Wave Solution – http://www.motorolasolutions.com/en_us/products/voice-applications/wave-work-group-communications.html

For Handsets, a number of vendors have or are in the process of releasing their dual mode handsets. For one example please refer to Motorola Wave Data Sheet:

http://www.motorolasolutions.com/en_us/products/two-way-radios/project-25-radios/portable-radios/apx7000l.html

Would current technology allow PSA staff to operate simultaneously across LTE and Wi-Fi networks? Has such interoperability been incorporated into 3GPP LTE standards yet? Are commercial solutions available?

Current non mission critical solutions for PTT over broadband operate on the IP Layer so are able to allow the application to connect over Wi-Fi networks in addition to LTE.

Additionally commercial solutions for access to the PS LTE core network (EPC) via both LTE and Wi-Fi are also commercially available. Ericsson supports such a solution together with the iPhone device (Apple).

Please refer to Ericsson Wi-Fi Calling Solution Portfolio and Ericsson Wi-Fi Mobility Gateway Introduction

What challenges would interoperability pose, and can these be addressed at present?

In regards to application interoperability between the applications on LTE devices and connection through a gateway to the LMR networks there is no identifiable impediment, not able to be overcome that we can see.

In regards to challenges in operating Voice over LTE applications and also being able to connect through Wi-Fi networks please refer to this reference White Paper titled Wi-Fi calling – extending the reach of Volte to Wi-Fi.

In regards to interoperability and roaming across multiple operators LTE networks, consideration should be given as to any variations in LTE network vendors between operator networks and potential differences in their interpretations or deployment of Public Safety grade features.

One advantage Australia has, in its consideration of PS LTE and the potential requirement to be able to interoperate and roam across operator networks is today all Australian operators utilise a single vendor (Ericsson) as the Evolved Packet Core (EPC) Vendor of choice, which is quite unique.

For example, would users of dual mode handsets be able to receive messages from one network while transmitting/receiving on another? (Eg, would a police officer be able to receive urgent 'push to talk' messages when they are already on a call?)

Technically speaking there is nothing preventing the PTT applications from being developed to prioritise one type of traffic over another and to determine how to treat or prioritise multiple calls or messages, however this is quite dependent on how the PTT vendors may choose to develop their applications and also how they leverage and control the UE terminals capabilities.

This is a UE question that needs to be answered by UE vendors.

Could data transmitted over a LTE network be converted to the LMR format when a user is outside of the LTE range (but within the range of the narrowband network)?

Yes.

1.6 General

Are there any relevant 3GPP LTE standards that have been formalised but not yet incorporated into equipment on the market?

3GPP SA6 is set up to develop Mission Critical Push-To-Talk solutions to PS LTE operators. 3GPP is targeting a final solution for the UE and the Application Layer (MC PTT server) in release 13, and will base this solution on the “Group Communication Service Enabler, GCSE” standardization developed in release 12. A large part of the MC PTT solution will also be targeting the “device-to-device” requirements, captured in the “proximity services, ProSe” work item in release 13. Ericsson plans to have a MC PTT solution based on 3GPP release 13 ready for deployment in PS LTE networks by the end of 2017, and is developing this end-to-end solution together with MSI and Qualcomm.

Ericsson looks forward to continued engagement with the Productivity Commission on Public Safety Mobile Broadband and digital economy related matters in the future, and is pleased to be contacted in relation to any points raised in this submission.

Yours sincerely,

Kursten Leins
General Manager, Government Affairs
Ericsson Australia and New Zealand