

Tomorrow's technology starts with today's spectrum planning

THIS IS AN EDITED EXTRACT OF ACMA CHAIRMAN CHRIS CHAPMAN'S SPEECH TO THE RADCOMMS08 CONFERENCE.

Spectrum is an exciting field, albeit one that has been somewhat of a comparative 'sleeper'. Now its time has come as we (the government, the department, the regulator and industry participants) collectively embark on various initiatives, reforms and developments that will ensure that spectrum delivers for Australia the maximum benefit possible from a scarce national resource. ACMA is committed to delivering on this legislative objective.

At the last RadComms conference, I spoke of a typical day in my life and how it was affected by spectrum. In a similar vein, on this occasion I would like to look at the seemingly 'small' things my spectrum planners do and how these 'small' things may make a material contribution to enabling momentous change in the world of tomorrow—be it 10 or 20 years hence.

These are things I think may eventuate; there are no guarantees, nor are they intended as any pre-emption. I simply wish to explore the role of spectrum and its management in the greater

ACMA has done a bit more work since the Radio Quiet Zone was first established—the engineers have written a licensing instruction (RALI) that specifies the licensing arrangements around the embargoed area.

The area itself has moved a bit as well and is now centred on Boolardy Station (just a few kilometres away).

The RALI is a comprehensive document that puts in place protections for the Radio Quiet Zone, which gives the Australian SKA bid some definite advantages. Indeed, let's just imagine

telescopes. The array spreads out to cover most of Australia, and even New Zealand in isolated sites, giving the telescope itself a gigantic effective aperture with which to collect faint radio signals from deep space.

The installation of this facility brought into the country not only dollars but skills. Australia is now a world leader in antenna and array systems design.

Maintaining the array is a significant task. Local people are being trained as engineers, electricians, technicians and riggers, providing new opportunities in these areas. The communications intellectual stock of the country is much higher as a consequence, which is starting to combine with other spin-off benefits from a smart digital economy.

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scheme of things. So, let's have some fun for a moment, cast ourselves into the future and take a peek at the effect of today's decisions many years down the track.

what benefits could flow from hosting the SKA in Australia.

The SKA is now huge—in the WA component alone we have a square kilometre of radio

SQUARE KILOMETRE ARRAY

Around the time of the last RadComms conference, ACMA's engineers did a small but unusual thing. They embargoed an area (not a frequency band but a small geographical area) around a small cattle station called Mileura in the central west of Western Australia. This embargo was unusual because, with the exception of spectrum-licensed bands, it covered all bands in that area under 25 GHz.

The purpose of the embargo was to create a Radio Quiet Zone to protect the site for the proposed Square Kilometre Array (SKA), for which Australia has been short-listed to host (in competition now only with South Africa).



AN IMPRESSION OF HOW A SINGLE ARRAY STATION (PART OF THE SQUARE KILOMETRE ARRAY) WOULD LOOK LIKE AT MILEURA STATION

INTELLIGENT TRANSPORT SYSTEMS

Intelligent Transport Systems (ITS) are examples of an interesting mix of different technologies all coming together to make driving easier and potentially safer.

Over the last two years, ACMA engineers have worked on spectrum arrangements to support a number of technologies that promise to make our day-to-day commute easier and safer. Some are obviously related to transportation; the impact of others is more subtle.

Vehicular radar is maturing—it now has an 'interim' band to operate in, one I might say that not everyone is happy about because sometimes even international 'solutions' involve painful compromises.

Intelligent Transport Systems are like the internet of cars, and Radiofrequency Identification (RFID) is a technology that will perhaps affect our lives almost as much as the internet does. We already use RFID—to pay motorway tolls, prevent shop theft and, increasingly, in inventory monitoring and control. But it is also a technology whose applications are only limited by our imaginations.

Let's look at my commute in 10 or 20 years time and see what changes have come about:

- My car is now smart. Not only can it automatically keep its distance from the traffic in front, it constantly reports its speed, fuel status and destination to roadside ITS terminals. These terminals monitor all passing traffic and the information is processed in a central computer.
- Vehicular radar has reduced the incidence of collision significantly—ITS can stop a car from running red lights.
- As ITS and vehicular navigation systems ensure traffic is correctly spaced, they direct and monitor traffic flow before a problem develops. Traffic jams are a thing of the past.
- RFID is my vehicle's registration. My registration fee is charged depending on what roads I use, the weight of my vehicle, its emission profile and the length of my trip. If I choose to travel in peak hour I will pay for it; thus market mechanisms will be used to control traffic and pollution as well.

At the moment, RFID is limited to inventory control and some charging applications—for example, motorway tolls—but in the last two years ACMA has been involved with GS1 Australia in evaluating the effect of a power increase for RFID systems on adjacent systems in the 900 MHz band. If the increase is feasible, RFID is



ACMA CHAIRMAN CHRIS CHAPMAN DELIVERS THE OPENING SPEECH AT RADCOMMS08

set to become an even more powerful influence in our daily lives.

RFID tags on our milk will tell our fridge when the milk is out of date. The fridge will then add milk to our shopping list as a part of the 'Internet of Things'.

All of the information about your food will be on its RFID tag. You will be able to see where it came from, its 'organic' history and its freshness—either on your home system or on your PDA while shopping.

All of your groceries will be tagged. Your kitchen will monitor them, reorder as you use them and even dispose of them if they go out of date. Your automated ordering system will correct for underused items.

Supermarkets will change but human interaction with the product will still be important. Pricing will be updated and displayed electronically, and your shopping trolley will have its own RFID reader. If you use an automated shopping list, the trolley will tell you where the next item is located.

If you choose to just browse and impulse-buy, then the trolley (connected to your PDA) will keep a running total of your purchases and, as you leave

the store, automatically debit them via your phone or PDA. No checkouts, no queues—nirvana.

Your home electrical appliances will be registered on the internet, identified by a RFID tag. If an item is stolen, it will quickly be traced. If the ID tag is removed, then the network will not register it and the power system will refuse to supply power to it. This will not stop theft, but it will certainly make it less attractive.

RFID will open up myriad opportunities—some simple, some controversial. We already tag our pets; some day will someone suggest that we tag our children so we can trace them and make sure they are safe? There are already companies that manufacture RFID bracelets for kids so parents can keep track of them when they are out shopping, in the park or even at home. This debate will continue well into the future.

THE INTERNET

Two years ago the internet was something I logged onto at work or at home.. I can now log on almost anywhere with my laptop.

As the world of infotainment grows, people will become more reliant on their mobile data devices

(currently laptops, phones and PDAs) for their news and entertainment. A recent IT article in *The Australian* highlighted the take-up of mobile internet, but it did not touch on the spectrum required to deliver this 'anywhere, anytime' broadband connectivity.

In broad terms, the carriers to date have had access to sufficient spectrum to offer these increasingly sought-after services. In the future, though, as customers demand more bandwidth and as customer numbers grow, carriers will seek more spectrum for these applications. And as machines become part of the internet, these demands will grow yet again.

Users (that is, people and machines) will want this connectivity everywhere. In the next few years, this will mean at least within the footprint of the larger cellular networks, but beyond that the word 'everywhere' may mean just that—on the land, on the sea and even in the air.

ACMA's spectrum planners anticipated this growing need and more than two years ago began looking at frequency bands and their potential for future broadband use. An important part of this study was to examine what was happening in spectrum allocations overseas; obviously a band that is used globally for internet is one that logically we should be investigating for such possible use here in Australia.

For now let's look at what ubiquitous broadband could deliver for the Australian economy.

Laptops will become 'connected' anywhere there is the population to sustain an economically viable connection. The government's recent broadband initiative promises this sort of connectivity almost anywhere people live. That is an exciting prospect. Competition will affect price and VoIP will become a viable alternative to cellular telephony—another plank in ensuring the digital divide does not divide us as citizens or consumers.

Devices will become connected, people with medical conditions be remotely monitored, and the early stages of a problem detected and dealt with. Perhaps medication may even be remotely administered through implants. If the problem is larger, help may be dispatched. This is but a small window on the complete transformation of the way government will deliver its services—overwhelmingly online.

RFID will keep track of people and things; for example, airline passengers with an RFID boarding pass could be traced in an airport. The days of waiting for a passenger who has failed to board would be over!

Beverage and food containers will have inbuilt screens; they might show the news of the day

to grab your attention, but they may also carry advertising to pay their way.

The possible applications of 'anywhere' connectivity may well be unlimited.

SENSING

Climate change is an issue at the forefront of our minds, but can radiocommunications affect it—or even be part of the solution? The answer is 'quite possibly'.

Power generation is a major source of greenhouse gases, especially that from coal-fired generators. This could be limited by controlling peak demand so that the peaks are smoothed and very little or no additional generation is needed to cover these periods.

This is where radiocommunications can help. As I touched on, the simple act of remote-metering your car via a wireless link will save dollars and emissions by traffic smoothing. But taking this a few steps further, and actually controlling appliances to smooth the load on power stations, promises significant reductions in required generator capacity and thus the sought-after reductions in greenhouse gases.

Predicting the weather these days is a massive mathematical exercise. I was treated to a tour of

to work with them so that we better understand their needs and they better understand the imperative ACMA has to manage the spectrum in the overall national interest.

What this sort of sensing means for the future cannot be understated. If global warming continues, then we know that weather patterns will keep changing. Being able to predict the changes, to perhaps track the first cyclone to hit Sydney, to be able to predict and maybe even redirect flood waters could save the nation billions of dollars.

Arrays of small sensors, joined together in a mesh architecture, will be able to provide more and more information. This should enable us to better control our valuable water resources, predict which crops will be viable and, when necessary, evacuate towns and cities efficiently. This, too, will require spectrum and though sensor spectrum is indeed a new issue for us it is one we increasingly have our eye on.

CONCLUSION

The spectrum arrangements that ACMA makes, and the services spectrum can deliver, have such a widespread influence that they continue to surprise me. We are constantly scanning the environment,

We understand that spectrum is increasingly valuable for both incumbent users as well as for future uses. When we work through proposals for change we will listen carefully to all sides of the debate, but ACMA will in the end always strive to ensure that spectrum is put to the use that best serves Australia's national interest.

how it is done at the Bureau of Meteorology. Like any big equation, the more data you have, the more reliable the answer.

The Bureau looks at what it calls 'the fingerprints of nature' and from that derives its forecasts. This is done from satellite, from balloons and aircraft and from the ground.

Recently, the Bureau approached ACMA's spectrum planners for support to protect a part of the 10 GHz band for space-based sensing. This was a complex question for our staff; after all, what is the value of the data derived from a foreign satellite imaging the Australian continent but provided to the Bureau at no cost? What is the impact of being able to predict the path of a cyclone? And how does it compare with the value of the band for other applications?

ACMA has reached an agreement with the Bureau about protection for the band. We continue

digesting signs of change here and overseas, so that we can do our bit to ensure Australia benefits from new technologies.

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Shortly after I arrived at ACMA, I challenged the management team to identify the steps that would make us the world's best communications regulator by the end of 2010.

Two recently released papers—the draft five-year rolling spectrum outlook and the draft spectrum management principles—have their origins in ACMA's program of transformation. Along with public events such as this conference

and a revitalised formal consultative committee (the Radiocommunications Consultative Committee), ACMA has resolved to make its spectrum work program more transparent to the industries that rely on spectrum and also to demonstrate its 'first actionable steps' to emerging demand pressures.

This is a key goal of the draft five-year spectrum outlook—to publish, and to keep current by regular updates, ACMA's understanding of emerging demand pressures, as well as to give an indication of ACMA's forward work program for addressing those pressures. The program is of necessity indicative and, as a disclaimer, is subject to three things:

- resources
- government (or ministerial) priorities
- unanticipated changes in the environment.

I make no apology for the disclaimer, which merely acknowledges the realities. But to ensure industry as far as possible enjoys the regulatory certainty required to facilitate investment decisions, we have committed to keep the document current through annual updates and to consult each time before we finalise it. The result, I hope, will be an unprecedented shared understanding of the pressures for change building

in the spectrum environment and of the regulator's indicative thinking (on a more iterative basis) about how to respond.

All of this, of course, is no substitute for detailed consultation on individual issues before decisions are taken that affect players in the spectrum space. Rather, it is something in addition, something new—the beginning, I hope, of a much more open discourse about what the priority issues are in spectrum regulation.

Transparency about priorities invites greater transparency about methodology and underlying philosophy. To this end, ACMA has also articulated in draft form its *Spectrum Management Principles*, a document not intended to supplant the legislative objectives that govern ACMA's exercise of its powers and discretions, but which should go some way to explain how we will approach those objectives.

Indeed, one of the proposed principles is that we will do our work with appropriate transparency and opportunity for consultation.

But this conference is not simply about ACMA initiatives—in framing the agenda, we have sought to balance government voices telling you about what we are doing with industry voices, so that information flows both ways. We have aimed for

topicality, and I would like to think that most of the major issues in terms of regulatory change affecting use of spectrum today have gotten a guernsey.

You will hear about analog television closure and the digital dividend, the digitisation of radio and I am hopeful we might hear something about another large issue that is quietly moving onto the agenda (namely, the expiry of the major spectrum licences that, for example, now carry the bulk of Australia's telephony).

Lastly, by way of a bit of serendipity, we have been able to align this event with the launch of two other major ACMA papers. The first is the initial discussion paper on the 400MHz land mobile issue.

The second is the release of the *Independent Review of Government Spectrum Holdings*, which represents a major contribution to spectrum policy-thinking in Australia and raises issues that go well beyond ACMA's remit to include not only the whole of the federal government but federal/state issues as well.

The full text of Mr Chapman's speech is on the ACMA website at <www.acma.gov.au> (go to About ACMA: News & media centre > Speeches).

Temporary community broadcasting licences allocated, May 2008

State	Licence area	Licensee	Community served	Frequency	Start	Finish	Allocated
Vic	Bendigo RA2	Goldfields Community Radio Cooperative Ltd	General	89.5 MHz	13/05/08	12/08/08	05/05/08
Vic	Bendigo RA2	Central Victorian Community Broadcasters Inc.	General	89.5 MHz	13/05/08	12/08/08	05/05/08
Qld	Mossman RA2	4CCC Coral Coast Country Community Radio Inc.	General	100.1 MHz	16/05/08	15/05/09	13/05/08
WA	Bunbury RA3	Harvey Mainstreet Inc.	General	96.5 MHz	20/05/08	19/05/09	13/05/08
Vic	Wodonga RA1	Albury Wodonga Christian Broadcasters Inc.	Christian	100.7 MHz	21/05/08	20/11/08	15/05/08
NSW	Gosford RA1	Coast Community Broadcasters Inc.	Country and sport	94.1 MHz	22/05/08	21/11/08	20/05/08
NSW	Gosford RA1	Radio Yesteryear Inc.	Music – nostalgia	94.1 MHz	22/05/08	21/11/08	20/05/08
Qld	Cunnamulla RA1	Cunnamulla Dreaming Aboriginal Corporation	Aboriginal	99.7 MHz	29/05/08	28/05/08	23/05/08
Qld	Cairns RA2	Smithfield Community Radio Association Inc.	Youth	101.9 MHz	01/06/08	31/05/09	26/05/08
Vic	Upper Murray RA1	High Country Christian Broadcasters Association Inc.	Christian	94.9 MHz	07/06/08	06/06/09	27/05/08