Dr Matthew Sorell
SENIOR LECTURER IN TELECOMMUNICATIONS AND MULTIMEDIA ENGINEERING, UNIVERSITY OF ADELAIDE

Untangling the mysterious Digital Dividend

In the process of converting Australia's free-to-air television services from analog to digital, the Government released in January two key papers: the Digital Dividend Green Paper[1] by the Department of Broadband, Communications and the Information Economy and the Review of the 2.5GHz band and long-term arrangements for ENG[2] by the Australian Communications and Media Authority. Both papers are currently open for comments and address the availability of radio frequency spectrum for the delivery of new telecommunications services in digital format, commonly described as the 'Digital Dividend'.

Specifically, the papers deal with two bands of spectrum, the 700MHz and the 2.5GHz bands, with a view to auctioning so called 'spectrum licenses' which provide a form of time-limited access rights to the use of radio spectrum for commercial purposes. Importantly, such licences are technology neutral, as they do not specify how the spectrum is to be used, nor the type of service for which it is to be used.

The 700MHz and 2.5GHz bands are both suited for the fourth generation of digital two-way telecommunications services (4G), which supersede the current mixed voice and data services (3G or WCDMA). Definitions of the fourth generation are starting to crystallise – imagine a pervasive system which provides instant and ubiquitous high speed wireless access to Internet services, with data rates exceeding 1Gbit/s when stationary, and 100Mbit/s when on the move (on the train, for example). Voice would be just another data service. Technology neutrality reaches another level – the focus is on services, not the limitations imposed by fast-evolving technology.

The term 'digital dividend', however, is misleading and the Green Paper is not helpful in this regard by highlighting how much spectrum has been de-allocated from broadcast TV as a result of digitalisation. This is nonsense, because in fact a great deal of spectrum had to be found to effect the digital changeover, and all we are doing now is handing an equivalent amount back, namely the spectrum which was previously used for analogue TV. The point is more subtle. For the same amount of spectrum as before, digitalisation now allows much more content to be delivered (multiple ABC, SBS and commercial channels), increasing the number of channels in major markets from 5 to 15. Digitalisation also allows for consolidation of radio spectrum into contiguous blocks, and it is really this which delivers the payoff. The result is up to 126MHz of contiguous bandwidth in the old UHF television band at around 700MHz, which is ideal for the delivery of high-speed data services over a significant distance and through barriers such as concrete walls.

4G services using technologies such as Long Term Evolution (LTE) and WiMax would be able to connect not only mobile users but also homes which are too far away from the proposed optical-fibre Next generation Broadband Network (NBN), thus complementing the NBN. However, neither is a suitable substitute – the bandwidth may sound impressive but radio is far more capacity constrained than optical fibre. A single fibre down a street, for example, can potentially deliver 100Mbit/s to each house, individually, with each operating at full throttle, but the capacity of 4G coverage of the same area would necessitate the total capacity being shared, so the full potential would only be seen by one individual user when all other customers are disconnected.

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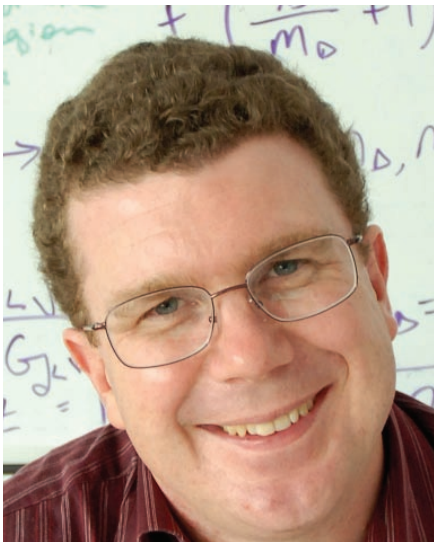

The 2.5GHz band could similarly complement the NBN, but with an important subtle difference. 700MHz radio signals propagate over long distances, which is undesirable in dense urban areas as radio signals cannot be contained easily, limiting the ability to re-use the same radio spectrum elsewhere as occurs in contemporary cellular voice and data networks.

In contrast, the 2.5GHz band is attenuated over fairly short distances, providing a form of natural containment. Hence, radio transceivers can be packed together more closely, providing capacity at high density. The 190MHz of bandwidth available here could potentially deliver high capacity, high speed wireless broadband in any urban area.

How the spectrum is sliced does matter, because spectrum allocation of necessity has to consider the requirements of current and emerging technology. LTE, for example, is standardised to work in 20MHz blocks of contiguous bandwidth, and while it is flexible enough for smaller bandwidths, its full potential would not be achieved.

Important lessons can be learned from previous auctions, such as the undesirable fragmentation that occurred in the 1998 and 2000 auctions of the 1800MHz band spectrum, in which each spectrum 'lot' consisted of two paired allocations of 2.5MHz. The GSM technology at the time would have required guard bands at the boundaries of each spectrum lot to prevent interference with other users, effectively wasting 12% of the spectrum. While licence holders were encouraged to trade their fragmented allocation for more efficient contiguous blocks of spectrum, a price rise of 1400% in Sydney and Melbourne from one auction to the next meant that Capital Gains Tax created something of a trade barrier!

Some challenges remain, such as accommodating incumbent users of the 2.5GHz band, predominantly television broadcasters accessing outside broadcast for news and sport. There is also a need in allocating the spectrum lots for auction to weigh technical merit on the one hand with maximising revenue on the other. While at 2000 prices, the spectrum is worth over $11 billion in today's money, it is only half the value if we use the 2001 auction of 2.1GHz spectrum as our yardstick. So, you can expect plenty of interest but don't expect the government to raise anywhere near the $10 billion mark.

[1] www.dbcde.gov.au, comments due 26 February2010; [2] www.acma.gov.au, comments due 12 March 2010.