



400 MHz BROADBAND SPECTRUM FOR PUBLIC SAFETY

Executive Briefing

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The demand for mission-critical data

In the challenging economic climate, governments are keen to look at mobile data services to improve their operations. When authorities' daily operations start depending on data, mobile data communication networks have to be mission critical – secure, reliable and always available.

Evolution to broadband is necessary for introducing new info-centric operations (that take advantage of digital information such as images and video, for example).

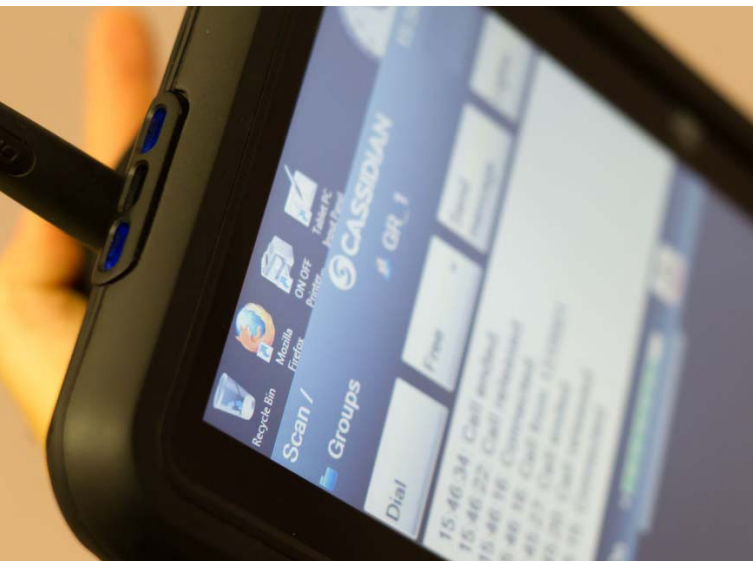
While current ETSI (European Telecommunications Standards Institute) SRDoc (System Reference Document) for PPDR (Public Protection and Disaster Relief) identified needs for 2x10 MHz of new spectrum for mobile broadband data, and the International Telecommunication Union (ITU) has started work towards its World Radiocommunication Conference 2015 (WRC-2015) PPDR agenda item 1.3, one should understand that these are long term goals set for the next 10-15 years. Even so, governments expect to have first implementations of secure mobile data services much sooner.

New possibilities for professional users

With the challenge to identify new spectrum, the foreseen availability of high power LTE (Long Term Evolution) broadband technology in the 400 MHz spectrum offers new possibilities, through Cassidian - Alcatel-Lucent partnership. The innovative, integrated LTE 400 PMR solution offers a pragmatic way to introduce broadband PPDR capacity in the tuning range 380-470 MHz. This approach leverages the LTE technology.

LTE is the global 4G standard, and it brings great performance in terms of throughput and latency (less than 10 ms). Also, LTE is based on IP, so integrating video, data, and voice applications is easy while controlling the Quality of Service of each individual flow. The integrated LTE 400 PMR solution uses channel widths of 1.4 MHz, 3 MHz or 5 MHz depending on spectrum availability that are deployed with a frequency reuse of 1.

Moreover, the Cassidian – Alcatel Lucent solution provides a platform for evolving today's TETRA and TETRAPOL networks toward a common professional broadband standard and ecosystem, ready to host future mission critical interoperable voice and data applications. The solution will be ready for field trials during 2012.



More spectrum needed – where to find it?

In North America, a dedicated 700 MHz band has been reserved and allocated for Public Safety use. It was allocated next to a commercial band to:

- Leverage the commercial ecosystem and
- Further increase interoperability between fragmented jurisdictions by a national broadband strategy and governance.

However, because this is a higher frequency band and low power devices are used, 3-4 times more base station sites are needed to reach the equivalent of APCO P25 Land Mobile Radio (LMR) voice systems' coverage.

In Europe, Public Safety networks have been implemented in the 380 – 400 MHz band. This was done with a national strategy and coverage leveraging decision made in the 1990's by NATO to re-allocate 2x5 MHz for Public Safety use across the European Union. Such an infrastructure, all the backbones and sites represent a huge asset on which to build future communications with a 1-1 site reuse strategy.

In the Asia-Pacific area, most Public Safety networks are built in the 400 MHz or in the 800 MHz band, while Mainland China uses 350 MHz frequencies.

- 400 MHz bands are available for Public Safety or Professional Mobile Radio in some countries, and they are occupied
- The 700 MHz range was identified for mobile use for some Asian countries in the World Radiocommunication Conference 2007 (WRC-2007), but it has not been available for PMR.
- The 800 MHz band is, as a rule, available for PMR and also occupied.

To build a feasible business case for dedicated broadband Public Safety network all measures need to be taken to keep the costs at acceptable level. Taking advantage of economies of scale is extremely important and requires harmonisation of standards and spectrum plus utilisation of maximal technology synergies.

As the International Telecommunication Union (ITU) re-opened the Public Protection and Disaster Relief (PPDR) agenda item for the study period up to WRC-2015, it is equally important that the Public Safety actors cooperate globally to build as harmonised solutions as possible.

Public Safety is not the only group of mission critical radio users that expects to deploy broadband services. Knowing the current scarcity of suitable spectrum it is unlikely that own bands could be made available to all user segments. Therefore it is likely that only efficient cooperation of all user groups can bring the broadband spectrum opportunity available to all mission critical users.

Making new spectrum available will mean some kind of re-farming or re-allocation of frequencies. Re-farming represent both an opportunity for improved spectrum efficiency and a risk of slow progress and delays. In any case re-farming will be needed to make the wanted new spectrum available.

Economical factors are a major consideration for governments when choosing the technology, the deployment strategy and the modes of operation for radio communication for the relatively small number of authority users. Because of these economical reasons, the PPDR community is looking for frequencies that are below 1 GHz, but the opportunities to find additional spectrum for broadband PPDR are limited. Frequencies below 1GHz allow a larger cell size, which would be a more cost-effective solution for governments.

Larger cells – fewer base stations – benefits

Because of the propagation characteristics of the signals in the Ultra High Frequency (UHF) band of 380-470 MHz, a given area can be covered with large cells, which means that coverage could be met with the same number of radio sites than current narrow band networks. Using the 400 MHz band together with higher power base stations and radio terminals would allow introducing LTE-enabled data capacity even at the cell edges of existing TETRA or TETRAPOL sites.

There would be the following technical benefits:

- lower path loss
- better building penetration
- lower Doppler shift.

In practice, these technical benefits would mean a better cell range and coverage – in other words, lower implementation cost per user.

Conclusions

Broadband efficiency to PPDR users is the main target of the Cassidian – Alcatel Lucent team.

Based on today's frequency spectrum situation and technology capability, this team is working on an LTE 400 MHz solution and supporting a step by step refarming process of the 380 -470 MHz frequency band, to free additional spectrum in the near future.

The refarmed bands may be further complemented by other new frequency bands for broadband PPDR, (in the 700 MHz band, for example) and/or below 380 MHz, over time. With limited spectrum, further consolidation efforts of national governmental users and other critical users are required. Mission critical and highly resilient future broadband communications infrastructure including voice and data services needs to be the focus of the users. This communication infrastructure will help to protect citizens and support the governments' security agendas.



When authorities' daily operations start depending on data, mobile data communication networks have to be mission critical – secure, reliable and always available.



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