Parliamentary Joint Committee on Law Enforcement into Spectrum for Public Safety Mobile Broadband network - Ericsson Submission

Rev A

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Re: The spectrum for public safety mobile broadband

Ericsson welcomes the opportunity to respond to the Parliamentary Joint Committee on Law Enforcement into Spectrum for Public Safety Mobile Broadband network.

Ericsson is the world's leading provider of technology and services to telecom operators. Ericsson is the leader in 2G, 3G and 4G mobile technologies, and provides support for networks with over 2 billion subscribers and has the leading position in the 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, and seeks to ensure a globally harmonised allocation of spectrum to foster a global eco-system of network infrastructure, connected devices, and other devices to benefit enterprises and consumers.

Ericsson has one of the industry's strongest telecom technology portfolios, with over 33,000 granted patents worldwide and is the leading patent holder for the 3GSM family of mobile network equipment standards: GSM/UMTS/WCDMA/LTE. 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.

Government authorities around the world play a significant role in maximizing the societal benefits of convergence and in creating incentives for industrial and societal transformation toward a digital networked society.

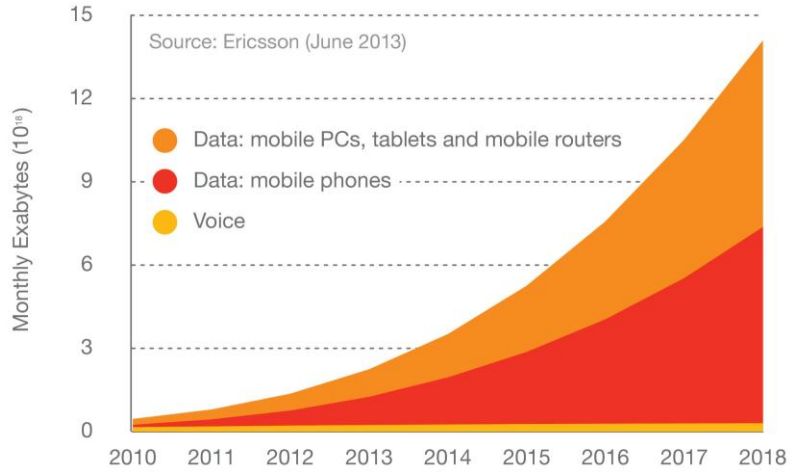
Ericsson has been an active industry participant in Australia since the 1950s, and currently has a strong presence of around 1400 employees, delivering high-value professional services capability across the Asia Pacific region, and establishing the first LTE Global Competence Centre for technical innovation and global support. Locally, Ericsson is also a member of following Australian Industry Associations: AIG, AMTA, and CommsAlliance.

Finally, as a board member of the Australian Mobile Telecommunications Association (AMTA), Ericsson is also a contributor to the association's submission on this topic.

1 Executive summary

Globally, the number of mobile broadband subscriptions has grown by around 45 percent over the past 12 months, totaling around 1.7 billion today. Further, mobile broadband continues to drive strong traffic growth, with mobile data expected to grow with a CAGR of around 50 percent (2012-2018) or a factor of 12 greater than today.

Figure 1: Global mobile traffic: voice and data 2010-2018[1]



Based on this projected traffic growth across a range of consumer and enterprise devices, the demand for spectrum to sustain this traffic growth is expected to continue well into the future. Techniques such as Heterogeneous Networks (new network architectures and small cells) incremental spectral efficiency gained through technology advancement, deployment of new radio technologies such as HSPA+ and LTE as well as additional spectrum is needed to deal with future capacity demands for commercial operator mobile broadband services.

In Australia, smartphone penetration is already around 60 percent today, and expected to continue to grow. Further, traffic generated by smartphones is expected to grow by a factor of 4 or greater between now and 2018. Globally, smartphone sales represented 50% of all phones sold in Q1 2013, up from 40% for the full year in 2012.

Key to achieving these vast economies of scale is the global and regional spectrum harmonization that has been achieved through close collaboration between mobile operators, infrastructure suppliers and device manufacturers.

In summary, Ericsson recommends:

1) Alignment to APAC (Region 3) harmonization for use of **3GPP Band 27** for Public Safety Mobile Broadband.

[1] Ericsson, Mobility Report, June 2013

2) Allocation of APT700 spectrum for commercial mobile broadband use, given the vast economies of scale that this band will enable for public mobile broadband services. Countries that have adopted and/or endorsed adoption of this band plan have a total population in excess of **2 billion people**, with additional countries expected to endorse this plan in the near term future.

2 Ericsson's response to Terms of Reference

2.1 (a) How much broadband spectrum law enforcement agencies need to be able to communicate safely and effectively during mission-critical events such as natural disasters and potential terrorist incidents;

Long Term Evolution (LTE), sometimes referred to by operators as '4G' is a mobile broadband technology that is designed to efficiently handle large volumes of data, delivering high performance, high capacity and reduced complexity compared to previous technology generations.

Through a global standardisation body known as the 3rd Generation Partnership Project (3GPP), comprising six standardisation bodies and including representation from operators, infrastructure suppliers and device manufacturers, LTE has been standardised to flexibly support a number of carrier bandwidths, including 1.4, 5, 10, 15 and 20MHz for both paired spectrum (also known as Frequency Division Duplex or FDD spectrum), as well as for a TDD (or Time Division Duplex) operation.

Significantly, this is the first time that a 3GPP technology has been able to operate across a range of carrier bandwidths, and is driven by the demand for operators to have maximum flexibility in utilising available spectrum.

As a general guide, a wider carrier bandwidth translates to a higher data carrying capacity for service providers.

For operators, the question of 'how much spectrum is enough' is one that requires detailed traffic modelling based on specific use cases and traffic or specific end-user service scenarios . Furthermore, dimensioning must be performed in conjunction with a specific target radio network design – including assumptions on density of towers (sites), and target coverage area. Ultimately, the quantum of spectrum is considered an input to the network design process – it is considered a variable factor that feeds into the overall design.

Specifically, radio network dimensioning and planning for mobile broadband networks is typically undertaken based on four 'geotypes' based on population density; these include dense urban (city), urban, suburban and rural geotypes. Each of these areas will typically have a different traffic profile, as well as different coverage requirements, with cell density highest in dense urban and decreasing to lowest cell density in rural areas.

Finally, it is not possible to claim with any degree of certainty that a particular quantum of spectrum would be sufficient without a reference network design, traffic scenarios and use-cases. This is particularly pertinent as an incident requiring law enforcement and/or public safety agency attendance can occur anywhere in Australia.

As a general guide, a 10-inch tablet can stream high-quality video at around 500kbps, and a 5-inch smartphone at around 200-300kbps. By comparison, a standard-definition video stream (SD) would typically require 2-3Mbps. As video is one of the most data-intensive services delivered over broadband networks, the device mix in a given incident area will also have a significant impact on traffic and network dimensioning.

Some of the most heavily loaded LTE networks in the world today are in the US, which first launched LTE services in 2010. These networks deliver 'typical' user speeds of 5-12Mbps, and utilise a 10+10MHz carrier bandwidth. Today, Australian operator LTE networks are deployed using 10-20 MHz of paired spectrum, although deployment of 5+5MHz networks is also under consideration to maximise utilisation of spectrum assets. Typical downlink network speeds delivered range from 2-40Mbps.

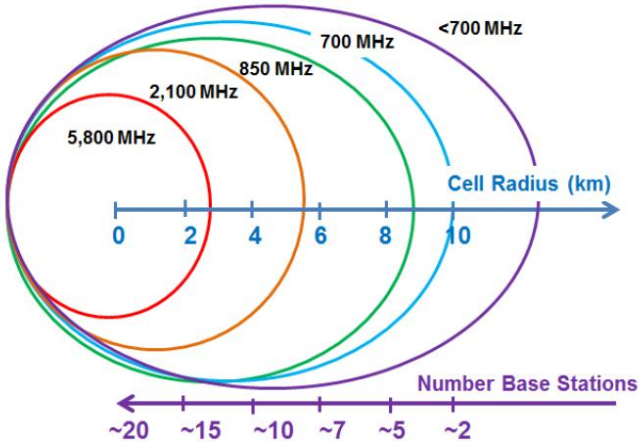
2.2 (b) which of the 700 or 800 MHz bands is the most appropriate for law enforcement agencies given the current licensees occupying spectrum;

Within 3GPP, many spectrum bands have been standardised to facilitate global and regional harmonisation, thereby enabling vast economies of scale for network infrastructure suppliers and device manufacturers.

During World Radiocommunication Conference 2012 (WRC-12), 3GPP band 27 (807-824 / 852 – 869 MHz) was recommended as a Public Safety Mobile Broadband band within the Asia Pacific region (Region 3). In part, this was due to the fact that there are a number of narrowband Public Safety networks in operation within this band throughout APAC, thereby creating a future evolution path to mobile broadband using LTE for Public Safety with regional scale.

Spectrum below 1GHz is generally regarded as 'premium' spectrum, primarily due to its excellent propagation over long distances, as well as its superior in-building performance. This is illustrated in the following figure. As can be seen, there is negligible difference in coverage characteristics between 700 & 800MHz spectrum bands.

Figure 2 - Cell site coverage radius at different frequency bands[2]



By comparison, 700MHz spectrum in APAC is known as APT700 (Band 28), and has been adopted and/or endorsed widely throughout the region, and increasingly across large parts of Latin America, for commercial operators to deploy future mobile broadband capacity and coverage.

Countries that have adopted and/or endorsed adoption of this band plan have a total population in excess of **2 billion people**, with additional countries expected to endorse this plan in the near term future.

[2] 4G Americas, The Benefits of using LTE in Digital Dividend Spectrum, Nov 2011

2.3 (c) how the necessary spectrum for public safety should be secured in a timely manner;

As per response to (b) above, band 27 has been identified by WRC-12 and 3GPP as a candidate band for Public Safety Mobile Broadband in Asia Pacific.

The Australian Communications and Media Authority has recently undertaken a review of the 800 and 900MHz bands, including proposed options for allocation for Public Safety mobile broadband spectrum.

2.4 (d) what arrangements should be put in place to ensure that, in extreme circumstances, law enforcement agencies can effectively use spectrum of commercial carriers to protect public safety and maintain public order;

Spectrum licensing is employed in Australia and globally to enable license-holders to effectively manage their mobile network performance, reliability and end-user experience. Commercial mobile networks operate on dedicated spectrum today.

In the US, FirstNet was created as an independent entity to manage access to public operator networks for use by Public Safety agencies, and agreements have been established with major operators in that market.

Within Europe, a different approach is being considered, with current interest in leveraging Mobile Virtual Network Operator (MVNO) agreements to enable Public Safety access over public operator networks. This approach requires a number of additional features that are not yet deployed by commercial operators, however these are being developed and released based on operator demand. Trials are expected in the near future within Europe to showcase this capability.

Although research is ongoing into ‘spectrum sharing’ solutions, these remain very much in a research phase, with current applications being considered for making better use of lightly-loaded spectrum (itinerant usage) by heavier and frequent users, such as mobile operators.

2.5 (e) what applications dependent on broadband spectrum will contribute significantly to saving lives and property;

Two key aspects of Public Safety operations can be enhanced through the utilisation of mobile broadband: 1) enhanced situational awareness and 2) achievement of a common operating picture.

As LTE can deliver high-speed mobile broadband, a range of rich communications services are enabled, including video, presence and voice – all delivered over a native IP network. Due to the open standards upon which LTE is based, it will be possible in the future to deploy new, innovative apps, thereby further enhancing the utility of any mobile broadband network. The availability of this additional level of detailed information has the potential to improve incident assessment and response management.

Having said this, it will be essential for Public Safety agencies to consider how they will enable such high-bandwidth services with ubiquitous coverage, across dense urban, urban, suburban and rural geographies. Leveraging commercial operator LTE network coverage and capacity provides an excellent opportunity to enhance situational awareness and achieve a common operating picture, particularly as many Australian operators have existing spectrum holdings that are standardised for LTE, such as 1800MHz (2 x 10-20MHz) or will deploy a number of LTE carriers in the near future, including 700MHz (2 x 10-20MHz) and 2600MHz (2 x 20-40MHz), to name a few.

It should be noted that Public Safety mobile broadband applications may require more symmetrical communication (ie up to 50% uplink traffic), as compared to consumer mobile broadband (typically 10-30% uplink traffic) traffic scenarios.

Finally, Public Safety applications require strict Quality of Service enforcements in order to provide the necessary reliability and service characteristics. Both Access Prioritisation and Service Quality must be assured during times of extreme network load/congestion, which may be common during major incidents. These features are under development within 3GPP standards, for deployment in operator networks in the near future.

2.6 (f) the impact on law enforcement agencies which utilise the available spectrum in relation to budgets, implementation strategies, current infrastructure and existing technology; and

Budget

Spectrum, although a strategic asset required for the operation of any mobile communications network, is just the tip of the iceberg.

As mentioned earlier, based on the available spectrum (high/low frequency, quantum of spectrum, metro/regional license area, etc), radio planning and network design is undertaken based on available resources. In this sense, spectrum is an input rather than a means to an end.

Based on Ericsson's extensive experience in designing and deploying networks around the world, the most significant cost for greenfield network deployments is the towers and sites themselves, which typically represent 80% of the overall radio network cost. The actual active antennas and radio base station equipment represents less than 20% of the radio network build cost.

Additional costs to consider include the provision of a core network, as well as high-capacity backhaul (typically a combination of fibre and high-capacity microwave links), as well as professional services for the rollout, installation and provisioning of infrastructure.

Finally, mobile networks are highly dynamic, with regular software releases, patches and enhancements being applied – typically first in a model environment - before being tested and then deployed into live networks. A network is a living entity, and operational costs represent a significant investment for operators.

Implementation strategies

As mentioned in response to question (D), a number of strategies are being developed: the US model of private PS MBB network, augmented with commercial operator agreements, and the European model taking an MVNO approach, with limited or no direct infrastructure investment.

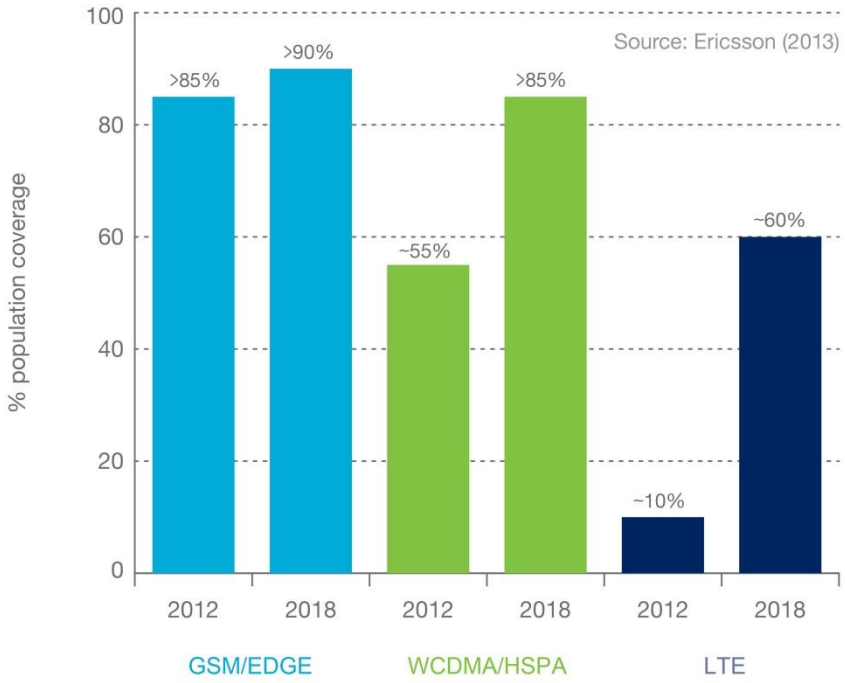
Current infrastructure and existing technology

LTE is the first truly global mobile technology, and as such has achieved vast global scale in just a few short years since it was first launched in Norway and Sweden in December 2009. It is widely acknowledged that LTE is the fastest growing ecosystem, ever.

LTE population coverage doubled globally from 2011 to 2012, growing from 5% to 10%, and it is expected that LTE will cover 60% of the world's population by 2018, with around 2 billion subscriptions forecast by then.

Australia, like a number of other advanced mobile markets, is today well ahead of this target, with Telstra announcing a target of covering 66% of the Australian population with LTE by mid 2013[3], and Optus announcing plans to cover 70 of metro population by mid 2014[4].

Figure 3 – Mobile technology population coverage



[3] Telstra Media Release, Telstra turns on 1500th 4G base station, 21 May 2013
[4] Optus Media Release, Optus to roll out Australias first multi-band 4G network, 20 May 2013.

2.7 (g) any other related matters.

Operators in many markets globally are considering the deployment of new traffic management features, such as tiered mobile broadband services (gold/silver/bronze features and packages), and are driven by commercial imperatives for customer experience and profitable growth. Many of these same capabilities can be leveraged for Public Safety mobile broadband applications, and combined with new public-safety specific features; a complete service offering is imminent albeit driven by market demand.

Secondly, commercial operators hold significant amounts of spectrum today, typically in the order of 100's of MHz of spectrum, in order to carry the large traffic volumes generated in commercial networks across both metropolitan and regional areas. In many operator networks, traffic continues to double every 12 months or less, so they are continually adapting and evolving their networks to deliver highly efficient mobile broadband capacity. Consequently, it makes good economic and commercial sense to consider how to most effectively leverage this vast mobile broadband carriage capacity, with it's associated spectrum band diversity, for Public Safety mobile broadband applications.

In many geographic areas, it may simply be more cost effective to negotiate service agreement(s) with commercial operators, deferring infrastructure spend to network hardening by way of ruggedisation and recoverability of operator sites, as required.

Ericsson looks forward to continued engagement on this topic, and is pleased to be contacted in relation to any points raised in this submission.

Yours sincerely,

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