

# Broadband for Australia: Why, How and When

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Sydney Mechanics School of Arts



I'm here today as a consequence of the alliance formed between the Telecommunications Society of Australia and the Australian Computer Society. After the alliance I've been offered up as someone from the TSA who could talk about something of interest to ACS members.

The TSA had a similar genesis to the ACS being very much a professional development body. As the TDM – Time Division multiplexing – world passed us by we found that all the young professionals were going to other places.

I'm going to talk to you today about a part of that happy little part of the world called convergence. To do that I'm going to talk about Broadband.

# Outline

## □ Why

- o Microcosm to Telecosm, everything 2.0
- o *'Cause I want it* and other claimed benefits
- o International comparisons
- o Missing out

## □ How

- o *Dramatis Personae*
- o Telstra vs G9
- o Ftt? and all that

## □ When

- o Politics
- o Projection



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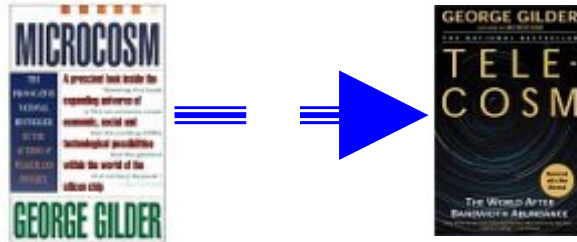
Broadband became a political issue in 2007, partly through Telstra's activity but also from the ALP policy agenda. But really for the ALP the important part commanding the space of "the future".

And it wasn't just about broadband but about high speed broadband. In telecommunications we talk about "fraudband" for anything that isn't particularly fast. As we'll see later we'll talk about statistics for services faster than 256K, whereas the ALP policy is about getting 12Mb/s to 98% of the population.

I'm going to talk about why we want broadband, how it might be delivered and when.

## Microcosm to Telecosm

- ❑ *What Intel giveth, Microsoft taketh away*
- ❑ Gilder's prophecy - when bandwidth is cheap, everyone connects to everything



- ❑ Applications assume bandwidth availability



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The move from Microcosm to Telecosm begins with the phrase “What Intel giveth, Microsoft taketh away” . While Moore’s law – doubling speed, capacity and halving price every eighteen months – works as soon as you get the faster machine the next release of Windows comes out and your machine is just as slow as it was before. There is no incentive on code writers to write efficient code. Applications take up the processing capability available.

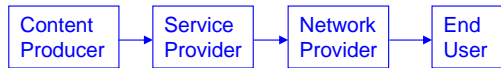
George Gilder’s two books “Microcosm: The Quantum Revolution in Economics and Technology” and “Telecosm: The World After Bandwidth Abundance” said that what we saw in the microprocessing world would happen in the telecommunications world – as we get increasing bandwidth people will just use it.

The simplest example is those same software companies, each of Windows, Office, iTunes, Adobe Creative Suite, Norton and even the hardware provider has an endless stream of multi-megabyte updates for you to download.

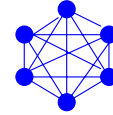
So you can see that pattern in the consumption of bandwidth.

# Everything 2.0

- ❑ Web 2.0 – from a telemedia model to an any-to-any model – symmetric high bandwidth



Telemedia Model



Any-to-any Model

- ❑ Enterprise 2.0 – social networking inside the corporation and between corporations



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What's really interesting is "everything 2.0" You are all IT people so you are familiar with the concept of Web 2.0 and the idea of social networking.

But it is more. It is taking what we are used to in telecommunications activity of any-to-any connectivity into broadband applications. What I've drawn up there is the "telemedia model" like PayTV where there is a value chain from content producer to Service provider, network provider and then the end user. Beside it I have the networked model where any node talks to any node in a symmetrical way.

And of course we now have Enterprise 2.0 which is the same thing happening in corporations.

I could have put all the stuff up here like e-health, e-education etc but as far as I'm concerned they are just instances of Everything 2.0.

## 'Cause I want it

- ❑ Australia's broadband position is *"embarrassing"* and there was a huge consumer demand for online video that is being held back by Australia's antiquated broadband infrastructure. *"Australia needs ubiquitous, high-speed broadband infrastructure to be internationally competitive. This is a top-order priority for the nation"* (James Packer)
- ❑ *"The encouragement of broadband is a critical element in Australia's overall media policy...internet speeds are slower and internet pricing is more expensive, than many other developed countries"* (Fairfax submission)
- ❑ Australian broadband is a *"disgrace"* and *"We are being left behind and we will pay for it."* (Rupert Murdoch)
- ❑ *"Significant and meaningful changes in attitude and leadership from the Government and policy makers"* (Internet Industry Association)

All the above extracted from Senator Conroy's speech to business observers at the ALP conference (January 2007)



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What are the other reasons. Well these quotes are all from Stephen Conroy's speech to business observers at last year's ALP conference, and they all amount to "cause I want it".

(read excerpts from above)

And the people who want it are all people who want someone else to build it so they can make money from it.

## Claimed benefits

- ❑ Broadband Advisory Group (2003) cited an Accenture study (2001) estimating that next generation of broadband could produce economic benefits of **\$12 billion to \$30 billion per annum** to Australia.
- ❑ A 2003 study by Allen Consulting Group estimated the direct and indirect economic impact of just one broadband network throughout a major urban centre in Australia in SE Queensland of an increase in real output in Queensland of **\$854 million per annum** at the end of 15 years (i.e., by 2018-19).
- ❑ A 2004 Multimedia Victoria report by economic consulting firm ACIL Tasman found that the annual contribution of broadband to the Victorian GSP (Gross State Product) was expected to peak in 2008 at just over \$2.5 billion. It estimated aggregate benefits to the Victorian economy from 2004 to 2015 of between \$12.7 billion and \$22.6bn. When scaled up for the Australian economy as a whole, this represents a boost the GDP of around **\$12 billion** in the peak year 2008, and benefits between **\$55 billion and \$96 billion** over 2004 to 2015.

All of the above extracted from Telstra's nowwearetalking website (May 2007)



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So is there some higher purpose? These three quotes refer to economic studies taken from that wonderful source of all reliable knowledge, the Telstra nowwearetalking website. The problem is they are really studies of fraudband, you don't need more than 256K to achieve these benefits. So we are still trying to figure out – why is there an issue?

## OECD Broadband Statistics Criteria

1. **DSL:** all DSL lines offering Internet connectivity which are capable of download speeds of at least 256 kbit/s
2. **Cable:** all cable modem subscribers at download speeds greater than 256 kbit/s
3. **Fiber:** all fibre-to-the-premises (e.g. house, apartment) subscribers at download speeds greater than 256 kbit/s & all fibre-to-the-building subscribers (e.g. Apartment LAN) using fibre-to-the-building but Ethernet to end-users.
4. **Other:**
  - a. **Wireless** (connections with speeds faster than 256 kbit/s to end users) Includes fixed wireless technologies ( Satellite, LMDS, MMDS, WiMAX, Other fixed-wireless transport technologies) & Does not include 3G mobile technologies, Wi-Fi(except in rare case that Wi-Fi/3G is the transport mechanism of a fixed-wireless provider
  - b. **Wired** (only connections with speeds faster than 256 kbit/s to end users); **BPL:** Includes all broadband over powerline subscribers with download speeds greater than 256 kbit/s

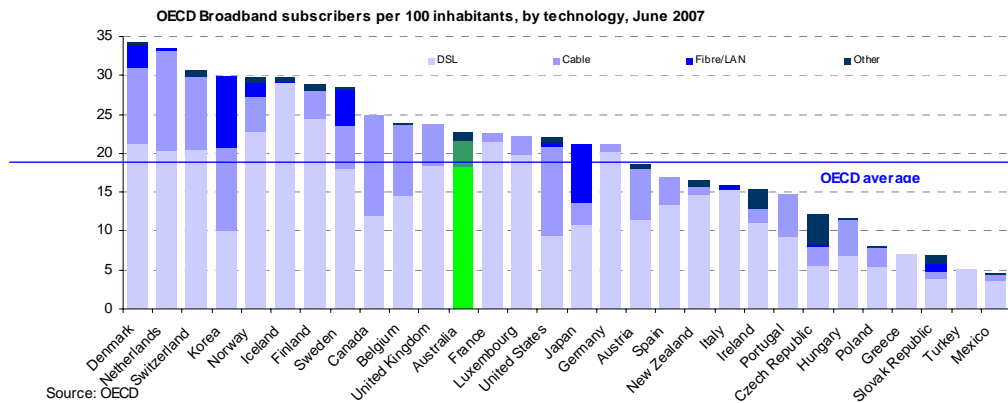


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Finally we get to the OECD statistics, what have been the ants pants of the issue. The definition they use is four different kinds of "if it is greater than 256K download we will call it broadband", though as you see there are all sorts of different kinds of technology.

There have been some recent disputes, much publicised in Australia, about whether they are reliable statistics or not. For the purposes of today we will assume they are.

# International Comparison - Penetration



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The first thing we see is the simple league table, with countries arranged by penetration per hundred inhabitants on June 2007 data. And Australia is sitting in twelfth place.

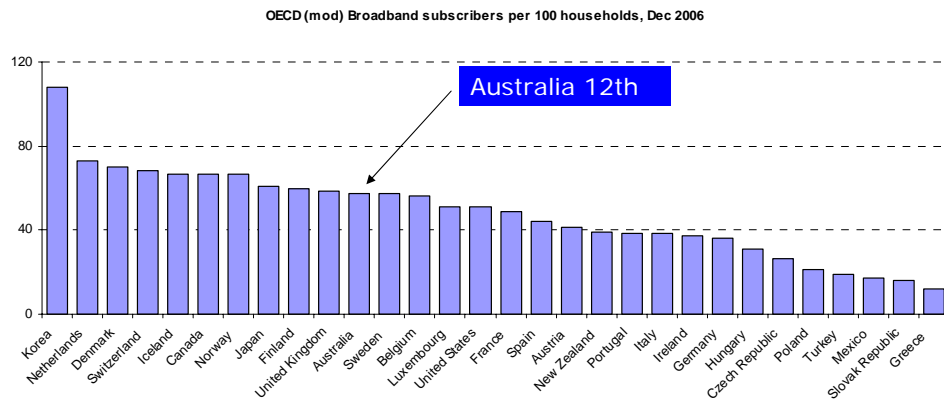
When this conversation started in Australia we were sitting in 16<sup>th</sup> or 17<sup>th</sup> place or even lower. As we will see in a moment we have been rising through the ranks.

But 12<sup>th</sup> doesn't sound good. The Australian cricket team would never be happy if it was in twelfth place. The Rugby team wouldn't be happy if it was in twelfth place...The soccer team would be ecstatic.

Our sense of national pride is affronted by that.



## A different league table



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But let's look at it in a slightly different version – because that was by inhabitants. You don't wire inhabitants you wire buildings.

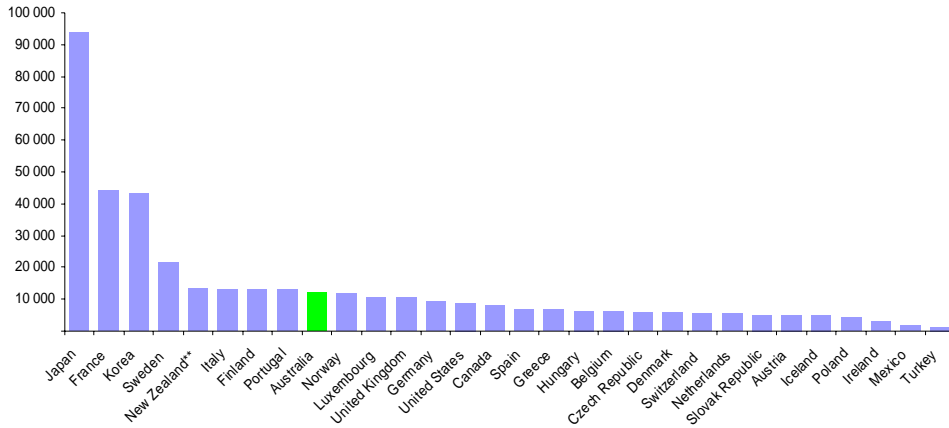
OECD household composition data is not the easiest thing to obtain, and this graph is also based on the December 2006 OECD data.

Australia is still 12<sup>th</sup> on this data (we were 13<sup>th</sup> in the Dec 2006 penetration table), but the curve is flatter over the top countries – there is less variability. Our performance is slightly less bad in this view.

Maybe we are fighting over the wrong issue.

# International Comparison - Speed

Average advertised broadband download speed, by country, Mbit/s, October 2007



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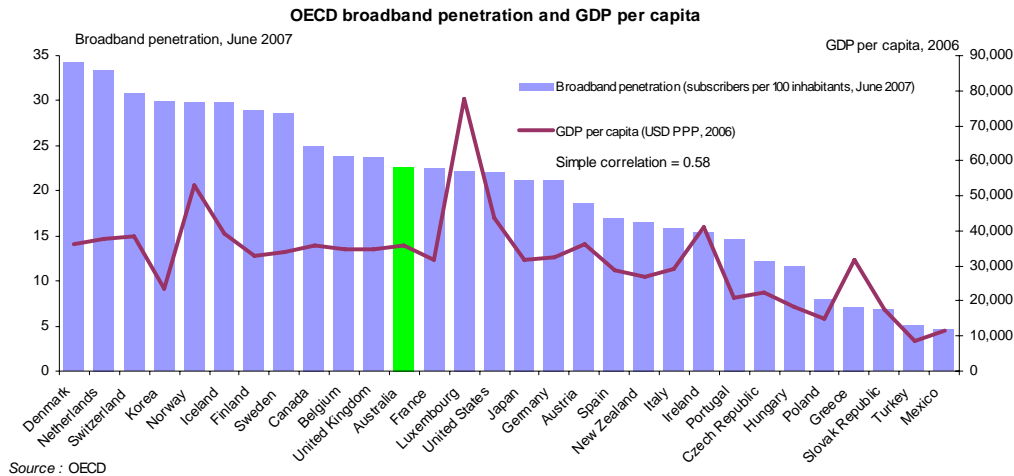
Maybe the issue is speed, we are forever being told our speeds are crap.

Other countries are supposedly chugging on at 50Mb/s.

Well the OECD has come up with a measure of average speed, and on that we come 9<sup>th</sup>.

So speed alone isn't a giant comparative issue.

# International Comparison - GDP

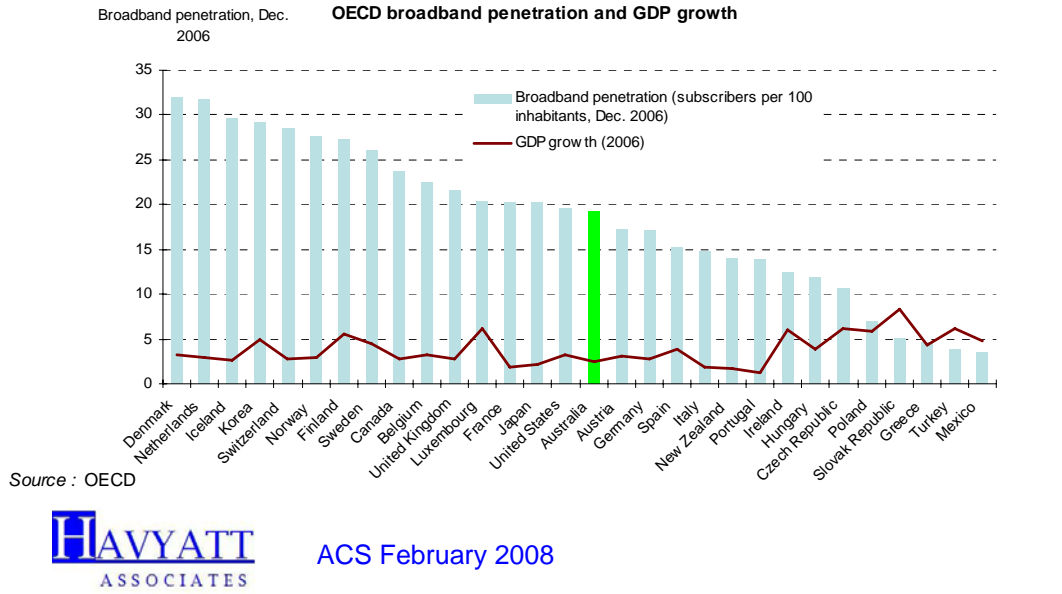


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Then there is the attempt to argue “it is all about the economy stupid!”

This graph which plots penetration in the bars and GDP per capita in the line is used as justification. The correlation between the two is about 0.6, a reasonable correlation, which is enough to suggest there is something going on. But I’d like to suggest to you that that is that to have broadband you have to be able to afford it, the causal link goes the other way.

# International Comparisons - Growth



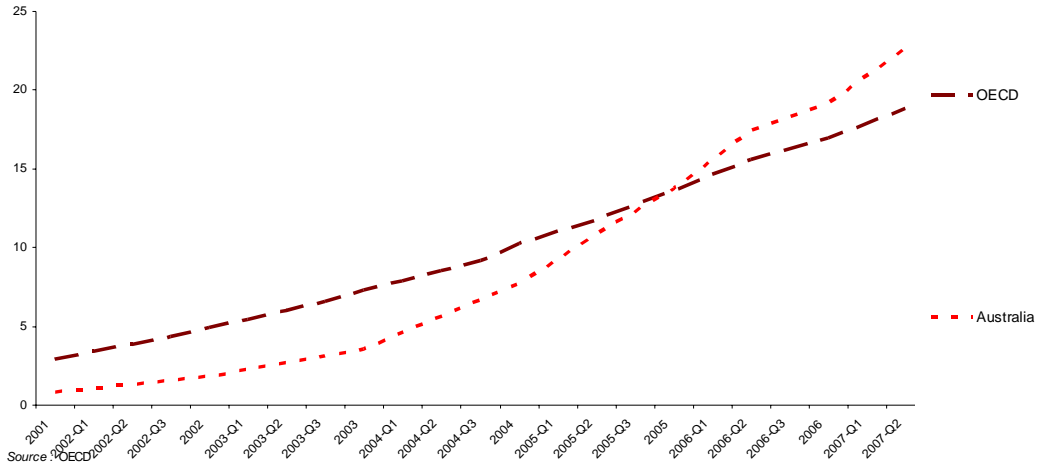
If broadband is a real driver of economic growth, what you want to match is broadband presentation with GDP growth rates.

When you do that, as the chart shows there is no relationship. The correlation is about .1.

So there is nothing in the data supports the argument that broadband drives economic growth. It is an oft' repeated claim, even *The Economist* included it in an article last month, but it is not something that shows through in the data.

# Not a losing battle

Broadband penetration, Australia vs OECD Average

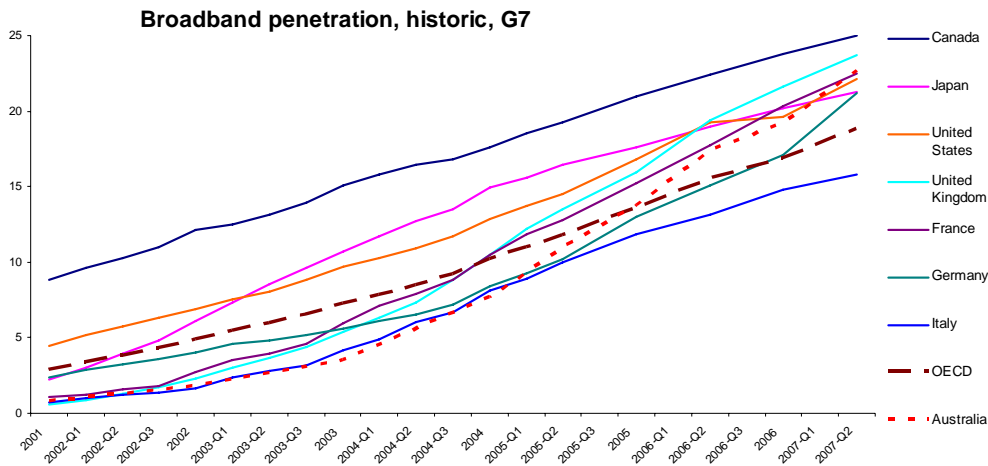


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This is the chart I said I'd show earlier that shows we've been gaining on the rest of the world.

You'll note that Australia passed the OECD average at the end of 2005.

## Not a competitive issue



Source : OECD

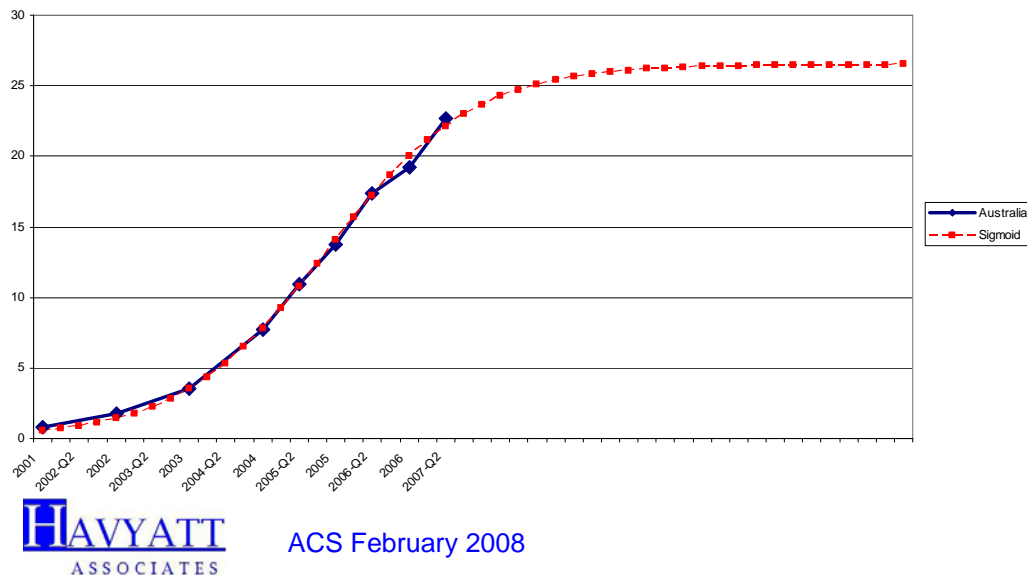


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We're also not too bad in a historical sense against the G7 – the G7 being the biggest economies.

The countries that still beat us on broadband penetration are Korea and a whole lot of countries that are very cold! That is really the group that we are behind. If you compare us to the economies that drive the planet, we were behind them but are now really only behind Canada the UK and Japan.

## Penetration - a logistic diffusion



The really interesting thing is what happens when you do some curve fitting. The blue line, a series of short straight line segments is the penetration rates in Australia since the statistics were gathered. The red dotted line is a standard s-shaped diffusion curve. It is what known by the mathematicians as a logistic curve. It is a shape determined by the demand in one period being proportional to the number of customers who have acquired the service in the previous period. When I fitted the curve the last data point wasn't available, so overall it is not a bad outcome, given how well it predicted that point.

The interesting feature of this curve is that how steep the section in the middle really depends on how easily each individual is influenced by how many others already acquire the service, a steep middle goes with a relatively slow initial period. Out mid section is relatively steep – and that goes for all the technology doption curves in Australia. *We are a nation of sheep.*

## International Comparison - Conclusions

- ❑ The data is unreliable
- ❑ There is no evidence that broadband penetration correlates to GDP
- ❑ There is evidence that broadband penetration follows an s-shaped diffusion curve the shape of which is determined by
  - o the years since launch
  - o the existence of competition between fixed line and Pay TV
  - o the cost of dial-up (especially untimed local calls)



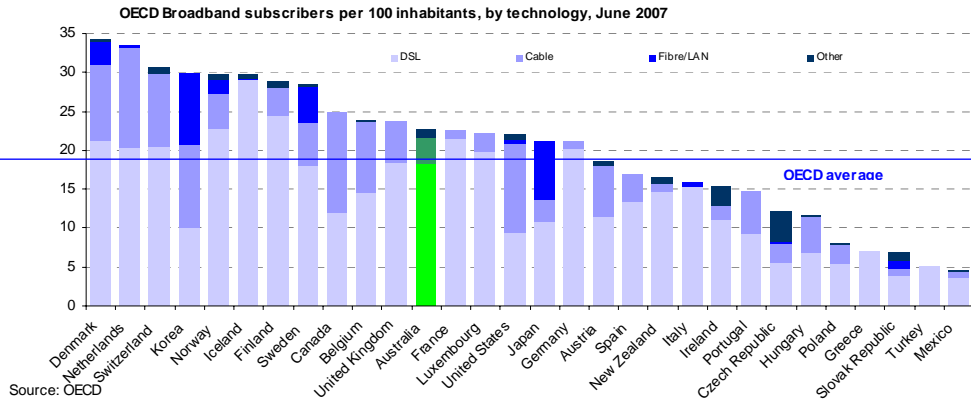
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The things we can conclude is the data might be unreliable, there is no evidence that broadband penetration derives growth, and that penetration follows an S shaped curve.

Where you are at n penetration relates to factors like year since launch, the effects of competition and (one of the reasons for a slow start in Australia) the cost of dial-up (that being relatively cheap in Australia through the untimed local call).



# Dominant technology is DSL



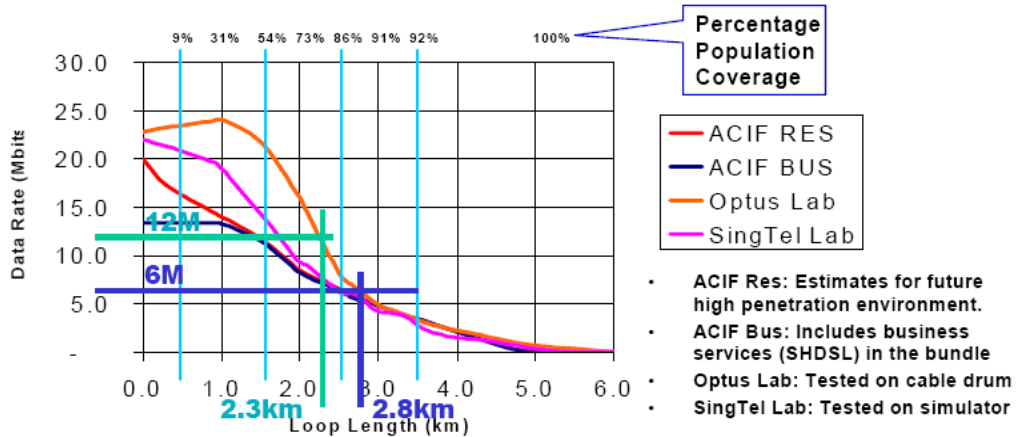
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Back to the penetration slide, the lighter bar is where the technology is DSL, whereas the darker are cable then fibre.

Now most of it is taken up with DSL, apart from Korea with a large amount of fibre.

# DSL - speed and distance

**ADSL2+ Downstream Rate Comparison**



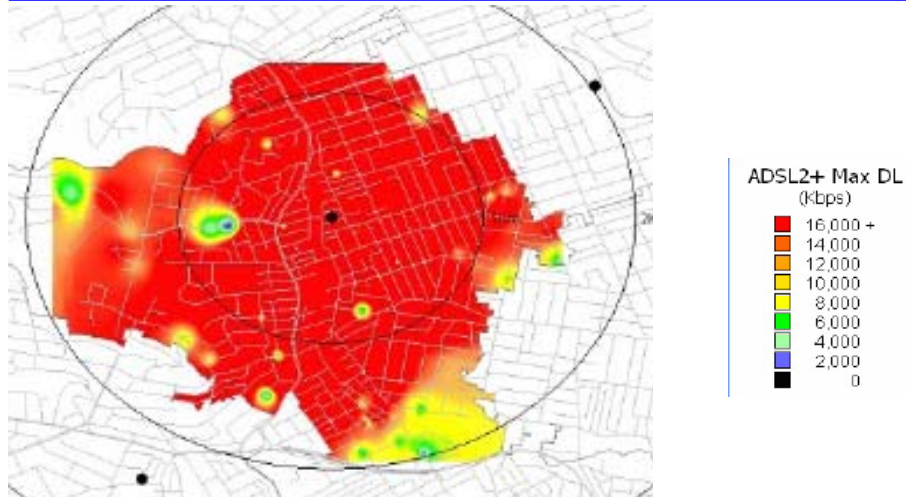
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Source: Optus

The reason I mention that is because if it is the dominant technology, then there are a few things we need to know about DSL. If you get far enough away from a telephone exchange, well, to put it bluntly, it sucks.

When the TSA was at it height they were all convinced about information theory and the limits of twisted pair. But with the development of PayTV networks Bell Labs got enough concerned about the issue to work on twisted pair and they basically came up with a solution by modulating the noise to come up with DSL. It falls off badly from 1.5km. What loop length you get depends on where you live.

## Example - Chatswood (Sydney)



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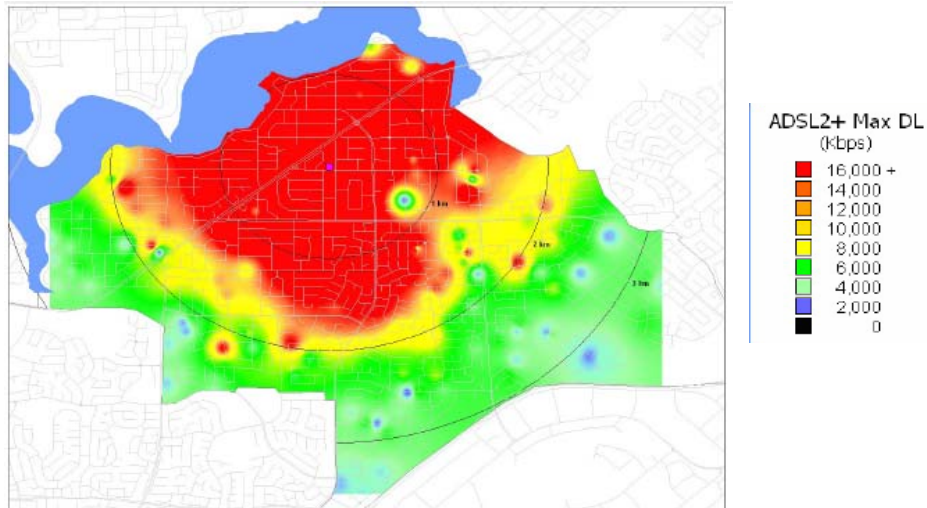
Source: iiNet

This is a heat map from iiNet and measured how fast their customers get service from the exchange. This is Chatswood, the dark red is customers getting 16Mb/s or above while yellow and green are 6-8Mb/s.

They tell us the dot to the left is one guy with a particularly dodgy piece of cable. That is one of the issues, it depends on the cable and there is some dodgy cable.

But the residents of Chatswood are able to get some reasonably high speed broadband from exchange based DSLAMs.

## Example - Riverton (Perth)



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Source: iiNet

However, that is not true for all of Australia. This example is Riverton in Perth, some customers get a good service but there is a group for whom it falls off to 6Mb/s or lower.

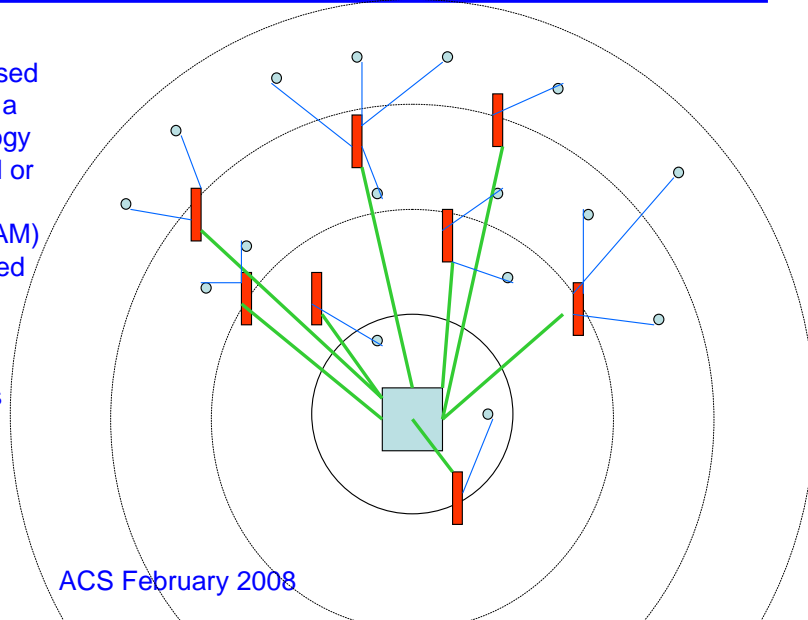
If we assume our desire is to give all our customers 12Mb/s then we won't be able to do it with exchange based DSLAMs. And all the technologies fall into a hole at about the same distance.

The problem with broadband in Australia isn't the penetration, it is these customers who simply can't access a higher speed service. And 10-12Mb/s is when you get to do things with lots of moving pictures.

Some people get carried away and look at this map and say well we'd get within the distance of we just put in three nodes in the green bit.

## Solution

To serve the missed customers either a different technology needs to be used or the “head end” equipment (DSLAM) needs to be moved closer to the customer. Cable runs determine where that needs to be.



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The cable network is based on main cable running to pillars from the exchange building. These (green) cables feed the pillar which then connect to the premises. The electronics at each pillar can only serve those customers – Telstra says we need 3000 nodes to get that penetration.

## *Dramatis Personae*

- Me
- CCC
- G9
- T4
- AUS Alliance
- OPEL
- Other Wireless
- Other Satellite
- FTTH/GPON



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I'm going to run through a quick cast of characters. Our industry is good at acronyms. There is a story that when Richard Alston was Minister he was running through something in Cabinet and the then PM said "Richard, I want to tell you, you are as bad as Defence. I can't understand a word you are saying".

Me - Cause I'm egotistical and I'd put myself on a slide. Formerly GM Regulatory and Public Affairs at AAPT, member of G9 and T4. Now "a gentleman between engagements" and consulting.

CCC - The Competitive Carriers Coalition was formed at the time of the Optus/Foxtel content agreement. Members Hutchison, Macquarie, Verizon, PowerTel, Primus, TransACT, iiNet, Agile. Interest in competitive environment.

G9 - The Fibre to the Node collective formed (by Optus, AAPT, Soul Macquarie, PowerTel, iiNet, Internode, Primus, and TransACT) to ensure the Government did not think that the only option for FTTH was to "give in" to the abuse from Telstra.

T4 - The "Tell the truth Telstra" campaign was launched in response to Telstra's "BACK Telstra". Participants include Adam, AAPT, Austar, iiNet, Internode, Macquarie, PowerTel, Primus, Telarus, TransACT, Unwired, Westnet.

AUS Alliance - Joint venture of Austar, Unwired and Soul to bid for Australia Connected funding. While they owned the best WiMax spectrum, lost to a bid from OPEL (go figure)

OPEL - OPEL is the joint venture between Optus and Elders (owned by Futuris which owns 19% of iiNet) which won the Australia Connected tender. Planning to use 5.8MHz public spectrum, except ACMA now auctioning 1.9MHz and has bought Austar spectrum.

Other wireless - Apart from OPEL, Unwired, 3G Mobile there are other WiFi and WiMax providers, e.g. CommsLogic.

Other satellite - Providers using IPStar (e.g. Australia Private Networks), NewSat and Optus.

FTTH/GPON - Primarily in new estates, multiple providers of FTTH builds.

## Some existing broadband networks

Technology	Company	Existing coverage	Potential coverage
DSL network	Optus	270 exchanges in Sydney, Melbourne, Brisbane, Adelaide, Perth and some regional areas	Extending to 340
DSL network	Ilnet	278 exchanges in major cities in NSW, WA, VIC, TAS, SA, QLD, NT and ACT, extending to 319 by 4Q07	
DSL network	Primus	200 exchanges in majors cities in NSW, VIC, QLD, SA and WA, extending to 300	
DSL network	Internode	41 exchanges	Extending to 65+
DSL network	Amcom	170 exchanges in WA and SA	
DSL network	Telstra	1000+	
HFC network	Optus	Passing 1.4M homes in Brisbane, Sydney and Melbourne	
HFC network	Telstra	Passing 2.5M homes in Brisbane, Gold Coast, Sydney, Melbourne, Adelaide and Perth	
FTTP	Optus	Melbourne, Sydney, Brisbane, Gold Coast	
FTTP	PowerTel	400+ buildings in Gold Coast, Sydney, Melbourne	
FTTP	Amcom	Adelaide (SABERNet), Perth and Darwin	
FTTH	TransACT	Forde in ACT	
FTTH	Project Vista	Brisbane – under development	
FTTH	TasCOLT	Tasmania	
FTTH	Aurora	Victoria	
3G	Telstra	95% population reach	
3G	Optus	Main capitals and some regional areas	
3G	Hutchison	Main capitals and surrounding areas only	
3G	Vodafone	Main capitals and some regional areas	
Pre-WiMax	Unwired	Sydney and Melbourne (part)	Capital cities
Pre-WiMax	Austar	Wogga & Tamworth	Major regional cities
Mobile wireless	iBurst	Sydney, Melbourne, Perth, Brisbane – distributed mainly by Chilli and Big Air	
Fixed wireless	BigAir	Sydney – offering connections up to 100 Mbps	
Broadband over Power Line (BPL)	Aurora	500 homes in Tolmans Hill near Tasmania	
Satellite	Various	Australia wide	

Source: Mark McDonnell BBY



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There are a lot of people doing Broadband doing DSL, fibre to the home, 3G, wireless satellite and even powerline.

With all that happening why is it a political issue. Let's just traverse some things that have happened over the last few years.

## Telstra's plan

- ❑ August 2005 – Telstra makes secret proposal to Government about a broadband network that is only flushed out after a leak
- ❑ November 2005 Telstra announces FTTN network – subject to “satisfactory regulatory outcomes” – announces 5 weeks later that it is off as the outcomes aren't achieved
- ❑ April-August 2006 Telstra discusses proposals to lead to a Special Access Undertaking with ACCC. Pulls plug with public announcement that they can't close the gap due to USO related issues (and privately because the ACCC continued on the de-averaged ULL price path)
- ❑ Rumours suggest a deal was close to being constructed on the ULL prices but either Telstra or Government pulled the plug
- ❑ 21 February 2007, Telstra launches BACK Telstra campaign and returns to secret discussions.



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Telstra in 2005 had a quiet chat with PM, they could build broadband for Australia if he'd like to contribute but it might delay his privatisation plans. That was the meeting at which some said they had never seen the PM angrier, and that he turned white hot with rage!

They then announced and withdrew a plan after not changing policy change in 5 weeks – we thought that was a hell of a stretch objective.

They then negotiated with the ACCC and ultimately went political in 2007.



## G9's response

G9 Position July 2006	We said that if Telstra...	...then G9...
Telstra's Nov 2005 proposal unacceptable-destroyed ULLS competition	Agreed to <input type="checkbox"/> Governance (SpeedReach) & <input type="checkbox"/> G9 joint ownership of FTTN network with Telstra	Would agree to FTTN proceeding and would co-invest with Telstra to expand the network's reach
We stated required access/governance model for FTTN to proceed – 'SpeedReach'	Agreed to Governance (SpeedReach) but rejected G9 joint ownership of FTTN network	Would agree to Telstra proceeding to build the FTTN network
We said G9 interested in joint investment with Telstra in FTTN network	Rejected Governance model (SpeedReach)	Would oppose Telstra building the FTTN network
We proposed financial model for FTTN network to be built and financed as infrastructure project	Indicated that it would not proceed with an FTTN network	Would explore building its own FTTN network under the infrastructure financing model



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Meanwhile Telstra's wholesale customers (G9) said we aren't happy if you build this network but we can't access on equal terms. What we want is a management company called SpeedReach. If you agree to that we are happy for you to proceed. If you agree to that on the condition we also invest then we are happy to invest.

But if you don't agree to it then we will oppose you proceeding. If you don't proceed we will volunteer to do it ourselves and come up with an alternative.

That's where the plan for the G9 broadband network came from. It's been confused that the G9 wanted to be an alternative to Telstra, whereas it really wanted to be the same as Telstra.

## FttN – what after the node?

- FttN is a misleading title for current proposals. FttN simply means a model of fibre from exchanges to intermediate distribution points. There are three possible
  - o HFC – Hybrid Fibre Coax (Pay TV networks)
  - o HFTP – Hybrid Fibre Twisted Pair
  - o HFW – Hybrid Fibre Wireless



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Just a piece of terminology FttN is misleading – the HFC networks are FttN. The question is hybrid fibre what – twisted pair, coax or wireless.

## FttN or FttH?

- ❑ Bottom line
  - o FttH faster but not a lot of demand for speeds above FttN
  - o FttH significantly more expensive to build
- ❑ The majority of the FttN capital works are reusable for an FttH build (fibre feeds and cabinets) – it is a good staging process



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There is a group of people trying to rustle up a group on fibre to the home, but the simple answer is the cost of lead in is simply too expensive.

At the same time nothing we do is going to not be reusable in FttH, FttN is a good staging point.

## The politics

- ❑ Howard Govt expert (in Govt policy) taskforce announced 18 June
- ❑ A tender for public policy or regulatory settings
- ❑ Taskforce disbanded December
- ❑ ALP policy a tender for up to \$4.7B infunding to achieve minimum 12MB/s to 98% of households
- ❑ Consultant tenders closed January, process announcement imminent
- ❑ Telstra agrees to "turn on" ADSL2+ in additional exchanges in Feb 2008



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That brings us to when – and it is all about politics now.

The Howard expert group – experts only in policy – issued a tender that was a strange tender, it was tendering Government policy.

The ALP Ian is slightly different – it is tendering \$4.7B in funding. You tell us what you'd propose to do.

## What are the important issues

- ❑ Cutover of all copper pairs at a node
- ❑ Ensuring that there is only one FTTN network – “race to the Node”
- ❑ Telstra proposal will result in immediate overbuild of competitor infrastructure, G9 proposal builds nodes in areas without any broadband first
- ❑ Telstra proposal requires regulatory determination of WACC for overlay, G9 proposal sees that determined by competitive market process
- ❑ All the issues could be sorted out by industry if Telstra was prepared to talk to its wholesale customers



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Underlying that all is you have to cut over all the pairs at a node at a time. Bottom line it is only economically rational and efficient to cut over all the pairs at once. The problem in a regulatory sense is can anyone do that other than Telstra.

The second issue is in what order do you want to do this. If you are Telstra you want to do it everywhere competitors have DSLAMs, because those competitors have to become bitstream access. If you are a public policy person you want it in the outer areas of exchanges like Riverton exchange where people aren't able to access higher speeds.

There are other issues like calculating the WACC.

But as users of telecommunications services you should be really cranky, because more progress could be made if Telstra just talked to its wholesale customers which it has consistently refused to do. Everything has been conducted as a public slanging match or through regulatory proceedings.

## How to improve the process

- Resolve information asymmetry
- Require proponents to not just propose access regimes but get support of likely access seekers (or an open assessment process by ACCC)
- Use cost of capital as major determining factor



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One of the issues in information asymmetry, as the only person who knows where all the cable runs are is Telstra and they haven't been forthcoming. So mapping where the customers are who need nodes to get speed can't be done. There's also issues about getting the proponents to talk to their prospective wholesale customers.

## When?

- ❑ When what?
  - o Timetable depends on objective
- ❑ Govt hoped to have decision made in six months, now looking unlikely
- ❑ Telstra's plan was three years from approval



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The timetable depends on the objective. The Government hoped to have decisions made in six months, but it turns out in Government that things can take a bit longer to get moving.

Telstra's plan was to get the whole thing going for 3 years.

Thank you

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So that's my take on why, how and when.

But there are a couple of things people mentioned to me outside. One is why is it so expensive – which is really to do with the cost of going across the pond. Firstly we pay for it all, not the Americans. Secondly it is a tightly held market. Some countries have the advantage of being linguistically different to the Australian market. In addition there are some exchanges in Australia that suffer from having restricted backhaul and thus high prices.



## Q&A

1. First comment by Phillip Argy – the ACS evangelised Australia going for very high speed broadband. We put into the NICTIA vision 30-100Gb/s because we need to take the quantum leap to make Australia globally competitive.

We know that 10, 20 maybe 50 years from now we know the world is headed for more broadband speed. The only way we will develop innovation for that high speed broadband space is to live, eat, sleep and breath it. If we are going to “dig up Australia” what are you going to put in it? To do very high speed – holograms etc.

- \* *The short answer is FttN isn't a matter of digging up Australia, we'll suck fibre through existing ducts to pillars. Once built it is useable to fibre to the premises. In fact one of the questions that is unanswered, is will the nodes be equipped to enable running a fibre to premises that wants to pay for it.*
2. Why is there all the discussion about speed to the home and not about backhaul and download quotas?
    - \* *Eventually at higher speeds need higher caps. The issue is not so much domestic backhaul, it is international. Why is it capped? Well for every megabyte being downloaded they have to pay to get that across the pond. Saying I want more doesn't make the cost less. If we could make things we want closer – can we make that innovation generate these things closer.*
  3. In the UK now there are no caps, no limits. Why is their experience different?
    - \* *One answer is the competitive dynamic, another was the slightly later entry on DSL, so entry was cheaper. We have a unique position with cable TV with the biggest operator owned by the telco. The other is the broadband capacity overinvestment across the Atlantic following the WorldCom memo that the capacity of the internet doubled every hundred days.*
  4. What about wireless, talk in the media of Telstra ramping up Next G.
    - \* *Mobile broadband is good for the transportable need, rather than a fixed location. Not sure about it for a truly mobile use. Has a drawback that the more users the speed reduces for all pretty fast. Talking up Next G has the effect of inhibiting the finance community from backing other developments.*