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HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON COMMUNICATIONS, INFORMATION TECHNOLOGY AND THE ARTS

Reference: Wireless broadband technologies

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HOUSE OF REPRESENTATIVES

STANDING COMMITTEE ON COMMUNICATIONS, INFORMATION TECHNOLOGY AND THE ARTS

Friday, 28 June 2002

Members: Mr Pyne *(Chair)*, Mr Hatton *(Deputy Chair)*, Mr Baldwin, Mr Ciobo, Ms Grierson, Mr Johnson, Mr Pearce, Mr Sercombe, Mr Tanner and Mr Ticehurst

Members in attendance: Mr Hatton, Mr Pyne and Mr Ticehurst

Terms of reference for the inquiry:

To inquire into and report on the current and potential use of wireless technologies to provide broadband communication services in Australia, including regional Australia, having particular regard to the following:

- The current rollout of wireless broadband technologies in Australia and overseas including wireless LAN (using the 802.11 standard), 3G (eg UMTS, W-CDMA), bluetooth, LMDS, MMDS, wireless local loop (WLL) and satellite;
- The inter-relationship between the various types of wireless broadband technologies;
- The benefits and limitations on the use of wireless broadband technologies compared with cable and copper based broadband delivery platforms;
- The potential for wireless broadband technologies to provide a 'last mile' broadband solution, particularly in rural and regional areas, and to encourage the development and use of broadband content applications;
- The effect of the telecommunications regulatory regime, including spectrum regulation, on the development and use of wireless broadband technologies, in particular the Radiocommunications Act (1992) the Telecommunications Act (1997), and Parts XIB and XIC of the Trade Practices Act:
- Whether Government should make any changes to the telecommunications regulatory regime to ensure that Australia extracts the maximum economic and social benefits from the use of wireless broadband technologies; and
- Likely future national and international trends in the development and use of wireless broadband technologies.

WITNESSES

Committee met at 10.50 a.m.

CHAIR—I declare open this meeting of the House of Representatives Standing Committee on Communications, Information Technology and the Arts. Today the committee will take evidence as part of our inquiry into wireless broadband technologies. In simple terms, broadband allows for high-speed data transfer, providing vastly improved Internet access with a far higher level of interactivity. Broadband also enables services such as digital video on demand and simultaneous phone and data, as well as a range of applications and content that can reduce the cost of doing business and delivering government services. Wireless technology can be used to provide broadband services over the airwaves, thereby providing unwired networking and online services, mobility and convenience for business users, an alternative to existing wired networks and a new range of specialist applications.

The committee are examining current wireless broadband technologies in Australia and overseas and the likely future national and international trends in their development and use. We are looking at the interrelationship between the various types of wireless broadband technologies and examining their benefits and limitations compared with cable and copper based broadband delivery platforms. The committee are particularly interested to explore the potential for wireless broadband technologies to provide a last mile broadband solution in rural and regional areas—that is, to connect businesses and households which are currently unable to receive broadband services. We are also looking at how wireless technologies can encourage the development and use of broadband content applications. In addition, the committee are examining the effect of the telecommunications regulatory regime, including spectrum regulation, on the development and use of wireless broadband technologies.

[10.53 a.m.]

COOKE, Mr Anthony, Technology Manager, Physical Sciences and Engineering, Anutech Pty Ltd

HARRIS, Professor Jeffrey, Head, Plasma Research Laboratory, Research School of Physical Sciences and Engineering, Australian National University

WEIGOLD, Professor Erich, Director, Research School of Physical Sciences and Engineering, Australian National University

WILLIAMS, Professor James, Associate Director, Research School of Physical Sciences and Engineering, Australian National University

CHAIR—I welcome Professor Harris, Mr Anthony Cooke, Professor Williams and Professor Weigold. Did you wish to make an opening statement?

Prof. J. Harris—We had hoped to be joined by a number of students from the ANU Faculty of Engineering and Information Technology who play key roles on our research team, but they are about to do their oral exams and presentations on exactly the material we will be discussing today.

We are here to tell you about BushLAN, which stands for Bush Local Area Network. BushLAN is our original, uniquely Australian, non-line-of-sight, low cost, last mile, wireless Internet solution for rural Internet users. After that last sentence, I have to add that, in spite of my accent, I am indeed an Australian. Rural Internet users outside regional centres are primary producers, who contribute significantly to Australia's economy and culture. Increasingly, they need good Internet connections to run their businesses and community services. In fact, a government survey showed that rural users access the Internet more than their city cousins. However, the quality of data service available to users even a few kilometres away from regional centres is often woeful. Because of telephone line noise quality, it is quite common for rural users to experience frequent line drop-outs and to wait five or six minutes for a single webpages to load.

Over the last several years the BushLAN team of staff and students have carried out calculations, surveys, laboratory experiments and field tests which show that low power—less than 100 watts—and very high frequency or VHF radio waves with frequencies of 45 to 70 MHz could be used for moderate speed wireless links over non-line-of-sight distances of up to 100 kilometres. The BushLAN technology which we are developing is a combination of low power FM radio with custom designed digital transceiver hardware and networking software. Rural users would have a computer top box a bit larger than a CB radio—costing about $600. This would connect their computer to an antenna like those used for VHF TV reception. Data would be transmitted to and received from a base station located some distance away at the Internet service provider in a regional centre. Repeater towers would generally not be needed as VHF radio waves with wave lengths of about six metres are able to bend around hills and other obstacles. The same physics governs the transmission of VHF TV broadcasts with the result that

broadcasts on channels 1 or 2, for example, are generally the easiest to receive in most parts of Australia.

The BushLAN base station would be somewhat more elaborate than the user unit. Its antenna would be located on a tower similar to that of a modest ham radio installation or possibly on an existing VHF TV transmission tower. Its control computer and software would link the wireless channel to a high speed Internet trunkline. These trunks, using fibre optics or line-of-sight microwave links, run along major highways between cities and regional centres. It is difficult to imagine a digital last mile wireless technology with less infrastructure than our BushLAN system. Our research shows that the data transmission speed on a single BushLAN channel would be greater than or equal to 100 kilobits per second. This speed is comparable to or better than that of today's good urban dial-up connections and would come at comparable cost—less than $50 a month.

Satellite or line-of-sight microwave links permit higher data speeds because of their higher carrier frequency but incur much higher capital investment and operation costs because of their massively larger infrastructure. The infrastructure cost factor is quite important in any rural Internet access scheme. The density of potential rural users even in the more populated parts of country Australia is quite low—approximately one to two per 25 square kilometres in our target study region around Cowra in country New South Wales. Large infrastructure costs with a small customer base translate inevitably into increased user fees, eternal government subsidies and large business risks.

The widely publicised financial problems encountered by satellite ventures like Iridium and Globalstar show how real these problems can be. The multi-billion dollar infrastructure of these worldwide systems has been traded at fire sale prices to cover debts. Similar problems obtain even with more modest technologies. In the US, the 400 MHz Ricochet fixed-mobile wireless Internet service featured wireless modems mounted on utility poles. Although the service attracted many enthusiastic users, the revenues were insufficient to support the system, and the purpose-built wireless modems appeared in auctions on eBay as memorabilia.

BushLAN would use frequencies that fall in the same frequency range as TV channels 0, 1 and 2. Indeed, one of the reasons for confidence that the system will work is the success of long-range TV transmission in this band. Acceptable cooperation of data communications with analog TV transmission on these channels can be achieved by locating the low-powered BushLAN data services on locally unused channels. Typically, at least one of the VHF channels is not occupied by TV in a given region. The use of spread spectrum technology like that employed in CDMA mobile phones will further enhance performance. Similar considerations are involved in present simulcast arrangements for analog and digital TV. Of course, spectrum access would have to be negotiated with government regulatory agencies and the broadcast community. It should also be noted that the use of VHF TV channels is scheduled to be phased out in cities in any case over the next six years with the advent of HDTV.

In our university based work so far we have addressed the feasibility and engineering basis for the BushLAN system. Specifically, we have studied the operating conditions of rural Internet providers and their customers using AllState Connect in Cowra, New South Wales as a test case. We have carried out field tests using narrow band transmission at 50 MHz in the ACT under a test emission licence. Our results indicate that BushLAN can achieve data rates greater

than 100 kilobits per second over distances of 40 kilometres using only 20 watts of power. I should point out that Canberra also has quite a few hills. We have built working prototypes of the BushLAN digital transceiver systems. We have developed basic link layer software allowing us to pass data back and forth between the high speed Internet link used for the trunk connection and the moderate speed BushLAN VHF wireless channel. And we have developed a market survey to determine usage patterns, conditions and expectations of rural Internet service providers and their customers.

In the next step to a working pilot system we plan to construct a low power, four-node BushLAN network in the Australian Capital Territory. This will allow us to use local facilities and staff and simplify licensing requirements. The nodes would be at two locations on the ANU campus, at the University of Canberra and at a more distant location near the boundary of the ACT. The BushLAN team will expand to include staff and students from the University of Canberra, the Research School of Physical Sciences and Engineering, and the Faculty of Engineering and Information Technology at the ANU. We then envisage establishing a larger test network around a regional centre. Cowra is a likely candidate because of the existing ANU-AllState computers ISP collaboration. This would involve an order of magnitude increase in effort and would move beyond the realm of student centred university research.

Our work on BushLAN so far has been supported by a combination of internal university resources and investment of external earnings from other communications research activities that we have done for the military and for Motorola in the United States. An important cash outlay has been to provide modest summer scholarships of about $3,000 each for engineering students entering their fourth honours year. The scholarships allow the students to work as members of a professional engineering team and to develop their individual contributions into research theses, which are required for their degrees. Student interest in this research area is high. This year, for example, we have seven students who are presenting their theses today.

Over the last few years that we have been investigating novel wireless technologies we have trained nearly 20 young wireless engineers in this program. Taking the BushLAN concept to larger scale network testing will require considerably more resources than can be provided by university funding alone. Accordingly, we have submitted a proposal to the ARC to fund the acquisition of the equipment we need to build the ACT BushLAN pilot network. We are preparing a proposal to the AusIndustry COMET program to fund prototype development and market research. We are also actively seeking private and government partners to involve in ARC linkage or AusIndustry START project proposals to get the additional support we need if we are to take this technology out of the laboratory towards commercialisation.

We anticipate that the successful development of low-cost long-range wireless Internet technologies like BushLAN in Australia could also lead to export opportunities. The technology could be applied in countries that have regions of sparse population or, alternatively, in countries like India, which has a high population density but sparse communications infrastructure and limited investment capital. Other potential applications of non line-of-sight VHF wireless data transmission include battlefield communications for the military—where not being seen can be quite important—and transmission of data from remotely located instruments or sensors such as those used in the resource industry.

In conclusion, we found that the tyranny of distance stimulates creativity. The development of innovative technologies for digital wireless presents unique opportunities for Australia to solve vexing public problems in providing communications services and to develop knowledge based industrial expertise with export potential. Coordinated government and private sector efforts to encourage the research, development, professional education and investment required, and to provide a flexible and enlightened regulatory environment for the innovative use of frequency spectrum will bring lasting rewards. Thank you.

CHAIR—Thank you for your opening statement. I got the impression from your submission that BushLAN, being reliant on the VHF spectrum, was also reliant on the take up digital television, but from your opening statement I gather that it is not quite so clear cut.

Prof. J. Harris—It is a bit of a subtlety. The public record is a bit deceiving on this. The plan is—you can check this with the ACA to see the detail—to roll back analog transmissions in the cities because of the coming of HDTV. However, considerable flexibility is allocated to what happens in the country areas. For the same reason that you have trouble with mobile phones and so forth in the country, you are going to have trouble with HDTV as well. It all tends to be dependent on line-of-sight availability. In fact, the VHF channels will be used less and less in the cities; the situation in the country is not so clear. I can imagine that they would remain for quite a long time. However, we envisage using whatever channel is not being used in a given region. The VHF TV system is laid out in a way so that in a given area they might use channel 1 and then towards the edge of that transmission range for the next region they shift to a different channel, say, channel 0 or channel 2. So you would switch the BushLAN system in exactly the reverse sets. You would use the channel that is not occupied in a given region.

There are two other important factors—that is, the power we envisage using is of the order of 100 watts. This is a tiny fraction of television transmission power. Furthermore, if you go to spread spectrum technology—and I would be happy to tell you a little more about that; it basically involves taking apart your signal and spreading it over a larger frequency range—you reduce the instantaneous power in any specific frequency band and then you can have multiple services sitting on top of each other without interference. This is the principle behind CDMA telephones; in fact, it is also the principle behind simulcasts of digital channels on top of analog channels, which we are already doing. So several possibilities are there—essentially, intelligent channel allocation, plus the use of technology to allow collocation of services.

We recognise that this is a rather important regulatory issue and, as I said, would involve collaboration between the government and the broadcast industry. We would point out something else—that is, the prime real estate for placing the base station antennae here happens to be on VHF television towers, so a business opportunity may be there for the broadcast industry.

CHAIR—Have you given any thought to what the government might have to do in order to facilitate a regulatory regime that will enable this to occur?

Prof. J. Harris—In the short term, all they have to do is give us low power licences, which they are quite happy to do. For the last three or four months, we have been emitting in the ACT where I think we are licensed up to a level of 100 watts. We emitted it typically with five—we could go 40 kilometres with 20—so that is all we used. The responsibility is basically that we

guarantee that we will not produce interference; and, if there is an interference problem, we are liable to fix that problem. Nobody complained; it is not a problem. I said at the end of the submission that what it requires is a sort of enlightened attitude in the sense that communication authorities all over the world tolerate experimental emissions for the purposes of experimentation, with the proviso that you do not harm existing services. You go into it with that understanding, and you contact all of the other providers and coordinate your efforts with them so as not to disrupt their services.

One quite important thing I have to say in all of this is that the communications technology industry is probably the most innovative industry in the world. People in the industry are very techno-friendly in the sense that, if we were to go in to tell them about a new idea, they would tend to get really excited about it. Because of this sort of professional bond, if you will, it is usually possible when you are dealing with communications professionals to negotiate these things.

CHAIR—To find a way through it.

Prof. J. Harris—Yes, that is correct.

CHAIR—Are you saying that you have been having trial runs in the ACT?

Prof. J. Harris—Yes, with the support and encouragement of the ACA. Their first remark when we asked them was, 'Good. Someone is thinking of what we are going to use those channels for.'

CHAIR—How successful were the trial runs?

Prof. J. Harris—We set up an antenna—we are talking about a piece of copper pipe—at the research school and then sent out students and a lot of test gear, complete with generators by the way, to ride around the ACT to put up antennae and do reception tests. We have lots of pictures on our web site of all of us. Needless to say, the students like it but it is incredibly time consuming, and Gerard Borg and I lost the use of our cars for a month. So it is really quite guerilla and improvisational.

Then we take the test measurements—we take short data runs—and bring it back to the lab and analyse it. Basically, in those kinds of tests you are looking at noise levels because the noise level sets the data rate—the lower the noise level the more data you can push through per second. We make very careful measurements of those noise levels at varying distances, and using Shannon's theorem, which allows us to relate noise levels and bandwidth to the bit rate that you can transmit, allows us to conclude that with something like 20 watts we can go 40 kilometres in the topography region of Canberra, lying as it does 200 metres above the plain hills.

Mr HATTON—Where are we with the rural versus remote situation?

Prof. J. Harris—I will have to make some operational definitions and make sure we agree. My understanding of rural is that you are talking about a region like country New South Wales, country Victoria or parts of Queensland where typically you would have a regional centre, like

Yass or Cowra, surrounded by agricultural properties. Then there is remote, which is Central Australia. The two are a bit different. There is some overlap and there are some possibilities for application of what we are doing in both cases but let me go through some of the details first.

The urgent use is probably the rural use for the simple reason that the rural industries are actually very high tech. We took our students out to Cowra, which we use as a target region because we have a good relationship with an ISP. He advertised in a tiny ad in the *Canberra Times* saying, 'I need technical help,' so we answered the ad. We took the students out there and what we found was a mom-and-pop computer store with three employees that ran as an Internet service provider with total hand-holding assistance for their rural users. They have about 600 ISP customers and 200 of them live more than three kilometres from the town centre. Cowra is a pretty sizeable country town but cannot get decent data rates because of their phone lines. We interviewed some of these people. It is a very serious problem for them. One woman told us that she runs a farm that breeds bulls and they sell their bull semen all over the world over the Internet. She needs always-on Internet. There are wineries, cafes and asparagus farms that are buying and selling their supplies and their products over the Internet. In order to operate with minimum staff and maximum profit, these rural producers want to have the assistance of computer technology. That is the rural picture and that is probably true of the productive farming regions in the eastern part of Australia. A lot of these rural regions have hills and water, all of which impede line-of-sight propagation of microwaves—the water absorbs them and the hills block them.

The situation in Central Australia is different. Here you have totally flat land, and microwave links running up the major highways work extremely well. I have researched this travelling around Central Australia and asking people how much their tower costs. There you typically have sheep and cattle stations that will have a microwave tower. If people want to make, even, phone calls from the surrounding regions they go in to the main station that has the microwave tower. They can actually get good service but at a price. The towers cost about $35,000 to put up and then there are also usage charges. There has been some interest. There was a CRC forming that was looking at desert living essentially, and they were interested in BushLAN to provide alternative Internet services and even telephone, using IP telephony, to regions that could not afford even a microwave tower. You could use the same technology in both places; we have been focusing on essentially the eastern wet Australia use, for the simple reason that that is where the people—the customers—are and that is where I think the perceived problem with digital divide is the most important.

Mr HATTON—There has been a fair bit of urging recently that things in the bush have been fixed up remarkably and Telstra could be sold off because they are almost ready to go. What is the reality?

Prof. J. Harris—I have to be careful here not to exceed my brief. I am a physicist and an engineer. Here is the point: there are two relations here. The place where it makes sense to increase services first is to the regional centres like Cowra—so you put in fibre optic lines. That is where, for example, if you are in a tearing hurry, a microwave link is a really good way to go. You run the microwave links up the main highways. Mind you do not forget this; it is absolutely important: line of sight, line of sight, line of sight. That is the name of the game in all microwave data transmissions. So you have to stay on the main roads. You run a trunk line to the rural centres, and that is generally going well. The problem is the radio branch out from

there. People have to make interstate calls in order to call from Boorowa to Cowra to get to their ISP, for example—that is another barrier I have not talked about. Even with the telephone tower structure, Boorowa has maybe 30 users.

There are even problems out on places like the Hay Plains, which are completely flat. The problem there is that they have depressions, and when they have a depression they cannot get mobile phone service and things like that. The problem is not to the main centres, which is, of course, where all the investment is going, because that is where it makes sense to make all the investment. This comes back to my other point. The real problem here is: what does it cost to put in your infrastructure and what is an acceptable return on your investment? Even in the United States, which has a lot more people per square foot than Australia does, infrastructure cost problems have been a major barrier to wireless services taking off.

Mr HATTON—There is a problem just in repairing the copper.

Prof. J. Harris—That is true.

Mr HATTON—So, in broad respects in rural Australia, having to deal with lighting strikes and all that sort of thing, it is a question of what kinds of services could be interlaid over the top of it.

Prof. J. Harris—The most frequent complaint we get about copper in the bush is when they have to go over or under a creek—they usually go under. If they go under the creek, they have problems with reliability almost all the time; if they go over the creek, they have problems when it is foggy. The problem with copper in the bush—you are running kilometres of copper—is that it has to be checked out rather frequently, and this just is not cost-effective. You say, 'Magical wireless'. But, going out of Cowra, for instance, the first thing you will see is a hill; so you would end up there with a series of microwave towers for each individual property. Microwave towers cost tens of thousands of dollars each, plus maintenance. You are just not going to be able to get them from here to there.

So the next game you ask about is, 'What about satellites? Satellites work great.' The origin of this project is an interesting story, It began in Senator Alston's office. I was sent over there with another scientist on Science Meets Parliament Day. We started talking to him about his concerns, and he was very interested in this problem of Internet access in the bush. So I asked him what he thought was going to be the solution. He said, 'Satellites. We will subsidise some of the installation costs.' I said, 'What about operation and return on investment costs?' He said, 'We do not know yet. We are counting on competition to fix it,' which is fair enough. This happened about two years ago. The problem is that the market has now spoken. Iridium is dead, and as a business it sold $8 billion of satellites for something like $25 million. It was sold off, and it is still being used. The American military has a real deal going. In fact, there are places in Australia that use iridium, but that is because it has been given away. The return on investment does not have to be. That will last for about five years, until they have to put up new satellites.

The other system advertised heavily in Australia is Globalstar. You may recall the actor from *Seinfeld*, Kramer, and a camel who ate the phone. You have not seen those ads in a while, have you? The reason is that Globalstar—this is about two weeks ago; I can give you the press release on this—gave 97 per cent of its equity to its creditors so as to stay in business. I am sure

that the Globalstar satellites will be useable for a while, and again in the short term there are some really good deals in satellite communications.

The long-term question is this: is anybody going to maintain these satellites? These are multinational companies; they are not just aiming at Australia. The problem is that satellites are superb for broadcast of television because you just blare out the broadcast but these two-way solutions are vastly more complicated and they have very high infrastructure cost implications. There are also some performance issues with satellite for aficionados. That is because if you use geosynchronous satellites there is a significant delay. Typically what happens is you type the Internet address—www et cetera—and you wait and then you get a big blast of data. Another problem is that the cheapest satellite services are what is called 'dual mode' where the download comes from the satellite and the upload goes through an ordinary telephone line. If you have not got a good ordinary telephone line you have a problem. The third issue is that satellite services often do not address well the problem of always-on Internet. If you are, again, selling bulls and cows from Cowra and you have your web site containing details of the genetics of your bulls, you may want to serve the web site from your home computer. Some people want to do that. The satellite, because of the up and down link problems, is a problem in that regard. Satellite services work, as do microwaves—all these things can be made to work—but the question is whether you can achieve the return on investment to stay in business when you have a very, very sparse user population.

Mr TICEHURST—Do you have problems with multipath with this system?

Prof. J. Harris—That is a good question. We thought we would. We would love to test the multipath problem—we would like to find some multipath first. We have not seen any evidence of multipath in the propagation studies that we have done. We anticipated that we would have a lot of problems with this. In fact, the way we would deal with multipath—the standard solution—is with spread spectrum technology. You use something like direct access spread spectrum where you have essentially a code. Let me digress: multipath is when you get the same signal bounced off different objects so you get two receptions at the same time and that is what gives you ghosting on television sets. Mobile phones have to deal with this and that was what the spread spectrum system was developed for. We have done some spread spectrum studies specifically to look at this issue. We did those in the citizens band, by the way, at 25 megahertz, so we know that we can do some spread spectrum. We needed to use spread spectrum for other reasons involving privacy, encryption and security but we anticipated that we would use it also for multipath, and that multipath would be a major topic that we would study in setting up a system in a given geography.

Mr TICEHURST—Does polarisation make a difference?

Prof. J. Harris—We have been using vertical polarisation for simplicity—I suspect that is what we would use.

Mr TICEHURST—We have been doing some data casting with VBI on TV for some time and we notice that, on UHF in particular, you can get thermal inversions on high temperature days. Do you have that?

Prof. J. Harris—I live on an 800-metre hill outside Queanbeyan in rural New South Wales and the good channel is the ABC. The higher up in frequency you go, the worse it gets because of thermal ducting over hills. At 50 megahertz you are going to have to worry about these problems. The only way to find out how they work is to go out into the field. Again, here is a case where doing things in cooperation with the broadcast industry is very important. The data that they have on TV coverage and transmission is exactly the data we need for this because we are using the same frequencies and we have been using the same kinds of coverage issues. We use much lower powers, obviously, than they do but we are trying to solve some of the related technological problems.

Mr TICEHURST—I live on the Central Coast in New South Wales and I get very poor overhead phone wire links. In fact, I have talked to my ISP about trying to do a wireless link to his place. We have a couple of 60-metre hills in the way, so line-of-sight is difficult. VHF technology would probably solve that problem.

Prof. J. Harris—As soon as you start to talk to anyone who is familiar with these communications issues they say, 'Gee, why didn't anybody think about that before?' We have had this reaction over and over again. There has been some work by the military in related areas. First of all, spread spectrum technology was originally a military secret, as you probably know. It was invented by the actress Hedy Lamarr—that is another story I will tell you. It then became a military secret and spread spectrum technology has been used to do things like communications right on top of a tower control frequency at airports without causing disruption. There have been some very severe tests of spread spectrum because it has to be unbreakable and unjammable in military applications. It was those advances which allowed for the invention of the CDMA mobile phone service.

CHAIR—I hope Hedy Lamarr was properly remunerated for that.

Prof. J. Harris—She was given a lifetime achievement award by the Institute of Electrical and Electronics Engineers.

CHAIR—How amazing!

Mr HATTON—In terms of capacity, both upload and download, if you are dealing with Cowra or any other regional area, would you have a problem with the number of people who can use cellular?

Prof. J. Harris—First of all, this is not going to be used in any dense population area for a very simple reason: 50 megahertz is a lot lower than one, two, three or five gigahertz. By definition, it is a sparse system. We would probably set up a cell which would be about the size of a television local service area—that is, 22 kilometres or 30 kilometres. It would be a bit different. It would not be a local cellular system; it would be essentially a radial cellular system where you have a base station and then users around it. By using a combination of spread spectrum, intelligent channel allocation in the sense of channelisation across a frequency band and also, probably, adaptive and smart antennas, you can actually use regional location, or you can use the same frequency in this direction and the same frequency in that direction if you have directional antennas at your base station.

Remember, this is not a mobile system. It is a fixed wireless system, so you get enormous simplification because of this. You would have this essentially single autonomous cell with a central system. We are not trying to communicate between cells, because that is what we have trunks for. The next cell over, which would use a different television channel so that we do not overlap with either the TV or data transmissions in the first region, would form its own separate cell. There are some complications that we have thought of. There are cases where you might end up having to have what is called the Digi-P. You might have to have a hop, because you might have to go around a bad hill or you might have one isolated user who you just cannot reach. What you would then do is that you might use one or two of your users that were in favourable positions as a hop. We have begun to think about that, but in the first instance we envisage essentially a hub-and-spoke type system.

A lot of the traffic control ideas and channel allocation ideas are borrowed from mobile telephony. Again, it all has to be adopted. All of the propagation delays are different because it is in a lower frequency. We have to customise everything in this. It is taking bits and pieces of ideas that exist and then combining them in a form that suits the low power, low frequency operation that we are doing here.

Mr HATTON—How many users per channel?

Prof. J. Harris—Remember, we are doing just single channel tests now. For example, if we took seven megahertz of bandwidth, that would be a single television channel. We find that in our good tests in the ACT, with about 250 kilohertz of bandwidth, we can get up to 250 kilobits per second. So, if we took 100 kilobits per second, we would be talking about easily tens of users with appropriate channelisation. Just to give you a feeling, it is typically 10 or 12 to one—in other words, if you are an ISP, you count on 10 users for each modem line that you set up. In the case of our Cowra ISP, who is really a superb source of information, out of 600 users, 200 of them have this problem—that is, 200 people are targets for the BushLAN technology. This would not supplant his entire system; this would be an add-on to take care of those distant users. Again, we come back to saying, 'You've got to do it cheap.' You have to have the absolute minimum infrastructure. This is essentially a glue-on piece that allows you to stretch to those specific difficult users. The value of it has to be compared with the alternative which might be 200 satellite dishes. That is the calculation that has to be done at the end of the day.

Mr HATTON—Would the alternatives be other wireless systems?

Prof. J. Harris—Yes. For example, you could use 802.11b, which is a 2.4 gigahertz ISN band. We do not regulate that band yet but if everyone uses it we are going to have problems. If you have a line-of-sight connection, 2.4 gigahertz can be a very good thing, too. In a university you need to choose research topics that are really unique. You can really get into trouble if you duplicate commercial research because there is no added value. In this particular case we chose a really difficult, unusual problem and we used this to do research in and to train our students. Our students come out and they know all about all this other wireless, too, because that is what they have to learn in order to do this project. We beg, borrow and steal bits and pieces. For many applications I think 802.11b is a superb case. If all you have to do is go from one house to the next you are going to get very high bandwidth. You will not have any interference problems but, unless you are willing to put four or five repeaters up and down the hill, it will not go over the hill.

Mr HATTON—Are we primarily talking about data here—data that is not particularly enriched? Are you envisaging people being able to use it as a voice service?

Prof. J. Harris—First of all, I have a laptop and if I hook it up over the phone line from my office I get 56 kilobytes per second. When I hook it up from home out in the bush—only about seven kilometres away from the Queanbeyan exchange—the same laptop drops to 28 kilobytes per second. We are hoping for that kind of service. We are hoping to give a rural user the service that an urban user gets now, unless he is on TransACT. Rural users—and some information is available in Senator Alston's office; his assistant has survey results that DCITA has compiled—check weather maps, email and things like that. They do not ship movies. But I do not ship movies and I love the Internet.

Secondly, you asked about TCPIP telephony. Anything that has a TCPIP connection can be used for telephony. We are doing TCPIP connection so in principle you can use telephony. The challenge in TCPIP telephony is to find out whether your guy is online—that is the trick. If you stick to TCPIP then you can use anything that will run on TCPIP and that includes these telephony services. We had not thought about this, by the way. The people who made us think about this were the desert knowledge CRC people who said that there is a serious problem with just getting marginal telephone connections in parts of Central Australia. In fact, something like this could be used.

Mr HATTON—Thank you for a very enjoyable brief.

CHAIR—Thank you. If we need to, we may ask you for more information as the inquiry progresses.

[11.34 a.m.]

HUXLEY, Mrs Judith, General Manager, Commonwealth Office of Spatial Data Management

TRELOAR, Mr Paul, Technical Adviser, Commonwealth Office of Spatial Data Management

CHAIR—Welcome. Would you like to make an opening statement?

Mrs Huxley—Yes. Reflecting the aims of the Commonwealth spatial data access and pricing policy, the Commonwealth Office of Spatial Data Management assists senior executives across the Commonwealth to implement the policy. The aims of the policy are to maximise the benefits for the Commonwealth from the application of spatial data, to support the growth of the private sector spatial information industry in Australia, and to facilitate community access to public sector spatial data. At the heart of this inquiry appears to be questions such as this: what are the wireless broadband technologies that are being used and how can they help deliver better communications services to Australian individuals, families, communities and businesses, including those in regional Australia?

The purpose of the written submission was to ensure that the committee was aware that there is a wide range of wireless technology applications that are used by broadband intensive spatial information services and that the Commonwealth has a spatial data policy. By way of background, the committee may wish to note that spatial data is information about where people and objects are located. Ready and timely access to spatial information is essential to Australia's continued development in the information age. For example, spatial data is increasingly being used in wireless environments to support real-time decision making at both the corporate and the personal level. Global expenditure in the spatial information industry is estimated at around $34 billion per annum with a 20 per cent growth rate and here in Australia the turnover is in excess of $1 billion per annum with 40 per cent growth in the new economy spatial information services.

Government is the main collector of Australia's spatial information but to maximise Australia's share of the world markets, the Australian spatial information industry recognises the need to expand its market development efforts. The government and industry are committed to doing so via the implementation of the spatial information action agenda, and I have brought a copy of that along if the committee requires it.

When endorsing the action agenda the government has also endorsed the spatial data access and pricing policy. The key points of that policy are that fundamental spatial data is provided free of charge where available over the Internet and at no more than the marginal cost of transfer for packaged data. There are no longer restrictions on commercial value adding to data, which enables value adding service providers to more readily deliver innovative applications to Australian communities using multiple spatial data sources. We are working towards the implementation of a long-term vision for access to spatial data to Australians irrespective of their locations, and that is really where the wireless broadband technology comes into its own.

As I explained in the written submission, the emergence of high bandwidth wireless mobile communications to the Internet is allowing for greater access and innovative sharing of spatial information, further enhancing the possibilities of industry growth. Distributing large spatial images and associated files over the Internet is a high intensity use of the Internet bandwidth. Similarly, the distribution of image data to mobile services in the provision of location based services is a very high intensity use of the mobile network. The spatial information users are at the high end of the broadband usage spectrum so the availability of affordable wireless bandwidth is of particular concern to our mobile spatial data users. Since forwarding the submission I have arranged for members of our reference group to meet and provide me with additional information of relevance to this inquiry, which I would like to quickly summarise against the relevant terms of reference for this inquiry.

Regarding the potential for wireless broadband technologies to provide a last mile broadband solution, particularly in rural and regional areas, and to encourage the development and use of broadband content applications, I would like to draw three points to your attention. The first is that increasing availability of wireless broadband technologies is providing the catalyst for a huge market in location based services. For example, services that combine spatial information with wireless technologies and global positioning systems are now emerging in areas as diverse as in-car navigation systems, on-scene emergency management tools, on-tractor precision agricultural facilities, mining, surveying and land management, just to name a few. Increasingly, the Australian population expects information services to be available wherever and whenever the need dictates. The need for cost-effective wireless broadband technologies to deliver that last mile, or final electronic link, to the end user is becoming increasingly essential as an enabler for the development of mobile spatial applications.

Wireless broadband technologies have significant potential to ensure that rural and remote areas of Australia access similar spatial data services as are becoming available in the more densely populated areas of Australia. For example, the positioning accuracy that is provided by FM radio based differential GPS systems available to those located along the eastern seaboard and in other densely populated areas have the potential through wireless technologies to also be delivered to other locations in Australia. For example, Geoscience Australia's geodetic section is looking at the provision of real-time GPS data processing services that deliver differential accuracy over wireless broadband to people anywhere in Australia.

Another term of reference relates to likely future national and international trends in the development and use of wireless broadband technologies. The inquiry may be interested to note that the availability of cheap mobile computing power is providing momentum for the development of an increasing range of spatial data applications which will be relevant for the use of wireless broadband technologies for communications on the go. Internationally there is an expanding range of applications that provide instantaneous updates to spatial conditions on the wireless broadband, the trend being for additional layers of superimposed map based information of increasingly finer resolution, a lot of which takes up considerable amounts of bandwidth.

The use of spatial data combined with the broadband wireless applications is only limited by the imagination. For instance, paper based maps could eventually be replaced by their electronic equivalents which are so much more easily maintained with the latest information and could provide a wide range of additional information, data collecting and processing services.

Regarding the benefits and limitations of wireless broadband technologies compared with cable and copper based broadband delivery platforms, wireless broadband technologies are an enabler for mobile spatial data services that have the potential to offer efficiency improvements throughout industry, government and the Australian community. In non-mobile situations wire based delivery platforms are often considerably cheaper than wireless platforms, but this is not always the case particularly in the more remote areas of Australia. If functionality and/or cost of accessing the broadband infrastructure is uncompetitive, this would act as a disincentive for the growth of the spatial information industry and it would increase the disparity of information services available in the wired city and the more remote areas of Australia.

Regarding whether the government should make any changes to the telecommunications regulatory regime to ensure that Australia extracts the maximum economic and social benefits from the use of wireless broadband technologies, which is another one of your terms of reference, the inquiry may wish to note that solutions using spatial information and technologies have broad applications across many industries, so the Australian spatial information industry has the potential to offer the nation enormous benefits. The government's spatial information action agenda points out that, while for the average consumer of broadband services Australian prices and availability compare favourably with the leading countries, for the high-end spatial data users, particularly businesses with large bandwidth requirements, there are some significant differences remaining which will affect their bandwidth cost.

For example, the current business model used by the Australian telecommunications industry is one of an up-front fee plus a usage charge based on the volume of data transferred. This differs from a number of overseas providers, including the US, which have a fixed charge for access. A report prepared by ER Mapper for the action agenda argued that the Australian telecommunications business model results in significantly higher bandwidth costs to the spatial industry in Australia for access to comparatively lower functional bandwidth. The action agenda noted that the Department of Communications, Information Technology and the Arts is working with the multimedia industry to address similar issues that we have in the spatial information industries relating to price and bandwidth of mobile communications.

In summary, spatial information is a critical tool in informed decision making on key economic, environmental and social issues. The provision of high capacity, competitive, cost-effective broadband wireless infrastructure is essential for the Commonwealth to support the growth of the private sector spatial information industry and facilitate community, industry and public sector access to the Commonwealth's significant investment in spatial data.

Mr HATTON—This looks like a good money making proposition for the Commonwealth again, because the Commonwealth has a pricing policy. In the past, we have not necessarily been too generous when it has come to the pricing policy, particularly, for instance, with census data information. I think Space-Time Research provided the first census data information on CD-ROM and then there was another development with MapInfo for Windows and so on. But if you wanted to go out and buy that information, it cost a minimum of $8,000 up to about $70,000 or so. To get the information that you might need to make decisions could be very expensive. That has probably, over time, become a little bit better but I have got a particular interest in that, as all members would have, because we have a spatial mindset around our electorates and there is a need to find information that is specific to particular areas of the electorate and bring that together. You said that essentially your pricing policy is virtually

neutral; your aim is to provide the information as cheaply as possible so that those people who want to value add can provide that at a reasonable cost. Is that the essential thrust?

Mrs Huxley—There are three elements to the policy. Looking at the pricing element, the policy is that all fundamental spatial data that is available on the Internet is now provided free of charge and at a marginal cost of distribution for package products, say on a CD-ROM. While the copyright remains with the Commonwealth, there are no longer restrictions or royalties put on fundamental spatial data and that is encouraging value adders in the industry to go out and use that data. It has effectively unlocked the vaults, if you like, to the Commonwealth's vast supplies of fundamental spatial data. You mentioned previous costs of $7,000 or $8,000. We have examples of the policy, for example in Geoscience Australia, where fundamental spatial data previously cost between $30,000 and $50,000 for particular data sets. Those data sets are now available on CD-ROM for $99 per CD. You mentioned statistical information, digital boundaries and so forth, which were available through the ABS. I think they cost about $8,000 and they are now available for $95 on CD. That order of magnitude of difference is really unleashing the data so that then the value adders can really make the best use of it. It is a quite significant change.

Mr HATTON—That is very important because it enables the use of the data which previously was not possible. I might be able to go out and buy the CD and do what I need to do with the census information. We are almost on the cusp of a great deal of use of this because the 3G phones are due to arrive in the next few years and make a big impact. Do you see an explosion in this area, particularly with 3G phones in combination with wireless connectivity?

Mrs Huxley—I am going to get my technical adviser to come in, if he so wishes, but certainly we are seeing an explosion. You mentioned third generation—I know that in some countries they are already leaping forward to fourth generation technologies. It is huge. The new economy growth rate—you are looking at 40 per cent growth—is an indication of where the technologies are trying to keep up.

Mr Treloar—For example, an Australian company in Melbourne, Resource Industry Associates, have conducted a trial with the Victorian Water Police to walk around with Palm Pilots and current mobile phones to do incident reporting online in real time. At the moment they are limited to picking the issues in the report and communicating a text string that encapsulates the report back to a central spatially aware database. They are looking—with the development of broader bandwidth—at being able to take a photo from a digital camera mounted to the Palm Pilot to send that back. They already know what they want to do; it is a matter of developing the bandwidth. The upside of that is if the water police are able to do it then the regular police will want to do it and it just keeps going. When people see it is working for one they tailor these sorts of applications for their own uses and there will be an explosion in demand for this sort of technology.

CHAIR—We saw an example of this in Sydney at Cisco Systems. They showed us how the police force in Los Angeles were using this technology and they had cameras in banks which were linked back to the base and then to the people out in the field. They have cameras in the cars and the person who was behind the police car watching the bank had one in his hand so they knew what was going on inside the whole time. It was extremely impressive. You are saying that is happening in Melbourne with the Victorian Water Police?

Mr Treloar—Yes, it is being developed initially as a trial project with this company but they are certainly doing it to develop technology and that will flow on. Their key limitation at the moment is that to send a report back takes about 20 seconds. That might not sound much but to send an image and a report will take a couple of minutes and that is an inordinate amount of time for a fellow who is supposed to be continuing on with his work. The efficiency gained in a higher capacity broadband network will be reflected in that sort of change in the time required to do it.

Mrs Huxley—There are efficiency gains in many different areas and we see these as being an encouraging factor because where there are efficiency gains to be realised innovation will follow.

Mr HATTON—Has your office done any work on digital compression techniques, looking at what is available and how much progress there has been in the utility of digital compression? Have you, internally, done any research? There is a direct connection between the amount that this is already used, the amount of bandwidth that it takes up, the amount that will be used when it explodes, and the necessity to have much more efficient uses of compression to be able to allow it to be used more effectively.

Mrs Huxley—No.

Mr Treloar—Some of our agencies, in particular Geoscience Australia, have looked at compression from a current product delivery point of view. They made a product that was effectively a complete set of all the 1:250,000 scale maps in Australia. They used technology developed by ER Mapper, which is an international company that was formed and is still based in Australia, to use wavelet compression on the images so that you could serve a complete mosaic of the map of Australia, which is some 80 gigabytes in size, over a phone line and people could get on a computer in an acceptable time—a matter of seconds—the portion of the map that they wanted. That is quite radically different from the traditional techniques of serving imagery. With compression you certainly have to differentiate between serving graphical pictures as opposed to serving data in which you cannot afford any corruptions or loss. The sorts of high-end compressions that we have been using are for graphical pictures where a few pixels out of place do not really matter because the human eye still interprets them as the feature that they were meant to be. In terms of compression of data that needs to be perfect, I do not know of anybody who has been approaching that within the realms of the spatial information industry.

Mr HATTON—It is highly visual. Jpeg2000 standards helped. There is better compression of visual data and certainly we can put the information in. Where is the fault line in terms of spatial data that can lose its utility because some of the information is drenched out?

Mr Treloar—In a graphical product such as a map it really comes down to when you turn the compression up too high and start to get white noise falling back into the image. Again, that comes back to the training of the eye of the interpreter on the other end. From an industry point of view, those technologies for compressing, segmenting and serving are still developing but they have made substantial gains in the last few years. Where we have yet to see those gains being realised is that it still takes 50k or 100k per screen shot to send down the line. In relation to the Palm Pilot issue that I talked about before, they were talking about 50k being delivered in

about 20 to 25 seconds. That is an update. So every time you want an update you have to wait that long. They also have much smaller screens. With a laptop in a ute or something, you are probably talking about a few more 'k' and a few more seconds—if you can get a connection.

Mr TICEHURST—I am trying to get the link with OSDM. You have this store of information that can be provided on CD. To me, when you are talking about broadband you are looking at real-time applications. You would not want to transfer a huge amount of data, such as CD stuff. Are you involved in the transmission issues as well as the storage of data?

Mrs Huxley—No. In fact the office is not involved in the storage of data either; the office is part of the policy coordination implementation arrangements. The actual data remains in the custody of the individual agencies.

Mr TICEHURST—So this application we are talking about that the water police use is not really associated with OSDM, is it? That is just an observation.

Mrs Huxley—It is an example, yes.

Mr TICEHURST—Where does the broadband wireless application fit in with what you are doing with OSDM?

Mrs Huxley—Our aims include support of the spatial data information industries and facilitation of community access to public sector fundamental spatial data and wireless broadband. For example, we are looking at getting the information to be increasingly distributed via the Internet rather than on CDs, because there are limiting factors with CDs. The difficulty is that the Internet is not yet a great medium to deliver some volumes of information because of their sheer size. But, for information that we are able to deliver via the Internet, wireless technology is a way for people to access information. It is the way to get that last mile to rural and remote areas, to people in vehicles, on tractors or wherever it is that they need the information.

Mr TICEHURST—If you are looking at real-time data, what sort of stuff would you be sending out to someone on a tractor?

Mrs Huxley—Precision agricultural type applications.

Mr Treloar—For the precision agricultural applications, the illustration we provided in the submission here is that of controlling the positioning of the tractor using positional accuracy equivalent to the digital GPS—differential GPS. That provides the ability to have positioning in real time at less than 10-centimetre accuracy. It is not just a matter of serving static databases; it is a matter of saying, 'This is information I know about where I am now' and either comparing that with a database on your mobile machine or sending some combination of that information back to some central area to be processed, to improve the quality of information so that you can enhance your decision making ability.

In the differential GPS example, the signal that comes from the satellite gives you an accuracy of between one and 10 metres, which is quite reasonable. But if you are able to send it back via the Internet to Geoscience Australia's processing section in the geodetic program, they can

process that data with other information collected through our fixed high-quality network and send you back, at the same time, an improvement on the precision of the information that you have.

Mr TICEHURST—So you can do essentially what differential GPS does using your database?

Mr Treloar—Yes. Using a processing of information from your specific location on the Geoscience Australia server, they can send you back corrections to that information to improve your position. The key point there is that spatial information is traditionally thought of as static maps or static data. One of the real benefits of static maps and static data is that they enable you to improve your decision making. That was the traditional defence and reason for being interested in maps; it is the traditional business reason for being interested in where your customers are. The efficiency gains are available to a wider proportion of the population if they can make their decisions using technologies that individuals are not able to readily develop, such as this differential analysis. The connection, using intelligent software, between your device and someone else's process enables you to improve your decision making. That is really the developing area in the spatial information industry. It is not so much the collection or assemblage of data; it is the facilitation of decisions through real-time calculations and determinations using that spatial data and your current situation.

Mr HATTON—If you think of people who are involved in exploration and people who are dealing with our water and salinity problems and with general land use and so on, a very rich environment could be created in utilising that information in situ. That runs in line with what we have just been talking about. There is another great possibility here. It is almost like every visitor from overseas or every Australian wandering this continent would be entering a different kind of matrix because they would be able, through the use of geospatial data, to get, wirelessly, as much information as they needed about a range of different aspects of where they were and what they were experiencing. So they will have in the future a tablet sized computer, a small Internet device to get it. Whereas currently you have to look at maps or consult tourist guides and so on, in the future you could basically do that in the palm of your hand with this stuff—around our regional towns, in the cities and at tourist sites. Wouldn't you be able to use the GPS stuff as you can now do in museums—you put the headset on and you are given all this information as you are wandering around?

Mrs Huxley—Yes.

Mr HATTON—I would expect it would be a fairly exploding industry as a result of that.

CHAIR—Thank you very much for coming, witnesses; we appreciate your evidence today.

Resolved (on motion by **Mr Hatton**):

That the committee receives, as evidence to include in its records as an exhibit for the inquiry into wireless broadband technologies, the document from Mrs Judith Huxley entitled *Positioning for growth: the spatial information industry action agenda, September 2001*.

Proceedings suspended from 12.05 p.m. to 1.41 p.m.

KEIGHRAN, Mr Benjamin William, Chief Technical Officer, Simply Wireless

O'GERAN, Mr Desmond, Chief Executive Officer, Simply Wireless

CHAIR—I welcome witnesses from Simply Wireless. Are you going to make an opening statement?

Mr Keighran—I am not.

CHAIR—Your submission is largely about Bluetooth, and we have heard quite a bit about Bluetooth in our hearings so far and in our visits to places like Cisco and so on. One of the interesting aspects about Bluetooth is the issue surrounding security. I am wondering whether you would like to expand on some of the things you said in your submission about security issues and the reliance on trusted devices.

Mr Keighran—Bluetooth itself was built from the ground up with security in mind. The way in which security at Bluetooth operates is actually quite complicated. If you are genuinely interested in hearing more about Bluetooth then I would probably like to put together a paper regarding just security and submit that. I do not think we have enough time to go further into detail about it today.

CHAIR—You do not want to give a summary of what you would say if you had as much time as you liked?

Mr Keighran—Sure. The three main aspects of security at Bluetooth are authentication, encryption and frequency hopping. I will discuss each of those just briefly. With authentication, two Bluetooth devices can communicate. Once authenticated, there is a secure connection between the two devices so that they can communicate. Authentication is a simple username and password. It is a hardware device authentication. It is not a software issue; it is a hardware issue. I guess that takes care of authentication.

Encryption is done using a number of cipher-plus algorithms developed by Cipher, a US corporation. It is a 128-bit algorithm, which basically means that if you try and listen in to the conversation it is an encrypted path. The last one is frequency hopping, which is Bluetooth hopping 1,600 times every second over 79 different channels, which makes it quite difficult to actually listen in to the conversation.

CHAIR—That was a good summary. Lots of this technological development for your security is obviously designed to make it harder for people to break into the transmission of information between users of your technology. As the offenders in this area become more sophisticated and try to get around the security devices which you have introduced, have you plans for greater security and different types of security in the future?

Mr Keighran—Not necessarily. No, we do not have plans to further secure Bluetooth because Bluetooth within itself is quite secure. In fact to date the algorithms have not actually been broken. With any type of network, with any type of wireless communication, the network

is only as secure as the network administrator makes it. What I am saying is that securing a wireless network is I guess securing it to the point where it is a wired equivalent, so if you are running a wire from a device to a network the difference between that and running a wireless network is that you do not have wires running all over the place for people to plug into. If I were to plug into any cable, hub or switch on a wired network, would I be able to crack into the network? If the network administrator is serious about securing their network, then I would say, regardless of whether the wireless connectivity is secure or not, it is going to be quite difficult to penetrate the network. Summing up, with Bluetooth already being secure enough, having not been cracked to date, I do not see any reasons to secure it any further, other than just securing the physical network layers that are actually the wireless part.

CHAIR—We have heard so far that the Bluetooth technology is very much for local or small areas, like 10 metres to 30 metres. Is that true?

Mr Keighran—No. With any radio transmission it is a matter of increasing the decibel of the transmitter, and then you can move further away. Bluetooth at the moment has three classes: there is a class 3 device, which I think is two milliwatts, which enables us to move from 0.2 metres to 10 metres away from the device; there is 2.4 milliwatts, which is a class 2 device, which enables us to move 10 metres-plus from the device, in the 10 to 30 metre range; and then there is a class 1 device which I think is three milliwatts, although the milliwatts might not be entirely correct, which enables it to move 100 metres from the device. Also, depending on the electromagnetic field in the atmosphere at the time of the connection, we are sometimes able to move even further away. We have had Bluetooth actually running up to about 600 metres, but not tested primarily with radio transmitters in the air to find out how much further we can move away. The idea of Bluetooth was that it was a low powered technology—it was not going to suck too much battery life out of our mobile devices. If you increase the decibel range of a transmitter too much further you will start to draw too much power out of the device and hence ruin some of the main points for developing the application.

Mr HATTON—It is a year or two down the track, or maybe a little bit further.

Mr Keighran—It was May 1998.

Mr HATTON—I am talking about from now. I am laying out a possibility.

Mr Keighran—Sure. Sorry.

Mr HATTON—We are in 2002 now. October will come along. Tablet computers will hit the deck in their first iteration. As someone told me, they will not be leading edge but bleeding edge at that stage, and they will have all the sorts of problems that we can expect of new technology coming into being. Three years down the track, though, if that technology beds in, and if they have overcome the problems that all the other devices have, whether the form factor is an A4 form factor for tablet computers or whether we have just got a DL-size Internet device, in this place every member of parliament and every staff member will be able to walk in, put the device on the desk that they have been carrying with them, and we would then be in the world of Bluetooth and WiFi.

Mr Keighran—That is correct.

Mr HATTON—In our situation, where we can go into the wired network in our offices and in the House, we do not have a physical problem in terms of security concerns—the sort of concerns the chair raised generally. It is a question of specificity. If we adopted that mode in the House we would have a great deal of flexibility. An indication of this is the paper material we bring with us now and the kind of submissions that you are making on paper; we could incorporate those electronically and everything would be more dynamic—but that could present real security problems. Someone camped outside who decided that Parliament House—if they were silly enough to do this—might be a place that had secret information could come in and crack through the Bluetooth or WiFi networks. Given what you have said, what is the set of problems that we have got? We would have to make determinations about whether we go down that path. Could you provide a one-box solution?

Mr Keighran—There are a number of different issues there. Firstly, I will stay with Bluetooth—we will not discuss WiFi because there are lots of issues with WiFi. Bluetooth runs only 100 metres. If you are outside that barrier and if you are using a really high-powered transmitter—maybe a kilometre transmitter—to try to tap into a network that is located in Parliament House, for example, then first of all you can only receive data; you cannot transmit. Because you cannot transmit it is quite difficult to tap into the network. You cannot input into the network, you cannot touch it; all you can do is try to listen to the existing radio waves there. Consider a person sitting in a toilet around the corner, quite close to the network and trying to listen in. Assuming they are within the vicinity and are able to transmit and receive, assuming they have high-tech equipment to actually pick up something that is transmitting over 79 different channels and 1,600 hops per second, and assuming they have managed to authenticate and break the encryption and actually get into the network, then it is up to the network to show that it is secure enough to handle the situation—internal firewalls, VPNs over the technology et cetera. They are your next lines of security. At the moment, Simply Wireless offers access point monitoring so you can say that for access points that are sitting near the outskirts of the premises only certain services are offered—for example, http, TCP or whatever it may be. There are things that you might separate from the existing network, there are internal firewalls for wireless traffic et cetera. It is classified—I have some documents that will back this up—by US military standards as an unbreakable technology.

Mr HATTON—You do not want to discuss WiFi, but I do because we are getting new notebook computers. The latest rollout is being supplied. They are Bluetooth enabled but they are also directly WiFi capable. They also have infrared to people's mobile phones. What are the problems with WiFi?

Mr Keighran—WiFi was primarily designed for notebooks and desktop machines—it is a typical wireless LAN replacement. Bluetooth was developed as a mobile computing technology for PDAs and mobile phones—you can walk into a zone and everything picks you up. The dramas that you will have with WiFi are because it was simply made as a wireless local area network technology, and security was not the main focus. It was, 'Hey, can I throw a computer over there; will it connect to my network? We'll worry about the security later.' In the initial stages that was not looked at.

To compensate, they developed a technology called WEP, which is the wired equivalent privacy. It is supposed to make it just as secure as if a wire were there. The way that technology works is that you have an encryption key which you use on each end of the network. You put

the WEP key in. It uses the WEP key to encrypt packets. It sends the encrypted packets through the air. When the receiver gets them, it decrypts them and away you go. At the moment, because it is a directional signal and not a frequency hopping signal, hackers can listen to those encrypted packets and, using pretty simple applications, they can reverse engineer, work out what that key is and then tap into your network.

The next line of security which is being deployed for 802.11 networks is 802.1x. That uses a second key on each end and actually rotates the key which is encrypting the data each way. What happens is that, even if the hacker finds out what the key is, the key will have changed by the next round. I mentioned other ways of securing 802.11 networks before, such as using VPNs, access point monitoring tools and so on.

Mr HATTON—So we have a bigger problem with the WiFi than with the other?

Mr Keighran—Yes. When you look at what sort of wireless network you are going to deploy, you have to look at why you are deploying it: the bandwidth reasons, security reasons, mobility reasons et cetera. If you wanted high intensive bandwidth, if security were fifty-fifty, if you were using a desktop machine that was going to be stationary and you were not walking around with your notebook, then WiFi would definitely be the optimum technology. There are ways and methods of securing it, such as with the VPNs using the new 802.1x security path with the rotating keys. If you were looking for a more mobile solution with not so much bandwidth and if you were looking for a high intensive security solution, then you would use Bluetooth for sure. If you were just going to check emails, calendar updates et cetera with your notebook in here, then you would probably use Bluetooth. We are getting exactly the same range with WiFi and Bluetooth, if not going further with Bluetooth, without intensifying the transmitters. I can get an off-the-shelf WiFi transmitter and one of our own Bluetooth access points from Europe, which is not enhanced in any way whatsoever, so that I have a WiFi PDA and a Bluetooth PDA, and when I walk away the WiFi one drops out first.

Mr TICEHURST—The security of the Bluetooth is coming from the paired devices recognition; is that correct?

Mr Keighran—No, the spectrum itself is where the security lies. It is in the baseband signal.

Mr TICEHURST—It has to be registered as a paired device before you can communicate, though, hasn't it?

Mr Keighran—Correct. I mentioned before authentication, encryption and frequency hopping. The authentication process is the pairing of the devices. Once they are paired, it is assumed that they are authenticated. The reason you do that is so that every single time you want to spark up a conversation with another device you do not have to re-authenticate. All they have to do is say, 'We've got the same keys. We've got the same MAC addresses. We're using the same encryption,' and so on.

Mr TICEHURST—It is a little like the password idea, isn't it?

Mr Keighran—Sort of, except it is hardware based.

Mr TICEHURST—Yes.

Mr Keighran—That is correct. When communication starts between two paired devices, what happens is that there is a master and a slave. The slave is the one that connects to the master. The master says, 'Are you a paired device?' The other device says, 'Yes.' The master sends a problem to the slave device and says, 'Decrypt this, find the answer, encrypt a packet and send it back to me so that I know you know the key.' Once that happens, the master sends back to the slave device a timeslot of how quickly they are going to rotate their keys, because whilst everything is happening the keys constantly rotate. This is all hardware based. The idea of pairing is so that you do not have to set the parameters for how quickly you are going to frequency hop and the encryption method et cetera.

Mr TICEHURST—If you were in the House, for instance, where you might have 150 users, and you had an access point, it would have to be able to recognise each of those users and pair them before it would communicate. Is that how it works?

Mr Keighran—Correct. Without high-powered technology, the only way that you can detect a Bluetooth device is if it sends in discoverable mode. Discoverable mode, in a way, does not turn off frequency hopping, but it sets itself so that it can be found by another Bluetooth device. Once the devices are paired, the devices can be turned off discoverable mode, and it is back into, if you like, frequency hopping mode, which means that no-one else can see the devices again. Once paired, once authenticated, the slave and master or master and slave, or whoever, can find each other because they basically know where to look. That is not the most technical answer; I am just throwing my points out there.

Mr TICEHURST—If you had an outside device and somebody trying to get into a network and if you had 150 named devices, the outside one is not a named device known to the access point. Is that right?

Mr Keighran—Correct. It would be quite difficult to even find the access point in the first place, whereas WiFi is continually in discoverable mode. Its signal can be constantly found. All you have to do is to open an encryption key and connect to it, whereas Bluetooth is not in discoverable mode and cannot be found, unless you have some pretty high-tech stuff.

Mr O'Geran—In the environment that you mentioned with, say, a house that had 150, or however many, devices—

Mr TICEHURST—I was thinking of the House of Representatives chamber in Parliament House.

Mr O'Geran—Perfect. What you would have there is a network management system that would basically know and trust devices, so there would be some configuration initially in terms of which devices can see in and can interact with this network. If somebody lost a PDA, it would be a case of, 'Let's cancel that guy,' so that that PDA would not be able to connect, and then a new password would be issued.

Mr TICEHURST—Fair enough.

CHAIR—What are you finding is the take-up of your technology in Australia?

Mr Keighran—It depends entirely on the scenario. If you are talking about an SME or some sort of corporate office—

CHAIR—Yes. Can you give us some examples of where your technology is in operation in Australia at the moment?

Mr TICEHURST—Here is one, Chris! It is a palm that connects through to the mobile phone and that sort of thing. It is Bluetooth enabled. That chip makes the palm Bluetooth enabled, and with that it can link through either the WAP or the Internet. I can pick up real-time stuff off my Internet server.

CHAIR—So that is for your personal use.

Mr TICEHURST—Yes.

CHAIR—What about businesses? Do businesses use this?

Mr Keighran—There are a couple of things I would like to say. Pretty much every person you speak to will tell you that, if you are looking at wireless enabling in your office, you would use WiFi because it is the standard. It is the thing that you hook up your laptops and desktops to around your office—any type of office, big or small. It is the way of not having to lay a cat 5 cable down, and you can connect to the network. If you ask anyone else why they use Bluetooth, they will tell you exactly what—

CHAIR—What Mr Ticehurst said.

Mr Keighran—Yes, thank you. They will tell you that, because they can connect without a cable, they use it for their mobile phone and their PDA for the secure transfer of personal information within a 10-metre space. The thing that is different is simply that wireless is using it as a networking technology, so that, when people who are mobile with PDAs et cetera walk into an environment that is Bluetooth enabled, they can receive services applicable to their environment.

CHAIR—To be able to do that, do you have to have an access point in each of these places?

Mr Keighran—Correct.

CHAIR—Do you have to have one in the room?

Mr Keighran—No.

CHAIR—How far away can it be?

Mr Keighran—It can be up to 100 metres away.

CHAIR—So you could have it on the floor of a building?

Mr Keighran—Yes. But walls and metal et cetera do deteriorate the signal, so you will not always get 100 metres, 150 metres or 50 metres. You have to run a site survey to determine how far you can get. In a building like this, for instance, you strategically lay access points, so that the signal will only go as far as the four walls of your building. As soon as you stand outside the building, it makes it harder, again, to break into the signal.

CHAIR—And the access point can be linked by wireless itself?

Mr Keighran—No, not yet; at the moment each access point has to be physically cabled via a cable back to a hub or switch.

CHAIR—So for a business purpose or for a library, a school, a hospital or whatever it would have some tremendously good applications within those particular confined areas?

Mr Keighran—Absolutely; anywhere where you have a requirement for information and you are going to be mobile—walking around—that is where Bluetooth is being used.

CHAIR—But it is really not going to be very useful for things like last mile solutions for rural and remote Australia?

Mr Keighran—Not necessarily, although we have had some interest from an island in Thailand. They were interested in Bluetooth enabling the entire island.

Mr HATTON—That is a very big island.

Mr Keighran—It is quite a distance.

Mr O'Geran—It is an island off the coast of Cambodia, so you can imagine that the infrastructure there would be limited and less than ideal.

Mr HATTON—How do you make a buck?

Mr O'Geran—We are rolling out practical business applications using Bluetooth technology. You did ask earlier what sort of commercial applications we have: at a recent CeBIT show we built the largest Bluetooth network in the world. We Bluetooth-enabled two exhibition halls in Darling Harbour and then we delivered services across that—things like location based services, so as you are walking around the exhibition you can find out things on your PDA: you can get your mail, you can access the Internet and you can also see map information and exhibitor information and things like that. Other industries that we are looking at include retail. The application for retail would be replacing terminals that are in fixed locations around a store with PDAs that can access, over a wireless network, all of the information. Real estate: real estate agents are highly mobile people. A lot of what we do is about helping people work smarter, be better informed and access whatever information they need—and they can do it wherever they are.

CHAIR—I have a bottle shop in my electorate which has all the workers walking around with one in in their pocket that links to MasterCard and other things, and they just do it straight there with you as you walk around. I guess that is all using Bluetooth technology.

Mr O'Geran—They are probably not using Bluetooth technology. If they were using Bluetooth technology they would be talking to us, and we do not have any bottle shop clients.

Mr Keighran—At the moment we see ourselves as the only company in Australia which is offering Bluetooth access points. Bluetooth is a developing technology. We do not know of any other company which has that capability.

CHAIR—I wonder how the people in the bottle shop are doing it.

Mr O'Geran—Is it real-time data transference?

CHAIR—Yes, I think so. It comes back with 'approved'.

Mr O'Geran—It could be an over-the-air wireless signal.

Mr Keighran—They could be using a number of wireless technologies: RF, Homerus or even WiFi—who knows? You would have to look at exactly what the process is doing and at the devices they are using et cetera.

CHAIR—We will move beyond that red herring and go back to Mr Hatton.

Mr HATTON—You talked about a real estate guy. The key thing with Bluetooth is that you have to be close to a facility. How can real estate people be using it when they are out in the field?

Mr Keighran—At the moment we have the set-up that a real estate agent has their PDA and when they walk into the office everything is synchronised; that is the general Bluetooth thing. When they leave the office and when their PDA goes to synchronise their information or to access data, the device is intelligent enough to say, 'Okay, there is no network around. What is the next Bluetooth device I am paired with?' It finds the phone, connects via GPRS back to the Internet and back to the server and synchronises again. We are actually delivering real estate solutions at the moment.

Mr HATTON—There is another version with pretty good privacy that is being used for wireless devices, and they are using the same kind of encryption model that was used by the Germans with their Enigma machine in the Second World War but only a lot faster and with a much higher bit rate. Say we go into the centre of Sydney. We went there a little while ago and had a look at some companies and how they were operating. The point was made to us that in the one building you can run this sort of gear—you can run the WiFi stuff and you can run Bluetooth—and you can have those services: you can directly link to places overseas and you can go down to the cafe to use it.

The key problem was that, unless you had the end entirely secured—if you did not, you could easily and cheaply go out and buy gear that was not secure—you would not be providing a service which people could be comfortable and happy with. Is part of what you would potentially be providing to a whole range of cafes within the CBD a link to businesses in the central towers? Would you be saying to them, 'We can provide you with an entire solution if you want to keep working while you have got people out in the city'?

Mr O'Geran—What you need for that solution is (a) bandwidth and (b) location. It is not our business. These are called WISPS--wireless Internet service providers. There are a number of players out there. What they do is put in the infrastructure. They bring in an Internet pipe and put an access point onto it. They would sell to clients a means of connection and give them X amount of bandwidth in any of their locations. We provide services to them. At this point, I do not think the financial model is there to justify the capital expense of putting in a whole number of hot spots and then hoping that people will come along and use them. I think the Australian experience to date is that companies who are doing that are finding it quite difficult. It is quite different from the US market where there is a large population and probably more access in the larger cities and probably more capital to put that in. The more densely populated the city is with hot spots, the more useable it is, because you can access it as you are walking along the street. It could be a case that one day all of the streetlights have within them an access point and connectivity, which could provide bandwidth to passing cars, to pedestrians and to houses et cetera. But that is probably quite some way away.

Mr Keighran—In my opinion, the reason you would deploy, say, a Bluetooth service in one of these hot spot wireless ISP zones is not necessarily to be a wireless ISP to start off with, but maybe to offer services to a user that are applicable to their environment. What I mean there is that, if I were to walk into a football match, I could watch instant replays of the game on my PDA et cetera. I can bring up live penalty scores and all that sort of stuff. Bluetooth enables us to do that. It is already built into these PDA devices so that, when you walk into an environment, you can use access points to push data on there. As a backup, you might use it as a wireless ISP as well, so that you can walk in there and access the Internet and synchronise your data and all of that sort of stuff. In my opinion, the immediate places in which it will be used are those where it can offer services applicable to that environment and at a high speed.

CHAIR—Thank you, Mr Keighran and Mr O'Geran, for coming along this afternoon and giving us your evidence. We look forward to seeing you again.

[2.15 p.m.]

DELAHOY, Mr Murray Edwin, Deputy Manager, Spectrum Planning, Australian Communications Authority

HAYDON, Mr John, Executive Manager, Universal Service Obligation Group, Australian Communications Authority

HORTON, Dr Bob, Deputy Chairman, Australian Communications Authority

CHAIR—I welcome Dr Horton, Mr Haydon and Mr Delahoy to our hearing this afternoon. Do you intend to make an opening statement?

Dr Horton—Yes, we will.

CHAIR—Although the committee does not require you to give evidence under oath, I should advise you that the hearings are legal proceedings of the parliament and warrant the same respect as proceedings of the House. The giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. You might go straight into your opening statement and then we will ask some questions.

Mr Haydon—I would like to introduce the ACA submission and the role that the ACA has played in preparing this submission. Firstly, as both telecommunications and radiocommunications spectrum regulator, the ACA sees its role as being one of facilitation rather than of having any particular theme to propose or propel. The ACA's purpose, as the first few dot points in our submission point out, is to assist and encourage different forms of telecommunications service provisioning arrangements, to interpret the legislation as it exists in terms of licensing and the entry of new operators, to provide for spectrum in these new kinds of services, and to manage the spectrum in a way that makes for the most efficient application of that national resource for the range of services that they might be able to provide.

It also has some roles in terms of consumer awareness, in terms of the kinds of services, and, of course, the ACA does produce fact sheets and consumer information packages that perhaps assist consumers in their making of decisions about kinds of products, although to the extent that it is possible the ACA is technologically neutral in any sort of commentary that it makes about products that exist in the marketplace. The ACA is very clear in its role that it is for the market to make decisions about the best technology for the best application and the best environment, and not for the regulator to favour in any way one product, one style or one technology over any other. But it does provide for a mechanism whereby all of these different products and different technologies can find a place to the extent that the legislation permits.

In its role in interpreting and applying the legislation, the ACA, with those objectives in mind, certainly does set out to maximise the flexibility that is permitted under the legislation and provides for sensible interpretations where possible. In the submission we have suggested three areas where the committee might want to consider matters about the current regulatory

regime, specifically about the telecommunications regime, and the authority has made representations to the department on these same three themes and has commenced discussions.

Clearly, the regime is a policy balance of many competing objectives and the authority will apply the legislation as it stands and as it is modified. With respect to representing the practical issues that it encounters in its day to day administration of the legislation, it has represented the views—as represented to it—of the industrial community to the department for improvement of the policy regime.

CHAIR—Mr Hatton, do you have any questions?

Mr HATTON—You are facilitating?

Mr Haydon—That is right.

Mr HATTON—You are not playing any favourites; you are technology agnostic but you still have the problem of allocating spectrum. Am I correct in that?

Mr Haydon—That is correct. I do not see that as a conflict, though.

Mr HATTON—Given that this area has become fashionable and this could be the key solution to getting last mile access to people, I think it is evident—even though everyone who has come before us has been very nice—that there is a tendency to have a gold rush mentality. Companies convince themselves that they can provide the solutions that people need and, no matter how well or how poorly the technology is developed at any particular time, that they will be able to rush in and provide that. Companies want to provide that no matter what difficulty that might create for you in terms of spectrum provision and an explosion in wireless usage—particularly when we have the situation of the 802.11a, 802.11b and all the rest of it. That is a fairly strange sort of statement and it may be projecting a lot more than what is there. Do you think that there is a particular problem: that we have a rush of companies running into this area and promising probably more than they can deliver?

Mr Haydon—The ACA's role is to facilitate but it is up to the market, ultimately. Perhaps there are two themes that I could pick up from your commentary. One is that the ACA manages a spectrum. Spectrum comprises managed and uncoordinated—I think that is the correct term—spectrum. Technology such as the 802.11, Bluetooth and a couple of others, operate in the uncoordinated spectrum portions. In those portions, entry and use of the spectrum is very straightforward: very easy to access and use. However, the consequences are that by its very nature it is uncoordinated and interference control is not guaranteed. People enter this area, which is in the nature of a public park, and make use of it as they can. But there is no preference of one operator or user of that portion of the spectrum over another and each entrant into this portion of the spectrum must recognise and respect the existence of and usages of other users of that spectrum.

That particular spectrum has, in turn, two subdivisions. One is managed under an EMC regime. That EMC regime is about non-communications devices that operate in the same band—a classic example is the microwave oven, but it is also used for medical diathermy, welding and all sorts of things that are not communications devices. They are potential emitters

in that same band and consequently potential interferers with communications devices. The other part is the communications regime where they operate under a class licence which permits wide access to that spectrum.

That is the first part of the spectrum package. The second part is coordinated spectrum. Coordinated spectrum is managed under spectrum licences or apparatus licences, and in that range the interference is managed through the ACA's processes of managing and coordinating this portion of spectrum. The coordinated spectrum is everything else beyond the 2.4 gigahertz band and the five gigahertz band, so there is a very large amount of spectrum that falls into the category of coordinated and a very small amount that is in the nature of a public park. The small portion that is in the nature of a public park is certainly one that is attracting most public attention at the moment.

Dr Horton—Philosophically, we would welcome a gold rush, because this is an opportunity for new entrants into the industry to try the market out and see how they get on commercially. 'Let a thousand flowers bloom' and we will get some spectacular successes. There will also be failures and we realise that, but customers and the market will determine that. We would seek to ensure that we are as flexible as possible in allowing that to optimally occur. In our submission, we pointed out a few cases where small players are disadvantaged at the moment. We are taking this up in discussions with the department, but we would certainly welcome any observations from the committee that might give us some pointers as to where we might better facilitate things, either in allocating frequency or in the telecommunications regulations that apply to carrier status, for instance, and which may be asphyxiating small players. So, yes, we would welcome a gold rush; I think Australia would—it is about time we had one.

Mr HATTON—Recently I have had two different positions put to me in regard to the probable future of the rush to wireless technologies to provide broadband. One is that, for the last 40 years, year after year, that has been the promise, but the probability is, as companies come to the fore, in six months or so they will get knocked over and they will fail, because the wireless area is simply not as dependable as the fixed networks and cannot be because of the nature of it. The second point of view is that may be the case now, but that developments are so rapid and so significant that probably in two to three years we will be at a position where a lot of technologies will be coming very much to fruition and they will be a lot more reliable than they were before. Do you have any views on that?

Dr Horton—Yes. First of all, when you evaluate the last 40 years, or even the last 20 years, of radio and the promise of radio—or wireless, whichever term you want to use—I think it has actually been spectacularly successful. Look at trunk radio. During the seventies, telephony between major capital cities was largely carried by trunk radio services—960 channel systems and 1800 channel systems—which were the precursor to the optical fibre systems that we had in the nineties. The digital radio concentrator system was invented and designed in Telstra's research laboratories in the seventies and eighties and then produced by NEC. That now feeds its way from all extremities of the network and snakes into the rural areas of Australia to something like 40,000 or 50,000 premises. That, on a world scale, was a breakthrough and a solution which has been repeated in many countries.

In the early eighties, we saw the advent of cellular phones. These days they have overtaken the number of fixed phones in Australia—now we have more mobile users than we have fixed

users. So radio, or wireless, applications—and we also think of satellites and broadcasting; this is all wireless—are a far greater and more successful part of our everyday life than we really imagined at the time. It is just as much a part of our life as fixed communications. So let us put aside the notion that there has been promise and that it has not been fulfilled, because I think it has been highly fulfilled. That gives us the confidence that we can look forward over the next two or three years—

Mr HATTON—The comment came from a rather acerbic engineer.

Dr Horton—I used to be an engineer too but I—

Mr HATTON—You are less acerbic.

Dr Horton—No, I have been promoted; I can see things in a broader sense. We look forward with excitement to the potential of wireless. It has its position and place in life, and the places where we need mobility and communications to be quickly brought out to society are the places where we can look forward to it and with increased capacity in the future too. So we are not so gloomy in our outlook on it, and we are prepared as regulators for quite an exciting future in this area.

Mr TICEHURST—This morning we heard a presentation using VHF at the lower end of the TV frequency band for telecommunications. It is an experimental thing. Would this require some sort of special consideration to be able get a licence in that area?

Mr Haydon—There are several paths. There would need to be a telecommunications licence for its commercial application, yes. But there are provisions to commence a trial with a very simplified entry mechanism, which the ACA administers. It is not a trial licence, but it just recognises that the application is a trial. It is a very straightforward administrative process.

Mr TICEHURST—If that were made commercial, would they have a USO obligation?

Mr Haydon—Once you become a telecommunications carrier, you have a range of obligations. USO is certainly one. An annual licence fee is another. Pre-selection, number portability and a range of things that are part of the Australian telecommunications regime also attach.

Mr Delahoy—There are some aspects to be careful of in this case. If you are talking about a service that is operating on frequencies that are normally used for broadcasting, there is an interrelationship between the regulation of radio spectrum issues and broadcasting issues. The Australian Broadcasting Authority has to grant permission for the use of channels that are normally set aside for broadcasting. If it is in an area where there is no television service operating on the particular frequency, that permission can be granted. However, there is an issue if the service starts on a particular frequency in a particular area and then wants to expand its use on that frequency, because eventually it may bump into a broadcasting transmitter. That would create a dilemma for the ABA, because its prime role is to manage the broadcasting spectrum for broadcasting purposes.

Mr TICEHURST—That is what I thought—there is an overlap between the two identities, isn't there?

Mr Haydon—Perhaps not an overlap, but certainly there are two separate obligations that are attached.

Dr Horton—Was the direction you are coming from about the obligations that would come with being a carrier?

Mr TICEHURST—Yes. We had a presentation from the ANU, and they were talking about telecommunications using VHF, essentially to get a longer range in semirural type areas. There were a few issues there. Obviously, as you say, it is in the broadcast band, so there would have to be some cognisance of just what channels are there. It was mentioned that the move to digital would free up some of those channels in future.

CHAIR—Have we had too many questions on the same subject?

Mr HATTON—I am running through with that. It was also pointed out in the BushLAN submission that there is a question about analog capacity in the bush for TV signals. There is no necessary run-down of that capacity after the full digitalisation in the capital cities. Do you have any views about what that situation will be? Their argument was that we will finally get digital television in the cities but because of the nature of regional Australia—

CHAIR—Because all the channels are not always used.

Mr HATTON—The channels are not used, but it is more that getting a digital signal out is difficult, so we may still be sending signals in analog form and not taking that spectrum back. Do you know if there are any specific plans?

Mr Haydon—Mr Delahoy could probably comment there. I am not sure what they are driving at.

Mr Delahoy—I am not quite clear on the question but my understanding is that the Broadcasting Authority has put in place a number of what they call digital channel plans, which are the plans for the rollout of digital television transmitters at major transmitting locations. They would cover the majority of people in the more populated parts of regional Australia. Those plans are published and I assume there is a commitment from the broadcasters to follow them. If you are talking about questions such as the turn-off of analog television services, I guess that is more an issue of what the legislation says.

Dr Horton—I think there are two issues here. I am also an associate member of the Australian Broadcasting Authority but I am not here to represent them today. Are they appearing before you?

CHAIR—I do not think they are. They have not made a submission either.

Dr Horton—Okay. Just in brief, what has happened so far with the digital rollout is that it has been planned for the major metropolitan areas around Australia and that will take us through to 2004, which is when more rural considerations come into play. There are no digital channel plans yet, other than for metro areas.

Mr Delahoy—There are. There is almost a fully completed—

Dr Horton—Okay, so we have progressed to digital channel planning for the whole of Australia; we have got that far. Of course, at some stage analog will cease but that is not our call. It is not a policy matter that we are involved with.

CHAIR—What the ANU was saying was that because their BushLAN proposal is to run along the VHF—

Dr Horton—Using the analog.

CHAIR—Yes, using that spectrum. And they are saying as the urban areas become digitised for television, the VHF spectrum will be even more freed up so they will have even less interference for their BushLAN. And, as in country areas, because all the channels are not used—

Dr Horton—Because of the lower frequency, the longer reach of it.

CHAIR—they will be able to switch between channels between regions and have a similar free spectrum on VHF to use for their BushLAN.

Dr Horton—The other question is whether there are equipment and systems available for using that frequency. Let us say there is, then presumably it is an obvious consideration that goes into the pot. It is not something that we would influence though. It is not our responsibility—the broadcasting services bands.

Mr HATTON—But if that spectrum is freed up, would it become your responsibility?

Mr Haydon—If it were applied for a telecommunications purpose, then that application would be regulated according to the telecommunications legislation and all of the things that flow from the telecommunications legislation.

Dr Horton—Radiocommunications, please.

Mr Haydon—Not if it is used for a telecommunications purpose. But there is an interference management issue, which is part of the radiocommunications spectrum management—two complementary themes there.

Mr Delahoy—My understanding of the situation is that the digital television planning in the VHF bands has proposed that the channels between numbers six and 12 will be used for digital television purposes or analog television purposes in the near future. The area where there is

some question, I suppose, are channels 0, 1 and 2. That may be what the ANU people were talking about.

CHAIR—That is what they were talking about.

Mr Delahoy—Those channels are administered by the Australian Broadcasting Authority and the decision as to whether or not that spectrum could be made available for other purposes is something that flows after the ABA considers whether or not it is needed for television purposes. So far the ABA has said that those particular channels are for analog only. There is no thought that they would be used for digital. The question that the ABA needs to administer at the moment is: what are the areas where they need to protect existing analog television services on channels 0, 1 or 2? And how much area around the service area of those channels is needed in order to make sure that people trying to receive those television channels do not suffer interference? That is an engineering management task that the ABA performs. Under the legislation, the ACA has designated so-called broadcasting services bands, which are the areas of the spectrum that the ABA manages, and at the moment those bands include channels 0, 1 and 2, which I gather are the channels that the ANU is interested in.

Dr Horton—So what might come out of that at best is a patchwork of availability which might drop through for other purposes.

Mr Delahoy—Possibly; if it were decided to free up this spectrum, then perhaps consideration would need to be given to what the appropriate use is, and this may be one of a number of things that would need to be considered.

Dr Horton—An important question to ask is about timing: when is all this likely to be done?

Mr Delahoy—This is getting to be more of an ABA story than an ACA story.

Dr Horton—We will give you our best shot anyway, Chair.

Mr Delahoy—My understanding of television planning is that, generally speaking, those particular channels have been used more often in regional and rural areas than in major capital cities, with the exception of channel 2, of course. Therefore, the timing is longer than it would be if you were talking about a metropolitan area. I think the date of 2008 is the time by which analog turn-off has been talked about in the legislation. It would be difficult to see it before that date, and after that we do not know.

Dr Horton—So that is a rough idea of timing and of an area of application that might have some opportunity.

Mr HATTON—According to what we were told, they could virtually coexist because the areas are relatively small—100 kilometres or so—and, if you have channel 0 operating, then usually channel 1 is there and available and they could switch through that. They could also use—with all the deference they gave to Hedy Lamarr because she invented it—a spectrum-spreading approach that is taken in CDMA and so on; they could even sit one on top of the other. Their expectation was—with a technology that was hatched in the minister's office, so

there might be some likely support from there—that this may be a way to at least partially fill the holes.

Mr Haydon—This would be the way to provide for the spectrum to fill the holes. As I mentioned earlier on, equipment availability at the right price would be the other issue.

CHAIR—They recognised that too.

Dr Horton—You mentioned Hedy Lamarr, Mr Hatton. Was she a better engineer than a film star?

Mr HATTON—Yes, apparently; we got CDMA phones through Hedy Lamarr.

CHAIR—We should thank Hedy Lamarr for many things. In section 3.1 of your submission you cited a report from Industry Canada called *The new national dream: networking the nation for broadband access*, which members of the committee had circulated to them early in the piece. You stated that they had written at the beginning of their report:

> Based on today's technology and applications, high-speed broadband is defined as a high-capacity, two way link between user and end user and access network suppliers capable of supporting full motion interactive video applications delivered to all Canadians on terms comparable to those available in urban markets by 2004.

In your submission you said that 'it may not be practical or realistic to deliver a symmetrical data rate of 1.5 megabits per second to all parts of Australia'. Canada and Australia have a lot of things in common in terms of their size and sparsity of population, so I am wondering how you came to the conclusion that Canadians would be able to do something with respect to this that we would not be able to do, and why that would be the case.

Mr Delahoy—The thought behind it is that the requirement is not just to deliver services to the end of the chain, it is also to make sure that the pieces in the chain to that point are in place. It is a major upgrade to existing infrastructure to provide this sort of capability, one which would probably require very considerable investment. In our paper we have discussed various options that may make this possible. The point that we are concerned about is the large amount of investment that would be required to achieve this; it really is a considerable advance on where we are at the moment. To provide this to every person seems a very large ask.

Mr Haydon—The issue really is about not the last mile but the second-last mile; that is, the one for the backbone network to actually deliver the volume that becomes 1.5 or 2 megabits to each subscriber. As soon as you start adding up 100 subscribers, each at a megabit or so, the volume that has to be transported via a backbone network—that is, a rural backbone network, and, at the moment, dimension it to accommodate voice and a fixed user high capacity circuit—suddenly changes. That backbone network needs to be substantially upgraded, which becomes a very expensive exercise.

Dr Horton—So you are saying that the difference between Australia and Canada is the capacity of the backbone network into rural areas.

Mr Haydon—Yes.

CHAIR—Is it also a difference, though, in a public policy decision that the Canadians have made that we obviously have not? In that paper, *The new national dream: networking the nation for broadband access*, it is pretty clear that they have decided that by 2004 they want to have every library, hospital, government building and school linked to broadband access. They see it as a major aspect of economic development in Canada in keeping in front of the rest of the world for their prosperity. Have we not made that sort of public policy decision? In Australia, is that one of the things that is holding us back?

Dr Horton—It is certainly true that Canada has made that commitment in a project called the Canary project, for instance, which is a high data rate or high speed optical fibre backbone network right across Canada, even down into North America. There are suppliers of that network who I think will be appearing before you. Perhaps Nortel is one of them.

CHAIR—Nortel is coming to Melbourne.

Dr Horton—They might be able to provide you with more information about how that has come together.

CHAIR—I think Sask Tel is coming to see us, too.

Dr Horton—Then you will get it first-hand from two areas. I think our priorities in Australia have been different in the past. Do you want to add to that?

Mr Haydon—I can add a little more. You have mentioned that the Canadian proposal is focusing on public services in a particular locality. The Australian perspective is about all subscribers, and the dimension is quite different from providing a one megabit per second link to the hospital, police station, school and library. This is a handful of services. To make a service available to all subscribers in a locality, you are talking about hundreds of subscribers.

CHAIR—Sure. That is a different question, isn't it? The Canadians have decided to do something in a public policy sense to link all their libraries. Comparing that with how much you need to do all subscribers is not what we are proposing to do. If the government was to decide in a public policy sense that we want to do the same thing as the Canadians, has the ACA got any advice on the sort of cost implications that would have for a government?

Dr Horton—I think you would have to see the carriers about the cost implications of any implementation of broadband infrastructure. We would not have that information. The ACCC would be closer, not just because we do not have physical data but because we are not involved in accounting or price issues these days. The ACCC has that information. There again I think it is best to probably get it direct from carriers because it is not information that the other regulators would have at this stage.

Mr Haydon—The question you would have to ask is: what is the state of infrastructure out there now?

CHAIR—Our infrastructure is pretty good, but it is not the new stuff; it is the old stuff, isn't it?

Mr Haydon—It is a mixture. It depends a lot on which particular destination you are talking about and the location of any particular destination. If the destination happens to rely on a route that is a path between two major population centres, then one would expect that the infrastructure would be quite reasonable and modern and of high technology. If the destination happens to be a spur, then you could expect it would be significantly less.

CHAIR—Is there a danger in the long term that Australia—unlike those nations whose infrastructure has been and still is poor, which is certainly the case with telephony in some of the Asian and subcontinent areas—will rely on its good infrastructure from the past and not make the effort to upgrade it, while those countries that have got basically poor infrastructure will be starting from scratch and will not have any hang-ups about what has gone from the past because it was not very good and the new stuff that they get will be the best stuff? Is there a danger that Australia might rest on its laurels in this area?

Dr Horton—I think you would have to say that there is a great possibility of that because, if you put in infrastructure, you want to maximise the returns from that. It is an equation that needs to be balanced regarding commercial opportunity versus potential for the future.

CHAIR—You also said in your submission that the intention of the Telecommunications Act was to be technology neutral but that there was an apparent bias between wired and wireless communications technology. Could you expand on what you meant by that?

Mr Haydon—That is probably a key impediment to the use of things like 802.11x. In the legislation, the phraseology that is used for wired connections provides that distances of up to 500 metres or a concatenation of segments up to an aggregate of five kilometres do not require a licence. The phraseology that is used for radiocommunications devices in the Telecommunications Act talks about any two points, without a reference to distance. The ACA have tried to sensibly interpret this, but we are constrained to the actual letter of the law. This means that, if it were a wired solution, distances of 500 metres or so would be easily achieved without the need for a carrier licence. As soon as it becomes an unwired solution, the different phraseology applies and it is intrinsically limiting and requires carrier licences for the same sorts of distances, the same sort of application and even the same sort of technology; but, if it were a cable solution, it would not require a licence. That is one of the three points that we have suggested this committee might wish to consider.

CHAIR—What would be your advice to the committee with regard to a change to the regulation that it could recommend to bring the two into parity rather than there being a bias in the act?

Mr Haydon—The two ought to be identical in terms of what is possible, so that where a cable solution permits 500 metres, a non-cable solution should also permit 500 metres. That would not be a major rearrangement of the wording of the legislation; but, in consideration with other matters, that might be a policy matter that will have to be settled through the policy processes.

Dr Horton—We would recommend that you consider equalising both wired and wireless to the same lowest common denominator, which would maximise the opportunity for everybody, whether they are a big company or a small company and that, in both cases, you look at some

possible relaxation of what qualifies as a carrier and all the onerous obligations that come with that. Thus, there are two things: the equalisation of conditions so that wireless is just as opportunistic as a cable environment, and perhaps think about relaxing some of the participation requirements to be a carrier.

CHAIR—Thank you. That is very helpful.

Mr HATTON—We have had some indication in the inquiry that, if they are not operating already, we may have some cowboys ready to invade the wild west of wireless. With the 802.11x area being free, and therefore a lot of people will get involved in it, there are claims that people would use that inappropriately, that they would pump up the strength of the signal being pushed out and potentially cause quite a lot of interference around country towns. As more people adopt those devices, they could run over the top of each other. Have you had any indications of people using that band but pumping it up and having it run much further than it is supposed to?

Mr Delahoy—I am not in the side that regulates this, but I am aware of a lot of claims in that area. We have been investigating and, in some cases, regulating. I am also aware that on some occasions there have been claims of interference but when it has been investigated they have not been proven. The idea of the public park operation of these things is perhaps something that people do not understand well or take to heart. It is an environment that says 'no interference, no protection': you have the opportunity to operate but there is a risk and in some cases that may mean that you suffer interference. That is one of the issues that people who choose to operate in that portion of the spectrum need to understand. Unfortunately perhaps, some of the understanding has not been as good as it might have been.

Dr Horton—We would be concerned if there were interference as a result of that on any adjacent bands, and that is no longer public park. Are we talking about the ISM band?

Mr Delahoy—That is the reference he is making, yes.

Dr Horton—You call it free but we would say it is class licensed.

Mr Haydon—You should appreciate that it is still regulated spectrum and there are limitations. The legislation sets limitations on the power that can be used, specifically to provide some kind of balancing of opportunity for use. But it is uncoordinated: the location of one user is not coordinated against the location of another user. The potential for mutual interference will always be there.

Mr Delahoy—The person who uses power beyond the levels allowed within the class licence is operating an illegal transmitter and there are sanctions for that, if it is proven.

Mr HATTON—I have a particular reason for asking this next question which relates to that matter. Next to my electorate office there is a big courier company. Prior to their moving in we had fantastic television reception, because the antennas I put up at my own expense cost about $1,000. I now have virtually no reception because the operation is very big. I have not talked to them yet but I probably should if I want to use the television. What are the provisions in relation to that?

Mr Delahoy—The television band is not adjacent to the ISM band. It is not even close.

Mr Haydon—You are talking about coordinated spectrum and interference within coordinated spectrum—

Dr Horton—He is just talking about his television reception.

Mr Haydon—That is right. You are talking about television reception and you are suggesting that the courier operator next door, operating transmitters of one sort or another, has spurious emissions that are affecting your television reception.

Mr HATTON—Yes.

Mr Haydon—That should not happen.

Mr Delahoy—You should make an interference complaint.

Mr HATTON—To us.

Mr Delahoy—I suspect that whatever is occurring is not due to ISM or 802.11 equipment. It is a long way removed, in spectrum terms, from that.

Dr Horton—It would be something else.

Mr Haydon—It would not be that. It would be a different type of thing.

Dr Horton—We would be very pleased to investigate that because that is what we are here: for compliance within the spectrum regulations.

CHAIR—There you go, Mark, we have had a successful afternoon's work.

Dr Horton—A third of our staff are in area offices where they investigate interference situations all the time.

Mr HATTON—Previously, when dealing with constituents who have had problems, we have had those investigated. Often it has been quite difficult to pin it down but the authority has done excellent work trying to sort it out and dealing with both the people involved.

Dr Horton—I am pleased to hear that.

Mr HATTON—I will use that example and run forward a bit again to the potential problems of people pushing out a signal at too great a level. As that 802.11 area of public park fills up opportunistically with more and more people using it, will it become your job to step in and say, 'We've got to be a bit more sensible about it'?

Dr Horton—Yes, they are operating unlicensed in that situation. Quite clearly that is where we step in.

Mr Haydon—There is another aspect to that, though, and that is that you could find a large number of users each operating within the class licence but in aggregate the spectrum could become unusable for the next entrant or even for other operators within that band. That is the nature of the public park.

Dr Horton—But we will solve the individual ones first rather than going through and multiplying Maxwell's equations.

Mr HATTON—Is there a prospect of that being ameliorated? We have 802.11b, 802.11a is coming out and there is 802.11g and whatever else. As that is segmented in terms of different technologies using different parts of the band, do you think the use will be spread in that way?

Dr Horton—They will spread throughout the band. It is only in particular parts of the band that we would have any problems, because there should not be much adjacent interference.

Mr Haydon—You are not talking about adjacent interference, though; you are talking about a number of 802.11 operators operating within their power limit in each case but the total of them meaning that they begin to mutually interfere.

Mr HATTON—Yes. Going on from that question, as we get different subclasses of 802.11 where they are using different parts, is that public park likely to expand in size again?

Mr Haydon—No, the public park is constrained. There are two walls containing the public park.

Mr Delahoy—You may have already touched on part of the development path. A lot of the current interest in wireless LAN equipment is in 802.11b equipment, which operates in the 2.4 gigahertz band. Some of the operators—and I suspect some have made submissions to this inquiry—are seeing the difficulties of operating that band and are looking at better alternatives. There are bands around the five gigahertz range that have been set aside for this type of use. It is essentially the public park again, if you want to use that thinking. The 802.11a standard is designed to operate in this five gigahertz range. At the moment at least, there are opportunities to get a larger play space within the public park in that frequency band. But, as the users increase, that will also become subject to these interference considerations, because in the end that is also a public park.

Dr Horton—But I think suppliers are smart enough to realise that if there is overpopulation in any particular band they should be designing for another band and exploiting that market, and that is what they are doing. There is only so much capacity available.

Mr HATTON—There are strict limits?

Dr Horton—Yes.

CHAIR—That is why if you do not want any interference you buy your own piece of the band.

Dr Horton—If it is for sale.

CHAIR—Mr Ticehurst, do you have any final questions?

Mr TICEHURST—What is the reaction to this community use? I was just reading this little bit about the Brismesh.

Dr Horton—Mr Haydon knows about that.

Mr Haydon—That is an example of the application of the Telecommunications Act in an environment where we are trying to find ways, literally, to the limit that is possible, of interpreting the strict letter of the law so that enterprises such as this one can exist and be put to their own trials.

Mr TICEHURST—It is a bit like the community radio thing, isn't it?

Mr Haydon—That is right.

Mr TICEHURST—Would that sort of thing be encouraged?

Mr Haydon—Yes. This is an example where we are finding that interpretation of the legislation sets a constraint on the liberties that we can permit. We have taken this up with the department as the sort of thing that should be provided for under the legislation but is currently not very well provided for.

Mr TICEHURST—Fair enough.

Mr HATTON—Yes, we have had evidence in Sydney with regard to that. It was a case well put.

CHAIR—Thank you very much for coming today.

[3.08 p.m.]

HARRIS, Mr David, Chief Executive Officer, Unwired Australia Pty Ltd

HAYNE, Mr Ian Davis, Radiocommunications Consultant to Unwired, Unwired Australia Pty Ltd

PRINS, Mr Hendrik Jan, Consultant, Network Planning and Development, Unwired Australia Pty Ltd

CHAIR—I welcome Mr David Harris, Mr Hendrik Prins and Mr Ian Hayne of Unwired to give evidence before the committee this afternoon. Although the committee does not require you to give evidence under oath, the hearings are legal proceedings of the parliament and warrant the same respect as proceedings of the House. The giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. Of course, we do not expect you to give any false or misleading evidence.

Mr HATTON—We are probably the only ones who are contemptuous of parliament!

CHAIR—I invite you to make an opening statement, and the committee will follow with some questions.

Mr D. Harris—Thank you very much for the opportunity to address the hearing. In our documentation submitted to you, there was a summary towards the end and I would like to pick up on some of the key points in it. I will briefly summarise the essence of the submission by Unwired. In the submission we introduced Unwired. We also explained that, through our ownership of spectrum in the 3.4 gigahertz range, we are able to set up an alternative national local access network infrastructure in Australia. Using the spectrum, we will be investing in a facilities based network, which we see as being the only alternative to the existing Telstra network in the local loop. Unwired has established a relationship with three parties—Vytel, Airspan Networks and Ericsson—to deploy this network across Australia, and we plan to offer broadband data services and last-mile telephony services.

As we plan and start building this network, we face a number of challenges, and we summarise these in the paper. I will briefly repeat these. We seem them as being the competitive environments and the dominance of Telstra in the local loop; a sensitive and depressed telecommunications capital market, I think exacerbated by announcements yesterday internationally, which we are all aware of, regarding WorldCom; and also some confusion in the public about what is meant by wireless broadband. We addressed each of those in our submission, and we also outlined for the committee our plans in terms of how we are going to roll out our network. Our initial network was focused on cities of more than 50,000 people, but we did outline how it was possible for us to go substantially below that number in terms of being able to provide services.

We also identify for the committee three general classes of broadband services and technologies. These are mobile services; fixed services including point-to-point, fixed point to

multipoint, and multi-point distribution systems; and also what we call proximity services. These are services such as WLANs and WPANs—wireless local access networks and wireless personal access networks. We believe that these three general classes complement one another. Rather than being substitutes for one another, they do actually complement one another in that there are some very important synergies to be captured between these different technologies in terms of being able to provide services. We see, for example, that Unwired and a WLAN technology actually complement one another very well in terms of extending the wireless coverage, so Unwired would provide wireless to a building—whether it is a residence, a small business or a school—and then, within that local environment, it would be compatible with WLAN to provide wireless within that building, wherever that might be. That is an example of how we see them being complementary in terms of operating.

We also drew on our extensive due diligence experience to highlight that, whilst fixed wireless access does have some specific applications, there are some areas where fixed wireless will not be suitable. These are areas, for example, in CBDs where there is a higher propensity of tall buildings. It is not that appropriate to deploy a fixed wireless access network. There are also remote areas where, frankly, to deploy a fixed wireless access network will not make economic sense, and technologies like satellite will probably be a more suitable type technology for those deployments. That is on a pure commercial basis. However, we do believe that from a technical point of view there are few environments where fixed wireless access will be unable to provide a solution, so we can operate everywhere where Unwired will roll out its network, as we will take into account where it is possible to obviously deploy it in the most economic way.

We also highlighted that WLAN technology, such as 802.11, is less adaptable in this role—the role I am talking about is the last mile access—because of its low work power and, therefore, restricted range. We talked quite a lot about that in our submission.

We also considered some of the regulatory issues that we wanted to bring to the attention of the committee. Top among our concerns is the current regulatory efforts that continue to treat Telstra's monopoly of the copper CAN—the access network—as a natural monopoly. We believe, and the evidence does suggest, that this is no longer a natural monopoly. There is a very strong, dominant player in that local access—we acknowledge that. But we do not think that it is a natural monopoly, and we believe that Unwired, through its wireless solution, can actually provide services in that local loop. Therefore, efforts directed towards mandating access and fixing access arrangements do not make a lot of sense in terms of where we see a competitive local loop setting. We would rather see a competitive local loop. We think that Unwired can provide that competition and, therefore, mandating pricing and access is not something that we support. Also, it can distort the market and it can actually end up resulting in less competition rather than more competition.

We are also concerned that we perceive there have been calls for changes to the regulatory environment for WLAN devices to permit higher levels and, thus, greater range. The reason that we feel that these are not good moves is that good engineering and radio spectrum management practice will require regulation. For example, for radio frequency to acquire spectrum planning, it requires a lot of network dimensioning and planning. Simply allowing these devices to be permitted at higher levels, thus achieving greater range, is counter to proper radio spectrum planning and a managed network. They are designed to operate at lower power levels as an interference avoidance mechanism and, therefore, allowing them to operate at higher power

levels will result in high interference and would effectively be counterproductive. We talked a lot about that in the submission.

We also highlighted our concern that funding arrangements directed to telecommunications technology through the state and federal governments are generally unavailable for profit enterprises like Unwired. They are, therefore, unavailable to companies like Unwired that are attempting to engage in large-scale infrastructure development. We are calling on the committee to promote funding and support initiatives that foster an environment which supports nation building infrastructure investment.

We have also noted for the committee the current depressed telecommunication market, which is very sensitive to headline changes in the regulatory environment that might be perceived to threaten or devalue existing investments. We are, therefore, seeking assurances from the committee that its recommendations will be sensitive to the effect of its work on the investment and development of wireless broadband—that is, sensitive to what Unwired is planning to do. Looking at spectrum and at the investment and facilities based competition, we believe that that will be the only true national competition. Obviously, if the regulatory environment were to change, that would be a serious concern for us. In summary, those were the key points that we raised in our paper.

CHAIR—Thank you very much, Mr Harris. In your paper and in your introduction today, you have talked about the obstacles to a competitive environment and the market dominance of Telstra. It is not really Telstra's fault that they have a market dominance. I am a bit perplexed as to what this committee could recommend or do that would make any difference to Telstra's market dominance. For the sake of argument, I would have thought that it is a matter for competition in the market and, if your product is the better product, surely that will create the competition and reduce the market dominance. Or, are there infrastructure problems or mandated decisions by the government over the past few years, or over many years past, that do not allow the market to operate as freely as it should? If that is the case, would you like to outline what they are?

Mr D. Harris—I fully agree about the issue of competition; Unwired welcomes competition. In our paper we raised the point that efforts have been directed recently towards mandating access to the local loop and fixing access prices. We understand the rationale for some of that and what is driving it. However, by setting an artificial price and saying that that will be the price for access, those processes imply that it is truly an economic price. It is predicated on the fact that Telstra's local loop is a natural monopoly; that is, the only way you can foster competition is by opening it up by force and mandating a price for access.

Unwired can provide a competitive infrastructure network. However, if the price that is mandated is set at a level that is extremely low it will affect our ability to put in infrastructure. While we know that we can be competitive, if that price is set at a level that is artificially low our ability to put in infrastructure and earn a return which we can justify to our shareholders would be extremely difficult. While we favour competition we would be very concerned if prices are set for access at artificially low levels because you would not get an alternative infrastructure player in the market. Therefore, people would get access to the local loop but at the end of the day there will still only be one company providing that local loop—and that will be Telstra. So there will be less competition. Our concern is not about competition; our concern

is more that, if prices are artificially set too low in the market, there will not be further facilities based investment.

Mr Hayne—I would like to add to that comment. It is not just the setting of prices that is the issue, and I do not think that that has happened so far. But there is a constant threat of price intervention. We recently saw a 30 per cent drop in access to the local loop that was fairly widely reported in the media. That was a commercial response to the threat of regulation from the ACCC. Whether it is done as a response to some sort of mandated regulatory direct action or as a response to the threat of that action, the outcome is the same. We would like to see the prices that are being charged in the market for access to infrastructure like that to be true, natural prices. I do not quite know how we get to that but it is very important that they be real prices because our network is being funded on the basis of real prices—it has to be.

CHAIR—Does this play into your other point about the uncertainty in this area and statements made by various players that lead to people not being sure of what the future of broadband is going to be in Australia? People are not sure what they should invest in or whether they should make any decisions until they know what the regulatory regime is going to be.

Mr Hayne—It is certainly an issue. As David has mentioned, the market at the moment is depressed and it is very sensitive to headline changes. The stuff that the media report on the front page of the business pages is something that our offshore investors in particular are sensitive to. They might not be as familiar with the local landscape as the Australian investors are and they see these changes and they react at a gut level to them, particularly in the current investment climate. As we go about trying to raise some money, stability and regulatory stability are fairly important.

CHAIR—So you would like some kind of national framework that talks about 'nation building infrastructure development' that was certain to remain in place for a period of time—with some review down the track—rather than ad hoc decisions being made by agencies of the government.

Mr D. Harris—That is correct. Unwired is very conscious that one of the drivers of broadband is price. So we are very happy to see price to the consumer come down because that is important to spread the growth of broadband in Australia. We are not against seeing price reductions in the market; we are just concerned about the mechanism for that and that there is constancy and consistency in policy.

Mr TICEHURST—Your biggest threat would be if Telstra came in and dropped their prices after you had put in your infrastructure.

Mr D. Harris—Mr Ticehurst, that is a point that we have made. You are quite right: we are going to roll out a network—we have started already—and we are asking the committee, and we have raised it in the submission, to be aware that there will be reactions and responses to us launching our services. Clearly, if there was a dramatic price reduction, we would be concerned and we would obviously be looking to see how that might be addressed.

Mr HATTON—We have just had the ACA give us a briefing. You have given them a belting in your submission in one particular area, so it is good that they have actually stayed. I might

just highlight it. On page 49 of your submission, with respect to the register of spectral licences and the registration devices, you have put a strong argument to say that:

> ... there is no public benefit in shrouding these licences in technical language and complex processes.

You have got a number of concerns with the device registration process and the procedures, and the key one is that:

> ... both the base station and the subscriber terminal are required to be registered under current rules. This is unnecessary, inefficient and costly.

You would rather have another regime put into place by the ACA. The problem is, as the number of subscribers go up, where they have to have individual registrations, you say that that is not necessary and should be covered more globally in the licence. For the benefit of the ACA, who are here, would you outline what your argument is.

Mr D. Harris—I would ask Mr Hayne to do that, because he has spent a lot of time on this.

Mr Hayne—Firstly, for the record, I want to acknowledge that the ACA is responding to our concerns. We have raised them directly with the ACA, we have raised them in the context of the Productivity Commission, and I really am delighted by the response from the ACA. They have asked us to work with them to develop an alternative model. We have put an alternative model to them and, so far, that has been warmly received in the discussions that I have had. It needs to be developed some more, but that is fine.

Our major concern is with subscriber terminals. Without putting on the public record anything about our market projections, if we were to assume for a moment that we were to get 200,000 subscribers, at the moment the rules seem to require that every one of those subscriber terminals needs to be registered. To be registered, a site has to be created in the ACA radcom database. I recently got an invoice for the creation of a small number of sites from the ACA, and it was large. I do not want to put the ACA on the spot by entering it into the record, but I can certainly show it to you and show you exactly what the cost was. The ACA might want to respond directly to that. Quite frankly, we cannot afford that overhead cost on registering a subscriber terminal—it is a cost on our business that is unnecessary in spectrum management terms.

There are two parts to our system: a transmit part of the spectrum and a receive part of the system—the communication crosses over. We support fully the idea of registering transmitters and receivers in the database station, because they are the key to the system. Other spectrum users need to know that there are high-power, high-site transmitters around so that they can avoid them, and they also need to know that there are high-site and sensitive receivers at particular sites, so that they can plan to keep their transmitters away from them. So we have argued that for an FWA system such as ours, we really only need two items in the register of radiocommunications licences: one is the base station transmitter and the other one is the base station receiver. At the moment, we need to register the transmitting element of all the subscriber terminals and we think that is excessive and unnecessary in a regulatory sense.

There are also privacy implications: all of those customers who have an unwired box now have their address in a public database. I do not think that they know that. It also has commer-

cial implications, because every one of our customers is listed in the public database, and our friends from Telstra, for example, if they were competing with us, would be able to come along and find out where they were. I am sure that Telstra has similar sorts of responses, as do other telecommunications carriers. To finish the line of thought, we are working with the ACA at the moment to come up with a different and better model, and I am very grateful for the effort that they have been putting in to respond to our concerns.

Mr HATTON—That is good. I imagine that you had to have this dialogue and you had to approach this, because it has not really been an issue before.

Mr D. Harris—No, it has not.

Mr HATTON—It is only because you are entering the market and you have done a projection in terms of what you need to do.

Mr D. Harris—That is correct.

Mr Hayne—This is the first fixed wireless access network that uses spectrum licences.

Mr D. Harris—We are looking for a group registration approach because we think that makes sense. We acknowledge our requirements but we are looking for a group approach because that is a more sensible way. Every subscriber terminal basically is the same, so that is the approach.

Mr HATTON—If I could go to one of the comments you made before, in terms of the high power of the transmitters and the receivers, even though you have a different part of the band—the 3.4 gigahertz band—you are pumping out at high power within that band. Is one of your concerns about the unlicensed public park area material being pumped out at a higher power than necessary there? Could that impact on you, or are the comments just related to the impact of that in other areas, in terms of interference?

Mr Prins—I would like to answer that. The public park spectrum is in relative terms quite a long way away from us, so we are not concerned about that. If those devices operate as per their licence conditions they should have no impact on us at all. That is quite a separate issue. That will be an issue about banned emissions, which should not happen under their class licence approach. No, that is not the issue.

Mr HATTON—In terms of having to register where your transmitters and receivers are, what other people do you have to worry about? Who are the people who are close to you in terms of the band? Why do they have to be notified?

Mr Prins—The people that we did get concerned with are the people who are next-door to us in spectrum terms, in terms of frequency, because typically devices do not limit their radiation purely within that channel, so there is an added band emission problem. Secondly, under the spectrum licensing regime there may be—and in some case there are—owners of spectrum using exactly the same frequency but separated geographically. In order to manage this, we have to be sure that we do not interfere with their receivers and that they do not interfere with us. Of

course, the higher the site of the transmitter and the more power you have, the greater the probability of some mutual interference.

Mr D. Harris—That is part of the reason why all the spectrum and network planning is so critical. We have to show that there is no interference. While Mr Prins said the issue is not so much with the unlicensed or the 802 type devices in terms of interfering with us, it is an issue that, if you are going to set up the network with certain integrity related to that network, you have to do the frequency planning, the spectrum planning, in a very specific way, otherwise you will get interference all over the place. That affects the performance of the equipment. It is an important issue.

Mr HATTON—Given that your rollout is expected to run through most of Australia, you have to plan with a number of constraints in mind, and a key part of those constraints is the topographical constraints—for instance, a place like Sydney versus Melbourne or Brisbane or whatever. Can you tell us a bit about the problems you have got with valleys and higher areas in a place such as Sydney in terms of the technical things you would have to do to take that fact into account?

Mr Prins—Unwired is fortunate in that we do have access to a large piece of spectrum. Also, we have contiguous blocks geographically all around Australia, so in that sense we can be our own spectrum manager. By and large we can be our own spectrum manager. In areas where the topography is difficult for wireless, such as Sydney, in order to deploy the network economically, we have to very carefully plan to minimise the number of base stations that we need to achieve coverage and the greater service that we are looking for. That becomes more of an economic issue than a spectrum management issue. In fact, in Sydney, for instance, we already have developed a very extensive database with elevation information all digitised, and we can predict with a high degree of accuracy the coverage from any particular transmission site. We use these powerful tools to optimise our network in terms of the number of transmitters and the height of those transmitters for two reasons: first of all, to maximise the coverage so that we can minimise the number of base stations, and, secondly, to minimise the mutual interference between our transmitters because we have to re-use that same spectrum again and again, like a cellular GSM network. So there is this balancing act between trying to conserve our own spectrum and not interfere with us, and minimising the number of transmitters. This is a classical frequency planning, spectrum planning, exercise.

Mr HATTON—If you become too popular, if too many people take up your services—

Mr Hayne—We will invite you to the party!

Mr HATTON—Given that you are pumping out voice as well as data and given the cellular nature of the service and the fact that once it fills up either you get a degradation of signal or you have to pump some more money in by putting some more infrastructure in, can you explain the implications of that? Can you tell us about that?

Mr Prins—Certainly. Our situation is no different from its use in the mobile network. Telstra, Vodafone and Optus have a limited amount of spectrum. They have had that spectrum for a long time. As the network builds up and there is a growth in the number of subscribers, they shrink the cell size, they deploy more transmitters and they re-use that spectrum again and again and

again. But, of course, if you have lots of subscribers you can afford to shrink the cell size, because you have the revenue to support additional base stations. It is really just a question of economics. You can continue to shrink those cells down to very small sizes. In Tokyo they are running at 100-metre diameter cells—very, very small cells—because they have the density of subscribers to support the cost of the infrastructure.

Mr HATTON—You plan to do this rollout on a very staged basis and basically pay your way as you are going—

Mr Prins—Yes.

Mr D. Harris—Absolutely. The advantage of the fixed wireless access technology is that it can be deployed in a very modular form. We can put up base stations, attract customers and then move to the next stage, and that is exactly the way we are going to do it today, with what we call a risk managed approach which is appropriate for the market. When a base station fills up, we can either add capacity to that base station or put in additional base stations. As long as we have the radiofrequency planning done properly and the spectrum management done properly, we can re-use that spectrum. It does give us some capacity upgrade opportunities.

CHAIR—Is the Paddington base station going well so far?

Mr D. Harris—It is going well, yes. All of this week we have been connecting people, and we will continue that for the next few weeks.

Mr HATTON—I will now go to the nub of my questions—this is the tough bit where we get into the wired versus the wire. I have had two entirely different prognostications about how Unwired is going to go. One is not just about certain associations but about the nature of wireless, the nature of the development of the technology so far. As I pointed out to the ACA, this view comes from a reasonably acerbic ex-engineer type. He argues that for 40 years there have been prophecies that wireless is the key to the future, that it is going to provide just about everything we need and that it will be the solution to the problem—so right now it will be the solution to the last mile problem. But, from his point of view, it has not succeeded over those 40 years and has not become dominant. He says that the wired connections are more reliable and that wireless is open to weather hazards and a range of other problems because of the nature of the ether, and he gives you six months before you fall over—not too generous.

The other point of view is that whatever the situation is now and whatever advances there have been—and, according to the evidence we have had from the ACA, there have been significant advances over the past 40 years in the provision of wireless, with quite a great deal of integrity and the whole backbone of the old telephone system prior to optical fibre being provided, so the wireless area has not been asleep during that period of time and has not let down the number of runs in the book—at this time we are probably three years or so away from the point where a lot of the technical problems in the wireless area will be solved. Obviously, if you were going to put your money behind this kind of project, you would have a look at all those sorts of things and you would like to believe in the second prognostication—that you will get through the six months and go through the three years and more will happen. Can you give me an idea of what your views are at this point? That is a provocative comment.

Mr D. Harris—You have asked a wide range of questions. Let me start and I will pass to my colleagues as well, because we will be covering a number of different issues here. Firstly, wireless has been around for a long time, as you quite rightly pointed out, and one should not forget the mobile industry as well, which is prospering pretty well at the moment. In fact, while there might be a bit of a slowdown, it is still the major growth component of most telecommunications companies now. Australia is no different. Our view is certainly that wireless is around and it will continue to be around—and it will not surprise you that that would be our view.

There have been tremendous advances. One of the advantages of the 3.4 gigahertz spectrum is the issue of interference from rain, dust et cetera—it is not as susceptible to that. As you go higher in the spectrum range, you then have to have more precise line-of-sight signal and you are, therefore, susceptible to some interference, but 3.4 is a good balance between getting decent speeds and not having to have the perfect line-of-sight in order to not be susceptible to problems. We have done a lot of work in the 3.4 gigahertz spectrum—and I will ask Mr Prins to comment on that—on rain and leaf interference et cetera, and it is not an issue. The reason we chose Airspan Networks as our radio solution provider is that they have been doing a lot of very clever things in terms of usage of the spectrum—for example, if somebody's signal drops, compensating for that—and I will get the engineers to talk in more detail about that. There have been tremendous advances over the last few years—there is no question about that.

The final point I am going to make is that we are not suggesting that wireless is going to be the only solution—far from it. There are going to be other solutions and we recognise that: ADSL is a perfectly suitable solution, HFC is a perfectly suitable solution and satellite is a perfectly suitable solution. What we are saying is that there are different, appropriate uses for those different technologies. We think fixed wireless has a particular role to play because of the demographics and distances and population densities within Australia. But there will always be ADSL and there will always be other solutions, so we are certainly not sitting here saying, 'It's only going to be wireless and wired is a thing of the past.' That is not true; we are certainly not saying that. I think there is room for a number of technologies. What wireless gives you is a quick way to put in an alternative access network because, at the moment, there is no alternative access network.

Mr Prins—I would like to add some comments. I suppose, basically, I am a wireless engineer, but I have worked in fixed networks in the old Telecom days, so I have had good experience in both fixed wireless, wired line et cetera. The issue is not simply one of the appropriateness of 3.4 gigahertz or wireless—I think the runs are on the board: there is no question that this technology works. The issue is not that; the issue is really one of cost. The reason these systems have not taken off around the world is because it has not been viable economically to deploy a $US2,000 terminal to compete with an ADSL or an ISDN network—that has been the real issue. We are reaching the stage now with companies such as the ones we are working with where the critical mass that is required to bring those prices down is getting to the point where you can compete. ADSL has a huge advantage: there is 100 years of sunk costs in the copper network which they are leveraging from and they are adding something to it to provide broadband. We have to start from scratch; we have to build our base stations and we have to offer subscriber terminals and recover that cost and still compete with somebody who has been able to leverage off a fixed sunk cost which has been amortised years and years ago. I really believe it is a cost issue and not a technology issue.

Mr Hayne—Telstra has been using fixed wireless access in this country since about 1996 for the 3.4 gigahertz band and even earlier than that for other systems. When they first started to use 3.4 in about 1996-97, the reason they went into that band was that fixed wireless access gave them an alternative solution to a problem that they could not otherwise solve with copper. They were using it to get into difficult-to-service locations: places where they could not dig trenches to lay copper because it was sandstone or rock or whatever or because they could not get lines into some remote pockets. So fixed wireless access became a way for them to solve a particular technical problem about extending access that just could not be done with copper, glass, HFC or whatever. We are in that position today. We understand that there are parts of Sydney, for example, where it is not possible to get additional telephone lines because the area is saturated. FWA provides a very easy, cheap and elegant way of extending equivalent services, but without having to dig up the streets to lay more copper or having to dangle them through all the powerlines and so on.

CHAIR—In your comments and submission you talk about partnerships and how your technology is complementary to other technologies. That is a theme we have heard from almost everyone who has given evidence so far. Are there any examples of where the major industry players, including Telstra, are working with other companies to employ various technologies that are complementary to each other?

Mr D. Harris—One specific example is our equipment: the Airspan subscriber terminals are now 802.11 equipped. In our office we have the capability now to connect, and new users will have the capability through wireless within their homes or offices to connect. That is one example of complementarity. We give the wireless signal to the building and then it can be extended through the 802.11 application, which is what the 802 is perfectly suited for, and we are suited for that last mile. So we are doing the last mile and they are doing the last 50 to 100 metres. That is a perfect example today where there is a real, live application. I am sure there are some other examples.

Mr Prins—I think if you look at the Telstra network today, they are using an amazing mix and array of technologies. They will choose a technology to solve a particular problem, and in that sense they are quite technology neutral.

CHAIR—That is referring to different technologies, but what about corporations working together to come up with solutions? Can government cause any cooperation to occur? You talked about the market dominance of Telstra. Are there examples of where cooperation would be able to bring about solutions but companies are not cooperating because they do not want to see competition?

Mr D. Harris—I am sorry, I misunderstood that part of your question. Absolutely, I think there are opportunities. Certainly, while I understand companies have their own commercial considerations, governments are encouraging companies to work together. In some of the regional and more remote areas our wireless technology, together with Telstra, for example, may be a more cost-competitive solution for the companies than each company actually ploughing its own furrow and doing it independently. That is very much the case; there are discussions on that subject and there is a good working relationship. I think the government can certainly encourage that and it is in the interests of the users, because the solution they are going to get will be the most cost effective. And it is not just cost effective; it is going to be quick. We can deploy

fixed wireless, and once we have a base station the time taken to connect subscribers is a couple of hours, so it is very quick to connect people. Once we have that base station infrastructure out there and the transmission back, to actually go out and connect to subscribers is very quick. So we believe that is good for the development of the economy, from a broadband point of view. I think there is definitely room for that.

Mr Hayne—We have been approached along the way by a number of players who have optical fibre based backhaul capabilities, particularly in the major cities. There are a number of them, some of whom you have probably had submissions from. We would love to work in partnership with people with that sort of capability. But it is not just in the commercial sector: government organisations, particularly state government organisations, have extensive telecommunications networks that are effectively closed networks. Railways, for example, have spent a lot of time laying optical fibre cable to provide traffic signalling and management, and those sorts of things.

It has huge bandwidth potential and, in partnership with a company like Unwired, we would be able to extend the capacity of those networks for other things into places where we would otherwise not find it economic to go. We may, for example, be able to reach arrangements to do some support for government entities to provide basic community services on the back of their infrastructure, and get a sufficient kick to make it economic for us to extend commercial services on a marginal cost basis. The potential for partnerships is very broad. It is not only commercial entities but also government entities, and we would be keen to work with anybody who had capacity that they were interested in opening up for us for backhaul.

Mr TICEHURST—I have a question on perpetual spectrum licences. Essentially now you have a 15-year licence, although some part of that is gone?

Mr D. Harris—Yes, that is correct. They were clearing out the spectrum before we could truly start operating in it—and that took about a year and a half.

Mr TICEHURST—You now have to make an investment in capital equipment and, if you cannot amortise all that in 15 years, this is why you are really looking for an extension or a perpetual licence?

Mr Hayne—It is not just the investment that we do today that is important. This is a network that will grow over time and it will require ongoing capital maintenance. We are concerned that our ability to invest in ongoing capital maintenance from years 8, 9, 10 and onwards starts to become quite high risk and we have to hedge against the risk of the licence expiring and it not being renewed. That might, in turn, mean that we have to wind down capital investment, in the sunset years of the licence, and that has detrimental effects for consumers ultimately.

Mr TICEHURST—Essentially you are almost creating another monopoly on the wireless side. If you had a perpetual licence you would have a monopoly. Also you made a comment about a nation building infrastructure because I guess in a way that is what you are trying to achieve. What happens if you are stuck with your original licence of just 15 years?

Mr D. Harris—We understand the reason why we get a 15-year period et cetera. The point that Mr Hayne raised is that we want to continue developing and growing the business. If one

does not know what is going to happen at the end of that 15-year period, you are then in a position where well before the end you start saying, 'What am I going to do? Do I continue investing or don't I continue investing?' You start making very short-term and potentially not the most sensible investment decisions because you are looking at the short-term approach. We are raising it as an issue; we do not suggest that there is an easy answer to it necessarily. But we have raised it and asked the committee to think about this as part of its work because it is not an incentive for operators to continue after say years 10 or 11. I think all the operators will face the same issue. We are not unique—we are just raising an issue that we think should be discussed.

Mr TICEHURST—It is a good point and quite valid from a business point of view.

Mr D. Harris—Yes, from a business point of view and I understand that there are other perspectives here as well.

Mr Hayne—I would like to add that we do not have a monopoly. We do have an exclusive spectrum licence in the 3.4 gig band, but there is a lot of spectrum out there that we do not have access to. Telstra has a huge amount of spectrum available to it, Optus has less, and the Department of Defence has a huge amount. We would not suggest for one moment that they have a monopoly over it. Certainly we have exclusive access on a very tiny amount of spectrum comparative to everything that is available but that does not make a monopoly.

Mr D. Harris—Even in the 3.4 gig band we do not have exclusivity.

Mr TICEHURST—When you look at Hutchison, their CDMA was providing a fixed local call cost—an untimed call in a certain area of a particular user. If that was a fixed arrangement, and I am not sure whether the new CDMAs are going to get anywhere near the bandwidth that you can get with Unwired, that is a potential competitor I guess.

Mr D. Harris—Yes, that is correct.

Mr Prins—Some people are arguing that 3G is a potential competitor because they can provide, certainly to stationary 3G terminals, notionally up to about two megabits per second. In theory they are competitors.

Mr D. Harris—Not just in theory. I think for certain classes of customers they will truly be a competitor. For example, for people who want to be on the move all the time it will suit them better than fixed wireless.

Mr TICEHURST—Do they have the same restrictions with access to the frequency?

Mr Prins—In terms of tenure, yes.

Mr Hayne—They have spectrum licences very similar to ours.

Mr HATTON—How wired is Unwired?

Mr Hayne—That depends.

Mr HATTON—Once you get it to someone's home, what do people face? They have a box; do they have to get everything around? I know there is a synergism with Bluetooth, but do they have to face that or can they use their existing resources such as telephone, TV and video?

Mr D. Harris—They can use everything because the connection into the box is just the standard connection that is there today. So they have a number of extensions in the house running off a wire system that just plugs straight in. If they do not want a wireless within their home and they do not want to change all their telephone sockets they do not have to do a thing. All they get is a subscriber terminal and a little antenna on the side of the building with a cable that drops down into the back of that subscriber terminal—and that is it.

Mr HATTON—So they can plug it in in the way they would plug in ADSL or anything else?

Mr D. Harris—That is correct.

Mr HATTON—You have already alluded to the subject of my last question, in answer to the chair's question. This is one of the most significant issues for us: provision of services in rural, regional and remote areas. We know there is going to be a mix. We have had a series of possible solutions about how to fit into the backbone services and get them to regional towns. There are some technical problems with some: they can broadcast but they are reliant upon other carriers to come back. How prepared are you to roll out into regional and rural Australia and to provide your services to country towns so that you can link back into the hub, possibly at a lower cost than the depleted copper network that is out there? Further to that, do you have advantages—as with satellites—in terms of uploading and downloading data? Can you do it at equivalent rates or is there an asymmetric data regime?

Mr D. Harris—I will start by answering the first part of the question. We plan to be in regional towns. As we said in the submission, the nominal planning is based on towns of 50,000 and above. But we have also explained that we can go much smaller than that. With the nature of our technology and base station, we can equip a base station economically on relatively few customers. I do not want to quote the number on the public record because I do not think it is appropriate but we know the economics and they are very attractive.

Where there are regional towns with a population much lower than 50,000—10,000 or even lower—as long as we can achieve a certain penetration of people who want a broadband service there is no reason why we cannot provide them with a service. We will provide them with a service; Unwired will be in those towns. So there will be a solution from us which will have all the conditions of a carrier in terms of quality of service and the related billing and provisioning et cetera. It will be a high quality carrier network. Clearly we have to link back into a carrier's backbone. There are people who we will link back into because we still have to carry that traffic back to points of interconnection. But that is not different, whether we are in metro, regional or rural locations. There is a solution; it is a solution that works effectively.

From a purely commercial point of view, in the most remote locations Unwired would need a minimum number of customers per base station. It would be very difficult for us to provide a service on a stand-alone basis for 20 people out there. However, you have to look at that in light of the alternatives for getting services to those customers. If the alternative is getting cable to all those customers, the solution would be much more expensive. As you know, Telstra has an ob-

ligation to provide services to those customers. We think that we can provide them with a service that will enable them to service those customers at a cheaper cost than if they have to run cable. If it were a stand-alone commercial proposition it would be difficult for Unwired to provide services to those remote customers. But if a carrier like Telstra has to provide those services, we think we can provide Telstra with the capability of doing that in a more cost-effective way than the alternatives. That is the benchmark we should be measured against.

As far as data upload and download speeds are concerned: the basic proposition we are offering is an asymmetric service of anything from 256 to 512 kilobytes per second download—although we can go much faster than that—with upload speeds from 64 or 128 and above. However, we are also provisioning our network to provide a symmetrical service, whether that is a 256 service or a 512 service—in other words, the same speed in both directions. We are conscious of the fact that there are a lot of small businesses that need a symmetric service as opposed to an asymmetric service, because they are both downloading and sending a lot of information, and therefore that is critical. So we have the capability of providing the full range of product. We have the capability of going into very small communities. As I said, when we start getting into very remote ones we come to the question of government funding. We raised that in our paper when we said that if we had that we could provide those services.

Mr TICEHURST—What range would you get in, say, the Hay Plain area from a fixed point?

Mr D. Harris—There are deployments that go up to 25 kilometres in radius. At our base station at Paddington today—and we have not tested it for range—we are picking up a high-quality signal 14 kilometres away. We can go up to 25 kilometres.

Mr TICEHURST—I was thinking of tens of kilometres.

Mr D. Harris—No, that is the number. It depends if there are a lot of valleys and so on, but if it is relatively flat the range is up to 25 kilometres.

CHAIR—Thank you very much for the very helpful evidence you have given today. I also thank you for having us when we were in Sydney a fortnight ago.

Resolved (on motion by **Mr Hatton**):

That this committee adds Mr Ciobo and Mrs Grierson to the subcommittee for the Adelaide hearing on 1 July.

Resolved (on motion by **Mr Ticehurst**):

That this committee authorises publication of the proof transcript of the evidence given before it at public hearing this day, including publication on the electronic parliamentary database of the proof transcript.

Committee adjourned at 4.03 p.m.