

**Two Cheap Proposals
Suggestions for Transport and
Telecommunications
Legislation Changes**

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Abstract

I wanted to write up proposals about expensive infrastructure ideas:

- Creating a Maglev network along the Australian east coast to replace air travel – which would be incredibly expensive, but probably cost-effective
- Electrifying all of Australia's rail-track infrastructure
- Extending the east coast electricity grid to connect to hypothetical inland wind and solar power systems
- Joining Nicholas Negroponte's One-Laptop-Per-Child vision

But I suspected that the Infrastructure Committee is likely to have received many such proposals.

So instead, I decided to submit two suggestions which will cost more to debate than they will cost to implement. They are both tiny changes to existing Federal legislation.

- Make time-based public transport tickets exempt from Fringe Benefit Tax (bringing them to the same footing as work-related motor vehicles)
- Legalise community-based wireless internet access systems in a way that preserves everyone's investment.

Contents

1 Making more productive use of public-transport infrastructure by correcting a quirk of Australian Tax Law	3
1.1 Background	3
1.2 The Proposed Legislative Amendment	4
1.3 Further discussion	4
1.4 The Benefits	4
1.5 Costing	5
2 Solving the digital divide by giving a legal standing to the wireless mesh	6
2.1 The problem	6
2.2 The current legal framework and why it is a problem	6
2.3 What are some bad solutions, and why are they bad? . . .	7
2.3.1 Remove the need for carrier licenses (anarchy) . . .	7
2.3.2 Keep the requirement for carrier licenses (status quo)	7
2.3.3 What is wrong with those solutions?	7
2.4 Broadband Infrastructure Criteria	8
2.5 The Mesh compromise	8
2.6 Benefits	9
2.7 Costing	10
2.8 The Proposed Legislative Amendment	10
2.9 What the amendment does	10
2.10 What is the economic model behind the Mesh?	11
2.11 Who will invest in Mesh points?	14
2.12 Conclusions	15

List of Figures

2.1 An ISP can use wireless easily to reach customers.	12
2.2 A second ISP sets up an overlapping cell, and both ISPs benefit	13
2.3 A community group puts an antenna on someone's roof . .	14

Chapter 1

Making more productive use of public-transport infrastructure by correcting a quirk of Australian Tax Law

1.1 Background

I run a small company with employees going to several different sites and I've noticed an incongruity in the Australian tax legislation which is penalising public transport over private transport.

- If I pay for an employee to take a taxi to a client's office every morning and afternoon, there's no question that that is a valid business expense. I can deduct it fully from the company's income.
- I could also choose to pay for train or bus tickets for an employee to go back and forth to a client's office each day. This too would be fully deductible.
- But . . . if I go for the cheapest and most environmentally-friendly option, and pay for them to have a TravelPass then it is regarded as a fringe benefit since they could also use it for personal use out of work hours. There is extra paperwork for me, and tax to pay.

Thus we are encouraging people to line up many times to buy individual tickets rather than (more efficiently) buying one ticket to last a longer period. We are also encouraging businesses to tell their employees to drive to client sites (therefore increasing congestion).

1.2 The Proposed Legislative Amendment

I propose we should make an amendment to the Fringe Benefits Tax Act of 1986, adding a clause 47A(1B) which states:

"Where:

i) an employer provides a residual benefit of a time-based pass to use public transport;

ii) the employee uses the pass to travel between places at which the employee performs duties of that employment;

the benefit is an exempt benefit."

1.3 Further discussion

The legislative change of section 1.2 would encourage employers to supply TravelPasses (and equivalent) to their staff because it would be cheaper to do so than it is at the moment.

You could have a quarterly or yearly universal public transport pass bundled in as part of your salary (for example) as long as you could demonstrate that as part of your job you sometimes had to leave your normal place of work and go somewhere else. That is, in the same way that lots of people salary sacrifice cars, this levels the playing field for a salary-sacrifice universal public transport pass.

Worldwide, this is not an usual situation. When I was working in Zürich (Switzerland), employer contributions towards the cost of an annual public transport pass were quite common.

1.4 The Benefits

It is much, much more efficient for public transport users to buy longer-term tickets than it is for tickets to be bought individually for each journey.

Consumers prefer flat-rate pricing structures, and will use a service more if they don't have to pay extra for more usage.

...it is very common for people, when their pricing plan changes from a metered to a flat rate one, to increase their usage by between 50 and 200 percent... Season tickets in Zurich increased bus passenger trips by 4.5 percent, while in other

Swiss cities, the increase was as large as 16 percent... bus ridership in London increased 40 percent...¹.

Since these “extra trips” are unlikely to be at peak times (since a person with an employer-sponsored public transport ticket is presumably going to be commuting to work), it promotes the use of public transport at a time when there is no marginal cost to providing that service, and plenty of marginal savings to be made from lowering use of private transport (such as a reduction in greenhouse gas emissions). Employers would encourage employees not to drive within CBD areas during the work-day, but to take public transport instead.

An interesting effect also is that there would be greater flexibility for raising ticket prices in the future, since companies are generally less price-sensitive than individuals.

With a more reliable cost-base, and more efficient use of public transport, the States may be able to fund some of their own infrastructure upgrades without additional Federal support.

1.5 Costing

There is no long-term cost to the Federal Government in implementing this proposal. While it is possible that salary packaging of public transport tickets may become very popular, and therefore take a bite out of Federal Tax revenues, it will be matched by an increase in the ticket-takings received by the State governments.

In fact, overall revenue from tickets would be expected to increase further still because the after-tax price point at which it becomes worthwhile for a user to buy a long-term ticket instead of a collection of journey-based tickets would be much lower.

The Federal Treasury can therefore compensate for any costs incurred by adjusting the Federal-to-State subsidies accordingly. The States themselves end up better off as well, even after the subsidy reduction.

¹David Levinson and Andrew Odlyzko. In special issue on Networks: Modeling and control of the Phil. Trans. Royal Soc. A, vol. 366, no. 1872, 2008, pp. 2033-2046

Chapter 2

Solving the digital divide by giving a legal standing to the wireless mesh

2.1 The problem

Most PCs and laptops include some kind of wireless LAN access circuitry. Some phones do too, and many other consumer electronic devices. It goes by many names: WLAN, 802.11a, 802.11b, 802.11g, Airport, WiFi to name a few.

Despite its prolific use as a small-area networking technology, we are missing out on using the wide-area capabilities of 802.11. This is a pity because it is one of the cheapest broadband technologies available and the places in Australia with the worst broadband coverage are the least likely to receive investments in 802.11 infrastructure.

At least, that is the way it is with the current regulatory regime.

2.2 The current legal framework and why it is a problem

The general legal opinion on using 802.11 antennas in the 2.4GHz or 5GHz range for a large-scale network is:

- That you do not need a carrier license to set up and use such a network if you do not offer the service to the general public.
- That you do not need a carrier license if you are a not-for-profit entity and you do not provide access to the internet.

- That you do need an (expensive) carrier license if you want to do anything else.

Unfortunately, there are several organisations which cannot reasonably fit into any of these categories. The vast majority of ISPs (internet service providers) do offer services to the general public, are for-profit operations and cannot afford a carrier license, but would dearly love to be able to offer 802.11 services to their community. Small regional ISPs are particularly keen to see expanded options for 802.11 as they have no other affordable two-way broadband options that they can offer their customers. And 802.11 is cheap and easy enough for them to deploy that if they can do so legally, they will.

There is clearly a need for more open access to the spectrum; what can be done? Section 2.3 suggests what we should *not* do.

2.3 What are some bad solutions, and why are they bad?

2.3.1 Remove the need for carrier licenses (anarchy)

Australia could conceivably opt for the “anarchy solution”. Since we already have a regulatory framework that allows 802.11 equipment to be used in a variety of ways, we could open this up to allow anyone to use it, even to make a profit. There would be no carrier licenses for its use (or very cheap ones) and anyone wanting to build a wide area network would end up using it.

2.3.2 Keep the requirement for carrier licenses (status quo)

Alternatively, Australia could opt to maintain the status quo.

If carrier licenses are kept expensive and hard to acquire, then it is likely that it would only ever be economically worthwhile to deploy base stations in highly built-up commercial zones and in rich residential areas. This is utterly pointless, since we already have both cable and ADSL capabilities to these regions, and all we would be adding is slightly better (but nowhere near universal) mobility.

2.3.3 What is wrong with those solutions?

Notice that the two main options (“anarchy” in section 2.3.1 and “status quo” in section 2.3.2) both fail to encourage deployment of 802.11 in regional and rural areas. And that is particularly tragic, because it

will waste a golden opportunity to bring these areas up to near city-levels for broadband internet access. 802.11 can have “cell” sizes of anything up to 30km radius (900km² – though 50-60km² is probably more realistic) using cheap off-the-shelf equipment.

“Status quo” under-uses the spectrum (thus wasting a completely renewable resource). “Anarchy” wastes the investments of the carriers and over-uses the spectrum (thus also wasting a completely renewable resource).

2.4 Broadband Infrastructure Criteria

So I propose that there are four criteria by which we should measure any proposed change we might wish to make.

1. Does this proposal provide a business model to make investment in rural and regional Australian access possible? (i.e. is this just going to benefit the big cities?)
2. We have a business climate which requires simultaneous closed and open access to the spectrum. Does this proposal preserve the investments of all parties, and give them options for future business?
3. We have to strike a balance between over-using and under-using the spectrum. Does the proposal waste the spectrum?
4. Can this proposal be enforced easily, and are people likely to want to abide by it? Does the proposal facilitate the legal structures to promote the above three points?

2.5 The Mesh compromise

Section 2.3.3 outlined the difficulties of the two main options (section 2.3) available.

I propose that we can legislate the existence of the “Mesh”. The actual legislative changes are outlined in section 2.8. The legal framework for this is quite straightforward and only requires a small amendment to the Telecommunications Act 1997.

The Mesh consists of open access wireless networks. It is deliberately designed to be:

- always available as a public resource,
- not requiring a carrier license to use,
- restricted so that it is very hard to monopolise.

The rules of the Mesh are:

1. You cannot charge anyone for transferring data over your part of the Mesh.
2. You are allowed to charge for electronic or data services which happened to be transferred across the Mesh. For example, you could run a mail server on behalf of a client and charge them for running the mail server, even though they only access it across the Mesh. You would not, however be able to charge them for the cost of transferring the data to them, since that is disallowed by the previous rule.
3. You must give access to everyone (including your competitors) to your part of the Mesh. You can prioritise traffic to give your customers faster response than your competitors, but you cannot prevent them from accessing your portion entirely.
4. Your competitors must give you access to their part of the Mesh (which is just rule 2 in reverse).
5. You are not forced to join the Mesh – if you have a carrier license, you are still free to build your own wireless networks just as before, with any access and charging scheme you choose. Carriers can completely join the Mesh if they want to. They could do a combination of both, and of course, they can provide services just like any non-carrier making use of the Mesh.
6. You still have to observe the relevant regulations with regard to radiocommunications transmission levels and also any telecommunications legislation.
7. You do not need a carrier license if your wireless network is part of the Mesh.

2.6 Benefits

1. It gives rural and regional Australia control over their own broadband destiny, and puts them on a par with the capital cities.
2. The improved business climate will encourage competition and lower prices
3. The resulting network is available to a larger proportion of the population, who may have been otherwise unable to pay for higher speed data services.
4. It gives assurance to Australian consumers that their providers are operating within the freedom of the law.

2.7 Costing

There are no costs associated with this proposal at all as far as I can see. Any organisation with an investment in wireless broadband sees their investment preserved.

2.8 The Proposed Legislative Amendment

The Telecommunications Act 1997 SECTION 34 states:

- (3) For the purposes of paragraph (1) (h), a network is an *exempt network* if:
- (a) the network is used, or for use, for the sole purpose of supplying carriage services on a non-commercial basis; or
 - (b) the network is of a kind specified in the regulations.

This document suggests an amendment to add a third alternative:

- (c) the network
 - (i) uses radiocommunications equipment as defined in the Radiocommunications Act 1992
 - (ii) provides open and free public access to all end-users under non-discriminatory terms
 - (iii) provides open interoperability to other networks exempt under this clause (c), transparently forwarding communications between itself and those networks
 - (iv) that no charges, fees or other kind of commercial transactions are levied for the carriage of data over the network

2.9 What the amendment does

The idea of the change in section 2.8 is to introduce to the Australian telecommunications market an open wireless network which for convenience I will call the "Mesh". Data transferred across the Mesh cannot be charged for, and the Mesh itself cannot be monopolised by any one party.

This now frees up ISPs in Australia to offer broadband access to customers via broadband wireless. While they cannot charge customers for transferring data over the Mesh, they most certainly *can charge* customers for:

- accessing the internet via the Mesh – here the ISP may charge for data transferal between the Internet and the ISP's Mesh access point

- storing the customer's email on a computer which can be reached via the Mesh
- running programs on a server in the ISP's office that displays remotely to the customer's computer where that data is sent across the Mesh
- equipment to access the Mesh – naturally they can sell wireless LAN cards to customers, antennas and services for setting a customer up to do this

Under the current legislation, these options are not available to ISPs.

How might this work if the amendment in chapter 2.8 were made? An ISP sets up a wireless base station to cover its local community, looking something like figure 2.1. They cannot afford to pay for a carrier license, so they elect to establish the wireless network under the Mesh clause.

This now allows anyone with a wireless card in the region to transmit data to other members of the local community. The ISP will probably set up some kind of authenticating proxy server for internet access, so only customers who have paid for accounts with the ISP will be able to access the Internet (e.g. surfing the web).

Things get interesting when a second ISP sets up a base station nearby as in figure 2.2. They also do not want to pay for carrier license, so they opt to join the Mesh as well. The second ISP can use the first ISP's wireless coverage to reach customers. This sounds unfair, but of course conversely the first ISP can use the second's coverage. Suddenly the first ISP can pick up customers from a much larger coverage area. Both ISPs now have the same coverage (expanded) area.

Possibly another nearby community group may become interested in high-speed internet access. They spend a few hundred dollars (in 2002 terms) setting up a base station to join the Mesh formed by the first two ISPs as in figure 2.3. This third community now has a choice of two high-speed ISPs. The ISPs now have access to an ever larger market without them having to expend any further investment in equipment.

2.10 What is the economic model behind the Mesh?

Unlike most other broadband transmission, radio bandwidth can be viewed as close to a pure public commodity.

non-rival consumption The lines of point-to-point links can happily cross over each other without interference (in nearly every case). Once the safety and equipment-usage procedures are in place, there is almost no extra cost associated with allowing additional users.

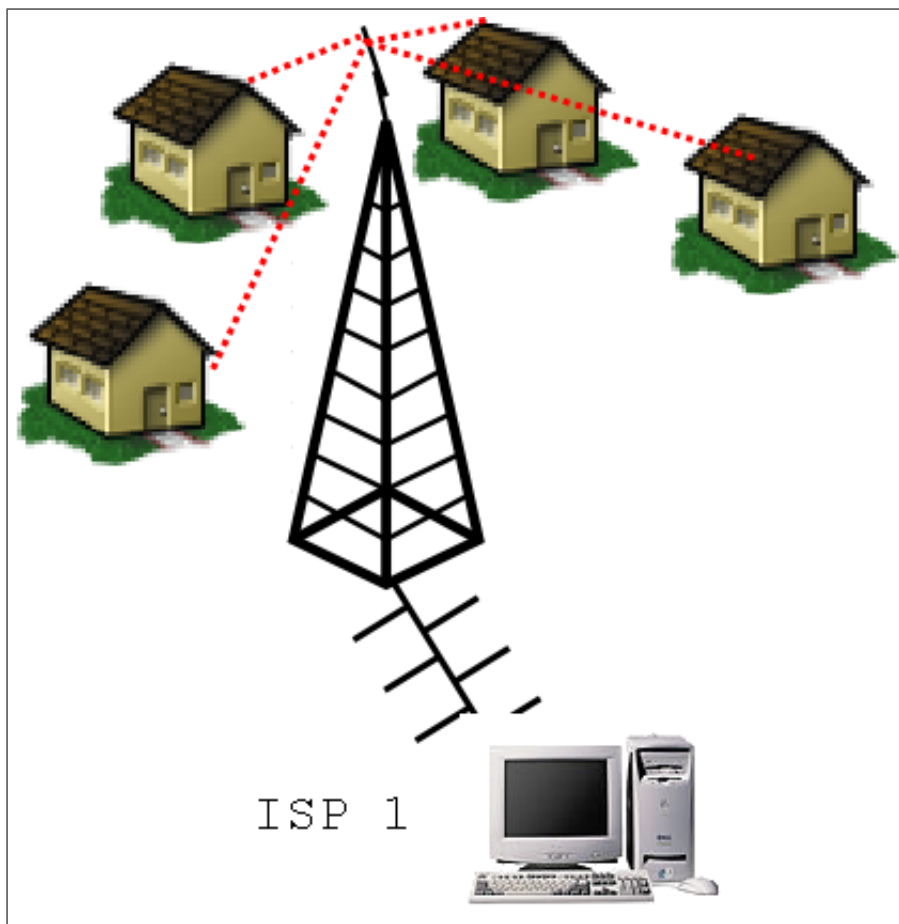


Figure 2.1: An ISP can use wireless easily to reach customers. . .

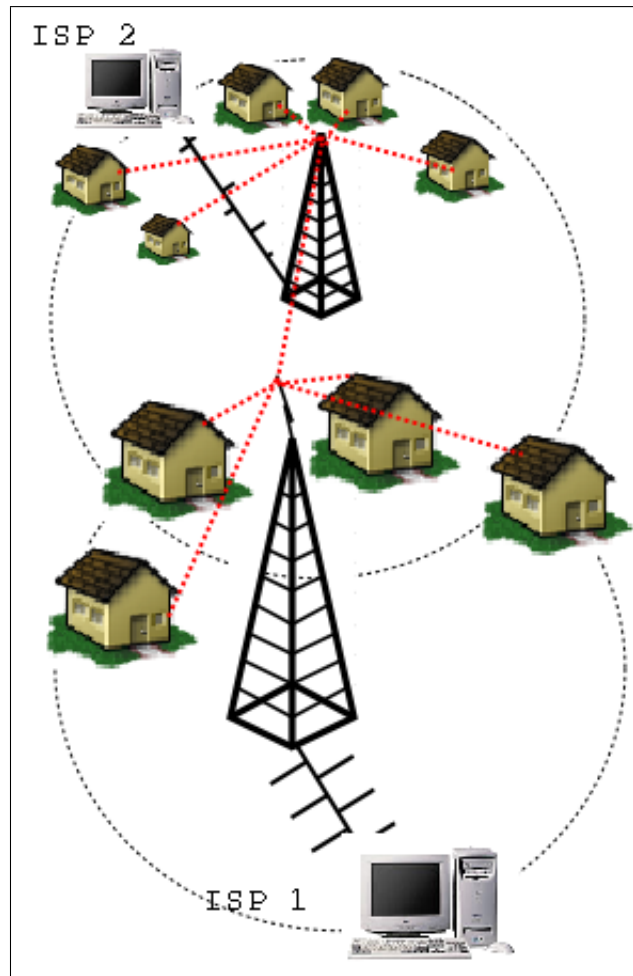


Figure 2.2: A second ISP sets up an overlapping cell, and both ISPs benefit

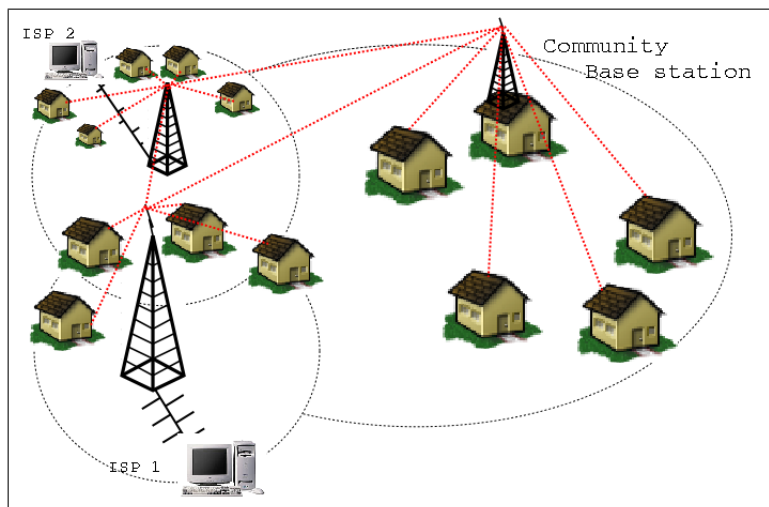


Figure 2.3: A community group puts an antenna on someone's roof

non-excludable consumption Short of equipping a policing force with signal strength meters and establishing a large-scale licensing scheme, the equipment required is too affordable and easy to set up to enable any kind of exclusioning.

Economic theory teaches us that the commercial market cannot efficiently allocate resources to a pure public commodity. The best way to make use of radio bandwidth is therefore to empower community groups, individuals, charities and governments to establish the infrastructure.

2.11 Who will invest in Mesh points?

Given that section 2.10 has ruled out wide-spread large-scale commercial investment, a related question is “is this whole idea an idealistic pipe dream?”. The answer to this is an emphatic **no**.

As I write this there are wireless broadband communities in every capital city and many large regional centres. These communities are unable to connect to the internet to provide a vastly better service to their members purely because the legal infrastructure does not allow them to do it in any reasonable way. At the same time, there are several ISPs who would be delighted to offer access services to these communities, and who can do so profitably. Simply announcing the legality of the connection would allow the demand for broadband wireless services to be unleashed within *days*.

But to answer the question:

- Individuals have already shown an interest in subsidising the development of these networks, as discussed in the previous paragraphs.
- Rural shire councils could be pushed by their constituents to put up some omnidirectional antennas on a few tall buildings or mountains to allow their whole shire to get high-speed internet access.
- Charities and computer user groups may choose to help impoverished areas by establishing base stations and connectivity. Such activities have already been seen in a few places around the world.
- When Lisa Harvey presented this proposal at the vision 2020 Summit, it was well received – particularly by the representatives from IBM.
- Politicians in marginal electorates may well get highly-developed wireless infrastructures¹.
- Nicholas Negroponte's One-Laptop-Per-Child project has already shown it is possible to deploy over a million mesh points in Uganda². James Cameron is a resident of regional NSW who was heavily involved in the testing and development of these systems and experimented with what is possible in a typical Australian environment.

2.12 Conclusions

If we allow companies and individuals to use consumer-grade wireless network equipment to form an open and public network, we can:

- Alleviate last mile problems in Australia.
- Build a state-of-the-art national broadband infrastructure extraordinarily cheaply.
- Avoid wasting the available bandwidth resources.
- Preserve investments of existing companies, both carriers and non-carriers.
- Improve the ability of consumers to control their access to telecommunications.
- Improve the quality of technology available to all Australians.

¹Of course, I'm not condoning this behaviour, merely acknowledging that these things happen. Ironically, unlike most pork-barelling it would probably work since knowledge industries would be attracted to a geographic region with extremely high bandwidth connectivity.

²Systems for Nicholas Negroponte's One-Laptop-Per-Child project include a built-in wireless LAN card which can forward traffic around a mesh even while the computer itself is turned off. Wow.

This is possible, simple and achievable. It merely requires the expanding of one regulation in the Telecommunications Act 1997 , as discussed in section 2.8.