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Attending to this matter: Ashwani Kumar

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Mr. Syed Tausif Abbas,
Advisor (Networks, Spectrum and Licensing)
TRAI
New Delhi.

Ericsson Response to TRAI Consultation Paper No. 15/2017 on "Next Generation PPDR Communication Networks"

Dear Sir,

Ericsson welcomes the opportunity to provide response on the TRAI Consultation Paper No. 15/2017 on "Next Generation PPDR Communication Networks. We appreciate the consultation to deploy national critical communication infrastructure for public safety and disaster recovery applications.

Ericsson hereby submits the detailed response, as attached to this letter, for your kind consideration.

Yours sincerely,

For Ericsson India Pvt. Limited,

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Ericsson Response to TRAI Consultation Paper No. 15/2017

Next Generation PPDR Communication Networks

TRAI Consultation on PPDR

Ericsson response to TRAI

Consultation Paper No. 15/2017
CHAPTER V: ISSUES FOR CONSULTATION

Q1. Do you consider the existing fragmented model of PPDR communication network in the country adequate to meet the present-day challenges? If not, what are the deficiencies in the existing model of PPDR?

Ericsson response

Currently, public safety networks adopt the narrow-band digital trunking technology, like TETRA and P25 systems, primarily meant for voice communication, providing low bandwidths and poor mobility. Besides, with the advent of LTE technology as a mature and a natural choice for broadband PPDR applications, these narrowband PPDR technologies will face a challenge in evolution.

The current framework despite consuming large amounts of costly spectrum, a dedicated organization to manage the network and services, scalability issues, does not offer the evolving needs of the public safety and emergency communication needs.

- The current PPDR networks based on narrow band technologies like ETSI/TETRA, APCO/P25 systems are going to be outdated and extinct once the global uptake for broadband PPDR based on LTE takes place on large scale hence there would be issues in evolution. Cost per Gigabyte for existing networks are prohibitive compared to high spectral efficiencies and flexibilities offered by LTE.
- Narrow-band digital trunking can no longer meet the increasing needs of multi-media services on public safety networks. Instead, LTE broadband trunking, featuring large bandwidths, high data-rates, and IP-based operation, supporting multimedia communication including eMBMS (video) to/from disaster site, is becoming the mainstream in the market, ushering an era of LTE-based public-safety networks.
- PPDR agencies in India are issued license by DoT under CMRTS category, accordingly spectrum is allocated by WPC Wing of DoT in the 300 MHz or 400 MHz or 800 MHz bands. This has resulted in fragmented assignments with inefficient use of precious and prime sub-GHz spectrum. Whereas, broadband PPDR using LTE, is the optimal choice for an integrated PPDR network providing leading-edge services standardized by 3GPP in Rel. 12, 13 and 14.
- This has been observed that while public safety and security agencies have their individual networks in place, they continually face a challenge to have seamless communication and information sharing with other agencies. This is due to the facts that their networks are either not inter-operable or they are just not compatible with each other. This deprives the agencies of instant cross-agency coordination and

exchange of mission-critical information exchange which eventually results in to ineffective mitigation of safety and disaster situation.

As urbanization and globalization speed up, an increased occurrence of terrorist attacks, natural disasters, crimes, and diseases pose greater threat to public safety. As a result, the governments are working their way to establish advanced public safety telecom system by using cutting-edge information and communications technologies, to deal with public safety problems.

In today's connected world, there is a great need for enriched multimedia tools, data & video analytics and sophisticated applications for public safety applications. We summarize some key global developments in this area in the following -

The increased demand from the public safety sector for better intelligence and situational awareness means that LTE and predictive policing will ultimately go hand-in-hand. Mobile broadband can help emergency services by creating more efficient processes, using live mobile video, situational aware dispatching and remote diagnostics etc. All this has been made possible by effort made by a diverse ecosystem of contributors working together on an open platform and communications standard approved by 3GPP – a global standards body.

Ericsson would recommend creation of a unified national infrastructure for critical communication, for use by all security, public safety and disaster recovery agencies, leveraging LTE technology catering to all use cases for public safety, police communication, disaster recovery. This provides cost efficient deployment, efficient spectrum usage and seamless upgrades without stranding capacity due to multi-user environment.

Q2. In the various models described in para 2.11-2.15, in your opinion which of the model (dedicated, commercial, hybrid) will be more suitable for Indian conditions? or Is there any other alternate model which would be more suitable for Indian telecom environment? Please provide rationale for the suggested model.

Ericsson response

The public safety organizations are currently operating narrowband technologies such as TETRA or P25. In the evolution to integrated broadband PPDR network based on LTE technology, PPDR agencies may continue using the TETRA network for voice-communication while assigning the broadband applications to the LTE PPDR network. The interconnection between the two may be done through a gateway.

MCPTT (mission critical push-to-talk) has now been standardized in the 3GPP LTE standard and eases difficulties to migrate from narrowband with identical feature sets as well as it offers the opportunity for Greenfield situations to avoid the costs of multiple-layer implementations. By leveraging the strengths of LTE and adding a comprehensive set of features needed for public safety communications, Mission Critical Push to Talk brings technical unity to commercial and public safety PTT communications. 3GPP has defined requirements for Mission Critical Push to Talk (MCPTT) application in LTE Release 13 (Technical Specifications TS 3GPP TS 24.380 version 13.0.2 Release 13). The functionality from TETRA and P25 standards has also been included in LTE Release 13.

As far as deployment strategy is concerned, the public safety agencies may there are three broad approaches to it – Dedicated PPDR network, PPDR infrastructure using Commercial networks, and Hybrid approach leveraging Dedicated PPDR infrastructure in part and sharing with Commercial networks in the rest, as summarized below.

TABLE - 1

Commercial networks		**Dedicated networks**		**Hybrid approach**	
Pro	**Cons**	**Pro**	**Cons**	**Pro**	**Cons**
Instant coverage	Main focus on commercial services	Control over network resources	Dedicated spectrum	Pay as you grow – cost managed	Dedicated spectrum
Lower costs	Governed by profitability	Hardened for critical communications	High upfront costs	Better control of coverage and resources	Large access network costs
	Low commercial viability for coverage in sparsely populated areas	Better security	Needs new organization to manage and operate network and services	Moderate costs and swift coverage	Needs new organization to manage and operate network and services

Irrespective of the approach undertaken, looking in to the stringent availability requirements, group communication with pre-emption facility and security requirements, the PPDR network infrastructure needs to be custom-built with necessary hardening and deployment of equipment which is equipped with critical communication requirements as specified by 3GPP in Release 12, 13 and 14.

The PPDR network should be built upon hardened requirements for critical communication which may be primarily meant for PPDR services while also providing the commercial services but the commercial services would be preempted once there is a disaster or some public safety incident.

Dedicated network, if deployed exclusively by PPDR agencies, will require huge capital investment. Further technological advancements will require periodic investments in future. It is appropriate and better to discuss and adopt futuristic approach which may not become economic constraint to PPDR agencies as well as can yield commercial value.

Considering the stated services aspects and budgetary constraints, it makes the most sense to take a middle path using hybrid approach -

- In certain highly vulnerable and disaster-prone areas, a dedicated network could be set up by public safety organizations. This would ensure very high security and availability aspects for certain key areas.
- In other places, the large telecom operators may be engaged to plan, design, build and operate the network for public safety agencies using the spectrum allocated to public safety agencies. However, the core for PPDR/ Emergency services may be separate from commercial operations.
- The agencies may choose different telecom operators in different parts of the country to provide diversity and redundant connectivity across them.

- To provide additional data and voice coverage and fallback in the event of a crisis, the LTE core can also be bridged to other commercial LTE and 3G radio networks. In all cases, additional coverage and capacity can be provided by a cell on wheels (CoW) for temporary expansion of the network in disaster areas – which can be dispatched together with emergency services.

Q4. Will it be technically feasible and beneficial to permit PPDR trunking service roaming on public telecom networks? If yes, what challenges do you foresee in implementation of such an arrangement? Please justify your answer.

Ericsson response

Given the large geographical area of the country and remote isolated locations of the disaster sites, this is recommended to put in place roaming arrangements of PPDR network with public networks to provide coverage outside PPDR network footprint. This would also provide a fallback option in case of PPDR network outages. The arrangement should be driven by clear SLA (service level agreements), TAT (turn-around time) and KPIs (key performance indicators) covering availability and performance objectives for various PPDR services.

Once the trunking user moves out of the private network or in case of network failure, it should be able to access the public network through an upper layer IP data-connection back to the PPDR PTT (push to talk) server, meaning that the user can still access the full range of services, broadband and otherwise, regardless of location.

The PPDR mobile applications can be installed on any commercial smartphone allowing the user to access PPDR PTT server and other backend servers, through the public network's data connection.

With hybrid-mode of deployment as the efficient approach for PPDR, wherein a captive PPDR user can also use public networks as well, Ericsson recommends planning the BB PPDR networks in popular LTE spectrum bands deployed in the country to ensure easy roaming across PPDR and public mobile networks along with large-scale ecosystem.

With a VPN connection between the PTT server and handset in the public network being already established, the end to end encrypted data can be transmitted through the public network in a secure manner. Therefore, issue of security of the PTT service over the public network is also taken care of.

Q5. Can frequency bands be identified exclusively for public protection and disaster relief? What are the candidate bands for PPDR operations in India?

Ericsson response

We are of the firm opinion that PPDR networks should be developed in commercial bands which provides roaming, fall back, cost efficiencies due to ecosystem availability, costs and choice.

With extensive work done by 3GPP on critical communication for robust critical communication infrastructure using LTE technology which is supported and backed by largest global operators including AT&T and Verizon. There is no need to identify specific spectrum. The global 6.5 billion successful subscriptions on LTE are a measure of trust and conviction in the powerful technologies being created by 3GPP and swift ecosystem availability at lowest price points. Given the size and spread of the LTE networks, LTE becomes the natural choice for PPDR. The PPDR based on LTE can work in any IMT bands specified by 3GPP for LTE technology hence we don't see a need to earmark separate dedicated spectrum for PPDR. Harmonization with commercial spectrum (and not isolation) is what is needed for a successful and efficient public safety communications infrastructure in terms of eco-system availability, roaming, and cost of network deployment and its operations.

The ITU-R Resolution 646 (Rev. WRC-15)[1] encourages administrations to consider parts of the frequency range 694-894 MHz (global) and 406.1-430 MHz, 440-470 MHz and 4 940-4 990 MHz (harmonized for Region 3), when undertaking their national planning for their PPDR applications, in particular broadband, in order to achieve harmonization.

In our view, the spectrum range in the sub-GHz range is a better choice to provide a good blend of coverage, capacity, especially the deep indoors or basements or interiors of localities typical of disaster incidents. A range 852/869/802-824 MHz, in 694-894 MHz (which is global harmonized view), is a good choice providing efficient coverage, capacity, better roaming with public networks, smooth coexistence and good eco-system availability.

Q6. If wideband/broadband PPDR is to be implemented in India, what quantum of spectrum will be needed for such solution for PPDR?

Ericsson response

As aforesaid, Ericsson recommends planning the BB PPDR networks in commercial LTE spectrum bands which are deployed in the country, to ensure easy roaming and compatibility between PPDR network and public mobile networks.

According to ECC Report 199[2] titled user-requirements and spectrum needs for future European broadband PPDR systems-

- With proper network planning a spectrum amount in the range of 10 MHz for uplink and another 10 MHz for downlink is sufficient to cover the PP1 (day to day communications) cases addressed in the report.
- It is considered that 10 MHz of spectrum for the uplink and another 10 MHz for the downlink provide enough capacity to meet the core requirements of the PP2 scenarios (large emergencies and public events) presented in the study. It should be noted that

[1] https://www.itu.int/en/ITU-R/information/Documents/Res.646(WRC-15).pdf
[2] http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep199.pdf

situations can occur where demand could exceed the capacity of the permanent WAN network. In the case of a pre-planned event, additional temporary capacity should be considered to increase the permanent network capacity.

While the exact amount would depend on the actual size of network, service requirements, peak traffic rates requirements, Ericsson suggests least 10/10 MHz spectrum for PPDR applications, in sub-GHZ band preferably Band 27 (852/869/802-824 MHz), providing better roaming with public networks and good eco-system availability.
