IPTV: GLIMMERS OF HOPE

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Abstract

The proposed $43 billion National Broadband Network (NBN) commitment to build higher capacity fibre networks throughout much of Australia will need many new applications and services that attract strong customer take-up to eventually justify the long term major NBN investment. This paper canvasses possible future prospects of new IPTV services as part of NBN, and offers some insights from overseas IPTV experience for Australia. Two different international network access case studies are examined, the companies Iliad Free in France and Axia in Canada, and it is postulated how those practices might translate to a new Australian situation with NBN Co. The introduction of IPTV to Australia has the potential to eventually transform the communications environment in term of institutional change for both the telecommunications and broadcasting industries, for communications regulation, and for consumers. The ultimate unknowns are what IPTV players might offer Australian consumers, how they might offer it at what cost both to suppliers and consumers, and how Australians will respond.

IPTV and NBN

On 7 April 2009 the Rudd government announced a plan to build a national FTTP broadband network to connect 90% of homes schools, and workplaces with speeds of up to 100 Mpbs. The company, NBN Co, with majority government ownership (51%) and 49% private ownership, will invest up to $43 billion over eight years to build the broadband network.[1] This venture will need to attract substantial private sector investment, have co-operative arrangements with some existing network operators, and be underpinned by a regulatory framework acceptable to many stakeholders. Crucial too to its eventual success is the offer of attractive and affordable services to a substantial customer base. Many present telecommunications services will need to be reconfigured through the new company, NBN Co, and many new applications and services will need to emerge to ensure the success of the project. IPTV is one of the key new broadband services that needs to attract good customer take-up to eventually justify the long term major NBN investment.

The principal questions explored here are:

(a) How is the term IPTV defined, and are there any forms of IPTV currently offered in Australia?

(b) How could IPTV be introduced into Australia in terms of the possible modes of network service and delivery with NBN Co?

(c) What might be some of the operational lessons for Australia from IPTV experience overseas?

(d) What are the key policy issues to be resolved for new IPTV services in Australia?

As far as the author is aware no other attempt has been made to integrate these questions into an analysis of the possible significance and future prospects for IPTV in the context of the new higher capacity broadband network to be rolled out for Australia. The principal text sources referenced here are the submissions made to the Senate Select Committee on the National Broadband Network and the two associated Senate reports.[2] Inputs are also drawn upon from personal discussions in the field with key industry and policy participants in Paris and Canada, notably OECD staff in Paris and industry personnel at the Calgary-based broadband company, Axia. Key local industry participants,

1 http://www.dbcde.gov.au/broadband/national_broadband_network, Accessed on 14 /8/09.

2 http://www.aph.gov.au/Senate/committee/broadband_ctte/index.htm.

notably from Telstra and Alacatel-Lucent were also consulted. To date little academic work has been undertaken on the demand side of the new broadband equation for Australia.

Broadband and IPTV

Many new applications and services are expected to emerge during the next few years following the introduction of new fibre-based platforms due to the increased capacity that comes with broadband. The point needs to be made that broadband is not Internet — though Internet services can be a part of broadband offerings. That is, from a broadband supplier's viewpoint — the organisation that signs up customers — two generic categories of services are offered, unmanaged and managed services:

– Internet services which are 'unmanaged' services by the supplier on an open network; i.e., the search engine *Google* is (obviously) Google's own service delivered via the Internet by a broadband supplier. So too can *You Tube*, *My Space*, and *Facebook* sites be offered as part of the unmanaged services provided by a broadband company.
– 'Managed' services are those other services offered by the broadband supplier as additional tiered services, at their determined rates. These may include packages of movies, sports, news and current affairs program packages. IPTV services are situated in this category of managed services.

A prime commercial motive for a broadband system operator is obviously to get as many people onto their system as quickly as possible. Hence there is a strong commercial imperative to create and market many popular new 'managed' services. Conversely a business case built around just more 'unmanaged' Internet-based services is considered to have limited growth potential. Some broadband suppliers in Europe offer the unmanaged Internet services on their broadband networks at very low costs to attract consumers to subscribe to their more lucrative managed range of services. Hence it is most likely that we will see the introduction of new IPTV services with the 100 Mbps broadband NBN Co during the next few years.

But what is IPTV? The term IPTV means different things to different people as the following list shows. A brief list of a few of the offerings of services sometimes described as IPTV includes:

- You Tube videos that travel over public Internet with usually 'low' technical quality, often with delays in network transmission.
- ABC iView where the 'catch up' programs previously broadcast over the air are sent via the Internet for viewing on a personal computer. (Similarly the US television network Fox.com offers replays).
- Big Pond offer movies that travel across an IP network with acceptable quality of service mechanisms.
- Video On Demand (VOD) is online subscription TV for movies from a cable broadband supplier.
- Streaming video services are available from the web site Hulu in the USA which offers streaming of TV shows and movies from NBC, ABC and Fox, as well as from other networks and studios.

The Australian Communications and Media Authority (ACMA) points out that there is no single, standard definition of IPTV, but it is often used interchangeably with the term 'telco tv' related to subscription television services offered by DSL-based carriers who compete with cable broadcast providers.[3] The contribution from the perspective of standardisation approved by the International Telecommunication Union (ITU) is:

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3 ACMA, *IPTV and Internet video services*, April 2008, p15.

> An IPTV service (or technology) is the new convergence service (or technology) of the telecommunication and broadcasting through QoS controlled Broadband Convergence IP Network including wire and wireless for the managed, controlled and secured delivery of a considerable number of multimedia contents such as Video, Audio, data and applications processed by platform to a customer via Television, PDA, Cellular, and Mobile TV terminal with STB module or similar device.[4]

Put simply, the acronym IPTV can be split into its two components, namely IP — delivered as Internet Protocol — and TV — to a television set. Though there are some telecommunications service organisations that market services described as IPTV in Australia these would not meet a standardisation based definition of the term. Hence Australia currently has no IPTV services that are offered as managed services.

The debates about future of IPTV services in Australia, in the context of the commercial viability of NBN, have increasingly focused on closed proprietary systems — of the managed, not the unmanaged, services. Geof Heydon of Alcatel (personal discussion 18 May 2009) prefers to use the term 'True IPTV' in rejecting all of the above 'non-premium' forms listed in the dot points above:

> True IPTV has nothing to do with the Internet and is not just VOD. It's a real broadband experience over an IP closed network with approved quality standards.

Here IPTV is a managed service typically supplied by a service provider using a closed network. IPTV in this strictest sense is a service that offers commercial, linear, premium TV streams delivered via Internet Protocol over DSL, or fibre. Such services though may be packaged with unmanaged services, such as Internet web access or VOIP telephony services in a 'triple play' — voice, video, Internet — offering to consumers. Where these three are offered together with mobility the service is then referred to as 'quadruple play'.

For the purpose of this paper the proprietary definition is adopted here. Hence what is not included is this discussion here is TV content delivered via cable or satellite networks, content accessed from an online portal or web site, 'catch up services' offered by public broadcasters such as ABC iView, and accessing You Tube videos.

IPTV and the National Broadband Network (NBN) access regime

NBN Co will be a wholesale only company required to operate on open access to organizations who want to supply retail services to customers. Legislation will be designed to ensure that NBN Co will 'provide non-discriminatory and fair access to all wholesale customers' and 'access to the National Broadband Network will be provided to all retailers on an equivalent basis'.[5]

At the time of writing it is not clear how such inherently complex arrangements involving so many different parties will work in practice for NBN Co. Two network/service models related to international practices that may be transferable to NBN Co are outlined below. The first is a French example of a successful conventional wholesale network access arrangement undertaken by a new competitor, the company Free Iliad, with an incumbent carrier, France Telecom. The second is a Canadian example related to structural separation of the company Axia which is the wholesaler for the Alberta SuperNet built by Bell Canada.

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4 http://www.itu.int/ITU-T/IPTV/events/072006/docs/ID/FGIPTV-ID-0025e.doc. Accessed on 20/09/09.

5 *NBN Regulatory Reform for the 21st Century Broadband*: discussion paper (PDF, 1.8 mb). http://www.dbcde.gov.au/__data/assets/word_doc/0008/110024/NBN_Regulatory_Reform_for_the_21st_Century_Broadband.doc. Accessed on 1 September 2009.

France's Free

France is widely regarded as having the most advanced IPTV market in the OECD, with the company Free Iliad seen as a major driver of innovation. Free (derived from a free internet service named Free.fr) established by the remarkable entrepreneur Xavier Niel in 1999, is now a 100% subsidiary of the Iliad group. Free first launched a DSL broadband service in October 2002 using lines wholesaled from France Telecom. Free was able to lease fibre capacity at a comparatively low cost due to the telecom bubble burst that occurred around that time. In 2002 Free was the first internet service provider to offer triple play services (IPTV, VoIP, broadband internet) to the French market and since then Free has consistently undercut the prices of incumbent France Telecom and other providers, and established a now standard price at €29.99 per month![6]

France has nearly ten times as many IPTV subscribers as does Spain (the second highest in Europe), and has nearly 75% of all subscribers in Western Europe, (6.9m subscribers at the end of 2007), which represents 57% of the global market.[7] By the end of 2006, Free had become the most successful IPTV operator in the OECD, with 1,260,000 subscribers. Over a third of broadband subscribers in France now take an IPTV service. In April 2009 Free introduced a fibre-based 'triple' play bundle with 100/50 mbps speeds in 1 April 2009, though mainly to apartment buildings. Iliad expects to cover 70% of Paris with its Fibre to the Premises (FttP) service by the end of 2011.

It has been suggested that the Free case 'may provide an example of service-based competition inducing facilities-based competition'.[8] In recent years the French telecommunications regulatory authority, L'actualité de l'ARCEP, has been more successful in unlocking some of the key regulatory bottlenecks of network access by competitors to the incumbent carrier than many of its European counterparts. By as early as 2001 nine alternative operators had signed access agreements to the local loop with France Telecom, and by October 2004 there were one million unbundled lines. By December 2007 the total access purchased from France Telecom by alternative operators was 7.5 million unbundled lines, one of the best outcomes for competition policy in Europe. Roland Montagne, head of broadband research at IDATE, has argued that 'Free brought competition to the French market' by spurring the regulators to open the market to competition, thereby prodding France Telecom to respond with aggressive price cuts and new services.[9]

New Australian counterparts to France's Free?

Parallels with Australia are not easily made because of the different institutional histories and operational dynamics in telecommunications. One of the critical factors that drove Free's commercial success was its single control of 'triple play' services, enabling it to use internal cross subsidies to build a business case, especially by offering free Internet access to sign up customers for additional 'value added' services. The commercial incentive for NBN Co management will be to get as many operators and services onto their network as quickly as possible to build their strong wholesale business. At present Canberra-based TransACT Capital Communications is one of the few companies that offers broadband access, fixed telephony, cable television services (not IPTV), and mobile phone services — by using the Vodafone Network, but only in the ACT. So might we see several major new broadband competing suppliers offering their version of triple play innovative services as an important opportunity for NBN Co during the next five years?

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6 See http://www.cisco.com/en/US/solutions/collateral/ns341/ns524/ns562/ns577/case_study_C36-454892.pdf. Accessed on 18/8/09.

7 Jacques, Robert, *France dominates European IPTV*, vunet.com, 11 March 2008.

8 OECD, *IPTV: Market developments and regulatory treatment*, OECD Digital economy papers, No. 137, OECD, 2007.

9 Business Week, 'The telcom exploits of Iliad', 5 December 2005.

Telstra could offer a substantial departure form its present broadband business model with its own version of triple play in the future. Though Telstra is strongly vertically integrated, and offers customers bundled discounts across voice, Internet, pay television and mobile services, it has never been a triple play company in the same way as Free. It has remained, or has had to remain because of competition policy, divisionalised with the DSL broadband, cable broadband and wholesale groups. Currently Telstra, as 50% owner of Foxtel, is associated with VOD services delivered by Foxtel via Telstra's HFC network to television sets.

However, two stakeholder issues have the potential to substantially change its IPTV policy. First, Telstra since the beginning of the creation of Foxtel a decade ago, has had non-compete agreement with fellow Foxtel owners, News Corporation and Packer's Consolidated Media Holdings, but this expired in November 2008. At the time of that change Telstra's CEO, Sol Trujillo, said that 'the question now about IPTV is how we can make it complementary with other services that we can deliver as we continue to offer value for customers. We have lots of thought and ideas'.[10] Second the major ministerial announcement of 16 September 2009 called upon Telstra to present a plan to the government to separate its wholesale from the retail divisions, and threatened to force Telstra to divest itself of ownership of Foxtel if could not devise an acceptable separation plan. This demand by the government may somewhat oddly act as a catalyst for Telstra to re-think its IPTV options in terms of its relations with Foxtel. Reports in September 2009 claimed that Telstra was planning to launch its own set top box, apparently in December 2009, to be called the T-Box, which would offer news, sports and entertainment packages to customers. This would be a major shift in putting Telstra in direct competition with both Foxtel's iQ set top box, and also with the television networks. So one of the wild cards in NBN's future service providers may be that Telstra could offer a substantial departure from its present broadband business model to introduce its own version of triple play — part of which could be its version of 'True' IPTV.

Open Access wholesale: the Canadian way

Two Australian NBN Senate enquiries were dominated by the complex issues related to operational or structural separation. The majority of submissions to those enquiries, of the order of 80% of the total, argued that Telstra's alleged dominance had to be addressed for NBN to eventually become commercially successful. Telstra predictably argued to the contrary, and called upon its opponents to demonstrate successful examples, anywhere in the world, of structural separation.

One innovative international example of an open access services model is to found with Canada's Alberta SuperNet project, which has been able to deliver broadband as multiple streams of video, audio and data since the completion of its construction in 2006. This is a distinctive model of structural separation where one company, Bell Canada, built the Alberta fibre network 2002–2006, but another company, Axia, accepted a self denying ordinance not to compete in the services layer on this network. Axia staff argued (personal discussions, May 2008) that the justification for this model is that it avoids potential conflicts of interest by the network operator of restricting access to those service providers who might compete with Axia's own services. Hence the proposed service model is to provide an Open Access — open to anyone, anywhere, at common non-discriminatory rates — to facilitate a plethora of services from multiple competitors.

Currently 65 providers have contracts with Axia, enabling them to connect to the Alberta SuperNet and who offer their services to customers throughout 278 communities of Alberta. Axia claims that 'prior to the Alberta SuperNet, Alberta's Rural Communities only had dial up access and any hope of IP connectivity was either very cost prohibitive or technically out of reach'.[11] Axia originally constructed its broadband plan with eGovernment services integral to its business model because of

10 Schulze, J, 'Telstra ponders media assets to complement Foxtel,' *The Australian*, 10 November 2008.
11 Axia, 'The Alberta SuperNet Case Study', 2007.

the strong support from the oil rich Alberta provincial government. The Alberta SuperNet is a broadband network now 'linking over 4,000 government, health, library and educations facilities in 429 communities across the province at affordable and sustainable costs to the government of Alberta'… through 'a ten year renewable contract with the government of Alberta to provide managed Real Broadband network to Alberta's schools, hospitals, libraries and government facilities.[12] Axia claims it can deliver government services to 3.3 million Albertans at speeds of up to 400 Mgps; non-government service providers pay Axia between $ 32.50 to $42.50 a month, depending on the number of network ports for connection to the SuperNet at speeds between 6–20 Mbps. For non-government consumers of Enhanced Services the Alberta eGovernment model appears to be one where the fibre network capacity is currently in abundance, the government has a long term financial commitment to the project and where a range of constructive innovative publicly funded services is emerging.

So how does this fit within an NBN model? Art Price, Chairman and CEO of Axia Net Media Corporation, advocated that Australia too should 'put the NGN fibre grid in a no-conflict open access business model by separating ownership'.[13] Axia disagrees with a system that would 'promote incumbents' to offer their bundled services in a triple play model. Price argued to the second NBN Senate Select committee that such a model puts 'Next Generation Networks (NGN) first but compelling services second' for organizations that are risk averse.[14] He argues that the Alberta model has promoted the 'evolution of a vibrant, competitive retail service sector … of high value services'. For Axia such transformational changes, where success is dependent on new capital, are much more preferable to the traditional monopoly environment that is later deregulated.

NBN Open Access: IPTV single service providers

In some ways the NBN Co is a national Australian version of what Axia provides for the state of Alberta in Canada — both are open access wholesale businesses. But unlike a triple play model operated as a 'big companies, big investment' model, the Axia version of open access is centred on a multiplicity of small adaptable, specialised, service providers (excluding their e-government services).

A possible small scale open access model that could translate to Australian experience is an 'IPTV trial model' offered by the company TPG IPTV in Australia at the time of writing.[15] This experimental service offered to subscribers of their other services is delivered via ADSL 2+ at a minimum speed 3.5 Mpbs, but consumers must have modems/ routers that are IPTV compatible. According to the definition of IPTV provided above TPG is not strictly an IPTV service because it is delivered to a computer not a television set. The programming shows great diversity and notably among their current 15 channels are Al Jazeera, the world's first 24-hour English news channel headquartered in the Middle East, Phoenix Infonews Channel, a 24-hour Mandarin language current affairs channel for Chinese communities worldwide, as well as Russia Today (in English), Thai TV5 (in Thai), TV5 Monde (in French) and Cuba Vision (in Spanish). Currently no television program that is offered by TPG is available elsewhere in Australia. The service currently carries no additional charges to TPG broadband subscribers, though most currently experience considerable technical complexities with the system at present. However certainly there are more diverse multi-lingual glimmers of hope here for the future.

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12 'Harnessing the SuperNet advantage', Axia booklet, 2008.

13 Price, Art, 'Next Generation Network Drivers and Implementation Approaches: A Global and Australian Perspective', ATUG Annual Conference, 12 March 2008.

14 Art Price, Axia presentation to Senate, http://www.dbcde.gov.au/broadband/national_broadband_network, Select Committee hearing, 5 August 2009.

15 See http://www.tpg.com.au/products_services/adsl2plus_pricing.php.

The single service provider model via NBN Co is one option for the future of IPTV in Australia. Alcatel-Lucent points to a perceived consumer advantage of such a system:

> The NBN operator will be able to manage and control how much Internet bandwidth is available to each household, meaning that consumers will be able to choose services purely based on their individual needs and budget.[16]

IPTV Regulation

Potential investors in the NBN understandably require clear undertakings of what regulation might apply, if any, before they wish to invest in offering IPTV services via NBN. The relevant legislation, the Broadcasting Services Act 1992 (BSA), defines a broadcasting service in relation to several technology based platforms, but does **not** include the Internet in the definition. Section 6 of the BSA states that a '***broadcasting service'*** means a service that delivers television programs or radio programs to persons having equipment appropriate for receiving that service, whether the delivery uses the radiofrequency spectrum, cable, optical fibre, satellite or any other means or a combination of those means, but does not include:

(a) a service (including a teletext service) that provides no more than data, or no more than text (with or without associated still images); or

(b) a service that makes programs available on demand on a point-to-point basis, including a dial-up service; or

(c) a service, or a class of services, that the Minister determines, by notice in the *Gazette*, not to fall within this definition.

As interest in IPTV in recent years progressively increased, the Howard government was called upon to be specific about possible regulation of Internet based television services. A ministerial determination about the use of the Internet in September 2000 by the then Minister of Communications, Senator Helen Coonan, stated that the following service was **not** a broadcasting service — 'a service that makes available television programs or radio programs using the internet, other than a service that delivers the television programs or radio programs using the broadcasting services bands'.[17] Several current services available in Australia, and described in some cases as forms of IPTV, that have not been regulated under the BSA include You Tube video downloads, TransAct's service called TransTV as part of its triple play, and TPGs IPTV service delivered via ADSL 2+ without an additional set top box.

In March 2006, the same Minister for Communications, floated possible changes to the way new services such as IPTV could be regulated:

> The availability of licences for commercial FTA broadcast services to be delivered over platforms other than normal BSB channels would offer an opportunity for new players to enter the industry and new television-like services to be developed over new and emerging platforms. For example, it may be possible to provide commercial television licences via satellite, or broadband, using IPTV technology or terrestrial wireless services in spectrum outside the BSB … the government proposes to legislate to transfer the decision making power for the allocation of new commercial television licences outside the BSB spectrum from ACMA to the government.[18]

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16 Alcatel-Lucent, *FTTP — Our digital future at the speed of light*, 2009, p 4.

17 Determination under paragraph (c) of the definition of 'broadcasting service (No 1 of 2000) No GN 38, 27 September 2000, quoted in Abrahams, Nick, 'Australia: Legal Issues Arising From IPTV', Deacons, 5 November 2006.

18 Australian Government, 'Meeting the Digital Challenge: Reforming Australia's media in the digital age', March 2006, p 24.

It appeared that the proposed transfer of licensing authority from ACMA to the government Department of Communications represented an awareness of the political sensitivity by the established commercial television networks to the perceived threat that IPTV might represent to them. History shows that this group has successfully lobbied both major political parties for retention of the status quo in television, most notably against the introduction of subscription television services throughout the 1980s and 1990s. This time, however, other new and powerful interests, including Telstra as potentially an IPTV player, had an opposing view to the Minister, and argued against the proposition that the government should be able to licence IPTV proposals. Tony Warren, Head of Regulatory Affairs, Telstra, put the objection to the introduction of IPTV licensing:

> Telstra is of a view that it is unnecessary to create a separate category of licences for IPTV, as indicated by the Minister's paper. To the extent that IPTV services are subscription broadcasting or narrowcasting services, or services on a point-to-point basis or over the Internet, these services should not be subject to new regulation. IPTV-like services are already currently supplied over the (unregulated) Internet, bringing a wealth of TV, movie, radio and media information to the household PC. Applying separate regulation to new broadcast content (i.e. IPTV) versus Internet content will hamper growth and competition in these new services while allowing the protection of existing FTA broadcasters. There are compelling reasons to leave IPTV services unregulated.
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> First, they are new services in an emerging market that is facing significant uncertainty and risk and hence must not be hamstrung by regulation. Second, IPTV can be delivered using a range of technologies (some of which do not involve utilising scarce government-owned spectrum) and will require purchase of a set top box. This lack of ubiquitousness means that there is no basis to regulate like FTA broadcasting. However, if the Government decides that IPTV should be separately regulated, a minimalist approach should be applied. This means that either a: class licence (as for narrowcasting) or over-the-counter licence (as for subscription broadcasting) should be issued by the Government depending on the type of IPTV service.[19]

Broadband policy as a whole became so confusing under the Howard government that IPTV licensing issues were put on hold. The Rudd government, now committed to an ambitious national broadband policy, is expected to have a different position on IPTV though at the time of writing no related legislation has been enacted. The present Communications Minister, Senator Stephen Conroy in the renamed (at the insistence of the Prime Minister) Department of Broadband, Communications and the Digital Economy, has indicted strong support for IPTV to an extent not seen before. According to Conroy:

> Convergence has happened. The broadband network is going to radically reshape the media sector. Some get it a lot, some don't quite get it yet and some have been in a position of privilege for some time and had competition kept away from them. But broadband network IPTV [will bring] hundreds and hundreds and hundreds of channels of choice for consumers. That is going to force a radical change. As the NBN is based on a fibre-to-the-premises (fttp) approach that can handle the bandwidth demands of IPTV, existing regulations such as the 75/25 rule — where broadcasters are not allowed to reach more than 75 per cent of the population.
>
> IPTV is an international phenomenon. Hong Kong IPTV, if you can get it connected up is just unbelievable. It is a threat not just to free to air networks it is a threat to existing, incumbent pay networks. It has a slice and dice [approach] — you can take an hour, you can take a genre, you can take a week, you can take a package of anything you want and slice and dice it any way you want. So there are enormous challenges to our media sector coming through the broadband revolution.

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[19] Telstra, Response to the *Media Reform Options Paper Meeting the Digital Challenge; Reforming Australia's media in the digital age*, 21 April 2006, p 22.

And more remarkably he added:

> If you said to me, in 20 years time what would be the way we are watching broadcast TV, the answer would be on the fibre network. There won't be any terrestrial TV anymore — there just won't be any reason to have it. There will be a migration to fully digital and then I think a migration to fibre-based delivery for everybody.[20]

IPTV: potentially transformative

Paradoxically, a communications applications and service that does not technically exit in Australia at present, IPTV, is potentially transformative across the communications industry. Clearly the NBN Co needs to facilitate as many new and different forms of services, including IPTV, that will attract strong customer take-up to eventually justify long term major NBN government and private sector investment. Though it is most unlikely in the short term that IPTV services will lead to radical institutional changes in the communications industry, this paper has set out to indicate that in the long term IPTV could act as a significant catalyst for change. The present and established pillars of regulation in communications, the twin towers of broadcasting and telecommunications, may have to come down to be replaced by an entirely new system of regulation, centred on IP. Major institutional changes are also conceivable in a world with multiple new broadband service players: Telstra could offer major IPTV services in its new role as a mediacomm organisation, and established commercial television networks may face a choice of either reinventing themselves within NBN, or become anachronisms.

IPTV has a history of multiple attempted start ups, false dawns, failures**,** and widespread scepticism about its eventual commercial success. More recently, however, there are 'glimmers of hope' that IPTV just might find a place in the new media NBN service culture.

[20] Clarke, Trevor, 'Conroy: NBN to bring hundreds of TV channels to Australia', ARN, 10 July 2008.