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CASE STUDY: BROADBAND THE CASE OF AUSTRALIA

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1 INTRODUCTION

The development of broadband networks and services is a key issue for governments around the world. Broadband services are underpinning the development of e-commerce, and access to bandwidth at globally competitive prices is an increasingly important determinant of competitiveness in the global knowledge economy. Policies that encourage the provision of affordable broadband access to a nation's firms can put them ahead of global competitors. Those that fail to do so risk condemning their economies to secondary or subordinate roles. Access to broadband networks and services can also make important contributions to the quality of life, in terms of education, health services and social inclusion.

In this paper we explore recent developments in Australia, looking at current and planned network roll-out of broadband technologies and applications, their pricing and take-up, and how the traditional telecommunications market is changing as players from cable and broadcast media, as well as new players, enter the market. We also examine recent regulatory developments in order to show how Australia is dealing with convergence, attempting to strike the balance between services-based and facilities-based competition, between general competition policy and telecommunications specific regulation, and dealing with the emergence of a possible third form of competition – content-based competition.

Recent developments in Australia include: the extension of universal service obligations (USOs) to include a Digital Data Service Obligation (DDSO); changes to universal service provision arrangements and the introduction of extended zone tenders; USO contestability pilots; declaration of the unconditioned local loop and analogue cable-TV networks; revised spectrum allocation arrangements; the advent of digital broadcasting and datacasting; streamlined submarine cable regulations; and attempts to reform international internet charging arrangements. All of these developments are discussed. We conclude by exploring some of the barriers to broadband networks and services development in Australia. These include: unattractive price-performance of broadband products viz-a-viz dial up internet access; adherence to, and extension of, USOs; limited access to quality programming content; and incumbent carrier market behaviour.

A lot has been happening in Australia and a lot has already been achieved, but a lot remains to be done if we are to reap fully the benefits of broadband services.

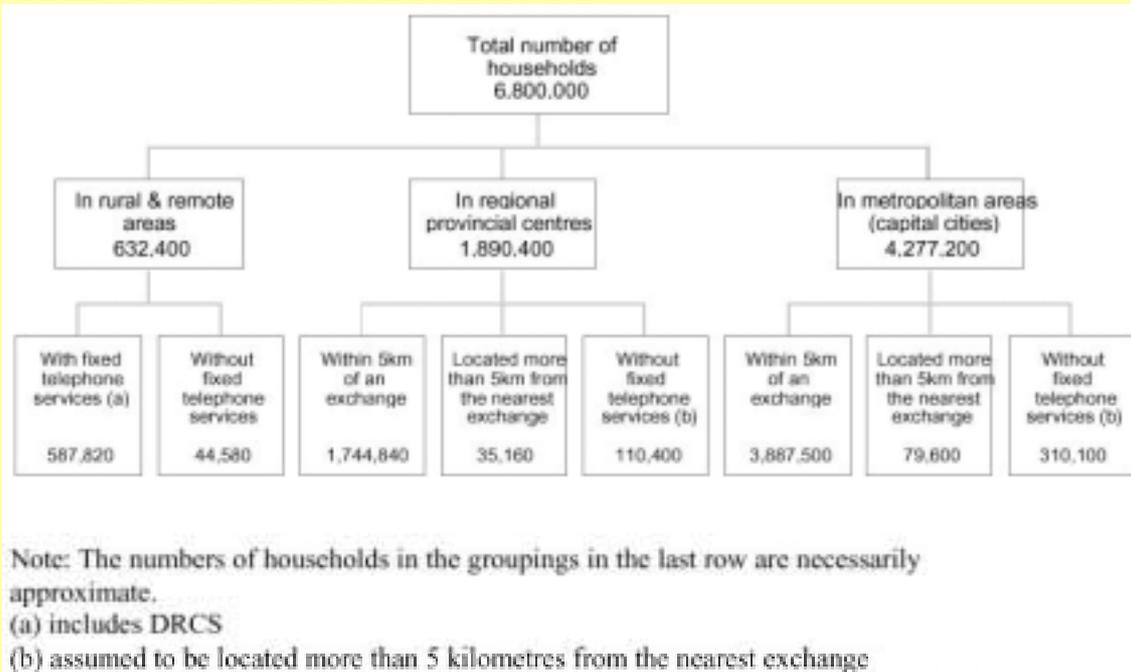
Australia covers an area of about 7.7 million square kilometres – a little less than that of the United States, about 50 per cent larger than Europe (excluding the former USSR) and 32 times larger than the United Kingdom.¹ In 1997, Australia's population reached 18.5 million – less than 7 per cent of the population of the United States, 1.4 per cent of the population of China and just over 30 per cent of the population of the United Kingdom.

Australia is not densely populated, but it is highly urbanised – Iceland, Canada and Australia being among the most highly urbanised OECD countries. For communications this population distribution is both a disadvantage (i.e., highly dispersed rural population spread across a large land mass) and an advantage (i.e., high proportion of population in just a handful of urban centres, with around half the total population in Sydney and Melbourne alone). In 1998, the Australian Communications Authority (ACA) reported that 63 per cent of Australia's total 6.8 million households were in the 8 State and Territory capital cities, 28 per cent in regional provincial centres and 9 per cent in rural and remote areas. No less than 83 per cent of all Australian households are within 5 kilometres of an exchange.²

One important focus of telecommunications policy and regulation in Australia has been the desire to ensure that the benefits of affordable communications flow through to rural and remote households.

¹ Australian Bureau of Statistics (2000) *Year Book: Australia*, ABS 1301.0 Canberra.

² ACA (1998) *Digital Data Inquiry: 1998*, ACA, Canberra, p53.

Figure 1.1 The distribution of households in Australia

Source: ACA (1998) Digital Data Inquiry: 1998, ACA, Canberra, p53.

2 COMMUNICATIONS IN AUSTRALIA

The Commonwealth Government assumed responsibility for telecommunications services in Australia in 1901.³ Until the introduction of limited competition in the late 1980s, telecommunications services were provided by various monopoly organisations. Operational and regulatory functions were the responsibility of the Postmaster-General's Department (PMG) until 1975, when they were moved to the newly created Telecom Australia. At that time, Telecom became the monopoly domestic telecommunications carrier with exclusive rights to install, maintain and operate the network and supply basic services. Telecom was also the regulator of customer equipment, private networks and value-added services. The Overseas Telecommunications Commission (OTC) was established in 1946, with responsibility for the provision of international services. In 1981, the Government established AUSSAT, to operate a domestic satellite system. AUSSAT began operations in 1985.

The major driver of telecommunications policy throughout this period was the extension of the network. However, by the mid-1980s network coverage was near complete, and new pressures for data communications, and new models for the competitive market supply of telecommunication services were emerging.

2.1 Deregulation

In May 1988, the Government announced a restructuring of the regulatory environment. The objective was a more efficient and responsive telecommunications industry, capable of successful commercial operation in Australia and overseas, as well as serving social objectives, such as basic telephone services. The reforms were implemented in the Telecommunications Act 1989 and related legislation.

As part of the reforms: the basic monopolies of Telecom, OTC and AUSSAT were retained, but competition was permitted in the provision of value-added network services and customer premises cabling, and in the

³ This brief history is taken from the Telecommunications Service Inquiry (2000) *Connecting Australia* ('Besley Report') pp24-26; and DCITA (2001) *Liberalisation of the telecommunications sector — Australia's experience*, DCITA, Canberra (<www.dcita.gov.au>).

supply, installation and maintenance of customer premises equipment. Telecom was subjected to a range of reforms designed to foster a more commercial focus, and provide greater operational freedom, management independence and accountability.

A key step was the separation of the operational and regulatory functions, with the establishment of the Australian Telecommunications Authority (AUSTEL) in July 1989. AUSTEL operated as an independent industry-specific regulator with responsibility for protecting the carrier's exclusive rights, protecting competitors from unfair carrier practices, protecting consumers' interests and administering price control and universal service arrangements.

In 1990, the Government announced further reforms. A phased approach was adopted for the transition from monopoly to open competition in basic services. This second phase of deregulation was implemented in the Telecommunications Act 1991 and associated legislation.

The most important components of the strategy were:

- Merging Telecom and OTC to become AOTC (later Telstra);
- Licensing Optus (now C&W Optus⁴) after a competitive tender process, as a private sector national facilities-based network competitor – based, in part, on the purchase of AUSSAT's national satellite service;
- Fixing the period for the facilities-based duopoly (to end in 1997);
- Licensing three public mobile operators (Telstra, Optus and Vodafone);
- Mandating open competition in the resale of telecommunications capacity and public access cordless telecommunications services; and
- Giving AUSTEL a stronger mandate to promote competition and protect consumers' interests – including setting carrier service quality standards and monitoring performance, monitoring and reporting on price controls and competitive safeguards, and enforcing the Universal Service Obligation (USO) and carrier license conditions.

Open competition was introduced in July 1997, with the *Telecommunications Act 1997* and related legislation. Regulation of telecommunications was brought more closely into line with general competition law, as governed by the provisions of the *Trade Practices Act 1974*. The Australian Competition and Consumer Commission (ACCC) assumed responsibility for competition and economic regulation from AUSTEL. The Government also inserted telecommunications-specific provisions into the Trade Practices Act to deal with anti-competitive conduct, and to establish an access regime governing the supply of services between carriers and service providers.

In keeping with the broad philosophy of competition policy, industry self-regulation was encouraged, particularly in technical regulation and through codes of practice. The Australian Communications Industry Forum (ACIF) became the principal body responsible for developing and administering these codes. The Telecommunications Industry Ombudsman (TIO) provided a mechanism for the resolution of user complaints.

The aim of the 1997 reforms was to provide a pro-competitive framework and promote user choice. There is no restriction on entry to any telecommunications service market. Consequently, there is no practical limit on the number of carrier licenses which could be issued, and any corporation or public body can apply for a license. Once licensed as a carrier, industry operators are free to pursue whatever business strategy they choose. However, license conditions oblige carriers to contribute towards the cost of providing universal service, fulfil industry development plans and comply with the telecommunications access regime.⁵

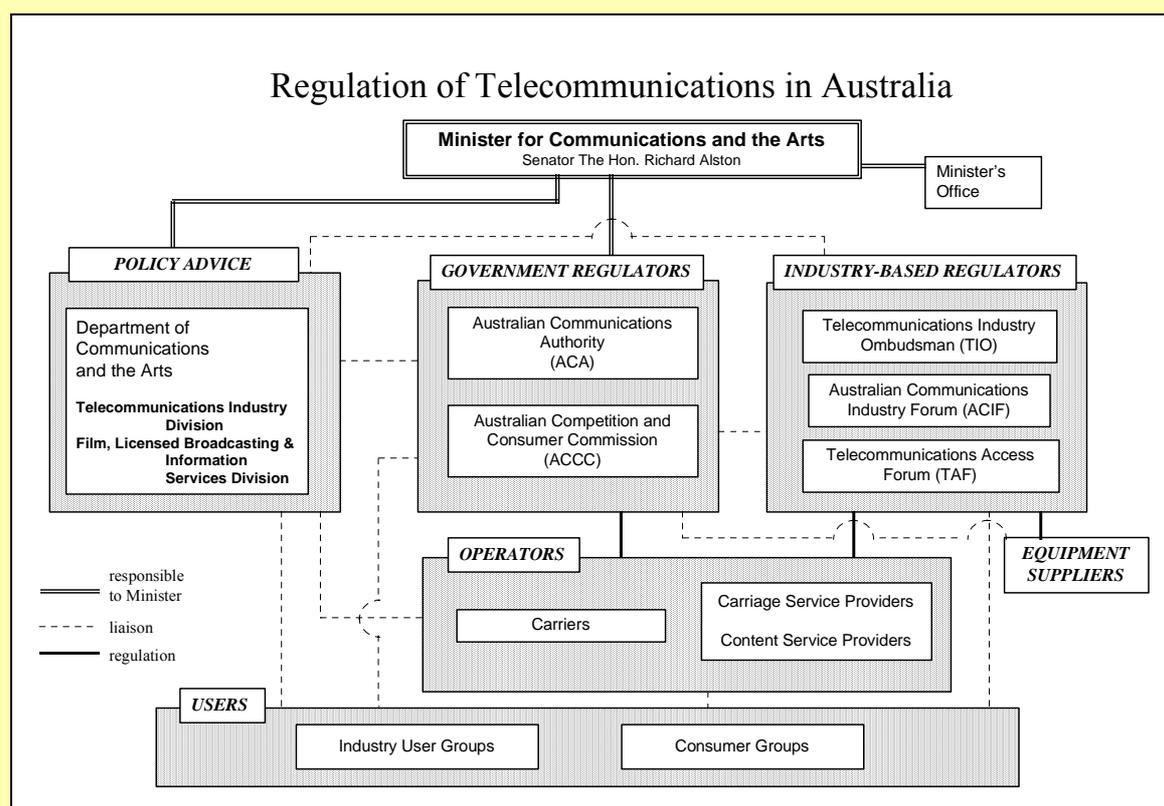
⁴ C&W Optus has recently been the subject of a takeover bid by SingTel (Singapore Telecom), in which C&W has agreed to sell its controlling share to SingTel. Other shareholders have also been offered various options under the bid worth AUD 17.2 billion. The deal must clear the Foreign Investment Review Board before it can be finalised.

⁵ It is not necessary to have a carrier license to provide the public with carriage or content services. Providers of these services are

The use of radiocommunications technologies and the related radiofrequency spectrum are regulated under the *Radiocommunications Act 1992*, which covers: planning for the use of radiofrequency spectrum; allocating and issuing licenses to users; developing technical standards; and enforcing compliance with the Act. In 1992, three major reforms were introduced: a market-based allocation system, improvements in administration, and the establishment of a spectrum regulator – the Australian Communications Authority (ACA). The market system for spectrum management was progressively introduced through spectrum licensing of defined bands, which operates alongside the established apparatus and class licensing system.⁶ Spectrum licenses are issued for fixed terms of up to 15 years, with considerable flexibility as to use of the spectrum. A comprehensive review of the *Radiocommunications Act* is currently underway.

Three Australian agencies regulate Pay-TV – the Australian Communications Authority (ACA), the Australian Broadcasting Authority (ABA) and the Australian Competition and Consumer Commission (ACCC). The ACA regulates the carriage of communications services under the *Telecommunications Act 1997* and the *Radiocommunications Act 1992*, and the ABA regulates the provision of broadcast content services, including online services, under the *Broadcasting Services Act 1992*. Broadcasting (free-to-air television and radio) is regulated under the *Radiocommunications Act 1992* and *Broadcasting Services Act 1992*. The underlying principles of regulation in Australia are technology neutrality and the separation of content and carriage regulation.⁷

Figure 2.1 Regulation of telecommunications in Australia



Source: DCITA (1998) *Australia's Open Telecommunications Market: the new framework*, Canberra.

not subject to any licensing requirements, but must comply with legislated rules, such as consumer protection.

⁶ As at June 2000, there were approximately 200 000 apparatus licenses on issue, delivering annual revenues to government of around AUD 95 million.

⁷ Details of communications regulation as it relates to the development of broadband networks and services are discussed in more detail in subsequent sections.

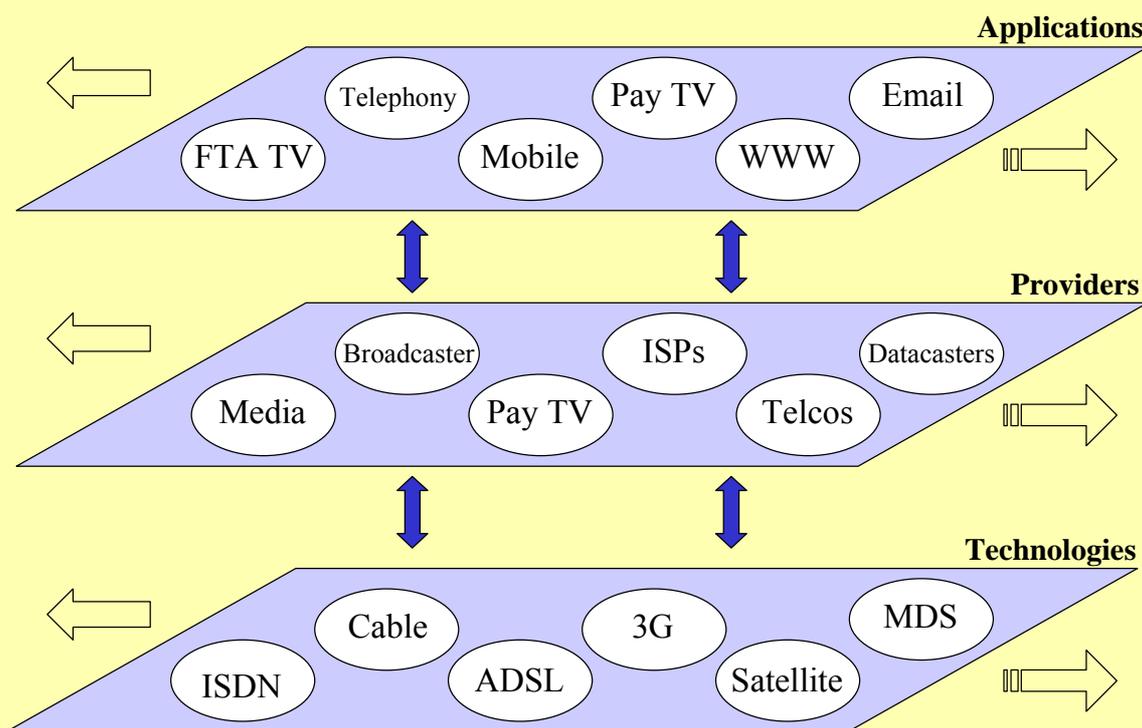
2.2 Forces for change

There are many forces for change in communications, but a handful can be seen as key drivers.

- *Competition* – many countries have opened their markets to competition, leading to substantial infrastructure investment, price declines, greater services diversity and product innovation;
- *Digitalisation and data traffic* – there has been an enormous expansion of data traffic compared with voice traffic, and increasing demand for digital networks, leading to a change in network design philosophy from fixed-path circuit switching to variable-path packet switching;⁸
- *International infrastructure investment* – the traditional consortium approach to cable and satellite investment is being eroded, and with it the traditional settlements system; and
- *Bandwidth as a commodity* – new wholesale capacity markets are turning bandwidth into a commodity, with various carriers' carriers and bandwidth exchanges emerging.⁹

These and other changes, can be characterised as a transition from a telephony world in which technologies, applications and providers operated in separate 'stove pipes', to an IP world in which an ever increasing variety of combinations of technologies, applications and providers is possible (see Figure 2.2). In this new environment, the regulatory and policy tools from the telephony world are in many cases no longer adequate.¹⁰ The underlying challenge is to develop new policy and regulatory tools for the new environment.

Figure 2.2 Convergent communications technologies, providers and applications



⁸ For Australia, international data traffic exceeded voice traffic in 1998, and domestic data traffic is expected to exceed voice in 2002. See AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, p10.

⁹ As suggested in AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra. <www.dcita.gov.au>

¹⁰ Exemplified in the potential for IP-Telephony to completely bypass, and thereby, undermine existing regulatory structures and arrangements, and, perhaps, even switched telephony networks and businesses.

3 AUSTRALIA'S NETWORK CHARACTERISTICS

The structure of Australia's broadband infrastructure is greatly affected by the country's vast distances and the concentration of population in comparatively few urban areas. The other important factor is the progress of telecommunications deregulation. Since the market was opened in 1997 the level of competition, in both network infrastructure and services, has been gradually increasing. Initially, this competition was geographically concentrated in the major east coast markets. In terms of market segments the greatest competitive activity has been in mobile telephony¹¹ and the provision of Internet services.¹² Competitive momentum has been building more steadily in other markets, such as broadband and related services, and gradually spreading to other geographical regions.

More than ten companies have established, or are in the advanced planning stages for the development of, regional optical fibre or microwave broadband networks to compete with Telstra and C&W Optus. Of these, almost half are planning major roll-outs to serve at least three States. The bulk of this activity has been in constructing broadband trunk capacity. It is only relatively recently that there has been much attention paid to broadband in the customer access network (CAN). This effort is largely focusing on the roll-out of DSL technologies. Nonetheless, the vast majority of broadband capacity is still owned and controlled by Telstra.

3.1 International capacity

International submarine and satellite capacity has grown rapidly. Capacity between Australia and other countries is predicted to increase twenty-fold by 2003. This growth will occur on the back of a ten-fold increase in the past two years. The vast majority of this planned and recent growth has come in the form of submarine cables. Market conditions are changing, with more players controlling access to international capacity and increased capacity ending an era of demand pull and scarcity.¹³

Commissioning the Southern Cross cable has been a significant step forward for many Australian ISPs. Prior to Southern Cross, bandwidth had been concentrated in the hands of the few. Since Telecom New Zealand (AAPT in Australia), C&W Optus and WorldCom (Ozemail in Australia) opened Southern Cross, smaller second-tier telcos and ISPs are able to drive down their costs by getting their own US bandwidth.¹⁴

3.2 Backbone or trunk network

Gaining an accurate picture of network capacity is complicated by the commercial sensitivity of the information, and by the large amount of 'dark fibre' in the network. Whereas cables would carry only 6 to 12 fibre strands in the 1970s they are now commonly being laid with 60 fibres.¹⁵ The marginal cost of including additional fibres is low compared with the overall installation cost. According to the National Bandwidth Inquiry, in 1999 potential but unused capacity exceeded the capacity in use by between 100 and 100'000 times.¹⁶

¹¹ The Australian Communications Authority anticipates that the number of mobile services will exceed the number of fixed line services during 2001.

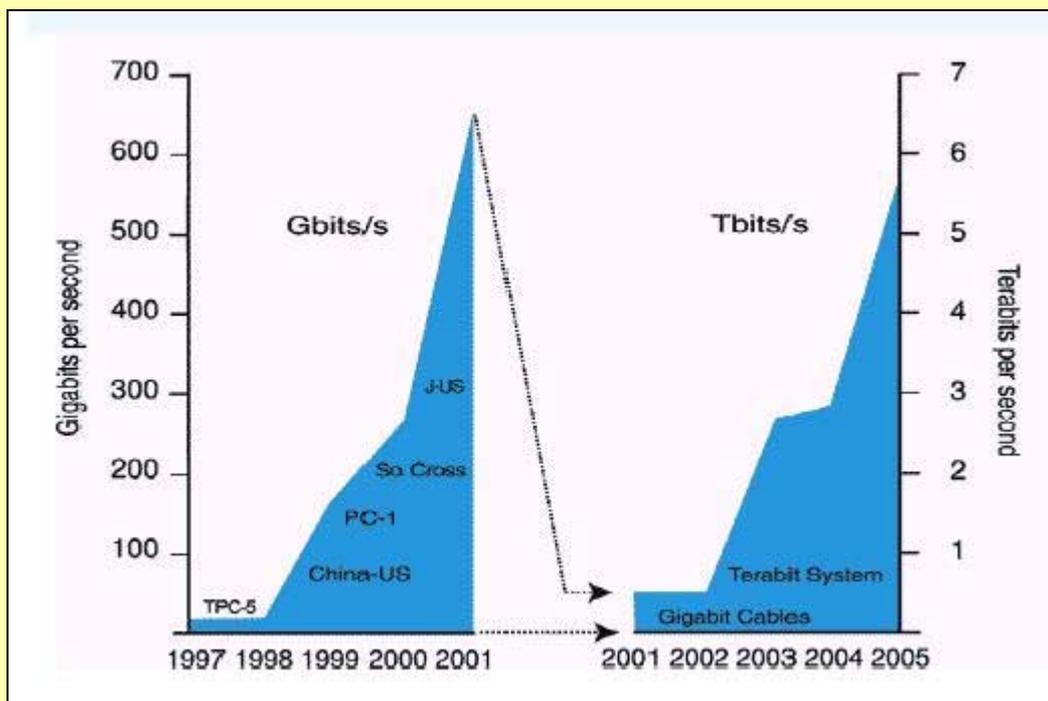
¹² By November last year 2.7 million, or 37 per cent, of households had internet connections. See Australian Bureau of Statistics (various years) *Household Use of Information Technology*, 8147.0.

¹³ Huston, G. (2001) *The Changing Structure of the Internet*, presentation to APEC Tel 23, Canberra, March 2001.

¹⁴ Braue, D. (2000) 'Southern Cross goes live at last, promises new services at lower cost,' posted on *australia.internet.com* on November 20 2000.

¹⁵ Consultel (1999) *Bandwidth for the Future*, DCITA, Canberra, p9.

¹⁶ AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, p50.

Figure 3.1: Existing and planned Asia-Pacific cable capacity, 1997-2005 (Gbps & Tbps)

Source: Huston, G. (2001) *The Changing Structure of the Internet*, presentation to APEC Tel 23, Canberra, March 2001.

In addition to the massive amount of capacity being installed, the impact of successive waves of technological development is dramatically increasing the amount of traffic each fibre is able to carry.¹⁷ As a result, the cost of broadband transmission capacity has fallen by an average of 30 per cent a year for the past 25 years.¹⁸ Current indications are that these technologies have not reached the limits of their development.¹⁹

The role of satellites as part of the backbone network has been declining, because their capacity is limited compared with fibre. But they do provide an alternative means of delivering broadband services which is particularly important for remote locations. In certain situations point-to-point microwave backbone networks can be a more cost effective option than either cable or satellite. This is particularly true if it is possible to share towers and other infrastructure with cellular mobile and broadcasting operators. The major limitations of microwave are the availability of spectrum and its susceptibility to adverse weather conditions.

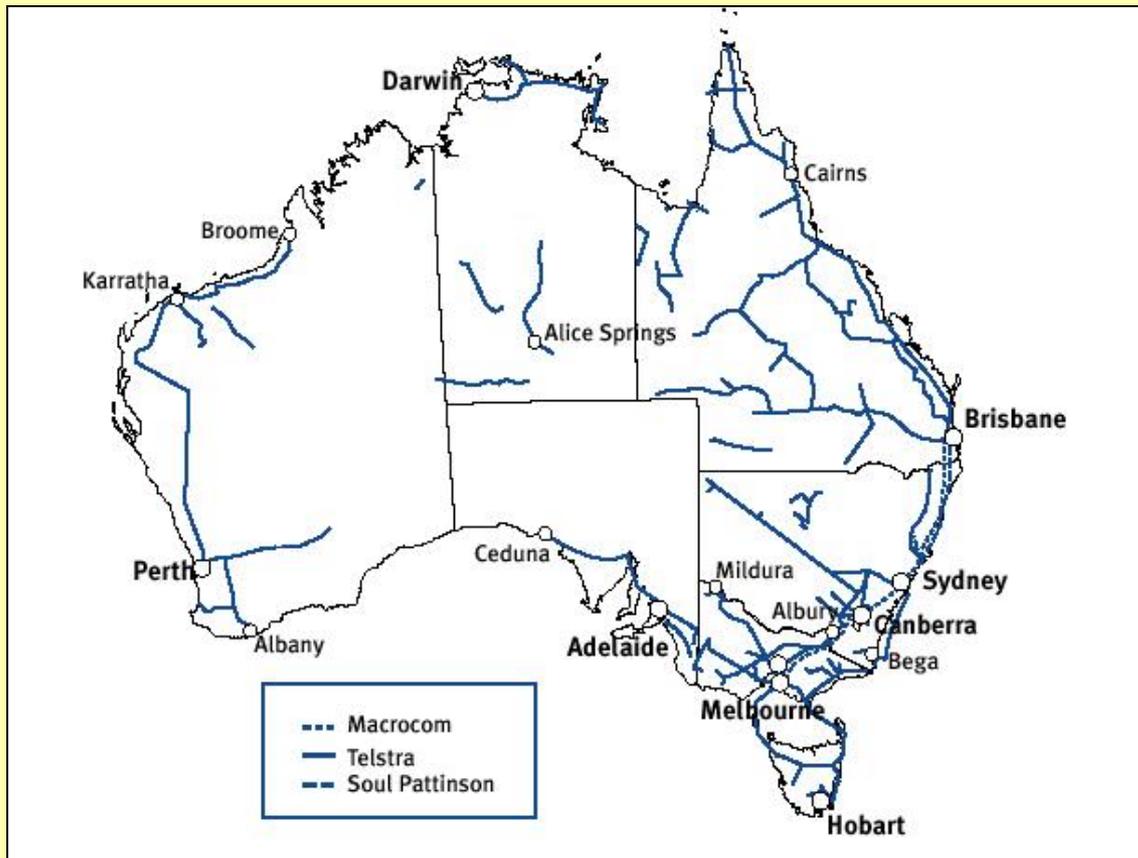
Technological developments are expected to increase the carrying capacity of microwave systems in the future, although the expansion is not anticipated to be anything like as great as for optical fibre. Even so, microwave has been widely used in Australia by the television industry to network its signals, particularly through regional areas, and by telecommunications carriers to provide service in some less densely populated areas. The cheaper installation cost of microwave has made it a preferred technology for some of the new carriers entering the broadband market.

¹⁷ Especially through the development of dense wave division multiplexing.

¹⁸ Ovum (1999) *Future Pricing Trends for Bandwidth*, DCITA, Canberra.

¹⁹ It is theoretically possible to apply the same capacity enhancing technologies to submarine cables as to those on land, but the cost of installing optical amplifiers along the cable once it is in place underwater is prohibitive. Submarine cables are usually installed at the maximum capacity current technology will allow, and remain at that capacity for their working lives.

Figure 3.2 Existing microwave networks of Macrocom, Telstra and Soul Pattinson, 2000



Source: Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra, p144.

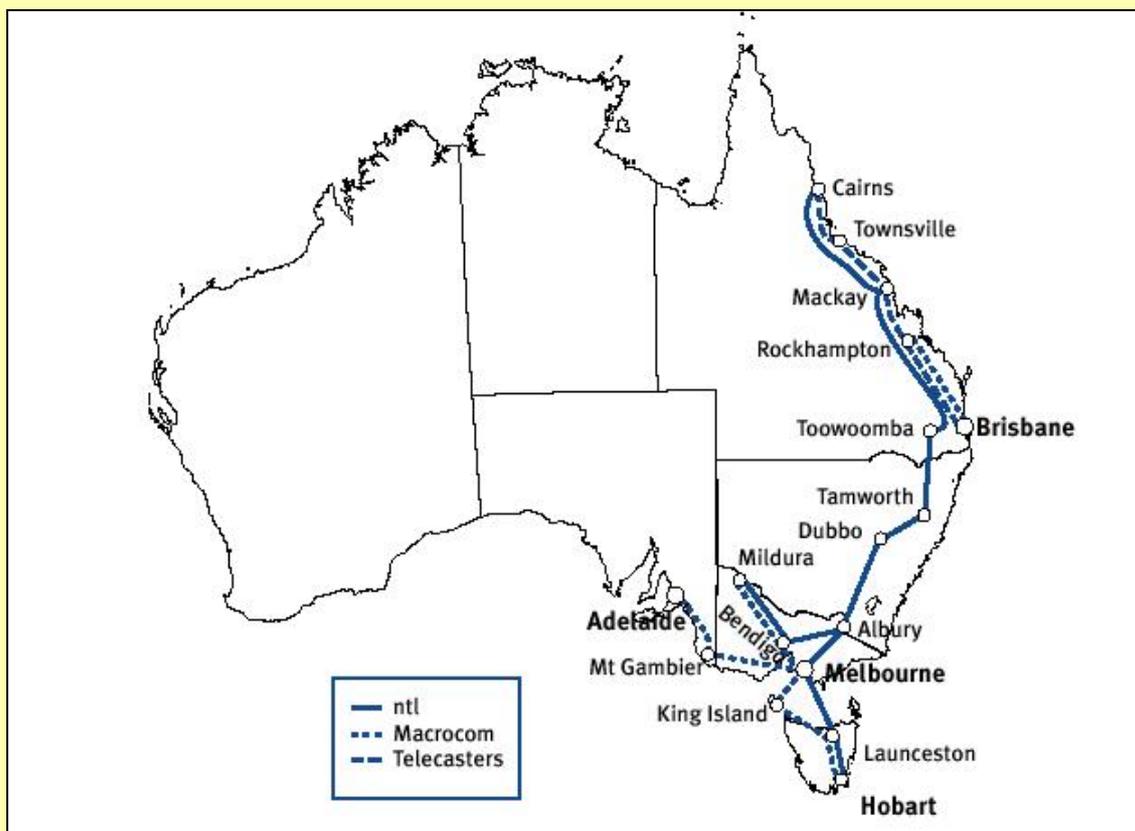
Estimating demand for broadband services is extremely difficult. Dramatic shifts in technologies can quickly raise the prospect of new applications and can also have a major impact on pricing. The Communications Futures Report (1995) stated that:

Medium-term forecasting of structures and trends is difficult, even for stable, well understood products. The problems become particularly acute for industries as new, as complex, and as global as those dealing with information and communications products. ...neither the economic nor the marketing literature offers many pointers to identify ways of testing future market developments.²⁰

Due to these difficulties in estimating demand and the relative ease of bringing very large amounts of optical fibre capacity into service quickly, none of the carriers have long-term network development plans. A three month to two year planning cycle is common.²¹

²⁰BTCE (1995) *Communications Futures: Final Report*, AGPS, Canberra.

²¹AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, p58.

Figure 3.3 Proposed microwave networks of ntl, Macrocom and Telecasters, 1999

Source: Telecommunications Service Inquiry (2000) Connecting Australia, ('Besley Report') DCITA, Canberra, p145.

Whilst there is no definitive information on the combined capacity of the backbone network, all the evidence points to there being many times more bandwidth than is required to meet current demand. Growth in capacity is being driven by spectacular improvements in technology and the entry of new players. Whereas many of the first wave of companies entering the telecommunications market were service providers (leasing capacity from the established carriers), more recently companies have elected to develop their own infrastructure (engaging in facilities-based competition).

Unleashing this capacity depends upon overcoming technical and market limitations in the CAN. The Bandwidth Inquiry (1999) concluded that: "the cause of most (broadband) capacity shortages at the point of sale may be due to provisioning problems, independent of the backbone capacity."²² It concluded that access to backbone capacity was subject to the limitations of the CAN, provisioning issues at local exchanges, and market factors – such as product definitions, billing and price.

²² AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, p72.

Box 1: Case study: Amcom

Amcom is one of the new breed of junior carriers that has developed from a regional base to having national aspirations. The company was founded in 1988 in response to the first stage of market liberalisation – which permitted competition in value-added network services, customer premise cabling and in the supply, installation and maintenance of customer premises equipment. Since then its growth has roughly mirrored shifts in the regulatory regime.

After working for a decade providing cabling services to city-based corporations in Perth, it won a carrier licence in 1998. This allowed it to build an optical fibre broadband network, first around Perth's central business district (to service the city's teaching hospitals), and later extending to the suburban areas. It has followed a similar strategy in Adelaide and Darwin. This approach has differentiated Amcom from many of the other newer carriers – i.e., having a significant local loop infrastructure for corporate customers. It has added further to this strong infrastructure investment by constructing its own ducting, rather than leasing space from others.

Recently, Amcom has moved into the more competitive east coast markets and announced plans to extend its operations nationally. The company says its national growth strategy is based on building its own national high-speed carrier network within and between major centres, using high-capacity optical fibre cable across an ATM switched network. Its strategy includes:

- 'Last Mile' Network Roll-Outs – developing broadband fibre networks in up to 30 Australian cities and financial centres (gaining access to buildings to connect into the communications backbone to provide for large bandwidth needs is a critical part of the strategy);
- Inter-City Roll-Outs – developing fibre links between major centres, or leasing capacity on existing infrastructure, to provide a door-to-door fibre service to customers across the country;
- Strategic Alliances & Partnership – developing a national network by establishing Points of Presence (POPs) in its weaker markets (Melbourne, Sydney and Brisbane) through alliances with established carriers; and
- Value-Added Services – developing value-added services such as DSL for potential customers beyond the central business districts.

To make the transition from regional to national carrier, Amcom is constructing a high-speed fibre link between Melbourne, Adelaide and Perth. Once complete this cable will add a competitor to the duopoly which has existed for terrestrial bandwidth between Australia's Eastern and Western seaboard. The Melbourne-Adelaide stage is due to be completed in May 2001, the transcontinental link is expected to be operating by mid-2002.

Sources: Amcom Website and personal communications.

3.3 Customer Access Network (CAN)

Integrated Services Digital Network (ISDN) technology has served as a benchmark for higher bandwidth capacity within the Australian system for many years. Telstra's 'OnRamp' ISDN service is available to 96 per cent of the population.²³ The 4 per cent of the population not served by line have comparable satellite access. As of 30 March, 2000 Telstra had 125'013 ISDN subscribers, up from 73'028 at 30 June 1998.²⁴ At the end of 2000, Telstra reported having more than 1.1 million ISDN 'lines', and claimed to be consistently selling 5'000 or more basic rate services a month since the introduction of its 'Home Highway' product.²⁵

A great deal of interest has been focussed on CAN technologies which increase the capacity of the existing copper twisted pair infrastructure. Recently, much of this attention has been on the suite of technologies known as digital subscriber line (DSL).²⁶ As with many transmission techniques, capacity declines with distance from the exchange or remote multiplexer and with interference, and is dependent upon the quality of the copper infrastructure. The impact of distance from the exchange to users is a significant in Australia, because of low population densities and great distances outside major cities.

²³ Telstra (2001) *Telstra Annual Report 2000*, Telstra, Melbourne.

²⁴ ACA (2000) *Telecommunications Performance Report, 1999-2000*, ACA, Canberra.

²⁵ Best, P. (2000) 'ISDN's success defies the doomsayers,' *IT News*, 4 December 2000. <www.it.fairfax.com>

²⁶ There are a number of different versions of DSL technology. Those which are most likely to be important in the Australian context are: HDSL — symmetrical, high data rate DSL; ADSL — asynchronous DSL, that is higher bandwidth downstream to the customer than upstream; and VDSL — very high, asynchronous data rate DSL.

Table 1: Digital data equivalent lines, 1998-2000

State/Territory	To June 1998	To June 1999	To June 2000
Telstra²⁷			
NSW/ACT	-	-	419'169
Qld.	-	-	173'670
SA/NT	-	-	79'076
Vic/Tas	-	-	278'300
WA	-	-	98'593
<i>TOTAL</i>	-	-	<i>1'048'808</i>
C&W Optus²⁸			
ACT	963	1'215	1'232
NSW	13'989	17'253	19'710
Qld	3'300	3'313	4'212
SA	1'715	2'549	2'942
Vic.	9'307	12'204	14'223
WA	2'761	3'121	3'470
<i>TOTAL</i>	<i>32'035</i>	<i>39'655</i>	<i>45'849</i>

Source: ACA (2000) Telecommunications Performance Report 1999-2000, ACA, Canberra, p75.

Roll-out of ADSL has begun, and up to 90 per cent of the population, are expected to be able to access ADSL services by 2002. Much of this roll-out is being undertaken by Telstra, although Optus also has ambitious plans for this technology – targeting 75 per cent of businesses with its ADSL network. Through a mix of access to Telstra's CAN and construction of their own infrastructure Primus, Pacific Internet, AAPT, One.Tel, Netcom, iiNet and RequestDSL are also entering the ADSL market. Industry forecasts for ADSL subscribers range between 720'000 and more than 2 million over the next few years.²⁹ However, with limited equipment supply and modest take-up to date, these may be optimistic. Informed sources suggest that at the start of 2001, there were 85'000 to 100'000 broadband subscribers in Australia.

²⁷ Telstra digital data equivalent lines — the number of ISDN circuits multiplied by the number of 64 Kbits channels. For example, a basic ISDN service, such as OnRamp 2 and Microlink, is multiplied by two as it provides two 64 Kbits channels; whereas higher level services, such as OnRamp 30 and Macrolink, are multiplied by higher figures due to the larger number of channels they provide.

²⁸ C&W Optus' definition of digital data equivalent lines differs from Telstra's as their definition excludes access lines with more than 64 Kbits capacity.

²⁹ Yankee Group predict 720'000 users by 2003, IDC forecast 2.1 million by 2004.

Box 2: Case Study: TransACT Communications

During the mid 1990s, in what might be described as a deregulatory rush of blood, millions of dollars were spent by the two largest Australian carriers (Telstra and C&W Optus) installing hybrid fibre coax (HFC) in the major cities along Australia's eastern seaboard. This whirl of activity was an attempt to claim territory in a belief that there was significant latent demand for Pay-TV services, which had been unfulfilled due to Australia's late adoption of this technology.

Canberra was overlooked in the initial roll-out, which was the catalyst for discussions in ACTEW, the publicly-owned utility which provides the Australian Capital Territory (ACT) with electricity and water, about the feasibility of adding broadband telecommunications to its services. ACTEW's ownership of the power poles and a quirk of ACT planning – all the poles run between the backyards of homes rather than along the street – made using them more difficult for other providers. The resulting company, TransACT, is currently in the process of building an advanced broadband communications network across Canberra. The service is tightly focussed on serving the 100'000 residents and 14'000 businesses in the ACT and the neighbouring regional centre of Queanbeyan (population of 25'000).

TransACT has adopted a radical business model, compared with other network owners, by acting as a pure infrastructure provider. The only exception to this has been a decision to offer a phone service. A variety of providers of video on demand, permanent 'high speed' connections to the Internet, free to air, pay per view and pay television services have all reached agreement to use the network to deliver their products and services (see Table 2).

Coming from a utility, direct customer access has always been a strength and an integral part of TransACT's planning. The bulk of the fibre cabling is being carried on the parent company's (ACTEW's) power poles. This has made it possible to implement a network design in which the fibre hub is no further than 300 metres from any customer's premises, enabling the use of *very high speed DSL* (VDSL) technology. TransACT says this will allow it to provide 52 Mbit/s capacity to each customer. This compares with between 1.5 and 8 Mbit/s using ADSL.

Testing began late in 1998 and continued through to mid-1999. The latter part of 1999 and the first half of 2000 were spent securing funding for the roll-out. Construction work is well under way with the first suburbs now coming online. Most customers in the ACT will have cable access by the end of 2002.

Sources: TransACT website and personal communications.

A number of the 'second generation carriers', including PowerTel, UeComm, AAPT, MCI Worldcom, Amcom, Ipera and others, are building fibre rings around the inner metropolitan areas of the capital cities. PowerTel has installed about 250 POPs in capital cities. UeComm has well over 1'000 kilometres of fibre installed in Sydney, Melbourne, Brisbane and the Gold Coast. AAPT is connecting over 200 buildings to the fibre rings it already has installed in the major capital cities, and Ipera is rolling out fibre links in Newcastle.³⁰

The two largest carriers, Telstra and C&W Optus, have invested heavily in hybrid optical fibre-coaxial cable (HFC) networks. These systems pass 2.5 and 2.2 million homes and businesses, respectively (about 35 per cent of Australian households), but are confined to major centres on the eastern seaboard. They have been used to deliver pay-TV, cable modem internet access³¹ and, in the case of Optus, telephony services. A decision by the companies to adopt different standards for the cable modems has kept costs high and take-up low. Both carriers are moving to a new internationally recognised standard, which should reduce prices and stimulate demand. Regional carriers have also established HFC networks in particular locations, including Neighbourhood Cable in Mildura in the north west of Victoria and Austar, which has installed cable in Darwin to reticulate its Pay-TV satellite service and to offer high speed Internet services.

³⁰ Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra.

³¹ According to an article in *PC User*, March 2001, broadband cable services account for less than 2 per cent of all consumer Internet accounts (not users).

Table 2: TransACT's business model

Vertical Integration Model	The TansACT Model
Resist efforts to force network open to third party content and service providers.	Welcome all third party service and content providers to give real choice to the consumer.
Establish own ISP service and fight to win customers from other ISPs, providing all of the support functions that go with a diverse range of Internet users.	Partner with many major ISPs and cooperate in enhancing service to their tens of thousands of established customers through provision of broadband access.
Try to limit customer's choice to "own" products and services in order to maximise revenue per customer.	Promote broadest possible array of services and products in order to optimise the value of broadband connection to the maximum number of customers.
Strive to uphold pricing of bandwidth as a multiple of telephony capacity.	"Lead the charge" in introducing broadband communications capacity at prices designed to foster higher usage.
Where wholesaling capacity to third parties, erect "Chinese walls" but compete vigorously at the retail layer.	In collaboration with service providers, promote all products and services that are available through the network.
Lose a customer whenever they churn to another provider's service.	Retain the customer irrespective of churn between service providers.
Amortise the cost of the network over only "own" products and services.	Amortise the cost of the network over multiple service streams, service providers and services.

Source: ACTEW Corporation (1999) *Introduction to the TransACT Communications Project*, Canberra. <<http://www.transact.com.au/pdf/tintro.pdf>>

Austar has also established a Multichannel Multipoint Distribution System (MMDS) in some areas to deliver a high-speed, two-way service over its wireless network. This service is targeting business users. AAPT is using Local Multipoint Distribution System (LMDS) technology to deliver high speed capacity to capital city and regional markets. A number of other wireless offerings are expected to become available from various companies in the near future. C&W Optus has acquired spectrum and is expected to commence roll-out of an LMDS ('fibre in the sky') network shortly. AAPT has been working on developing a similar product. One of the newer entrants, Unwired, is proposing to offer high bandwidth local loop services using the 3.4 GHz band spectrum.³²

Satellites also fill an important role in providing telecommunications services to isolated areas in Australia. However, high capital costs and limited capacity have, to date, made satellites a prohibitively expensive means of delivering broadband capacity. For users wanting to have a high capacity back channel there is the additional cost of a sophisticated satellite uplink. Telstra offers a high speed Internet service using asymmetric satellite technology for data transfer to users (at between 64 Kbit/s and 1 Mbit/s), with the return connection via the terrestrial telephone network. C&W Optus, Ihug and Austar also have asymmetric satellite services with download speeds ranging from 64 Kbit/s to 400 Kbit/s. Carriers are now introducing two-way satellite services in response to customer reservations about asymmetric systems. Given high remote area call costs in Australia, these two-way satellite services are likely to find a ready market.

3.4 The Australia communications market

Liberalisation has resulted in the entry of many new service providers.³³ In 1997, there were 3 carriers. As of January 2001 there were 66 licensed carriers – 14 were licensed during the second half of 1997, 11 were licensed during 1998, 8 during 1999, and no fewer than 32 during 2000.

³² Third Generation Mobile Services also have the capacity to deliver some high bandwidth services.

³³ This section draws on Telecommunications Service Inquiry (2000) *Connecting Australia* ('Besley Report'), DCITA, Canberra, pp33-34.

Table 3: Service providers, 1997-2001

	Carriers	Telephone service providers	Internet service providers
Jun-97	4	16	395
Jun-98	15	60	460
Jun-99	24	76	751
Jun-00	47	71	865
Jan-01	66	N.A.	N.A.-

Sources: Telecommunications Service Inquiry (2000) *Connecting Australia* ('Besley Report') p33 and TIO.

It is no longer accurate to speak of a single telecommunications market.³⁴ The market for mobile telecommunications services is contested in most regions of Australia – more intensely where terrestrial coverage is available. In fixed services, all Australians have access to alternative providers for some services, such as local and long distance calls supplied over the Telstra network. In terms of infrastructure competition, markets in large metropolitan areas are contestable, and a number of companies now compete in both residential and business markets. The central business districts are even more competitive, with the information technology and financial services industries demanding bandwidth and specialised services. Competition is also developing on trunk routes between the major population centres.

Fixed telecommunication services in larger regional centres are contestable, but beyond these centres competition has been slow to emerge, because of the higher costs associated with providing services in areas of low population density. The Productivity Commission recently suggested that average line costs in low density areas of Australia (less than about two lines per square kilometre) are between six and ten times the average cost per line in the rest of Australia.³⁵

Total Australian telecommunications market revenue amounted to around AU\$ 33 billion during 2000 – with Telstra accounting for just over 50 per cent. It is estimated that fixed voice revenues were around AU\$ 11.3 billion, equipment revenues AU\$ 7 billion, data communication revenues AU\$ 6.7 billion, and mobile revenues AU\$ 5.3 billion. Public data communications revenues reached an estimated AU\$ 3.5 billion in 2000 – of which leased line services accounted for a declining AU\$ 710 million, ISDN for around AU\$ 1.1 billion, and frame relay services for around AU\$ 900 million. Telstra accounts for around 85 per cent of the leased line market, 40 per cent of the frame relay market, and 70 per cent of the ATM market.³⁶ As of July 2000, there were 17 frame relay services providers and 19 ATM service providers, with a further 5 ATM network operators not offering public ATM services.³⁷

³⁴ Telecommunications Service Inquiry (2000) *Connecting Australia* ('Besley Report') DCITA, Canberra.

³⁵ Productivity Commission (2000) *Population Distribution and Telecommunications Costs*, Staff Research Paper, August 2000, p. ix.

³⁶ Paul Budde Communication (2000) *Telecommunication Strategies in Australia 1999-2000*, Paul Budde Communication, Bucketty, NSW.

³⁷ See Evans S. (2000) *Australian Data Services: Who's Who in the Next Generation Networking*, and other Telsyte reports at www.telsyte.com.au

Box 3: Australian broadcasting and television production industries

The broadcasting industry is made up of:

- 48 commercial television station licenses, organised into three networks – the Seven, Nine and Ten networks;
- two national public broadcasters – the Australian Broadcasting Corporation (ABC) and the Special Broadcasting Service (SBS). The ABC provides one national television service, four national radio networks and a number of stand-alone metropolitan and regional stations. The SBS provides multilingual and multicultural television in most areas, and radio services in the major cities and some regional areas;
- three major subscription television operators (Foxtel, Optus and Austar), with no more than two major subscription television operators in any one area;
- 220 commercial radio licenses on the AM and FM bands. Austereo and the Australian Radio Network have the largest potential audiences, with most of their licenses in the metropolitan areas;
- 228 community radio broadcasting licenses, including 80 Broadcasting for Remote Aboriginal Communities Scheme (BRACS) licenses. BRACS broadcasts both radio and television to remote indigenous communities from low powered sites which receive their signal by satellite;
- six community television stations, broadcasting on channel 31 in Sydney, Melbourne, Brisbane, Perth, Adelaide and Lismore;
- 126 AM and FM radio open narrowcast licenses, catering for ethnic or other minority interests and providing education services or tourist radio services;
- television program production valued at \$1'140 million in 1996-97;
- advertisement production valued at \$234 million in 1996-97;
- television program exports of around \$100 million (royalties) in 1997-98;
- commercial television and radio licenses valued at over \$3 billion and \$800 million, respectively, in 1997-98; and
- employment of 45'000 people in June 1999 – half in broadcasting and half in film and video, production, distribution and exhibition.

Source: Productivity Commission (2000) Broadcasting Inquiry Report, Report No 11, Ausinfo, Canberra p27.

Table 4: Public data communications market revenue, 1997-2000 (AU\$ million)

	1997	2000 ^(a)
Leased line services	930	710
Analogue (Datel)	30	10
Digital 64 Kbit/s (DDS)	680	550
Digital 2 Mbit/s (DDS)	220	150
Other data network services	970	2'825
ISDN	450	1'100
International	220	350
Packet switching	115	75
ATM	10	150
Frame relay	100	900
Other	75	250
Total data communications market	1'900	3'535

Note: (a) estimated.

Source: Paul Budde Communication (2000) *Telecommunication Strategies in Australia 1999-2000*, Bucketty, NSW, p146.

Pay television operators are the other main broadband network and service providers in the Australian market. There are three major players:

- Foxtel, jointly owned by Telstra and two of Australia's largest media enterprises, Publishing and Broadcasting Limited (PBL) and News Corporation, is the largest – with around 635 000 subscribers at the end of June 2000, rising to 703 000 at the start of 2001 (465 000 by cable and 235 000 by satellite).³⁸
- C&W Optus is the controller of Optus Television, which had 217 000 subscribers. Both Foxtel and Optus rely primarily upon hybrid fibre-coaxial cable (HFC) for delivery.
- The third major player, Austar, has around 420 000 subscribers to its predominantly satellite and microwave-based regional system. However, during late 2000 Austar was losing subscribers (being about 5 100 down over the 4th quarter³⁹) and losing value (being 85 per cent down on its stock market value of 12 months ago), and is now reigning in its internet ambitions.⁴⁰

During 1999-2000, Pay-TV operators realised AU\$ 758 million revenue, on a subscriber base of around 1.2 million – 16 per cent of households.

Table 5: Pay-TV networks and services, 1999-2000

	Austar	Foxtel	Optus Television	Total
Owner/controller	UnitedGlobalCom	Telstra (50%) News Corp (25%) PBL (25%)	C&W Optus	
Service area	Regional/remote NSW, Queensland, South Australia, Victoria, Northern Territory (Darwin)	Adelaide, Brisbane, Melbourne, Brisbane, Canberra, Central Coast, Geelong, Gold Coast, Melbourne, Newcastle, Perth, Sydney & parts of WA	Sydney	
Delivery systems	Satellite, Microwave, Cable	Cable, Satellite	Cable	
Number of channels	32	36	35	
Subscribers	406'326	635'000	217'000	1' 258'326
Revenue (AU\$)				757'782'000

Source: ACA (2000) Telecommunications Performance Report 1999-2000, ACA, Canberra.

4 BROADBAND REGULATION AND RELATED ISSUES

Broadband infrastructure and services are underpinning the development of e-commerce, and access to bandwidth at globally competitive prices is an increasingly important determinant of competitiveness in the global knowledge economy. Broadband communications can also make important contributions to the quality of life – in terms of education, health services and social inclusion. In this light, there have been a number of inquiries and reports dealing with the accessibility of broadband networks and availability of

³⁸ Lacy, C. (2001) 'NDC and Foxtel still up in the air', *Australian Financial Review*, 8 March 2001, p23.

³⁹ Collins, L. (2001) 'Sluggish Foxtel reflects pay-TV trend,' *Australian Financial Review*, 9 February 2001, p50.

⁴⁰ Collins, L. (2001) 'Austar Searches for New Focus,' *Australian Financial Review*, 8 March, 2001, p20.

broadband services in Australia. These provide an insight into some of the key issues in the development of broadband in Australia.

4.1 Recent inquiries and reports

4.1.1 Before 1998

In 1993, the then Minister for Communications launched an inquiry into issues relating to the delivery of broadband services to homes, schools and businesses – undertaken by the Broadband Services Expert Group (BSEG). Having examined a range of issues the BSEG report, *Networking Australia's Future* (1994), sought to raise awareness of the importance of broadband development, foster a sense of urgency and encourage greater commitment to the development of broadband infrastructure.⁴¹

During 1993-94, researchers at the Bureau of Transport and Communications Economics (BTCE) undertook a major project exploring Australia's communication market outlook over the decade 1995-2005. Their work was published in *Communications Futures* (1995) and a number of related working papers.⁴² The communications futures project focused primarily on residential communications networks, and sought to make public an economic framework within which to assess the forces driving the evolution of the network – including technological changes and a range of demand and price factors. The study examined models for four technologies: direct broadcast by satellite (DBS); multipoint distribution systems (MDS); hybrid optical fibre-coaxial cable (HFC); and asynchronous digital subscriber line (ADSL). General conclusions included the sense that a broadband future for Australia was likely to involve a mix of products and technologies, and that, for economic rather than technical reasons, its realisation was some years away.

In 1996, the then Minister for Communications asked the Information Policy Advisory Council (IPAC) to examine and report on the policy options available to government to foster the further development of networks and services, especially in regional Australia. IPAC's recommendations focused on policy settings:

- *on the regulatory side* – to ensure that the new regime would bring about increased competition in regional and rural areas, promote new investment in rural infrastructure, and produce a significant shift towards 'location independent' pricing;
- *on the service delivery side* – to ensure a commitment by all levels of government to work together to provide high quality, user-friendly services to all Australians; and
- *on the program side* – to ensure that the funding of special initiatives was well-targeted and cost-effective.⁴³

4.1.2 The Digital Data Inquiry, 1998

In 1998, the Minister for Communications, Information Technology and The Arts directed the ACA, to review whether a carriage service that provides digital data capability broadly equivalent to 64 Kbit/s, comparable to the capability provided by a basic rate ISDN service, should be incorporated into the Universal Service Obligation (USO), and to assess the costs and benefits associated with such a decision.⁴⁴

The inquiry revealed that access to a data capability was becoming increasingly important in Australian society, as evidenced by high internet and e-mail usage. While it found encouraging signs that the data services market would deliver, it also found that a disparity existed in data service capability and access charges between metropolitan and rural consumers. The major features of this disparity were lack of access to untimed local calls and the relatively slow data rates achievable over the PSTN in rural and remote areas.

⁴¹ Broadband Services Expert Group (1994) *Networking Australia's Future*, AGPS, Canberra.

⁴² BTCE (1995) *Communications Futures: Final Report*, AGPS, Canberra.

⁴³ IPAC (1997) *Report of the Working Party investigating the development of online infrastructure and services development in regional and rural Australia*, DCITA, Canberra. <www.ipac.gov.au>

⁴⁴ ACA (1998) *Digital Data Inquiry: 1998*, ACA, Canberra.

One of the factors contributing to Australia's high take-up of internet services is that dial up access is relatively cost effective, because of the availability of untimed local calls. The ACA found that there was an increasing number of ISPs offering services in regional Australia, but around 37'000 rural and remote area subscribers did not have access to untimed local calls. The ACA also found that while in urban and provincial centres 95 per cent of subscribers could achieve data rates of 9.6 Kbit/s and 60 per cent could achieve rates of 28.8 Kbit/s, in rural areas just 70 per cent could achieve 9.6 Kbit/s and a mere 30 per cent could achieve 28.8 Kbit/s.

In addressing the urban-rural disparity the ACA did not favour specifying a digital data carriage service as part of the USO – because it was not supported by their cost/benefit assessments, and because the use of the USO provisions might have unfavourable impacts on competition.⁴⁵

4.1.3 *The National Bandwidth Inquiry, 1999*

In 1999, the Government asked the Australian Information Economy Advisory Council (AIEAC) to conduct a National Bandwidth Inquiry because of the importance of bandwidth (broadband) for the performance of Australia in the global information economy.⁴⁶ The focus of the inquiry was Australia's international and domestic trunk telecommunications network. However, issues relating to the timely provision of services to customers were also considered.

The Inquiry found that, as at December 1999, peak bandwidth demand usage in Australia, including incoming and outgoing traffic, was in the order of 300 Gbit/s, of which around 15 per cent was trunk or backbone bandwidth. Usage on the domestic trunk network was estimated to be less than 1 per cent of capacity. The Inquiry concluded that:

*"the market outlook for the trunk network, particularly in the inter-capital markets, is reasonable, with competition likely to develop further over the next few years. However, while the trunk infrastructure to provide services is largely already in place, substantial anecdotal evidence suggests that there are problems with making data services available in a timely and affordable manner in practice, particularly outside the central business districts of Sydney, Melbourne and Brisbane. If this shortfall in customer available bandwidth is not addressed, there is a risk that Australia's ultimate performance in the global information economy will be adversely affected."*⁴⁷

The National Bandwidth Inquiry identified two 'bandwidth' challenges facing Australia. First, to enable, through the operation of a vigorous and innovative market, the creation, in any location, of centres of Australian 'bandwidth excellence' which are capable of matching the bandwidth supply conditions in North America and Europe in terms of innovation, quality and price for bandwidth prevailing in the emerging centres of e-commerce excellence. Second, at the same time, to find appropriate and empowering ways of meeting the challenges of providing affordable, quality and timely access to bandwidth, to enable Australians living in regional, rural and remote areas to participate fully in the information economy.⁴⁸

4.1.4 *The Telecommunications Services Inquiry, 2000*

In March 2000, the Minister for Communications, Information Technology and the Arts established a Telecommunications Service Inquiry to assess the adequacy of telecommunications services in Australia, with particular reference to services in regional and remote areas. The Inquiry found that people in regional, rural and remote Australia want access to services on an equitable basis compared with their counterparts in metropolitan and large urban centres. During consultations they heard the frustration of many rural and remote consumers in getting basic and reliable telephone services connected quickly, and repaired in a timely manner.⁴⁹

A substantial number of those who contributed to the Inquiry pointed to the problems they experienced as a result of unreliable service, dated network capabilities or issues regarding the infrastructure available in their

⁴⁵ ACA (1998) *Digital Data Inquiry: 1998*, ACA, Canberra, p3.

⁴⁶ AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra.

⁴⁷ AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, ppx-xi.

⁴⁸ AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra.

⁴⁹ This section draws on Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra.

area. Many experienced slow data speeds when accessing the internet. These people were sometimes further disadvantaged in lacking access to the internet at local call rates. Indeed, service providers acknowledged that, despite recent market developments, a proportion of the Australian community does not currently enjoy access to a full range of reliable and advanced communications services. The urban-rural disparity and unrealised expectations about 'the death of distance' were central concerns.

4.1.5 *Review of telecommunications specific legislation, 2001*

The Productivity Commission is currently undertaking a thorough review of telecommunications specific legislation, which is likely to be a major influence on the direction of reform over the next 5 years. It is due to report in mid-2001. In its draft reports, released at the end of March, the Productivity Commission raised concerns about: the detrimental impact upon infrastructure investment of too low access prices; slow and inefficient processes for access/interconnect negotiation and agreement; and the overemphasis in the current regime on promoting competition rather than efficiency.

The Commission recommended the retention of a telecommunications-specific access regime subject to:

- the replacement of the existing declaration criteria with more objective requirements, all of which must be met before the ACCC can declare telecommunications services;⁵⁰
- the use of principles and processes convergent with those of the national access regime;
- the ability to determine prices jointly for a group of access seekers, rather than always using bilateral arbitration;
- the introduction of sunset provisions for declaration;
- legislated access pricing principles, recognising the importance of investment in core telecommunications facilities;
- abolition of the Telecommunications Access Forum; and
- indicative non-binding time limits for arbitration⁵¹

One issue that arose in the Telecommunications Service Inquiry was referred to the Productivity Commission for review. Namely, the implications of Pay-TV programming arrangements for the development of telecommunications competition in regional Australia. It is becoming increasingly clear that facilities-based competition and the roll-out of broadband networks may be held back by the competitive carriers' or service providers' lack of access to programming content – content which, in the Australian case, has been locked away in exclusive contracts by the Foxtel (Telstra) and C&W Optus Pay-TV operations.⁵²

4.2 Universal service

Among the more significant recent developments, with implications for the development of broadband networks and services in Australia, are: changes to universal service obligation (USO) arrangements – with the introduction of digital data service obligations, a rural and remote 'extended zones' system and contestability in the provision of USOs; the development of mobile data technologies and the allocation of 3rd generation (3G) mobile spectrum; and the introduction of digital broadcasting and 'datacasting'. Internationally, recent activity has included deregulation of submarine cables landing rights, and negotiation on international charging arrangements in relation to the internet (ICAIS).

4.2.1 *Universal Service Obligations*

Current arrangements define the USO as the obligation to ensure that all people in Australia, wherever they live or work, have reasonable access on an equitable basis, to the standard telephone service (including

⁵⁰ For an explanation of the concept of 'declaration' see Section 4.2.

⁵¹ Productivity Commission (2001) *Telecommunications Competition Regulation: Draft Report*, Canberra, 29 March 2001, pxx.

⁵² Productivity Commission (2001) *Review of Telecommunications Specific Competition Regulation: Issues Paper 2*, Canberra, January 2001, p7.

customer equipment), payphones and prescribed additional carriage services. A supporting obligation requires those services to be supplied on request.⁵³

The key elements of the universal service regime include:

- the specification of the USO and Digital Data Service Obligation (DDSO);
- the declaration of universal service providers (USPs) and digital data service providers (DDSPs) – Telstra is currently designated as the USP and the DDSP for all Australia, and C&W Optus is a special DDSP for Western Australia;
- scope for regulation of universal service and digital data service charges; and
- the preparation of universal service and digital data service plans.

The standard telephone service required under the USO is a service for voice telephony. For people with a disability, an equivalent service is required to be supplied in order to comply with the Disability Discrimination Act 1992. Under the Telecommunications (Consumer Protection and Services Standards) Act 1999 the losses that result from supplying services in the course of fulfilling the USO are shared among carriers. All carriers contribute proportionately, based on their share of total eligible revenue.

4.2.2 *Digital Data Service Obligation*

Access to data services is guaranteed via the general and special Digital Data Service Obligations (DDSOs). The general digital data service is a service that provides data capability broadly comparable to that provided by a basic rate ISDN service. Since October 1999, the general DDSO has been available to 96 per cent of the population upon request. Telstra is the declared supplier.

The special DDSO applies to the remaining 4 per cent of the population who do not have access to ISDN services – primarily those customers living more than 4 kilometres from a metropolitan exchange or 6 kilometres from a country exchange. It provides for the delivery of data to an end-user broadly comparable to a 64 Kbit/s basic rate ISDN service via a satellite downlink services. The special DDSO is supplied by Telstra (Australia-wide), and will be supplied by C&W Optus in Western Australia as from 2001. A subsidy of 50 per cent of the cost of necessary customer premises equipment, up to AU\$ 765, is available to special DDSO customers. Telstra supplied 74 special digital data services during 1999-2000.⁵⁴

4.2.3 *Universal Service Provision*

In March 2000, the Government introduced contestability into the provision of universal services.⁵⁵ These new arrangements are currently being trialed in specific areas using two contestability models. The first involves tendering for the provision of untimed local calls in the extended zones (i.e., rural and remote areas – see map), with the successful tenderer becoming the regional universal service provider for the area. The second model involves conducting pilot projects in designated areas where multiple carriers will be able to compete to provide services, and receive subsidies for loss making services on a per service basis. The Government has also announced that it will widen the base for USO funding, with carriers and service providers being required to contribute.

4.2.4 *Extended zones tenders*

In October 2000, the Government invited 7 companies to tender for the provision of untimed local calls, untimed internet access, payphone services and other carriage services in the extended zones (see map). The tender provided \$150 million for the infrastructure upgrades necessary for these services, and the successful tenderer is required to become the sole universal service provider for the extended zones.

During the ten-year contract period the successful tenderer will be required to offer:

⁵³ This section draws heavily from Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra, pp29-30.

⁵⁴ ACA (2000) *Telecommunication Performance Report 1999-2000*, ACA, Canberra, p77.

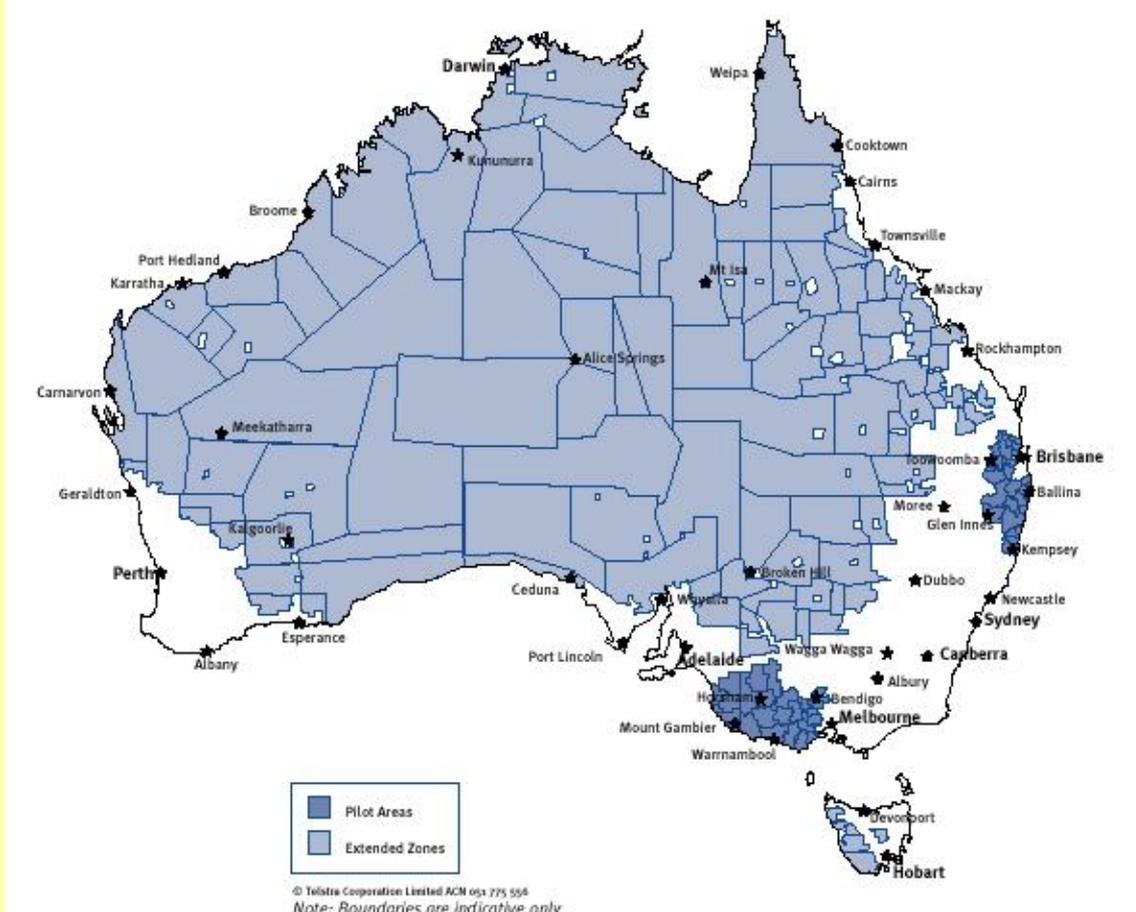
⁵⁵ Details of the new USO arrangements are taken from ACA (2000) *Telecommunication Performance Report 1999-2000*, ACA, Canberra, pp77-80.

Australia case study

- All calls within an extended zone at the untimed local call rate;
- Calls from customers in an extended zone to customers in its local 'community service town' at a preferential rate;
- Local call rate access to at least one ISP;
- Services at capped prices, including untimed local calls at 27.5 cents (inclusive of government sales tax) per call, calls to the local town at 25 cents per 12 minutes and local untimed payphone calls at 40 cents per call; and
- Other services – such as 24 hour access to emergency service numbers, fault reporting, directory assistance and operator assisted services.

Tenderers were also encouraged to offer enhancements, including improved data rates, improved quality of service and additional services, such as Pay-TV.

Figure 4.1: Extended zones and USO contestability pilot areas



Source: Telecommunications Service Inquiry (2000) Connecting Australia, ('Besley Report') DCITA, Canberra, p156.

Following the award of the untimed local call tender, the universal service provider has exclusive access to the USO subsidies for the area for three years. After that time, the provision of USO services in the extended zones may again become contestable. The aim is for these services to be available to all extended zone customers by the end of July 2001. To the dismay of some, Telstra has been selected as preferred tenderer.⁵⁶

⁵⁶ See, for example, Lindsay, N. (2001) 'Optus chief slams policy,' *Australian Financial Review*, 23 February 2001, p5.

4.2.5 Contestability pilots

There are two pilot schemes for the competitive delivery of the USO in regional areas.⁵⁷ Both trials will enable carriers to compete with Telstra for subsidies to provide standard telephone services that would otherwise be non-commercial. One of the two pilot projects, in south-west Victoria, has received funding support under the Government's AU\$ 70 million 'Building Additional Rural Networks' program, which supports the development of innovative market models for the delivery of regional communications services, including new kinds of community-owned or regionally-based carriers. This pilot will help test the importance of supplementary funding in facilitating contestable USO arrangements.

In both pilots, carriers will be required to pre-qualify with the ACA to become a universal service provider (USP). All USPs will be able to offer an ACA-approved alternative telephone service, such as mobile services or a service providing enhanced internet access, which will be eligible for a subsidy. Consumers will be able to choose either the standard Telstra offering, or an alternative offering from Telstra or a new service provider. USPs supplying the standard telephone service will be required to meet standard regulatory requirements in relation to the service. These include an untimed local call option, pre-selection and emergency facilities, and disability equipment where relevant. Telstra will be required to remain in the pilot areas as the primary USP, and must continue to offer its existing standard service, thus insuring all consumers continue to be served. Telstra will be able to exit the market only when another carrier agrees to take its place. Telstra's existing standard service will continue to be price capped.

4.3 Unbundling the local loop

One important regulatory development was the declaration of the local loop in July 1999. The unconditioned local loop service (ULLS) declared by the ACCC enables competitors to use existing CAN between their customers and Telstra's exchange facilities. Competitors can connect their own equipment in order to supply telephony and high speed services for carrying data direct to end users. Declaration gives competitor carriers greater flexibility to develop and supply new services. It is particularly important for the development of xDSL services.⁵⁸

Telstra launched wholesale and retail ADSL products, and its wholesale ULLS product, in August 2000. The wholesale ADSL service is a Telstra (conditioned) high bit rate product that can be resold by service providers to retail customers, whereas the wholesale ULLS is an unconditioned service. Telstra's wholesale ADSL service will be marketed to ISPs for resale to residential and business users. Telstra's wholesale ULLS service will be offered to carriers and service providers who intend to attach their own equipment to Telstra's local exchanges.⁵⁹

Although a growing number of companies are seeking to use Telstra's CAN to roll-out these services, there have been disputes over the price and timeliness of access. The government encouraged the ACCC to step in, and in its preliminary finding the ACCC suggested that the prices Telstra was proposing for access to the ULL should be cut by more than 40 per cent.⁶⁰ As a result of the disputes, the introduction of new services stalled. No fewer than seven carriers sought arbitration in an attempt to resolve the pricing issue, and months passed without a clear indication of even an interim price, making it impossible for new entrants to develop roll-out or pricing plans.⁶¹

The other 'local loop' development was declaration of analogue Pay-TV broadcast carriage services at the end of August 1999 – opening access to the Foxtel (Telstra) and C&W Optus cable TV networks. Foxtel and Telstra immediately appealed the order, but the full bench of the Federal Court found in favour of opening access and giving competitors access to its analogue set-top boxes. While the ruling related only to analogue cable, and does not cover any other networks (such as Multichannel Multipoint distribution station (MMDS),

⁵⁷ This outline is from Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra, p157.

⁵⁸ Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra, p136.

⁵⁹ ACA (2000) *Telecommunication Performance Report 1999-2000*, ACA, Canberra, p156.

⁶⁰ Australian Financial Review (2000) 'Flowcom seals funding for DSL network,' 28 November, 2000; and 'Alston urges ACCC to crack whip over internet issues,' 11 December, 2000.

⁶¹ Clark-Dickson, P. (2001) 'All Aboard the Broadband Bandwagon' *Communications Yearbook 2001*, Informa Publishing, Sydney, p22.

satellite or digital), some have suggested that an important precedent has been set which may spill over into other broadband services.⁶² The impact to date appears to have been limited, with pricing and access disputes taking time to resolve.

4.4 Mobile and wireless data

Technological advances in mobile and local multipoint distribution communications, consumer demands for anytime, anywhere communication, the development of the internet, the convergence of telecommunications, computing and the media, and the introduction of competition have all contributed to strong growth in the demand for spectrum.

4.4.1 Spectrum allocation

In recognition of increasing demand for access to spectrum, reforms to the regulatory framework for the management of spectrum were introduced through the Radiocommunications Act 1992. This Act provided for a new form of license, known as a spectrum license, which gives the licensee an access right to a band of spectrum in a defined geographic area. Unlike the tightly specified apparatus licenses, a spectrum license provides a licensee with the flexibility to decide the number and location of transmitters within the spectrum and geographic area, as well as the purpose for which the spectrum is used (i.e., the license is technology-neutral). A spectrum license can also be sold, sub-divided or shared at the discretion of the licensee.

The *Radiocommunications Act 1992* also introduced spectrum allocation by price-based mechanisms, such as auctions. Australia's first auction occurred in 1994, with the allocation of apparatus licenses for MMDS – which enabled the introduction of Australia's first Pay-TV services. Since then, more than a dozen auctions have been conducted, raising in excess of AU\$ 2 billion.⁶³

A secondary market for the trade of spectrum rights has recently been established, and it expects to conduct its first auction this year. The market will be operated by SpectrumDesk,⁶⁴ a subsidiary of the Macquarie Bank. The company says that its operation will maximise the use of spectrum. The online trading exchange will be based around units of spectrum called 'Standard Trading Units'. Macquarie Bank believes the market for secondary spectrum trading will be worth more than AU\$ 200 million in its first year.⁶⁵

⁶² Liddell, C. (2000) 'Broadband Open for Business', *australia.internet.com* 24/11/00.

⁶³ The following summary of spectrum auctions is taken from ACA (2000) *Telecommunication Performance Report 1999-2000*, ACA, Canberra, pp209-213.

⁶⁴ See <<http://www.spectrumdesk.com/index.htm>>

⁶⁵ Australian Financial Review (2000) 'Macquarie first in online spectrum trades,' *Australian Financial Review*, 20 December, 2000.

Table 6: Competitive spectrum allocations, 1994 to February 2001

Year	Band	Revenue (AU\$)
1994	Multichannel Multipoint distribution station (MMDS) channels (apparatus licenses)	90'600'000
1995	MDS channels	10'200'000
1997	500 MHz band	1'078'000
1998	800 MHz and 1.8 GHz bands	350'100'000
1998	1.8 GHz band (residual lots)	30'631'000
1999	28/31 GHz bands	66'176'780
1999	1.8 GHz band (residual lot)	20'000
1999	Trunked land mobile (apparatus licenses)	47'000
2000	1.8 GHz band (additional allocation)	1'327'735'500
2000	MMDS spectrum	71'000'000
2000	3 GHz spectrum	112'472'000
2000	27 Ghz spectrum	37'603'000
<i>Total</i>		<i>2'097'663'280</i>

Source: ACA (2001) <www.aca.gov.au>.

4.4.2 Broadband mobile developments

Major technical developments are occurring in the area of mobile data. While these developments are far from mature, some interesting applications are emerging. These include: 2.5 generation mobile technologies like Wireless Access Protocol (WAP), the SIM Application Toolkit, General Packet Radio Service (GPRS), technologies like Bluetooth and, of course, the introduction of 3rd generation (3G) mobile. Predictions about the importance of wireless data and these technologies vary considerably, but Telstra has stated that it expects mobile data volumes to equal mobile voice traffic within five years.⁶⁶ The global 3G market is estimated to grow from US\$ 1.5 billion in 2001 to US\$ 9.2 billion in 2005, with investment in infrastructure to support 3G services of US\$ 1 billion in 2001, increasing to over US\$ 5 billion in 2003.⁶⁷ IDC suggest that there are already up to 100'000 mobile internet subscribers in Australia.⁶⁸

The purpose of WAP is to provide a mechanism for delivering Internet services to wireless terminals. Telstra's Research Laboratories demonstrated the control of home appliances using WAP in mid-1999. As an application protocol, WAP is designed to operate over any available connection from Short Message Service (SMS), which provides packets of up to 160 characters, to the standard wireless data service (typically 9.6 Kbit/s). Its operation will be greatly enhanced by higher data rate wireless packet mode data services, such as GPRS. There were less than 10'000 WAP capable handsets in use in Australia at the end of June 2000, but that number is increasing rapidly.

The alternative to WAP in many situations is the Subscriber Identifier Module (SIM card). Application Toolkit, which enables a network operator to download applications to the handset SIM. The handset must support the SIM Application Toolkit and the SIM must have suitable software installed and have sufficient memory to store the application software. Telstra claims to have at least 2 million suitable handsets on its

⁶⁶ This discussion of mobile data developments is derived from ACA (2000) *Telecommunication Performance Report 1999-2000*, ACA, Canberra, pp104-106.

⁶⁷ ITU (2000) *Media Release*, May 8th, 2000.

⁶⁸ Kennedy, D. (2001) 'New message system still over the horizon,' *Australian Financial Review*, World without wires (special report) 28 February 2001, p13.

network, but these would all require new SIM cards. A major advantage of the SIM Application Toolkit is that it does not require a WAP capable handset.⁶⁹

Mobile internet without GPRS is currently restricted to fairly limited volumes of information. GPRS provides mobile data rates of up to 114 Kbit/s by utilising a larger amount of the network's capacity, more timeslots for shorter periods, to transport the information more rapidly between the network and the handset. GPRS will provide sufficient capacity to browse websites and support e-mail activities. Enhanced Data for GSM Evolution (EDGE) further extends the data capabilities provided by GPRS by introducing more sophisticated modulation techniques. Data rates of up to 384 Kbit/s are expected. All four GSM mobile operators in Australia (Telstra, C&W Optus, Vodafone and One.Tel) are well on the way to enabling their networks for GPRS,⁷⁰ although the nature of the content and concerns about radio emission levels from handsets remain unresolved.⁷¹

3G mobile technology will provide text, voice and video at data rates of up to 2 Mbit/s – sufficient for internet, multimedia and even television services. The ITU recently determined the radiocommunications spectrum that may be used for 3G services. It includes spectrum in the 800 MHz and 2 GHz bands. This means that all existing holders of spectrum for 2G services in Australia (i.e., Telstra, C&W Optus, Vodafone, One.Tel, Hutchison and AAPT) control spectrum that may be used for 3G services.

The ACA has recently conducted an auction of 2 GHz (3G) spectrum covering all major cities in Australia. It was a simultaneous, multi-round, electronic Internet-based bidding system for licenses that will apply for 15 years from October 2002. The ACA received seven applications for the auction: AAPT Spectrum (TCNZ); CKW Wireless; Hutchison Telecommunications; Optus Mobile; Telstra 3G Spectrum Holdings; Vodafone Pacific; and 3G Investments (Qualcomm).⁷² AAPT dropped out, but the other five bidders were successful in picking up various spectrum lots. The auction raised AU\$ 1.17 billion. This amounts to AU\$ 61 per head of population covered, compared to an average of AU\$ 407 per head in Europe and around AU\$ 1'000 per head in Germany and the United Kingdom.

It is still early days, but 3G systems could be ready for trialing in the second half of 2001. Although full commercial deployment is unlikely to occur before 2003. The availability of handsets may be a constraint, given the complexity of 3G and current difficulties with availability of first generation wireless data handsets. And as coverage of 3G system cells is expected to be smaller than that of GSM 1800 cells, more base stations will be required, also raising the cost of, and slowing roll-out.⁷³

4.5 Digital broadcasting

"The switch to digital television is the most fundamental change in broadcasting since the introduction of television itself. Digital television can improve reception, enhance sound and picture quality, and provide more channels and new interactive services. But the greatest benefit is that spectrum can be freed to facilitate the introduction of new players and services."⁷⁴ Digital broadcasting began in Australia's major cities in January 2001, and will be extended to regional stations by 2004. Analogue simulcasting is to be maintained for a minimum of 8 years in each license area. Australian satellite services have already been converted to standard definition digital transmission.

⁶⁹ One application in Australia currently using the SIM Application Toolkit is the Mobile Bank service from the Commonwealth Bank, which runs on the Vodafone network. The Commonwealth Bank used the SIM Application Toolkit because of the increased security that it can provide, but uses WAP for the supply of public information such as stock prices.

⁷⁰ Telstra launched GPRS services in mid-March, 2001. See Hanlon, M. (2001) 'A wireless revolution, n'est pas?', *Australian Financial Review*, 28 March 2001, p5.

⁷¹ Masters, D. (2001) 'Wireless as an Application,' *Communications Yearbook 2001*, Informa Publishing, Sydney, pp 40-41.

⁷² See the ACA auction website at < <http://auction2.aca.gov.au> >

⁷³ From Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra, p150.

⁷⁴ Productivity Commission (2000) *Broadcasting Inquiry Report*, Report No 11, Ausinfo, Canberra p9. The subsequent paragraphs also draw on the same source. See also DCITA (1999) *Digital Broadcasting Industry Action Agenda: 'Thinking outside the box'*, Canberra.

Under the Television Broadcasting Services (Digital Conversion) Act 1998 Australia's free to air stations in each license area were given free use of an additional 7 MHz channel to enable them to convert from analogue to digital television transmission. To facilitate the commercial stations' conversion they will be insulated from new competition – with the entry of new commercial broadcasters banned until the end of 2006, and the scope of digital services constrained. To protect subscription television operators the government has prohibited multichannelling by commercial stations, subject to review at the end of 2005.

The 1998 digital television legislation mandated high definition television (HDTV), but in 1999 the Government modified this policy. To make conversion to digital television more affordable for users, stations will be required to carry a standard definition (SDTV) signal at all times. They will also be required to carry at least 20 hours per week of programming produced and broadcast in high definition. Clearly, these requirements increase the cost of implementation for TV operators and may create some difficulties for the international distribution of Australian programming content.

4.5.1 *Datacasting*

One of the potential benefits of the switch to digital TV is the opportunity it creates for additional 'datacasting' services. Datacasting was defined in the Television Broadcasting Services (Digital Conversion) Act 1998 as a non-broadcasting service using spectrum set aside for broadcasting services.⁷⁵ After two years of vigorous discussion the Government has decided that the definition of a broadcasting service should remain unchanged, but that a new definition of datacasting was necessary. Now, a datacasting service is a service delivered in the broadcasting services bands, which cannot provide television programs in genres commonly regarded as free-to-air television.⁷⁶

Under the Broadcasting Services Amendment (Digital Television and Datacasting) Act 2000, datacasters will be able to provide short news, business information, and weather overview bulletins, except in formats that resemble existing broadcasting. They will also be able to offer services outside these genres, such as programs providing information on products and services, educational programs, foreign language news bulletins, and home shopping, banking and bill paying transactions. Datacasters will also be able to provide their customers with individual point-to-point connections to the Internet, thus enabling a datacaster to function as an Internet service provider (ISP), as well as a provider of content. Datacasting using spectrum outside the broadcasting services bands will not be subject to these controls.⁷⁷

A licensing regime for datacasting has been established, which includes:⁷⁸

- a new category of individual service licence (a datacasting licence);
- licence conditions which include restrictions on undesirable content, tobacco advertising, and a requirement for the industry to develop and register a code of practice taking into account appropriate elements of existing broadcasting and online content codes; and
- penalties for providing datacasting services without a licence and for breaching the conditions – being the same as similar offences relating to broadcasting, and including the ability to cancel a licence.

The ABA has been given the power to direct datacasters to cease transmitting programs that it believes transgress the genre restrictions.

The provision of a 7 MHz channel to datacasters is intended to ensure that the services will be readily available on television receivers, and to provide datacasters with significant capacity to offer a wide variety

⁷⁵ This is a subset of a wider group of services referred to as broadcast data transmission (BDT), which includes all data services directly linked to radio frequency point to multipoint television and radio transmissions delivered by any terrestrial or satellite means. Narrowband analogue BDT services currently available in Australia include teletext (Austext available on the Seven Network), Stocktext (up to the minute stock market quotes on the Seven Network), some internet services (Seven Network and the Special Broadcasting Service) and captioning.

⁷⁶ DCITA (2000) *Digital Data Review*, Vol 1, DCITA, Canberra, p46.

⁷⁷ Neither is activity outside broadcasting services bands (eg. internet-based radio, televisions, live webcasts, or video streaming) subject to the regulation under the Broadcast Services Act.

⁷⁸ As outlined in DCITA (2000) *Digital Data Review*, Vol 1, DCITA, Canberra, pp46-48.

of services. Existing cross media and foreign ownership regulations will not apply to datacasters, as existing free-to-air broadcasters will not be allowed to bid for datacasting transmitter licences.

There is a degree of scepticism among industry players about the viability of datacasting under the current regulations. The ACA is to conduct an auction for datacasting licenses in April, and it was notable that when the ACA received applications to the auction in February, Rupert Murdoch's News Limited, Australia's largest newspaper publisher, did not participate.⁷⁹ Since then, John Fairfax Holdings, Australia's other major newspaper publisher, the interactive television group OpenTV and the digital broadcaster Online Media Group have all withdrawn, leaving just 4 potential bidders for datacasting transmitter licences – i.e., Australian Datacasting Corporation, Barwix, ntl Australia, and Telstra Datacasting.⁸⁰ Online Media Group chairman, Graham McVean, has stated that he believes the datacasting licences to be "all but worthless."⁸¹

It remains to be seen whether the contrived regulation of free-to-air and Pay-TV operators and emerging datacasters will satisfy any of the players, accelerate the development of broadband networks and services, and work for the benefit of the Australian community; or whether it will turn out to be a case study on the difficulties of regulating convergence.

4.6 Submarine cable regulation

Submarine cables form an important part of the trunk network linking Australia with other countries and, in some cases, linking places within Australia.⁸² At the beginning of 2000, there were twelve submarine cables landing in Australia. Since then, the Southern Cross Cable has been commissioned. These cables include both coaxial and fibre optic systems. Telstra estimates suggest that more than 95 per cent of international telecommunications traffic to and from Australia is routed via submarine cables, and in the case of major destinations the proportion is closer to 98 per cent.⁸³

The regulatory picture has been a complex one. There has been no authority able to grant permission to install, and none capable of offering much protection for installed cables. However, there is an enormous range of Commonwealth and State agencies with powers to prevent installation in particular places. In the Bandwidth Inquiry (1999), AIEAC concluded that the problems with the current regulatory framework were: lack of explicit authorisation to install submarine cables, and insufficient protection of cables once they are in place; multiple legislative obligations imposed on carriers installing cables; and an ineffective enforcement regime, and inadequate penalties in relation to cable damage.⁸⁴

Consultations are currently being conducted with a view to introducing a more workable regime. Under the proposed regime licensed carriers, subject to the adherence to planning requirements, will be given explicit authority to install submarine cables in Commonwealth-controlled waters (Australia's territorial seas and Exclusive Economic Zone), and protection zones will be established over submarine telecommunications cables of national importance. It is proposed that:

- the Australian Communications Authority (ACA) will be authorised to declare these protection zones;
- within these protection zones, submarine cables will be deemed as 'low-impact facilities' under the Telecommunications Act 1997 and as such, would be afforded certain immunities from State and Territory laws;
- marine activities most likely to damage cables, such as anchoring, trawling and dredging, will be prohibited within the protection zone; and

⁷⁹ Collins, L. (2001) 'News absent from datacasting licence auction line-up,' *Australian Financial Review*, 23 February 2001, p5.

⁸⁰ See <www.aca.gov.au>.

⁸¹ Collins, L. (2001) 'Major players back off datacasting spectrum auctions,' *Australian Financial Review*, 2 March 2001, p9.

⁸² This outline of the submarine cable infrastructure and issues is drawn from AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, pp174-182.

⁸³ Telstra has been one of the largest owners of submarine cables in the world.

⁸⁴ AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra.

- penalties will be introduced for those engaging in prohibited activities, and higher penalties than currently exist are proposed when actual damage to a submarine telecommunications cable occurs.⁸⁵

These proposals are open to public discussion to April 2001, with implementation of an agreed regime expected to follow shortly thereafter.

4.7 International internet charging arrangements (ICAIS)

International internet traffic has not been subject to the same treaty-based settlement systems that are applied to international telephony.⁸⁶ In international telephony a terminating carrier provides an end service to the originating carrier and bills the originating carrier for it (usually at half the 'accounting rate'), and international links are often shared equally between carriers at either end ('half circuits'). In the IP world, ISPs have linked their networks on a 'peering' basis, with no cash settlement involved – based on the assumption that the link is of equal value to both parties.

In the report of the National Bandwidth Inquiry (1999) it was stated that:

With the burgeoning growth of the commercial Internet, the formerly insignificant data volumes have increased dramatically and ISPs of all different sizes are operating in the marketplace. As a result, the larger ISPs have not been willing to enter into domestic peering arrangements with smaller ISPs. Larger ISPs are 'peering' domestically only with other ISPs that have similar size networks and hence traffic levels. Smaller ISPs are required to pay to interconnect to their networks. The large ISPs may have significant market power, making it difficult for the smaller ISPs to negotiate fair prices.

...In the US the so called Tier 1 ISPs will only peer amongst themselves. Other ISPs, both domestic and international, are required to pay for the full cost of reaching their network and pay to access the major US ISPs (referred to as 'port charges'). This creates a disadvantage for ISPs in countries such as Australia as there is no reciprocal payment or offset for US-generated traffic – i.e., US customers accessing Australian websites or sending e-mails to Australians, etc.

The consequences of these arrangements are that Australian consumers accessing the Internet pay more than their US counterparts because the US ISPs don't pay the Australian ISPs anything to use their international capacity to the US or their domestic Australian Internet networks to carry traffic generated by US customers. In effect Australian consumers are subsidising US consumers.

...It had been estimated that the total annual cost of international Internet connection to the US for the Australian market in 1999 would be around \$300 million... and in 1999-2000 around \$406 million....Telstra estimated that when the flow-on effects of this increased cost on Australian businesses and the Australian economy were taken into account, the current arrangements cost Australia around \$585 million in 1999-2000.⁸⁷

The Australian government and industry has been actively negotiating for the establishment of a more equitable and orderly regime in a number of international fora, including APEC. The APEC Tel meeting in Mexico in May 2000, established a set of principles to guide negotiations. They were:

1. Internet connectivity is an essential element of the global information infrastructure that should be encouraged to strengthen the Asia-Pacific information infrastructure;
2. Governments need not intervene in private business agreements for internet services achieved in a competitive environment, but where there are dominant players or *de facto* monopolies, governments must play a role in promoting fair competition;
3. Internet charging arrangements between providers of network services should be commercially negotiated and, among other issues, reflect:

⁸⁵ See DCITA (2001) *Regulation of Submarine Cables: Discussion Paper of Public Comment by 3 April 2001*, www.dcita.gov.au/submarine_cables

⁸⁶ This outline is drawn from AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, pp184-191.

⁸⁷ AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, pp184-189.

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- The contribution of each network to the communication;
- The use by each party of the interconnected network resources; and
- The end-to-end costs of international transport link capacity.

It remains to be seen how much influence these sorts of internationally agreed principles have on commercial negotiations.

In the meantime, it appears that bandwidth and competition are having a bigger impact. Since the Southern Cross Cable⁸⁸ was commissioned in November 2000, tripling capacity, Telstra has moved from its controversial 19c per minute wholesale pricing to offer flat rate deals for ISPs, and ISP prices in Australia have fallen. The average of AOL, C&W Optus, Ozemail and Telstra ISP prices for unlimited hours in March 2001 was more than 40 per cent lower than it was in early 2000. This puts the best Australian internet prices in line with those in the US.⁸⁹

5 SUMMARY

Surveying recent inquiries, reports and discussions suggests that, in general terms, infrastructure is developing reasonably rapidly in Australia, with sufficient trunk capacity to meet foreseeable demand. The situation in regard to the customer access network (CAN) is more varied, with most population centres of any size relatively well served in terms of infrastructure, but some infrastructure gaps and shortfalls remaining in rural and remote areas. A raft of targeted regulatory reforms and funding programs are now addressing these shortfalls, and seem likely to improve the situation over the coming years.

The situation in regard to the provision of services, and the price of those services to users is less clear, and generally less encouraging. There is anecdotal evidence that small businesses are sometimes finding it difficult to get the broadband services they require at an affordable price,⁹⁰ a view that Telstra's market power is hindering the development of competition in broadband services, a view that retail bandwidth prices are high in both absolute and relative terms,⁹¹ and a view that there are problems with bandwidth availability in the customer access network in regional and remote areas.⁹²

Despite encouraging signs of recent activity and emerging roll-out plans, there is a widespread sense that Australia is lagging behind North America and parts of Europe and Asia in broadband access developments. One observer close to the Australia market has suggested that at the end of 2000 there were no more than 50 000 broadband customers, mainly connected via HFC cable; that less than 30 per cent of all Australian households could be addressed by broadband networks; and that it will take another 4 to 5 years to bring the addressable market up to 70 to 75 per cent.⁹³ Our own research suggests that there are currently 85'000 to 100'000 broadband customers in Australia,⁹⁴ which does not compare favourably with the 3 million xDSL subscribers alone reported in South Korea.⁹⁵

⁸⁸ Jointly owned by Telecom New Zealand (50%), C&W Optus (40%) and Worldcom (10%).

⁸⁹ Personal communication with Dr. Sam Paltridge (OECD), and reported at APEC Tel 23, Canberra, March 12-16, 2001.

⁹⁰ For example, the Business Council of Australia's recent *e-business scorecard* recently stated that: "Australia is lagging in broadband infrastructure in the 'last mile' to the home. Only 1 per cent of Australian households have purchased broadband internet access because it is too expensive." BCA (2001) *e-business scorecard*, reported in Gottlieb, R. (2001) 'BCA warns of tech fall,' *The Australian*, 19 February 2001, p 33.

⁹¹ See Appendix III for some indicative price comparisons.

⁹² AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, p195.

⁹³ Paul Budde Communications reported by Clark-Dickson, P. (2001) 'All Aboard the Broadband Bandwagon' *Communications Yearbook 2001*, Informa Publishing, Sydney, p24.

⁹⁴ Telstra reports installing 12 to 17 services per day, 6 days a week in Victoria. A pro-rata estimate would suggest that implies around 300 connections per week nationwide, which over the 6 months since the introduction of ADSL services in Australia would imply around 8'000 customers.

⁹⁵ KR NIC reported 3 127 415 xDSL subscribers at the end of February 2001. See <www.krmic.net>. In addition, there were cable modem subscribers at the same date.

6 DISCUSSION

"With advances in digital technology, broadcasting, telecommunications and the Internet are converging rapidly. They are being fundamentally redefined in terms of what they are, who provides services, and how they are produced and delivered."⁹⁶ A recent Commonwealth Government review of convergence noted the pervasiveness of convergence across a range of industries and the importance of digitalisation in spawning different models for service provision.

Structural convergence affects all of the knowledge and transaction-intensive services industries, including telecommunications, finance, broadcasting, education, health, and retail. Convergence began decades ago in some industries, but has barely begun in others. It is eroding traditional economies of scale and scope, leading to a corresponding shift in industry structure and business strategy. The inflexibility of analogue technology and physical infrastructure makes it difficult to supply customised services. Traditional service industries are dominated by the supply side with standardised services aimed at mass markets. Regulation in traditional industries is industry specific, closely matching this model. In contrast, digital technology permits multiple service offerings to be provided over the same network. This allows third party service providers and customers greater control over service delivery, shifting control of the services market away from traditional infrastructure owners. A different structural model for service provision on digital networks is emerging with business activity at three main levels: applications, connectivity and infrastructure.⁹⁷

This situation can be seen in the increasingly varied combinations of communications technologies, providers and applications – where each of the levels depicted in Figure 2.2 (above) move around, temporarily linking combinations technologies, providers and applications in the delivery of services and solutions. This is convergence.

Despite the widespread discussion of convergence there has been relatively little in-depth analysis of what it means. Especially dangerous for policy makers and regulators is simply to assume that convergence is an inherently pro-competitive force. Waters and Lloyd (2000) put forward the following analysis:

...convergence is not a single homogenous process, but a range of processes operating at a variety of levels. Convergence is actually comprised of a series of discrete developments in technologies, networks, content, gateways, retail marketing strategies, services and markets, as well as the changing relationships between all of these distinct areas. Some of the distinct forms of convergence are:

- **Network level technology convergence** which involves the merger of underlying transport technologies, such as circuit-switched and packet-switched networks, such as the migration of circuit-switched voice networks to packet-switched data networks;
- **Bundled convergence** on the other hand emerges where services continue to be delivered over their traditionally separate platforms and continue to be used separately, but they are marketed, priced and billed in a single retail package. For example, fixed telephone and pay-TV access offered as a single, cut-price package;
- **Gateway convergence** involves separate services, usually delivered over one transmission pathway, which are accessed by the customer through a single user interface. For example, access to voice telephony and e-mail via a mobile handset;
- **Service convergence** involves the delivery of multiple services through a single 'pipe' to the customer, such as pay-TV and Internet over xDSL;
- **Substitutional service convergence** emerges where an existing service 'encroaches' on a separate existing service, becoming substitutable for that service. For example, the gradual

⁹⁶ Productivity Commission (2000) *Broadcasting Inquiry Report*, Report No 11, Ausinfo, Canberra.

⁹⁷ NOIE (2000) *Convergence Report*, NOIE, Canberra, pp3-4; and Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra, p152.

emergence in some markets of the substitutability of mobile voice services for fixed voice services;

- *New **converged services** emerge where new technologies and functionality are used to develop entirely new services, which may or may not substitute for existing services. For example, unified mailboxes that operate over a variety of networks; and*
- *The **convergence of markets** which involves the development of services to such an extent that they become genuinely substitutable for other services as far as both suppliers and consumers are concerned. For example, it is often claimed that HFC Cable and xDSL over copper are fully substitutable.*

Once convergence has been ‘unpacked’ into a series of inter-related developments it is easier to assess the pace at which each form of convergence is occurring, the different implications which each has for competition in electronic communications markets and the regulatory responses that are most appropriate.⁹⁸ (See Appendix II).

Waters and Lloyd conclude that rather than scrapping the current industry-specific regulatory regimes in broadcasting and communications, convergence regulation should focus on three issues:

1. Ensuring that like issues are regulated in a similar manner;
2. Addressing the risks of cross market leverage; and
3. Ensuring adequate regulatory tools for monitoring and intervention.⁹⁹

What is clear is that the key dilemma facing telecommunications policy-makers and regulators of encouraging competition while ensuring that the incentives for infrastructure investment exist (i.e., getting the balance between services and facilities competition right) is becoming even more difficult.¹⁰⁰

6.1 Questions remaining

There are many questions remaining unanswered, but the key one for us is: what are the brakes or disincentives operating to slow the roll-out of broadband infrastructure and services in Australia?

Clearly, the relative price-performance attractiveness of dial-up internet access is one of them. For many users in Australia, dial-up access has provided adequate service levels at competitive prices, because:

- Australia's untimed local call regime permits dial-up users to stay online for a low, once-only call cost without a telco meter ticking;
- ISPs offer ready access to local points of presence (POPs) for most users, enabling them to take advantage of Australia's untimed local calls;
- The great majority of dial-up users live within 5 kilometres of an exchange, and Australia's CAN is in relatively good condition, which means the modem speeds in excess of 28.8 kbit/s are available to a large proportion of dial up users;
- There is vigorous competition among ISPs, with many offering internationally competitive monthly access plans – some with no time charges or download restrictions; and
- 56.6 kbit/s modems are readily available for prices as low as AU\$50 to 100 (US\$ 25 to 50).

In short, relatively high quality dial-up access is available to most users at rates of around AU\$ 25 per month plus untimed local call costs, which involve no time or volume charges. By comparison, ISDN, cable or

⁹⁸ Waters, P. and Lloyd, D. (2000) *Competition in Converging Markets*, Gilbert and Tobin, Melbourne.

⁹⁹ Waters, P. and Lloyd, D. (2000) *Competition in Converging Markets*, Gilbert and Tobin, Melbourne.

¹⁰⁰ From an Australian perspective, there appears to be more facilities-based competition in Scandinavia, the United Kingdom, New Zealand and elsewhere than has yet materialised in Australia.

ADSL access seems relatively expensive, and providers are finding it very difficult to hit attractive price points for such services.

Another factor is the relatively limited, and now largely stalled, roll-out of cable for Pay-TV. One possible explanation for the relatively limited take-up of Pay-TV services is the late arrival of Pay-TV into the Australian market. In its absence, many households had bought video cassette recorders (VCRs), and an extensive network of video libraries and shops had developed. It is estimated that there are over 6 million VCRs in Australia's 6.8 million households.¹⁰¹ By comparison, HFC (Pay-TV) cables pass only 35 per cent of Australian households and have attracted little more than 1 million subscribers. Another limiting factor was the adoption by Foxtel and Optus of different standards, making set-top boxes expensive, and thereby discouraging subscribers.

A further factor is the level of competition in some areas. Clearly, outside major urban centres it is taking time for vigorous competition to emerge. There are at least 10 major trunk bandwidth suppliers, but only Telstra's network stretches throughout Australia.¹⁰² This is compounded by a degree of regulatory uncertainty as potential anomalies and contradictions arise at the points of convergence between telecommunications and broadcasting regulation, and, of course, by the significant technological risk inherent in the range of rapidly evolving technologies involved. The large amount of installed dark fibre is another factor. This capacity acts as a deterrent to new carriers.

Arguably, another factor retarding broadband development is Australia's adherence to a 'USO mindset'. Telecommunications appears to have over sold the dream of the 'death of distance' – a dream that is held dear in Australia, with its large land mass and small, highly dispersed population. This has recently become caught up in the rising pro- versus anti-globalisation debate, which, in Australia, maps reasonably closely onto urban versus rural communities.¹⁰³ Telecommunications services in rural Australia have become a symbolic battleground. In this environment, any carrier (especially Telstra) is open to criticism if it offers services to urban centres that it will not, or cannot, also provide in rural Australia. Consequently, there is an incentive to avoid the controversy, and wait until services can be widely offered. Australia's commitment to USO/DDSO, and more generally to the ideal of universal services, may be condemning us to a lose-lose situation, in which urban Australians wait longer for the introduction of, and/or pay more for services in order to subsidise fundamentally uneconomic network extension and enhancement in remote areas.

There is also widespread concern that content is a critical barrier. The late introduction of Pay-TV in Australia has brought together the major carriers and broadcast and other media players in combinations that have effectively locked attractive television content (eg., movies and sport) into the two now largely stalled cable TV systems. Without access to key television and/or film content, new services and new facilities providers face great difficulties in winning subscribers. The ACCC argues that:

- The range of services that can be carried over broadband networks can be offered as a bundle of services;
- Pay-TV programming quality is a key factor in attracting customers to a bundle of services, and increases the overall take-up of all services; and
- Higher revenues per subscriber, and economies of scope from bundling services, can be critical to supporting the cost of network roll-out.

The obvious consequence of Australia's exclusive content contracts is that some additional competitive communication services have not been forthcoming.¹⁰⁴

¹⁰¹ DCITA (1999) *Digital Broadcasting Industry Action Agenda: Australian industry 'thinking outside the box'*, DCITA, Canberra, p3.

¹⁰² AIEAC (1999) *National bandwidth inquiry*, DCITA, Canberra, p52.

¹⁰³ Recent political developments, such as the rise of the One Nation political party, show how rural communities in Australia feel that they are at the mercy of the forces of globalisation (declining commodity prices, etc.) and are suffering from its consequences, while those in the major cities benefit.

¹⁰⁴ Productivity Commission (2001) *Review of Telecommunications Specific Competition Regulation: Issues Paper 2*, January 2001, pp 9-10.

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Finally, and perhaps most controversially, there is the behaviour of the incumbent carrier. The duty of a corporatised or privatised carrier is to grow and maximise shareholder value. The rational market behaviour of the incumbent in a competitive environment is to compete to win. Unfortunately, a vertically integrated incumbent wields a lot of power in the market, and regulating market behaviour and resolving disputes in a timely fashion (i.e., in a timeframe that works in Internet or 'dog' years) remains a key challenge in Australia, as is does elsewhere.

A lot has been happening in Australia and a lot has already been achieved, but a lot remains to be done if we are to reap fully the benefits of broadband services.

APPENDIX I

Table A1: Broadband Carriers and Service Providers in Australia

Company	Geographic coverage	Target market	Access technology used	Roll-out plans	Value-add & Content services available
AAPT < www.aapt.com.au >	Fibre: Syd., Melb., Bris., Perth, Adel. & Canb. LMDS: Melbourne DSL: major capitals during 2001 CDMA: Bris., Perth, Adel., Canb., Darwin, Tas., Regional Qld., NSW, Vic. SA, remote Qld., NSW & WA	SME, business, corporate, government and wholesale	Fibre, LMDS, DSL and CDMA	Currently expanding its first mile capability using LMDS, CBD fibre, xDSL and CDMA networks	N/A
Access 1 < www.access1.com.au >	Australia-wide	Residential business and government	Satellite	In capital cities plus regional centres in NSW, Vic. & south-east Qld.	Access TV, C7 Sport, Bloomberg, SMA (music)
Agile Communications < www.agile.com.au >	Adelaide	Corporate and government	ADSL	Rural and regional SA	Help desk, billing, ISP services
ARBT/Heartland < www.vsat.com.au >	Australia-wide, New Guinea, parts of Indonesia and South Pacific	Rural regional and remote consumers, SMEs	Two-way satellite tech.	Currently have 250 subscribers, respond to demand	Internet, Pay-TV, FTA TV, VoIP, ATM, Frame relay, video conferencing, distant education
Austar United Communications < www.austarunited.com.au > < www.austra.com.au >	Regional Australia, except WA & Wellington NZ.	Residential and SMEs	MMDS wireless	Faster symmetrical MMDS	Pay TV, Chello broadband and international content
Bush Telegraph < www.bushstel.net >	Regional WA and Northern Territory	Institutions, SMEs and residential	Wireless, 3.4Ghz-5.7Ghz	Darwin and larger centres in coverage area mid-year	VoIP, unified messaging, entertainment

Contd.

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Company	Geographic coverage	Target market	Access technology used	Roll-out plans	Value-add & Content services available
Cable and Telcoms < www.cableandtelecoms.com.au >	Deploying a network for a major banking group to support video on demand.	Residential	DSL	-	
Davnet < www.davnet.com.au >	CBDs in Syd., Melb., Perth and Bris.	Medium to large corporations	IP-Ethernet	Wiring CBD buildings in target markets	Voice, sporting and financial news services
Evolution < www.evt.com.au >	Sydney	Apartments and residential developments	DSL	20'000 apartments over the next year (to 2 nd qtr 2002)	In-building LANs, web pages, FTO TV
Excite@home Australia < www.optushome.com.au >	Cable & Wireless Optus HFC cable passes 2.2 mill. homes in Sydney, Melbourne and Brisbane	All	HFC		Pay-TV offerings
HunterLink ISP/IPERA < www.hunterlink.com.au > < www.ipera.com.au >	Newcastle business district/inner city	Business	Optic Fibre Ethernet ring		Hosting and content provision
Kooe Communications < www.koee.com.au >	Primarily focussed on the Sydney to Brisbane corridor	Business and consumers	DSL, radio and fibre	Expanding to north Qld and to Melbourne	Full service telco
Neighbourhood Cable < www.neighborhoodcable.com.au >	Central and Western Victoria.	Residential, business and government	HFC		Video on demand, VoIP, Video conferencing
Necomm < www.netcomm.com.au >	Planned coverage of all capital cities and major regional centres	Residential, business (particularly SMEs) and government	xDSL		Telephony, Video on demand, internet content.
Ntl < www.ntla.com.au >	Urban, regional and rural areas on the east coast – Vic., NSW, Qld., Tas. And ACT	Corporate, in particular telcos, broadcasters, new media	ATM and radio	VPNs, IP, Ethernet	
OmniConnect	Melbourne CBD and rural Victoria	SMEs	Wireless, microwave, ISDN, ethernet	Expansion plans for NSW and Qld. over the next 18 months (to 3 rd qtr. 2002)	VPN, VoIP, web site hosting

Contd.

Company	Geographic coverage	Target market	Access technology used	Roll-out plans	Value-add & Content services available
PowerTel < www.powertel.com.au >	Sydney, Melbourne, Brisbane and the Gold Coast; central CBD and nearby suburban business centres in each city. Backbone also links Canberra and Newcastle.	Corporate (banking, finance, insurance, govt. and ICT) and wholesale	Optic fibre, DWDM	Expansion plans will be determined on a customer/revenue-driven basis.	
Primus/Jet Stream < www.iprimus.com.au >	Capital cities	Corporate, SMEs and residential	ADSL, HDSL		Videoconferencing, VPNs, data recovery
Request DSL < http://www.requestdsl.com.au/ >	National	ISPs, ASPs, system integrators	xDSL	Progressive targeting of regional areas	VoIP, Pay-TV, video on demand
Smart Radio Systems < www.snoop.com.au >	Cooma (sthn NSW)	Business and residential	Ethernet	Tumut (sthn NSW) in 2001, other areas under investigation	VoIP, FTO TV, Pay-TV (potentially)
SPT < www.sptel.com.au >	Major capital cities, regional centres between Sydney and Brisbane.	Business and residential	SDH, ATM, IP over DSL, fibre and copper	Regional areas between Sydney and Melbourne	WAN, VPNs, firewalls
Swiftel < www.swiftel.com.au >	Perth and Adelaide CBDs	Corporates	Optic fibre		
Telstra Big Pond < www.bigpond.com/advance >	ADSL: in all capitals and various regional centres Cable: servicing Sydney, Melbourne, Brisbane, Gold Coast Satellite: Australia-wide	Business and residential	ADSL, HFC, Satellite	ADSL: 90% pop'n coverage by Dec. 2002 Cable: N/A Satellite: upgrade to 2-way connections	Multiple user accounts, web hosting
TransACT < www.transact.com.au >	Canberra	Business and residential	VDSL	100'000 homes and 15'000 business by Dec. 2002	

Contd.

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Company	Geographic coverage	Target market	Access technology used	Roll-out plans	Value-add & Content services available
VivaNet < www.vivanet.com.au >	Capital cities and major regional centres	Corporates and wholesale services to ISPs	Dial up and leased lines, DSL	Concentrating on extending service in regional NSW	Help desk
XYZed < www.xyzed.com.au >	National coverage concentrating on CBDs and metro areas	Wholesaler to retail carriers.	DSL	N/A	No

Notes: ACT – Australian Capital Territory, FTA TV – Free to air TV, HFC – Hybrid Fibre Coax, NSW – New South Wales, NT – Northern Territory, NZ – New Zealand, Vic. – Victoria, SA – South Australia, SME – Small to Medium Enterprises, Qld. – Queensland, Tas. – Tasmania, VoIP – Voice over IP (Internet Protocol), VPN – Virtual Private Networks, WA – Western Australia.

Source: CommsWorld (2001) Communications Yearbook 2001, Informa Publishing, Sydney.

APPENDIX II

Table A2: Forms of Convergence, Benefits and Risks

Form	Example	Benefits	Risk	Pace
Network Level Technology Convergence	Circuit & packet-switched networks converge to packet-switched ATM networks	Allows realisation of substantial technological and economic efficiencies and economies; Reduces sunk costs and facilitates entry.	Incumbent realises greatest economies; Underestimation of incumbent market power in downstream retail markets; Convergence of technology mistaken for convergence of markets.	Reasonably slow, but pace increasing.
Bundled convergence	Fixed telephony and Internet access offered as single cut-price package.	Facilitates end user access to emerging services; Offers purchasing economies.	Incumbent leverage from monopoly services into emerging and competitive services; Convergence of retail packages mistaken for convergence of markets; Over-estimation of Substitutability of services.	Fastest form of convergence – implemented from late 1990s in Australia.
Gateway convergence	Palm-top access to voice telephony, Email and limited web-browsing.	End user convenience; Purchasing economies.	New bottleneck constraining downstream competition; Renews advantages of vertical integration and ‘last mile’	Slow, but gathering pace. Compatible services from 2000.
Service convergence	Pay TV & Internet via ADSL	Assists entry through multiple revenue streams	Incumbents able to delay innovation through control of local loop; Creation of new bottlenecks.	Present overseas, but not in Australia.
Substitutable service convergence	Fixed and mobile telephony	End user choice and convenience; Possible challenge to market power in local telephony.	Overestimation of degree and pace of substitutability overestimates convergence of markets and disguises incumbent market power; Incumbent scale and scope offer significant advantages	Gathering pace.
New Converged Services	Unified mailboxes	End user convenience; Development of new markets.	Incumbent delays or prevents access and interconnection; Renewed advantage of vertical integration.	Slowest form of convergence

Source: Waters, P. and Lloyd, D. (2000) *Competition in Converging Markets*, Gilbert and Tobin, Melbourne.

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APPENDIX III

The indicative international price comparisons presented here are taken from Telecommunications Service Inquiry (2000) *Connecting Australia*, ('Besley Report') DCITA, Canberra, Appendix E.

Table A3: International comparisons for ISDN services

Country	ISDN Provider	ISDN Product	Connection	Annual Rental	Average Annual Fixed Cost	Cost for 20 hrs Local Calls
			AU\$	AU\$	AU\$	AU\$
Australia (incl GST)						
	Telstra	OnRamp 2	324.50	660.00	768.17	49.94
		OnRamp Home Highway	324.50 (190.30 upgrade of exist. Line)	514.80 (5.50 free calls)	622.97	32.67*
		OnRamp Business Highway	324.50 (190.30 upgrade of exist. line)	792.00 (22.00 free calls)	900.17	27.94
Canada						
	Bell Canada	Microlink ISDN	233.86	1,348.77	1,426.73	0.00
UK						
	BT	ISDN 2e	498.50	1,382.77	1,548.93	120.24
USA						
	Bell Atlantic	ISDN BRI (Maryland)	199.07	831.72	898.08	155.94
	Pacific Bell	Personal ISDN (California)	196.98	694.96	760.62	107.50
New Zealand						
	NZ Telecom	ISDN BRA	136.09	1,045.18	1,090.55	46.66
Singapore						
	Singapore Telecom	ISDN-d-way	0.00	113.68	113.68	15.92
Sth Africa						
	Telkom SA	ISDN 2	104.91	571.39	606.36	52.34

Note: Exact comparisons cannot be made given the differences associated with ISDN packages in different countries. Telstra's Home Highway service includes untimed local voice calls. Average Annual Fixed Cost includes Annual Rental plus Connection Costs averaged over three years.

Table A4: Internet access by DSL in OECD member countries, (US\$)

Country	Company	Connection charge (\$US)	Monthly rental (\$US)	Mbytes included	Extra cost per Mb (\$US)	Add Mthly fees – ISP access &/or set up (\$US)	Extra cost for equipment (\$US)	Speed: down/up stream (kbits/s)
Australia	Telstra (Blast off)	157.99*	54.60/44.53**	250	11.53***			256/64
	Telstra (Business Standard)	157.99*	61.31/51.24**	500	11.53***			512/128
	Telstra (Business Deluxe)	157.99*	80.83/70.76**	500	11.53***			1500/256
	Telstra (Freedom Standard)	157.99*	57.65/47.58**	AUP#				256/64
	Telstra (Freedom Deluxe)	157.99*	64.36/54.29**	AUP#				512/128
Austria	Telekom Austria (A-online Speed alpha)	7.04	56.83	1'000	0.07	Included		512/64
Belgium	Belgacom – Turbo Line (Plus)	215.93	38.07	3'000	0.1	67.89		1000/128
Canada	Bell Canada Sympatico (Bell Sympatico High Speed Edition)	39.56	27.51	Unlimited		Included		
Denmark	TeleDanmark (NetExpress)	216.84	51.91	100	0.03		255.6	512/128
France	France Telecom (Netissimo1)	115.64	39.54	Unlimited		24.62		500/128
	France Telecom (Netissimo2)	147.72	104.45	Unlimited		24.62		1000/256
Germany	Deutsche Telecom (T-Online Speed 100)	149.63	74.56					768/128
Iceland	Iceland Telecom (ADSL 256)	82.16	41.08	1'000	0.07	61.62	328.63	256/128
Japan	NTT (Trial)	190.22	40.69			111.67	7.57 /month	512/224
Korea	Korea Telecom	29.04	38.72					128/128
New Zealand	Telecom NZ (Xtra Velocity 1500)	165.83	97.07	1'500	0.17	9.76	219.51	
Norway	Telnor	741.54	185.39					640/256
Spain	Telefonica (Terra Familiar)	180.82	44.35				156.94	256/128
	Telefonica (Terra Professional)	249.06	95.3				156.94	512/128
USA	Bell Atlantic (Prof. Infospeed)	99	99.95			Included	350	1600/90

Notes: * Telstra Connection - 3 months = \$243.39; 12 months = \$157.99; 18 months = \$115.29 ** Without/with Telstra long distance pre-selection. *** \$11.53 per Mb up to 5Gb; \$10.68 per Mb after 5Gb. AUP #: Subject to Telstra acceptable use policy.

Source: OECD (modified by DCITA CRU). OECD figs as at Mar 2000 while Telstra figures are August 2000.

Table A5: Internet access by cable in OECD member countries, (US\$)

Country	Company	Plan	Connection charge (\$US)	Monthly rental (\$US)	Mbytes included	Additional cost per Mbyte (\$US)	Additional mthly cost for cable modem (\$US)	Speed downstream and upstream (kbits/s)
Australia	Telstra Big Pond	Freedom	61.1	40.7	Unlimited	0	0	400/128
	Telstra Big Pond	Blast Off	61.1	30.83	250	0.15	0	400/128
	Optus@Home	Warp Speed	243	39.01	Unlimited	0		
	Optus@home	Lightening Speed	121	45.72	Unlimited	0		
Belgium	ALE	Economy Pack	70.24	24.14	250	0.14	10.84	
		Family pack	70.24	38.7	1'024	0.14	10.84	
		Power Pack	70.24	111.49	Unlimited		10.84	
Canada	Shaw Communications	Shaw @ Home	118.8	34.4	Unlimited	0	0	
Denmark	TeleDanmark		262.18	12.88			0	512
France	France Telecom (Wanadoo)	Cable Prime@access	80.57	47.75	500	0.37	0	512 128
Ireland	Cablenet	Cable Net Plus	186.4	55.92				256
								128
Japan	Titus Communications	ALLNET	208.2	56.78	Unlimited	0	0	512 100
Mexico	InterCable	CableLink 300	64.03	31.91	300	0.15	10.67	
New Zealand	Saturn Communication		146.34	56.07	85.37 worth of traffic	0.17/ Mb intern., 0.017/ Mb national		512 128
Sweden	Tele2		57.49	35.64			9.77	512
Switzerland	Cablecom	Hispeed: BUSINESS	118.6	115.56	2'000	0.12	9.12	
UK	NTL	Hispeed	39.86	78.52				
USA	Cablecision Systems orp.	Optimum online	0	43.95	Unlimited	0		

Source: OECD modified by DOCITA CRU. OECD figures as at March 2000 and Telstra figures as at August 2000.

Table A6: Satellite Internet direct to subscriber comparison – July 2000 (\$AUS)

Country	Provider	Product	Connection	Monthly access	Call allowance per month	Additional hours/Mb costs	Download speed
Australia	Telstra	Basic Sat	\$108.90	\$44.00	250Mb	26.4c per Mb	64 Kbit/s
		Liberty Sat	\$108.90	\$54.95	Unlimited	n/a	64 Kbit/s
		Business Sat	\$108.90	\$60.50	1Gb	26.4c per Mb	400 Kbit/s
		Giga Sat Residential only	\$108.90	\$76.95	3Gb	26.4c per Mb	400 Kbit/s
	Chello/ Austar	Chello	\$95-199	\$65.00			n/a
	Ihug	SatNet Mercury	\$193.45	\$43.95	1Gb	11c per Mb	400 Kbit/s
		SatNet Mars	\$193.45	\$54.95	2Gb	11c per Mb	400 Kbit/s
SatNet Jupiter		\$193.45	\$65.95	3Gb	11c per Mb	400 Kbit/s	
US	Hughes Corp	Executive Surfer	Equipment costs only	\$49.75	25 hours	\$3.30	400 Kbit/s
	DirecPC	Family Surfer	Equipment costs only	\$82.93	100 hours	\$3.30	400 Kbit/s
		Office Surfer	Equipment costs only	\$215.64	200 hours	\$3.30	400 Kbit/s
Canada	Bell	DirecPC	\$334.56	\$55.89	60 hours		400 Kbit/s
	Express Vu						
South Africa	InfoSat	Solo 24	\$726.99	\$72.46	Unlimited		64 Kbit/s
N.Z	Ihug Ultra	Swift Satellite	\$115.87	\$46.62	300 hours	\$1.17 per hour	
Europe (Slovakia)	Astra		\$46.64	\$23.32			500 Kbit/s

Notes: Currency conversion from Australian Financial Review published 'buy' rate at 30 June 2000, sourced from Westpac 29 June 2000. Telstra connection fees vary according to location, from \$108.90 for supported self installation up to \$2036 for a remote business installation of a large satellite dish. Ihug requires modem connection for upstream access, and local call access is only available from Sydney, Melbourne and Brisbane.

Sources: Company websites researched by DOCITA CRU.