A WIRELESS FUTURE? OVERVIEW AND GLOSSARY

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This document offers an overview of each of the wireless and spectrum themed papers in this issue of TJA, and concludes with a Glossary of terms used.

Notwithstanding the current global economic situation and questions now raised in relation to telecommunication investment there are strong indications of a growing future role for wireless applications, and need for more market-oriented spectrum management approaches to replace older command and control models. Driven by attractive new applications, their cost effectiveness, high demand for mobility, availability of faster broadband and new expectations of geographical ubiquity, recent technologies and associated spectrum reforms are combining to bring such possibilities closer. A rapidly growing array of worthwhile, user-friendly wireless based services and hand-held devices are progressively appearing in the market. Not to be ignored also is the status some of these products bestow on purchasers.

Emerging market-oriented reforms in the allocation and management of spectrum at international and national levels are allowing these benefits to occur more quickly and efficiently. Progressive availability of some re-allocated spectrum, for example after the Digital TV switchover period in Australia between 2010 and 2013, will further this trend and also open up new broadcasting services. From April 30 to May 2 this year such issues were pursued at Radcomms08 in Melbourne. The special series of radio and spectrum reform related papers that follow also address similar issues and to some extent were prompted by that event, but have a more international focus.

Another impact of current global economics is the bad press that ‘market forces’ at its extremes have recently received. There are consequently already signs of some selective shift back towards stronger regulation. The ways in which this might or might not express itself in current spectrum reforms are yet to be played out.

TOMORROW’S TECHNOLOGY STARTS WITH TODAY’S SPECTRUM PLANNING

ACMA Chairman Chris Chapman’s paper is an edited version of his opening address to Radcomms 2008. It is as interesting for what it now says about ACMA’s new “can do” and more consultative approach to spectrum policy and management reform as it is for the good examples used to illustrate some of the wireless developments likely to continue to drive these reforms in Australia and elsewhere.

The “can do” approach is well illustrated by ACMA’s approach to the establishment of an impressive “Square kilometre Array” aerial system in Central West Australia for deep space radio tracking. Apart from the intrinsic value of this system to the scientific world its supporting communications grid connecting the port town of Geraldton with Kalgoorlie, Meekatharra and the surrounding townships is impressive and dismissive of any digital divide in and around those areas.

The need for spectrum reform is illustrated by various examples of developments in wireless-based systems ranging from Digital Audio Broadcasting to Intelligent Transport Systems. The
latter, for example, make commutes easier, safer and more efficient. Associated with that but also significant in its own right the example of radio Frequency Identification (RFID) devices which potentially also has major significant impact on our lives. Of course there are many other examples.

Radio devices in conjunction with the Internet, for business and pleasure, have significant impact on spectrum demand and management and are an important driver of ACMA reform. Responses to ACMA’s two discussion papers on Wireless Access Services (WAS) have highlighted some significant objections and concerns as well as support for re-planning and re-allocation of associated bands. In that context the paper also considers important benefits to the Australian economy of broadband that is ubiquitous.

The fast growing field of “sensing” technology including its use in environmental, climate and navigational applications also draw heavily on spectrum availability and management processes, particularly in conjunction with increasing use of satellite systems.

The paper concludes by reinforcing and illustrating the more consultative and transparent approach now adopted by ACMA to accommodate and fairly balance stakeholder needs in ways that more readily and quickly support new wireless developments and hence the Australian economy. These new processes are designed to make more effective ongoing use of a valuable but finite resource.

An ‘Editor’s Postcript’ updates some outcomes of ACMA initiatives outlined at Radcomms08 and affirmatively reinforce the notion of an emergent new era of spectrum stakeholder collaboration within Australia.

**NEW DIRECTIONS FOR SPECTRUM MANAGEMENT: AN INTERNATIONAL PERSPECTIVE**

In his paper ‘New Directions for Spectrum Management: An International Perspective’ consultant and part time ACMA Member Geoff Luther points out, in a private capacity, that changes in communications technology and markets have placed great strains on traditional approaches to spectrum regulation, which have had difficulty coping with the current rate of change in radiocommunications. He argues that new technologies including mobile telephony and wireless broadband have posed challenges for governments that needed faster and more objective means for allocating spectrum to competing commercial interests. He then points out that spectrum regulators have turned increasingly to market-based and more flexible approaches to regulation, including auctions, pricing and trading. In looking to the future he argues that challenges ahead include improving technology neutrality, improving the efficiency of use of government spectrum, and deciding how much spectrum to set aside for the spectrum commons.

Geoff emphasises that spectrum management reform is still very much a “work-in-progress”. His paper significantly suggests that despite the potential benefits from ensuring that government spectrum is used efficiently very few countries have attempted to address this. He refers to the UK exception and in particular the work of Professor Martin Cave in recommending that there should be a presumption that new spectrum needs should be met through the market, and that there should be greater sharing of government spectrum with others. In the following paper Professor Cave directly discusses these and other critical issues being pursued in Europe and the UK as part of their current and planned spectrum reforms.
MARKET-BASED METHODS OF SPECTRUM MANAGEMENT IN THE UK AND THE EUROPEAN UNION

Australia together with the US, Europe and the UK (amongst some others) are increasingly pursuing market-based spectrum management reforms. In this paper Martin Cave (Warwick Business School, University of Warwick) drawing on joint work with Fulvio Minervini of the University of Macerata and Warwick Business School considers the development within the European Union of common policies towards the application of market-based instruments of spectrum management, and with their development and use in the one member state, the United Kingdom, where they have been applied most fully. The European Commission legislative proposals if adopted would create frequency bands that are subject to trading and flexibility of use and predominantly rely on spectrum markets. It involves an extensive programme of spectrum awards, the development of a new method of specifying spectrum user rights to permit spectrum change and use, and integration of commercial and public sector spectrum markets.

With comprehensiveness, great clarity and minimal acronym use the paper outlines the methods under consideration, focuses on their potential role within the public sector, describes developments on the EU and UK respectively, and concludes with a helpful assessment of progress or otherwise so far. For anyone concerned with spectrum management reform this comprehensive and well-structured analysis is very accessible despite complexity of subject matter and provides a valuable assessment of the outcome so far of European and UK spectrum management reforms.

MAXIMISING PUBLIC BENEFIT DERIVED FROM USE OF THE SPECTRUM

Successful Spectrum management reform requires clear understanding of the limited availability of spectrum and actual and potential market value of that spectrum. In this context ACMA economist Rebecca Burdon discusses in this paper the roles of the market, the regulator and regulatory tests in promoting an efficient allocation of spectrum to maximise benefits from its use.

One of the tests relates to a “total welfare standard”, which the paper describes, and assesses the impact of regulatory proposals on total welfare to inform its decisions in relation to those proposals. The paper starts with a helpful background outlining core elements of Australia’s spectrum management regime. It then considers why a total welfare standard is the appropriate test in maximising spectrum management. Alternative approaches to spectrum management are often characterised by a command and control approach, market approaches based on exclusive property rights, and a commons approach in which there are few entry restrictions and limited protection from interference. Recognising the variables and complexities involved in alternative regulatory approaches and any measures of total welfare the paper considers the type of analysis likely to be involved in evaluating the various options.

The paper finally comments on when this sort of cost-benefit analysis is likely to be most useful. Its conclusion reminds us that whilst Australia has been at the forefront of development and implementation of flexible approaches and whilst the regulator remains responsible for shaping market rules, ultimately it is spectrum users who determine how spectrum is used.
OUTCOMES OF THE WORLD RADIOCOMMUNICATION CONFERENCE

Many of the developments discussed in these papers are possible because of much preliminary work and consequent agreements successfully fought out at the ITU World Radio Conference (WRC07) from late October 2007, on frequency allocations and associated services. Australia has long been active in the area of international standardisation and radio frequency allocation and planning and in particular devotes much effort to the latter.

In his paper, which is a record of significant WRC07, events and outcomes ACMA's Stuart White systematically describes the process required to reach international agreement in this area, and outlines overall outcomes achieved for the world and that are of particular interest and importance to Australia and Australian industry. The paper appropriately highlights the exhaustive preparatory arrangements. Australia’s WRC07 broad objective was to promote the development of international world radiocommunication agreements that “enhance efficient and coordinated access to spectrum and increase Australia’s ability to implement and use satellite and terrestrial systems”, an objective that was satisfied overall. Preparations are already underway for the next Conference in 2011, in the process benefiting from regional collaboration via the Asia Pacific Telecommunity (APT).

BROADBAND WIRELESS – A TUTORIAL ESSAY

With all the ready commentary and speculation on alternative broadband wireless technologies and comparisons between them it is often assumed that readers understand the technology differences. Reg Coutts’ timely and helpful tutorial overview of the two dominant broadband wireless standards today, 3G (or HSPA) and WiMax provides that detail for those wishing to look more closely into these alternatives. After providing definitions for each of these particular solutions the paper describes their respective genealogy, and offers basic metrics for comparisons. To provide a further context for comparisons the paper then helpfully comments on the commercial rivalry between these alternatives.

An interesting observation offered by the paper is that any conclusion concerning the relative superiority of one of these broadband wireless technologies over the other is significantly influenced by differences in market assumptions and availability timing for the sought application. Technology factors are not the sole criterion. Choices by operators are also complicated by uncertainty over the sustained cost of implementation for one solution over another in a competitive supply chain where costs can vary significantly over time.

For those wishing to deepen understanding (or others somewhat masochistically inclined) readers are invited to accept the challenge of pursuing this tutorial!

WIRELESS BROADBAND TECHNOLOGIES FOR REGIONAL AND RURAL AUSTRALIA: A LAST-MILE PERSPECTIVE

In support of the paper’s stated objectives to provide a last-mile perspective on wireless broadband technologies for regional and rural Australia, the authors Dr Niloufer Selvadurai, AHM Razibul Islam, and Professor Graham Town begin with a helpful and comprehensive general review of alternative broadband technologies in the context of Australia’s population density and geographical distribution. The paper then offers a useful comparative analysis for each of these. This in
itself provides a valuable resource. The alternative technologies are analysed in terms of data rates and coverage distance in order to determine the best possible last-mile wireless connectivity solution for regional and rural Australia. Subsequently the paper focuses specifically on alternative last mile technologies that exploit wireless technologies, including wireless Local Area Networks (WLAN), 3G, Satellite, Wireless Local Loop, and WiMax. With respect to the latter the paper alludes to some successful international deployments of WiMax technology and relates these to potential use in Australia.

The paper concludes with comments on the need to be able to deploy a mix of wired and wireless last-mile technologies in order to achieve quick and cost-effective service provision, in all areas, that balances the needs of all stakeholders – customers, service providers and the Australian Government.

HIGH ALTITUDE PLATFORM STATIONS FOR AUSTRALIA

Imagination leading to Innovation are both characterised in this joint contribution on high Altitude Platform Systems (HAPS) by Les Davey & Richard (Dick) Butler of Sky Station – Australia and Richard Buchanan, Robert W Phillips and Dr Y.C.Lee of StratoCom Corporation. Whilst the concept has been a proposed solution for telecommunication and other services for several years it is only in recent times that the viability and actual potential of such solutions in particular situations has become clearer. The range of complementary solutions available to quickly satisfy particular telecommunication needs can now potentially include HAPS.

Of particular interest is the lighter-than-air vehicle (LTAV) which is attracting renewed interest in recent years as a potentially economic way to provide telecommunications infrastructure and services over wide areas. A number of trials of small scale airship HAPS have been conducted by companies in Japan, USA, and Switzerland.

The paper describes the technology, reviews progress towards a viable HAPS and considers potential applications in Australia, particularly for rural and remote areas. It also helpfully discusses business planning and regulatory issues together with some remaining technical challenges.

RADIO’S DIGITAL CHALLENGERS

Australian broadcasting has a rich history of challenge. The earliest AM radio broadcasters could afford to be at the forefront in introduction and innovation, given at the time radio’s novelty, ready market acceptance, important reach into outlying areas and lack of spectrum constraint. Amongst other things the introduction of television broadcasting in 1956 and FM in 1974 were further challenged geographically and by the standards choice from possible contenders, and particularly the band choice in the case of FM. In ‘Radio’s Digital Challengers’ Swinburne University’s Jock Given provides an excellent analysis of and background to decisions surrounding the many issues leading to planned official introduction of Digital Radio Broadcasting (DRB) in Australia in mid 2009.

DRB has faced and in some cases continues to face the earlier challenges together with a much broader and more complex set of issues. Collectively these include the nature and definition of DRB, its continually evolving functional potential, the question of whether or not it’s a replacement of or supplement to existing services, spectrum allocation and geographical challenges, new competition issues, the possibility of simulcast obligations, potential misalignment of stakeholders
interests, rapidly evolving market and competing technologies, and its relatively high introductory cost compared to some alternative radio solutions.

The current economic climate is also acknowledged as an additional issue. However the paper observes that this medium does provide new opportunities and that the industry has historically dealt well with both depressed times and, over time, all its other challenges. Given that the UK is generally seen as digital terrestrial radio’s most successful market, the paper helpfully explores and draws from the history and present position of digital radio there. The paper provides a valuable analysis of past and current challenges and offers useful observations about those facing digital radio’s future.

REGULATING INTERNET AND CONVERGENT MOBILE CONTENT: THE NEW CONTENT SERVICES REGIME

Papers in this series have so far considered new developments for wireless based products and services and reform of processes to allocate and manage the spectrum they utilise. Whilst continuing the theme of new developments, the final paper in this series by David Lindsay, Sharon Rodrick and Melissa De Zwart of Monash University extends beyond spectrum considerations to helpfully explain the regulatory regime that applies to the wide range of content now delivered via mobile wireless devices as well as the Internet. The paper is a comprehensive and valuable resource as the content services regime represents an important attempt to establish a consistent, uniform regulatory regime that applies to the full range of content delivered over diverse new communications platforms. As such, it amalgamates and harmonises existing regimes, specifically the stored Internet content regime.

The scope and depth of contributions from leaders in their field make this set of papers a valuable resource. Amongst other things what is clear from them is the new focus on working collaboratively to create an environment in which innovation is encouraged and the benefits of many new wireless developments are more quickly delivered to users, and all other stakeholders. Despite some uncertainties over past decades there is little doubt now that with market and technology developments and spectrum reforms wireless has a strong future. As suggested at the start of this Overview it is yet to be seen whether current international signs of backlash to extreme free-market conditions will impact in any way on moves towards greater market-driven approaches to spectrum management.

Again given the scope of themed contribution this Overview now concludes with a Glossary of terms that also considers international readers less familiar with names of some identified local organisations.

GLOSSARY OF TERMS

3G 3rd Generation mobile technology standard
3GPP 3rd Generation Partnership Project
4G (future) Internet Protocol advancement of existing 3G mobile communication standard
ABA Australian Broadcasting Authority
ABC Australian Broadcasting Corporation
ACA Australian Communication Authority (preceded ACMA)
ACMA Australian Communications and Media Authority
ACT Australian Capital Territory
ADSL Asymmetric Digital Subscriber Line
AES Advanced Encryption Standard
AIP Administered Incentive Pricing
ALRC Australian Law Reform Commission
AMT Aeronaucal Mobile Telemetry
APT Asia Pacific Telecommunity
BSA Broadcast Services Act
BWA Broadband Wireless Access
CCM Counter mode algorithm for authentication and privacy
CDMA Code Division Multiple Access
C-DOT Indian Government's telecom technology development institute
CMAC Cipher based Message Authentication Code
CPE Customer Premises Equipment
CSA Content Services Act
CSC Content Services Code
CSIRO Commonwealth Scientific and Industrial Research Organisation
DAB Digital Audio Broadcasting
DBCDE (Australian) Department of Broadband, Communications and the Digital Economy
DCITA Department of Communications Information Technology and the Arts (now DBCDE)
DRAC Digital Radio Advisory Council
DRB Digital Radio Broadcasting
DSL Digital Subscriber Line
EAP Extensible Authentication Protocol
EBU European Broadcasting Union
EC European Commission
ESS Earth Exploration Satellite Service
EIRP Effective Isotropic Radiated Power
EU European Union
FAA (US) Federal Aviation Administration
FANSS The Federation of Australian Narrowcasting and Subscription Services
FCC Federal Communications Commission
FTTH Fibre To The Home
FTTN Fibre To The Node
GMDSS Global Maritime Distress and Safety System
GSM Group System Mobile (standard)
HAPS High Altitude platform Station
HDTV High Definition Television
HF High Frequency
HFC Hybrid Fibre Co-axial (cable)
HMAC Hash Message Authentication Code
HSPA High Speed Packet Access
HSPDA  High Speed Download Packet Access
ICT  Information and Communication Technology
IDA  Infocomm Development Authority (Singapore)
IEEE  Institute of Electrical and Electronics Engineers (original acronym)
IMT  International Mobile Telecommunication
IP  Internet Protocol
ISP  Internet Service Provider
ITIS  Intelligent Transport Systems
ITU  International Telecommunication Union
LMDS  Local Multipoint Distribution Service
LOS  Line Of Sight
LTAV  Lighter Than Air Vehicle
LTE  Long Term Evolution
MAC  Media Access Control
MCITA  Minister for Communications Information Technology and the Arts
MIMO  Multiple Input and Multiple Output
MMS  Multimedia Message Service
MPLS  Multi Protocol Labelling Switching
MPSI  Mobile Premium Service Industry
NGA  Next Generation Access
NIC  Network Interface Card
NTIA  National Telecommunications and Information Administration (USA)
Ofcom  Independent regulator and competition authority for UK communications industry
OFDMA  Orthogonal Frequency Division Multiple Access
OPBR  Office of Best Practice Regulation
OPEL  Optus & Elders Consortium
OSA  Online Services Act
PCS  Personal Communication Services
PDA  Personal Digital Assistant
QAM  Quadrature Amplitude Modulation
QoS  Quality of Service
RALI  Radio Licensing Instruction
RAD  Restricted Access System
RCC  Radiocommunications Consultative Committee
RF  Radio Frequency Identification Device
RFID  Radio Frequency Identification Device
RSPG  Radio Spectrum Policy Group (EU)
SBS  Special Broadcasting Service
SHF  Super High Frequency
SIM  Subscriber Identity Module
SKA  Square Kilometre Array
SLA  Statistical Local Area
SMDF  Spectrum Management Decision Framework (ACMA)
SMS  Small Message Service
A WIRELESS FUTURE? OVERVIEW AND GLOSSARY

RECENT HISTORY

SSA  Sky Station Australia
STS  Stratospheric Telecommunications System
TTS  Transitional Telecommunications System
UE  User Equipment in 3G mobile telephone systems
UHF  Ultra High Frequency
USIM  UMTS equivalent of SIM Card
VDSL  Very high bit-rate Digital Subscriber Line
VOIP  Voice Over IP
WAPECS  Wireless Access Platforms-later changed to ‘policies’-for Electronic Comm. Services
WAS  Wireless Access Service
WiMax  Worldwide Interoperability for Microwave Access (a wireless broadband standard)
WLAN  Wireless Local Area Network
WLL  Wireless Local Loop
WRC  World Radiocommunication Conference