An Industry Vision for the National Broadband Network Plan

Prepared for the

Minister for Broadband, Communications and the Digital Economy

Senator the Hon. Stephen Conroy

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Background

In March 2006 the previous Minister for Communications announced a $600 million Broadband Connect initiative that resulted in the current OPEL initiative. At the time, the Minister invited the industry to speak with one voice and, as a result, the Wholesale Industry Group (WIG) was established. This group developed the Telecommunications 'Open Access Principles' that are referenced in Appendix A of this paper.

At the BuddeComm FttP Roundtable in Sydney in October 2007, the Minister for Broadband, Communications and the Digital Economy, Senator Stephen Conroy, subsequently invited the industry to prepare a telecoms infrastructure vision paper as a term of reference for the Government's National Broadband Network (NBN).

Building upon the previous work of the Wholesale Industry Group, and referencing the Australian Labor Party's 2007 document, 'New Directions for Communications - A Broadband Future for Australia – Building a National Broadband Network'1, a 'FttP Special Interest Group' was established to formulate ideas and provide a common voice for the FttP industry. A key output of this group has been the development of this collaborative industry paper that puts forward a series of industry recommendations for the Government's NBN.

As in any collaboratively derived paper (in this case, where approximately 600 pages of contributions were submitted) there will always be a multitude of views on various topics. This paper attempts to categorise these viewpoints within the context of the Minister's National Broadband plan and present them fairly. While the industry has provided broad consensus on the views and recommendations in this paper, it is inevitable that sometimes, opinions may occasionally differ. In those cases the conflicting views have also been expressed.

This paper will be presented to the Minister at a BuddeComm Roundtable on the 6th March 2008.

Acknowledgements

Facilitated by Paul Budde, this paper has been prepared collaboratively by various volunteers who have contributed a range of individual submissions that have been discussed at an Industry Roundtable on January 31, 2008.

Commitment from the Industry

Despite the fact that over 600 pages of submissions were received, this report has been kept brief. Once the Minister has made a decision regarding the direction the Government will be taken, the FttP SIG would be delighted to assist the Minister with more details. The key here is that industry based working groups can be established to work out the details, for example, in relation to technical issues, regulatory issues, industry cooperation, mapping of infrastructure, and arranging cooperation with local governments and state government. The network of the 140 companies represented in this group is at the Minister's disposal to assist in realizing his vision regarding a true National Broadband Network.

[1] Available at www.alp.org.au

1. Summary

The Fibre to the Premise (FttP) Special Interest Group is very supportive of the Minister's plan for a National Broadband Network (NBN). This document outlines an industry vision and a suggested framework to support how the Government's NBN initiative can be maximised.

Underlying all of the recommendations in this report is a fundamental message and recognition that broadband is more than just faster Internet connections. Real broadband is about provisioning ubiquitous levels of connectivity that provide a catalyst for further developing a wide range of other industries. These include health, education and other utilities in addition to telecommunications.

The FttP group has identified the following recommendations for the special attention of the Minister:

1. **Ubiquity –** Establish an advanced, scalable, and long-term sustainable broadband network infrastructure that has national coverage and is accessible to all Australians.

Open Access Network Environment

2. **Open Access Networks** – Promote a strong commitment towards 'Open Access Networks', with a clear enabling set of rules attached to it. These rules will provide access seekers with equal opportunities to deliver content and services as well as to be provide them with equal access to the network at identified demarcation points.

3. **Fair Access Pricing** – Ensure fair access pricing caps are in place for uncontested markets.

4. **Consumer Flexibility** – Establish necessary legislative and regulatory structures that support a *long term* capability to maximise consumer choice of service providers.

5. **Competition and innovation** – Promote competition and a culture of innovation between service providers who access the open network environment.

6. **Appropriate Governance** – Establish appropriate changes to telecommunications and competition legislation to support an Open Access Network environment. Appoint an independent body, such as the ACCC, to oversee this legislation. Whilst changes are sought, the resulting environment should be one of minimal regulation. Once balanced NBN markets have been established, competitive market forces and industry self-regulation should be the main method of achieving outcomes for network deployments and network operations in that market.

7. **Network Layer Approach** – Arrange the current 'broadband' industry into two independent 'access' and 'applications' sectors. Establish the necessary legislative and regulatory framework that will support each sector's requirements.

Industry Benefits

8. **Multi-Industry Benefits** – Formally recognise that the NBN offers multiple industry opportunities and is far more significant for Australia than just a faster means to access the Internet. Through appropriate government policy, new NBN applications can play a

pivotal role in addressing e-education, e-health, climate change, communication, smart utility grids, and entertainment services as well as high bandwidth Internet access.

Technology

9. **Realistic Time Frames** – Establish realistic timeframes for the implementation of a comprehensive FttP plan. The concern here is a need to ensure successful outcomes. A well executed plan will involve timely policy making, detailed and considered planning and a delivery timeframe that recognises the commercial needs of bidders.

10. **Technology Neutral** – Recognise that the technology choice for a NBN should come down to an evaluation of which solution will deliver Australians the most scalable and long-term sustainable answer. Whilst the NBN is ultimately expected to deliver FttP to many parts of Australia, this solution may have to initially involve some hybrid technology components.

11. **Stepping Stones** - Recognise that in order to reach the end vision of a national FttP solution, that a staged approach to an infrastructure build may have to be undertaken in some areas. An FttP solution will be a 5-10 year process and may therefore require a number of stepping stones to achieve. Accordingly, the industry accepts FttN as a necessary step but not as a goal in itself. A staged approach towards an agreed end goal of FttP, should result in avoiding an overbuilds of infrastructure, promote more realistic investments and avoid endless regulatory debate along the way.

12. **Clear Technical Specifications** – Require NBN bidders to provide clear technical and standards driven specifications of their proposed services. The specifications should be sufficient for potential access seekers to assess the capability of the NBN, engineer and plan migration to the NBN, and to develop new and innovative services that utilise high speed connectivity speeds offered by FttP technology. The services should also adhere to strict privacy and security standards.

13. **Promote Shared Industry Plans** – Require NBN bidders to indicate and co-ordinate their plans for investment with other bidders. When building a national infrastructure, cooperation is essential either voluntarily or via legislation. As a country, Australia can't afford to waste resources through overbuilding where it is not economically viable (as is the case for most of regional Australia). For example, the Wholesale Industry Group has promoted industry cooperation by working together with the Government to map the locations of existing infrastructure to highlight the gaps that will need funding and to indicated where the interconnect points between the various networks could or should be (meet-me-points).

14. **A Holistic Approach** – Develop a holistic approach to the NBN that also includes social, industrial and commercial requirements in addition to technical and financial considerations. The industry would prefer the government to set affordability goals, coverage targets and time frames for initiatives such as e-health, e-education and smart grids, so that the industry can develop appropriate infrastructure plans to support them. In addition, the Government should build upon initiatives like these and link together various other related governments plans in a whole-of-government approach. (eg. national smart grids for the utilities, $100 million for e-learning infrastructure, e-health infrastructure etc.).

Leveraging Government Investment

15. **Alignment with Other Programs** – Ensure a seamless integration with the National Regional Backbone project (OPEL).

16. **Leverage Investment** – Leverage as many government resources and initiatives as possible to attract investment in a national broadband network infrastructure. By developing a visionary government strategy to co-ordinate a range of related government initiatives under one umbrella (such as OPEL, NBN, health, education and smart grids) it will be possible to maximise the effectiveness of the proposed investment of $4.7 billion of government funding.

Education

17. **Industry Education** – Ensure industry training programs on NBN technologies are established that will address the current shortfall in skills available in the marketplace. The winning bidder should also promote the benefits and uses of an advanced broadband network infrastructure to all Australians.

2. Open Access Networks

It is recognised that a new equal and open access regime, as per the current Government's policy, is the best way forward. Despite the enormity of this challenge in the context of existing legacy infrastructure, it is strongly believed that the establishment of equal and open access to a National Broadband Network would provide a catalyst for industry wide change. This access would extend from the passive physical infrastructure through to service providers wishing to provide new and innovative services to their end customers.

The establishment of an equal and open access model for the NBN infrastructure would prevent monopolies from developing from the outset. A key concern is that if monopolies are allowed to develop when other options are available, an enormous effort is required to regulate and dismantle this distorted market at a later date.

Equal and open access from the access seeker's perspective, requires achieving a degree of co-ordination across a range of alternate access methods and technologies. For example, if more than one access technology is deployed to serve the same market or region (eg. FttP in one part of the community, FttN in another part, ADSL2+ in another and wireless in another), the points of interconnection for these delivery methods, should ideally be located in the same physical site.

2.1 Defining Open Access Networks

The equal and open access approach relates to all technology and the operating company(s) for the new NBN. It also relates to many of the key features of the Ministers own broadband vision. Structural separation, and even operational separation, would substantially simplify the regulation of the NBN. However, if very strong equal and open access principles are implemented, the industry can accept the network will be a positive step forward.

Because the NBN will rely heavily upon public resources for it to succeed, this poses an ideal opportunity to incentivise the development of an equal and open access model.

Open Access Network

Building upon the open wholesale principles identified in Appendix A, an open access network should operate under the following guidelines:

- Equivalence of Access Charges (Labor vision);
- Full scope for access seekers to differentiate their product offerings by allowing the customisation of access speeds, quality of service and contention ratios (Labour vision);
- No discrimination against Access seekers;
- Equal access to accommodation, backhaul and necessary public resources;
- No penalties on consumers who wish to change service providers within a short a period, should the service provider not have met contracted conditions to the customer;
- A high availability of information about services so that informed users are able to make correct decisions.

Open Access Network Company Regulations

The industry should be confident of proper structural separation of 'Open Access Network Company(s)'. Regulation could be based upon an adaptation of 'stockmarket' collusion rules and the following key characteristics would apply:

- No single commercial organisation will be allowed to establish a monopoly over the NBN or parts of the NBN;

- An enforcing of conditions to ensure autonomous participant decision making processes by the various operators;
- A limitation on cross shareholding, or type of shares to ensure there is no ultimate concentration of control; and
- Where an operator has utilised a public resource to build a portion of the NBN' and there is no competition, the investors returns must be capped and the employees salaries must be tied to that of the public service.

2.2 Open Access Model

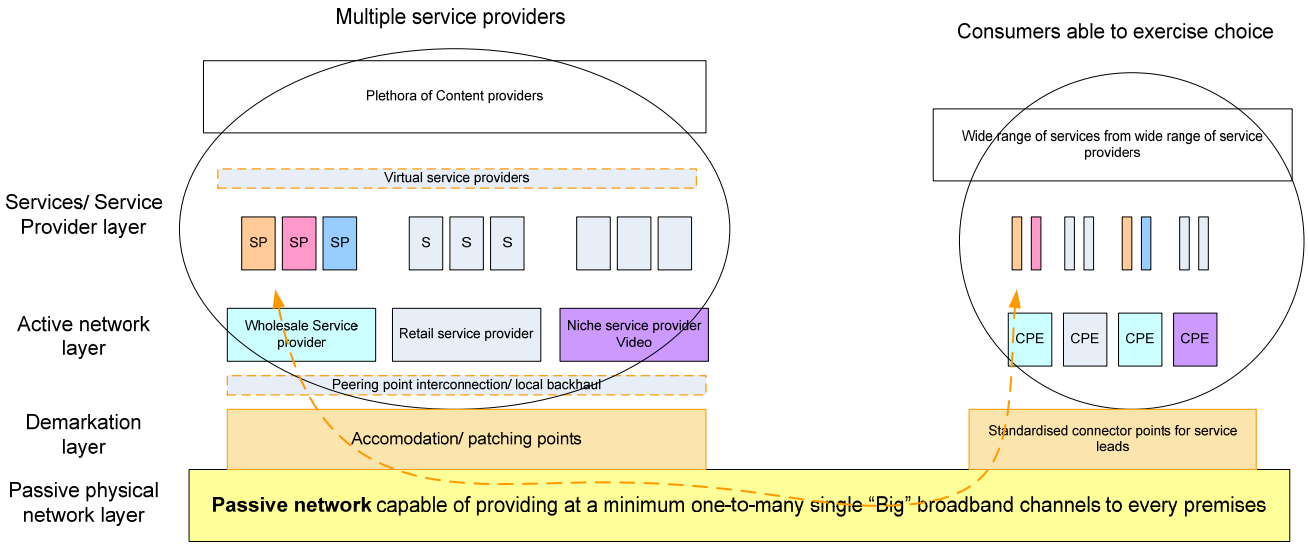

Figure 1 – The Open Access Model

The end vision favoured by the FttP SIG, is a multilayer value add connectivity model as illustrated in figure 1. This model is similar to models used elsewhere, and is based upon an operating principle of physical technological and structural separation that allows for intra-layer contestability at multiple layers.

The engineering to achieve such an open model is possible without unnecessary economic burden and some of the details for the network performance of this model are presented later in this paper.

The model would be equally applicable to a single national network as well as for multiple regional based networks. For example, using this model, it is possible for local municipalities to actively participate (as opposed to conducting passive toll collections) and this approach has been successful in Fibre-to-the-Premise rollouts in the USA[2].

In terms of government funding, the group believes that the government's earmarked $4.7 billion budget should, in principle, be restricted to the least economically viable parts of the network. This should be supplemented with regulatory controls that actively encourage investment in other parts

[2] Chapter VI, A Blueprint for Big Broadband, An EDUCAUSE White Paper, John Windhausen Jr,.Telepoly Consulting, January 2008

of the NBN. This public “seed money” would apply to the passive physical infrastructure layers (the lowest two layers of the model) and within certain geographic areas.

It is proposed that regulatory touch would be lighter further up the value stacks and be commensurate with normal markets with increasing levels of competition.

In this approach, there should always be aid available for special projects further up the value stack, such as the provision of services to disadvantaged communities, education, e-health etc).

A detailed explanation of the Open Access model, taking a top down approach is as follows:

2.2.1 Content Providers

Content providers provide any form of end user content that is delivered over a service layer. This content can be provided by a mix of local and international providers and include: video or music streaming, IP TV, news or any other type of Web based information service. This layer does not require any extraordinary regulatory intervention as the existing tools are deemed to be sufficient.

2.2.2 Service layer

At this layer, both virtual and physical service providers will “own” the customer. The services offered to end consumers include basic services such as telephone and internet access. As the “owners” of customers, service providers would negotiate with the electronics infrastructure service providers (the layer below them) for carriage of their offered services. This layer could provide opportunities for niche service providers.

2.2.3 Active Network layer

The active network layer provides a capital intensive, competitive carriage layer that consists of equipment that meets the technical connection standards and the operator’s business plans. In the same way that DSLAM operators currently provide service to modems, the Customer Premises Equipment would be paired with the operator’s equipment and the operators would make use of either timeslots or assigned wavelengths, or a mixture of both over the passive physical layer.

Ultimately this physical layer would extend to the premises via whatever method the Service Provider choses, such as: dedicated optical service tails, FttN copper tails, wireless etc.

Today, an element of vertical integration with Service providers already exists, however, the ideal environment would be for multiple equipment operators being able to compete for the business of the service providers. Subsidisation of this equipment is not generally favoured to be included as part of the planned $4.7 billion program.

It is assumed that as an interim measure, solutions such as FttN or wireless, will be proposed and will make use of public resources to provision. Since these solutions have active electronics, they do not lend themselves easily to regulation. Therefore, guidelines for ‘bitstream’ services and ‘multiservice’ capability are proposed.

2.2.4 Demarcation / Accommodation (Service Provider Side)

This layer provides the points of interconnect for operators who gain first physical access to the aggregated network.

Operators in this area will require access to the physical plant as well as access to competitive backhaul that will be either active or passive for their particular content and network architecture. This backhaul could be part of the NBN or some operators might even wish to provide their own backhaul.

The proposal is to have the demarcation points designated to be as close as possible to the customer. (An alternate view is that regional peering points be established instead.) The request for close customer interconnect points is driven by past experience of expensive backhaul.

Based on comments made by the contributors to this paper, regulatory intervention will be necessary at demarcation points that will enable at a minimum:

- The mandating of a standards driven approach for operators who wish to place equipment at the facilities of an open access network;
- Facilitating access to the "real estate" locations required to accommodate demarcation points;
- Subsidise construction of demarcation facilities as part of the $4.7 billion;
- Mandating a minimum number of backhaul providers (or reasonable backhaul costs) to be available at any site; and
- Facilitating operator builds to ensure that alternative backhaul options become widely available.

In the design of these facilities, it should be required to provide at least two separate tiers of demarcation points:

- The first tier would permit passive access to the network with no electronics to be housed; and
- The second tier would include the electronics housing.

2.2.5 Demarcation (Customer side)

The customer demarcation point is deemed to be the location where equipment associated with final service delivery is located. For passive FttP equipment, this will be a point that allows multiple vendor pluggable connections to the passive cable. For multi-dwelling premises these demarcation points can be positioned within a communications room or board. For single residential premises, these can be located at a point on the kerb or an external serviceable and easily accessible area of the dwelling. Using this model, a service provider wishing to provide a service tail to customer equipment would apply to be assigned a connection point. The network infrastructure operator would then ensure that suitable jumpering was in place.

Because the NBN will potentially comprise a mix of alternate access technologies, there will be a need to consider separating the customer demarcation interface into an "access demarcation point" (something similar to the 'first socket' in today's telephone network) and an "application demarcation point" (something similar to the connection between today's DSL modems and the home network.

The distinction will become increasingly important when application-specific capabilities start to be deployed using devices outside the access termination device (eg analogue telephony termination, Pay TV termination, Digital Rights Management, and so on). This distinction will make it easier to impose legislative and regulatory requirements and other responsibilities upon access and application providers. This is particularly important in an environment where several alternate access technologies have been deployed.

2.2.6 Passive Layer

It is anticipated that the $4.7 billion funding will be required for this layer in certain geographic regions. Making use of limited public resources and possible public financial investment, this will be a layer that is subject to regulatory aid and procedures to ensure that the natural monopolistic nature of the built infrastructure is not abused.

This layer will offer passive transport between the customer equipment (via a service provider tail) and the active equipment located at various demarcation points. The ideal would be to provide access to an unlimited number of competing equipment operators (most likely on a wavelength basis). However, *current* technological constraints would mean that 5 – 6 active equipment providers would be required before a sharp downturn in the economies of the solution became apparent (Fibre sweet spots, economies of scale, splitting losses etc).

2.2.7 Equipment

It is anticipated that current equipment offered by vendors could need to be modified to allow multiple pieces of equipment to simultaneously co-exist over the same passive fibre run to a customer. Once regulatory approval is obtained for an access seeker wishing to provide a connectivity service over this layer, access to this layer would then be standards driven. For example, no control over the equipment would be permitted other than to ensure that it did not interfere with other equipment sharing the passive medium. (This is similar to field connectors etc.)

Current technological limitations indicate that a cell size (or area surrounding each demarcation point) is around 15 – 20 km radius.

2.2.8 Passive Layer Operators

Within the context of a revised regulatory environment, there is a potential for a mixture of operators including: incumbents, local councils, consortiums, investors or existing second tier Telco's bidding for the opportunity in the larger centres. These operators (which could include a consortium of local councils) could make use of public funding, such as the $4.7 billion fund.

It is the recommendation of this group that proposals for this layer with large geographic coverage should be favoured. This would substantially simplify the task of the value add equipment operators and service providers.

2.3 Open Access Governance

Given some of the potential bottlenecks and the extensive use of public resources, a measure of public overview of the NBN management would be required. This level of governance would be required to deal with a range of practical problems (eg. lost the key to the Point-of-Presence) as well as governance over implementation of standards and policy. such as physical site.

The regulatory model proposed here is similar to the Office of Telecoms Adjudicator (OTA) in UK. This model needs to remain independent and be cognisant of the input from the incumbents, the smaller operators that make use of the network and the consumer groups. The OTA for example, provides all small players with opportunities to voice their experiences on the ground and get action if required. In Australia, the ACCC should be empowered as the observer to check for anti-competitive behaviour. However, some have expressed the view that the existing declaration process is not the way forward.

Pivotal to this multilayer model is that:

- A passive fibre layer be established, owned and managed by a separate entity or multiple separate geographical entities to those who offer the connectivity and application type services over the fibre. Given that natural monopolies will develop in some geographic areas, the Government should regulate these “passive physical” layer entities aided by a board made up of industry representatives.
- The $4.7 billion provides a unique opportunity to incentivise the industry and investors participating in the NBN, including the incumbents, to voluntarily align to the open access model.

If there is a desire to attract additional investment to multiply the effect of Government’s commitment to this infrastructure, then a number of regulatory changes will be required.

It is encouraging to note that there is now clear evidence in those countries which have made these regulatory changes (New Zealand, Singapore, UK, Netherlands, Sweden, Denmark and others) that there has been an enormous benefit to the consumers, with the incumbent carrier and competitors profiting as well.

2.4 Open Access Pricing

There have been some concerns expressed that an open access regime could be met by carriers and then used to either gouge the market or drive out competition with short term pricing. Therefore, once an open access scheme has been defined, it should define a recommended pricing format.

This pricing format should be flexible and creative to allow for a variety of offerings which should not focus on the technology or the fibre itself. Options may include:

- Services based leasing on VLANs, per Mbs (volume based) or even peak/off-peak (time based) traffic
- Wavelength based on xWDM systems.

All pricing should come with an indication of "Traffic up time" which reflects a SLA (Service Level Agreement). In the case of carrier grade traffic, this is listed as 99.995% (less than 25min per year down time). Traffic may be sold at better or worse, but must be priced accordingly.

Special pricing considerations should be placed on ongoing delivery of service to schools, hospitals, police/fire stations, universities, libraries and other community utilities. These utilities should be based on a direct fibre connection associated with data rates starting at 100Mb/s up to 1Gbs.

Excluding inter-capital or long haul traffic, the delivery of fibre access (whether rural, or city traffic) should not be separately priced when sold as an access service.

In determining the approach to pricing, the government needs to consider Australia’s longer term broadband requirements. It is likely that Australia will have bandwidth demands that are significantly higher than the capabilities initially proposed by the initial 12Mbs capability. Therefore, the method for funding access investments will need to be considered in order to keep up with the progress being made in other OECD countries.

Setting access prices at a level which only covers the initial NBN deployment and maintenance cost, will assure consumers of the lowest cost services today, but may not enable the NBN investment community to proceed with upgrades (eg towards FttP) until the NBN has reached the end of its economic life. If Australians require better than NBN capabilities earlier than the expiry of the NBN's economic life, then a new digital divide and industry crisis will be unavoidable.

Within the context of the government's considered views on these issues, an independent body such as the ACCC should have the power to oversee pricing and enforce this.

2.5 Operator Selection

A Public Private Partnership model is suggested with no operator to be considered unless they have committed to equal and open access principles and a future compatible network.

One option for operator selection is a dual tendering process. This could be done on a region-by-region basis where national bids will be considered. If the incumbents do not co-operate on the first round with a competitive national bid, the Government should pick a number of regional operators and award contracts for the building of an open access FttP network that is built straight over the top of the incumbent networks.

The following actions are suggested to improve and maximize the effectiveness of the NBN bidding process:

- The development of a broad vision identifying government and private NBN beneficiaries outside of the telecommunications sector would provide tenderers with the opportunity to describe how their proposals will serve Australia's broadband needs in a wider context.
- Encourage bidders to outline how the capabilities of their proposals will meet the requirements of the broadband vision and incorporate meaningful bitstream commitments where passive optical routes are not offered.
- Review NBN proposals to assure that multi-service capabilities will adequately meet the needs of all stakeholders and Australian consumers for the identified key applications. This includes government and non-telecommunications industry stakeholders, throughout the investment life of the NBN.
- Ensure that bidders outline how capabilities beyond the NBN's proposed initial capabilities (such as the ability to extend to a FttP solution) will eventually be deployed.
- Solicit the bidder's commitment to aligning the capabilities and configuration of their individual deployments with other NBN deployments. This is required so that Australia's overall NBN has sufficient uniformity to support national services and applications from the largest possible variety of access seekers.
- Obtain assurances from NBN bidders that the network proposed is capable of meeting existing service quality if existing services are phased out.
- Obtain a description for the transition process from today's access methods to the proposed NBN. Existing ISP's should also describe how they will continue to service their customers.
- Obtain a proposed communication and education schedule to inform the public and other service providers, how they can best make use of the various components of the NBN.
- Provide industries and government beneficiaries with an opportunity to consider and comment upon the NBN proposals as an element of the evaluation process.

3. Industry Benefits

Labor's "New Directions for Communications" vision paper provides numerous examples and benefits to the Australian economy. The FttP SIG recognises the extent and depth of these benefits.

To further identify additional benefits a number of supplementary papers have been provided in Appendices B and C.

The principle areas of benefit identified in these papers include:

- Education
- e-Health
- Environmental
- Economic
- Local Community

4. Technology

4.1 Flexible Approach to Technology

The contributors to this paper have repeatedly stressed a concern that any issued Government request to provide “Real” broadband should not be technology specific. The concern is that a technology specific ‘Request to Industry’ could stifle innovation or lock the country into an inappropriate technology.

This paper, therefore, focuses upon a vision rather than attempting to specify a particular technology. The technologies mentioned in this paper are purely to indicate what is believed to be currently available best practise.

The contributors to this paper are generally in consensus that a passive FttP capable solution is currently the best available technology to achieve the real broadband vision. The group would, however, welcome other possibly more innovative technologies if they met the spirit of the connectivity and “equal and open” access.

Even though no specific technology is identified, the selection process of any technology should follow internationally recognised standards and minimise proprietary solutions that diverge from existing international forums. The challenge will be to identify an approach to building a NBN that addresses current requirements but is scalable in its capabilities, more affordable over time and does not inadvertently preclude future options.

4.2 The Role of Non Fibre Technologies

Although a direct fibre connection to the premises is of primary importance, it should be emphasised that flexibility is needed for the final service delivery to consumers as no single technology is likely to fulfil all requirements.

It is recognised that technologies such as wireless broadband, (such as WiMAX, 3G, LTE 4G etc.) is a complementary technology to FttP. Wireless broadband fulfils a need for both flexibility and mobility and has an advantage of being able to be deployed relatively quickly. People don’t want to be necessarily constrained to broadband access by being tethered to a fixed Ethernet cable. Society is becoming increasingly mobile in it’s use of technology and it is expected that within 5 years, Australians will own millions of mobile Internet access devices.

Wireless technology not only allows people the flexibility to access the Internet from a multitude of locations including schools, universities and hospitals, it also overcomes the need for extensive physical distribution within these places.

4.3 A Stepping Stone Approach to Implementation

Due to the sheer scale of the undertaking to implement a new National Broadband Network, it is recommended that a stepping stone approach be undertaken. This approach is necessary due to the significant degree of alignment that will be required in the industry to address such topics as:

- Technology;
- Standards;
- Legislation;
- Regulations; and
- Physical access pathways

Underpinning all of these issues is the element of timing. Not only do each these areas need to be addressed but they need to be coordinated in a logical sequence that will ensure a series of progressively successful outcomes.

4.4 Future Technology Requirements

One of the key objectives of the Government's National Broadband Network plan is to create an infrastructure that is capable of "dramatically increasing broadband speeds[3]". To achieve this, the plan calls for a minimum of 12Mbps to 98% of the population via a rollout of a new 'Fibre to the Node' (FttN) network.

On the surface, the figure of 12Mbps appears to be reasonable compared to the current national average, however, the following table illustrates that this is related to market maturity rather than predicted future use. Australia's current average broadband access speed is currently lagging behind international averages and in 2008 is currently positioned in the phase marked 2003-2005 relative to maturity in other International regions.

Time frame	User development	BB speeds
2003 – 2005	Early adopter	300-500Kb/s
2005 – 2007	Seasoned user	2Mb/s
2007 – 2009	BB part of life	6-10Mb/s
2010 – 2015	Fully-integrated BB	25-45Mb/s

Table 1 - Future Broadband Bandwidth Requirements[4]

Whilst the proposed minimum of 12Mbps represents a significant improvement over the average current speeds across Australia, current indications are that these speeds only represent a stepping stone towards the significantly higher speed levels that have already been exceeded in many other countries *including* some parts of Australia (eg. ADSL2+ up to 20Mbps and BigPond Cable 17-30Mbps). Telstra has also recently announced a planned upgrade to their Next G mobile network to theoretical download speeds of 21Mbps in 2008 and 42Mbps in 2009 using HSPA+ technology[5].

One of the key drivers for the availability of these bandwidths is consumer demand and "by far, the greatest demand on bandwidth will come from video, with HDTV being the most intensive" [6]. Based upon many international examples and evidence to date, some authorities have already suggested that 50Mbps is a minimum speed that should be considered[7]. For example, the education sector has reported requirements for at least 100Mbps per school. The strategy for the NBN, therefore, also needs to take into consideration these projected demands beyond the current need for basic internet access.

[3] New Directions for Communications, Labor Party, March 2007
[4] Planning the year ahead, 31st January 2008, Paul Budde Communication presentation.
[5] As reported in PCWorld 12th January 2008 http://www.pcworld.idg.com.au/index.php/id;1216950001
[6] Internet Industry Association, 2010 National Broadband Targets, 31 July 2006.
[7] Drivers for Deep Fibre Access solutions, William R. Kautz, William A. Walker, Tellabs

To remain internationally competitive, it will be essential that Australia develops a real broadband capability that is consistent with our trading partners[8]. In this context, a widely held view is that the proposed FttN solution may not technologically suit Australia's longer term technology requirements. The concern is that FttN technology has already become outdated and by the time it is implemented in Australia, will still be behind International standards and consumer demand. A more appropriate, scalable, long term solution would be to implement a solution that provides and end to end fibre solution ie. FttP. A more detailed discussion comparing FttP and FttN technology is provided in Appendix E.

Taking aside the actual technical solution, the following requirements for a National Broadband Network are suggested as a minimum capability (either initially or via a simple network upgrade):

- 12Mbps immediately with >100Mbps per Home following a simple upgrade, not an overbuild;
- HDTV broadcast quality capability (eg. For Free to Air & PayTV services);
- A capability for multiple service providers to use the platform;
- A potential to offer passive connectivity from a backend equipment point of interconnect point through to a customer premises;
- At least a bit stream standard carriage capability (for the upper layers);
- Support for multiservice capabilities (for the upper layers).
- Capable of carrying timing and synchronisation information.
- Capable of carrying an RF video overlay.

5. Leveraging Government Investment

5.1 The Importance of Government Initiative

When analysing the characteristics of countries that are successfully deploying FttP solutions, it is evident that successful countries have:

- Government and Regulatory commitment to FttP (The focus of this paper).
- Strong user demand for broadband services (Australia has seen growth from less than 50,000 users in 2004 to close to 5 million by early 2008).
- Competitive broadband markets (successful broadband markets such as Japan, Korea, Netherlands, Sweden, Denmark, Singapore and Hong Kong, all have competitors utilising different technologies as well as utilising the existing national incumbent infrastructure through services such as ULL, WLL or the Last Mile connection etc).

(See Appendix I and a range of other International BuddeComm reports on this topic)

Those countries which enjoy extensive FttP networks today, have Governments and Regulators that:

- Publicly acknowledge the benefits to the economy and users of FttP.
- Implement a clear plan to equip their country with FttP, identifying targets, dates, and strategy.
- Provide clarity to the industry on the regulatory model to be implemented, and certainty regarding the protection of investor's assets.

[8] New Directions for Communications, Labor Party, March 2007.

5.2 Alignment with other Programs

The current Government has inherited numerous historical projects including the OPEL consortium commitment. It is recognised that these projects must be integrated with the Governments vision for the NBN. In particular, the $600 million committed to the regional backbone investment will be instrumental to enabling a real broadband connectivity for rural and other areas.

The same applies to the Government's plans and initiatives in relation to e-health networks and smart utility grids. There is enormous potential for synergy and efficiencies when these plans can be clearly aligned with each other.

5.3 Government Financial Support

The Federal government's Broadband Advisory Group has previously stated that "next generation broadband could produce economic benefits of $12-30 billion p.a. to Australia." [9] This therefore implies that there is a significant return on investment that could be achieved from Government's proposed $4.7 billion investment under the National Broadband Network Plan.

The initial provisioning of broadband infrastructure presents a conundrum for investors. In order to confidently enter the market there is a need for:

- A sound regulatory environment.
- Financial support to offset the initial high cost of entry until the subscriber base can increase sufficiently enough to drive access prices down.

When examining International examples, the existence of a sound regulatory environment based on Equal and Open Access principles has promoted investments to be made in the normal commercial way.

Potentially, not all regions will require public financial investment and the $4.7 billion available must be husbanded to achieve maximum benefit. For example, based on the mapping plan done by the Department and the Industry in 2007, the industry could advise the government where extra infrastructure investments are actually needed and the Government could then focus financial support on areas that are not as economically attractive to the operator(s). Alternatively, in some areas, investors would be prepared to pay a fee for the right to establish the required infrastructure. If the Government proceeds with this approach contestability should be encouraged. Operators who were not in contested markets would need to be regulated.

6. Industry Education on FttP Technologies

An important contribution to the success of the National Broadband Network will be an ability to educate the industry on range of topics relating to FttP and related technologies.

Reliable statistical data on training is not available at a national level and much of the industry information on current skills shortages is anecdotal, however, there seems to be a general consensus that there is a problem. The problem ranges right across the stakeholders in the industry from Property Developers in Greenfield sites, to field engineers, to installers of customer premises equipment and finally to the actual customers of the technology themselves.

[9] Commonwealth Government, Broadband Advisory Group, "Australia's Broadband Connectivity", 2003

At it's most basic level, there is a need for an awareness of the various benefits of FttP technology all the way through to the more advanced technical skills that will now be required in the field.

Appendix K expands on this topic in more detail.

7. Additional Areas of Consideration

The following issues were identified at the FttP SIG meeting held on January 31st 2008.

7.1 Greenfield Developments

In the planning of residential community developments on Greenfield sites, the telecommunications infrastructure needs to be considered today, as equally important as all other utilities such as power, water, gas, roads, street lighting and storm & waster water.

On Greenfield sites, it is generally recognised that the preference for a FttP solution is non contentious. However, this market is relatively immature compared to other utilities. Anecdotal evidence to date would also suggest that there are a broad range of issues being faced by developers that highlight the need for resolution on key areas such as:

- The benefits and capabilities of FttP
- The incumbent regulatory framework
- The range of technology options
- Their obligations and rights as a developer
- Selecting an appropriate provider
- Implementation Costs

Appendix J expands on this topic in more detail.

7.2 Key Customer Conflicts

Some vendors have indicated they would prefer the Minister to be prescriptive about key policy goals. What is sought are time frames for related government initiatives such as healthcare, education, entertainment and smart utility grids. Based on these requirements the tenderers can then respond with their technology solutions and better integration and co-ordination can occur between government schemes. Some vendors have expressed the view that there is a possible risk of alienating potential key customers by suggesting contrary policy views to those that have been lobbied.

7.3 Lack of International bandwidth

Time Magazine reported in November 2007 that by 2010 the global Internet has the potential to be paralysed by the increasing popularity of video based services and information. Despite the advantages of FttP for the customer access network there is concern over Australia's backhaul Internet links having sufficient capacity to carry this increased traffic, particularly to the USA.

This is an issue to be aware of but is beyond the scope of this paper to address and the Minister has indicated that this should be an issue to address separately.

7.4 Rights of Way

Pathways for reticulation of FttP infrastructure can, in many cases, make use of other existing infrastructures such as in-ground waste drains, electricity reticulation, gas distribution networks, rail corridors, bridges etc. In most cases these existing pathways have already been public funded and constructed with public forbearance. In some cases these rights of way have limited capacity to carry additional fibre. For example, many urban electricity poles (use of which is already strongly resented by electricity utilities, residents and local council planning departments), are over burdened and have physical limitations to accommodate additional cables. This issue of the physical limitation of certain rights-of-way must be addressed equitably for any network infrastructure build.

7.5 Ensuring Sufficient Bitstream Capability

Today, many of Australia's broadband services are offered on a national basis. As the industry moves to implement new applications, it will be important to ensure that equivalent access to these services in both metropolitan and regional locations is provided. It is essential that uniformity across the many alternate access platforms and different access providers is attained so as to not comprise the overall NBN.

This paper has previously highlighted a number of important applications that can be enabled by a national broadband network. Two examples that highlight the need for bitstream capabilities are Voice over IP (VoIP) and remote medical monitoring.

- VoIP is capable of replacing the standard telephone service (to emulate today's 'naked DSL' services).
- Remote medical monitoring services can potentially allow patients to be discharged from hospital early on the basis that their progress can be reliably and confidently monitored through their home broadband network.

Each of these examples, have modest data requirements and could be supported on a range of technologies (FttN, FttN, ADSL2+, Wireless). However, each these examples requires a network management capability known as 'Quality of Service' (QoS) that enables different types of network traffic such as voice, video or data (such as the medical traffic) to be prioritised to be differentiated from regular Internet traffic.

A uniform approach for bitstream and multi-service should be adopted so that applications, such as these voice and medical applications can be guaranteed at least a minimum throughput with a specified reliability. This does not mean that every access solution must have identical capabilities – but that the capabilities are implemented in a sufficiently uniform manner so that QOS based applications can be offered to any Australian NBN consumer, not just those in defined areas or served by particular technologies.

Appendix H expands on this topic in more detail.

8. Conclusion

Real broadband connectivity to the premises is essential as a replacement for the 50-year-old copper loops and ageing cable networks that currently constrict bandwidth to connected homes and businesses. This shortcoming is further exacerbated by the maintenance costs of the ageing cables.

FttP – as an infrastructure end-goal – delivers the enabling technology for all new broadband and existing telecommunications services (video, music, data, telephone) to/from the home/business, as well as the essential infrastructure for mobile wireless services. The NBN should be flexible, so that it can include all available technology stepping stones that will enable us to reach this point. In cases where FttP is not economically viable, the NBN should also be flexible enough to enable deployment of alternative technologies that deliver equivalent services outcomes. Wherever possible, existing backhaul and local access infrastructure should be used, including the new smart utility grids which are currently under development.

The $4.7Bn investment in the new NBN should underpin the government's education, healthcare and environmental policies, as well as enabling the Australian industry to create local and export products that meet international standards and market needs, resulting in organic infrastructure growth and a significant return on investment to the Australian economy.

The increased network bandwidth will also reduce the high infrastructure cost of commuting from home to office by enhancing tele-presence capabilities and this will have solid environment benefits.

It is contended that if the Australian government invested in truly 'open access' networks, both in relation to backhaul and access – delivering affordable consumer services, competition and innovation – all the above benefits will create a thriving Australian economy, equal to the best of all other OECD countries.

Paul Budde

On Behalf of the FttP Special Interest Group

9. Appendices

The following papers have been contributed by various authors as additional background information to either support the arguments or provide additional information to the key topics raised.

Appendix A – Wholesale Access Principles

By the Wholesale Industry Group

The following principles were developed under the auspices of the Wholesale Industry Group in 2006 and have been provided to the Communications Alliance.

The following principles will underpin negotiations and commercial arrangements between access providers and access seekers in respect of the supply of wholesale access and interconnection services provided by means of telecommunications networks (Services).

These principles will apply to Services whether or not they are regulated under the telecommunications access regime in the Trade Practices Act 1974.

- Access to Services will be provided on fair and reasonable terms in the spirit of industry co-operation with the aim of promoting the long-term interests of end-users of telecommunications services, namely the promotion of competition, achieving any-to-any connectivity and encouraging the economically efficient use of, and investment in, the infrastructure by which services are provided.
- Access providers will act in a non-discriminatory manner and provide Services to access seekers on equivalent terms to that which the access provides to its own retail operations:
- access providers will ensure that the price and non-price terms on which it supplies Services to access seekers is equivalent to that which the access provider provides to itself. There shall be accounting transparency for access pricing; and
- access providers will ensure that ancillary terms on which it supplies Services to access seekers, including in respect of billing, technical and operational quality, fault detection, handling and rectification, ordering, provisioning and customer and service migration, are equivalent to that which the access provider provides to itself.
- Access providers will not unduly discriminate between access seekers in the provision of access to Services.
- The terms on which access is provided to Services shall be commercially negotiated by access providers and access seekers in good faith.
- Negotiations and contractual arrangements between access providers and access seekers shall be treated as commercial-in-confidence.
- Access providers will take a flexible approach in points of aggregation and interconnection given technical, commercial and practical considerations.
- Access providers and access seekers will include provisions in commercial arrangements that protect an access seeker's confidential information and relationship with its end-users while allowing access provider to engage in fair marketing in the same manner as its competitors.
- Access providers and access seekers will in good faith endeavour to resolve access disputes (including billing and non-billing disputes) between themselves in a timely manner. Simple, flexible, quick and inexpensive dispute resolution procedures will be included in commercial arrangements between parties that involve an escalating resolution process, including face-to-face discussion between the parties before recourse to mediation and arbitration.

Appendix B – Broadband Economic Benefits

This is a complete reproduction of material developed by Martin Stewart-Weeks, Director (Public Sector, Asia-Pacific), Internet Business Solutions Group at Cisco Systems prepared at the FttP groups request based on and updated from an earlier information paper presented. It is sourced from some of Cisco's contributions over the past two years to the policy debate about broadband futures for Australia.

The material cites some of the same references as used by the "New Directions for Communications" vision document.

Improving the quality of broadband connectivity

Economic benefits and social outcomes

> The debate is not about provisioning broadband, but about provisioning connectivity. People want access to technology that helps them save time, have fun, learn something, make money, stay or get healthy, stay in touch or be creative. It's what broadband does that matters, not what it is.

Connectedness and collaboration are the defining characteristics of our time. People and communities and businesses and governments are discovering more and better ways to communicate and share ideas, information and knowledge quicker and more effectively than ever before. From the astonishing possibilities of new research networks that span the globe to the new possibilities of tele-health and collaborative learning across countries to the rapid growth of new entertainment services that use web-based video to the continuing proliferation of social networking sites and services, the demand is always the same. Make it easier for people to talk to each other, to see each other, to share their ideas and concerns and to work, play and learn in new communities of rich interaction and exchange.

People and companies and governments are pushing forward in their instinctive reach for the new value they can create and enjoy from these new forms of connection and collaboration. In the last 12 months, for example, Australia's residential broadband population grew by over 1 million, with over 40% of the population now already investing in broadband. Instinct and aspiration often lead hard evidence, but the reality now is that the more formal evidence of real and sustainable economic benefits and social outcomes is slowly but surely mounting.

We have well and truly left behind the assumption that the only real value of broadband is faster Internet connections and quicker email. Real broadband creates the conditions in which to think of completely new ways to connect people, communities and services. We are irrevocably launched on a "tipping point" journey of innovation and invention fuelled by the astonishing possibilities of connectedness that the new broadband capabilities promise and are already delivering.

A good conceptual framework within which to assess the value of investing in the infrastructure of the digital economy is provided by a recent study from the US. The report, *Digital Prosperity: Understanding the economic benefits of the information technology revolution*[10], articulates the logic that links broadband infrastructure with social and economic impacts.

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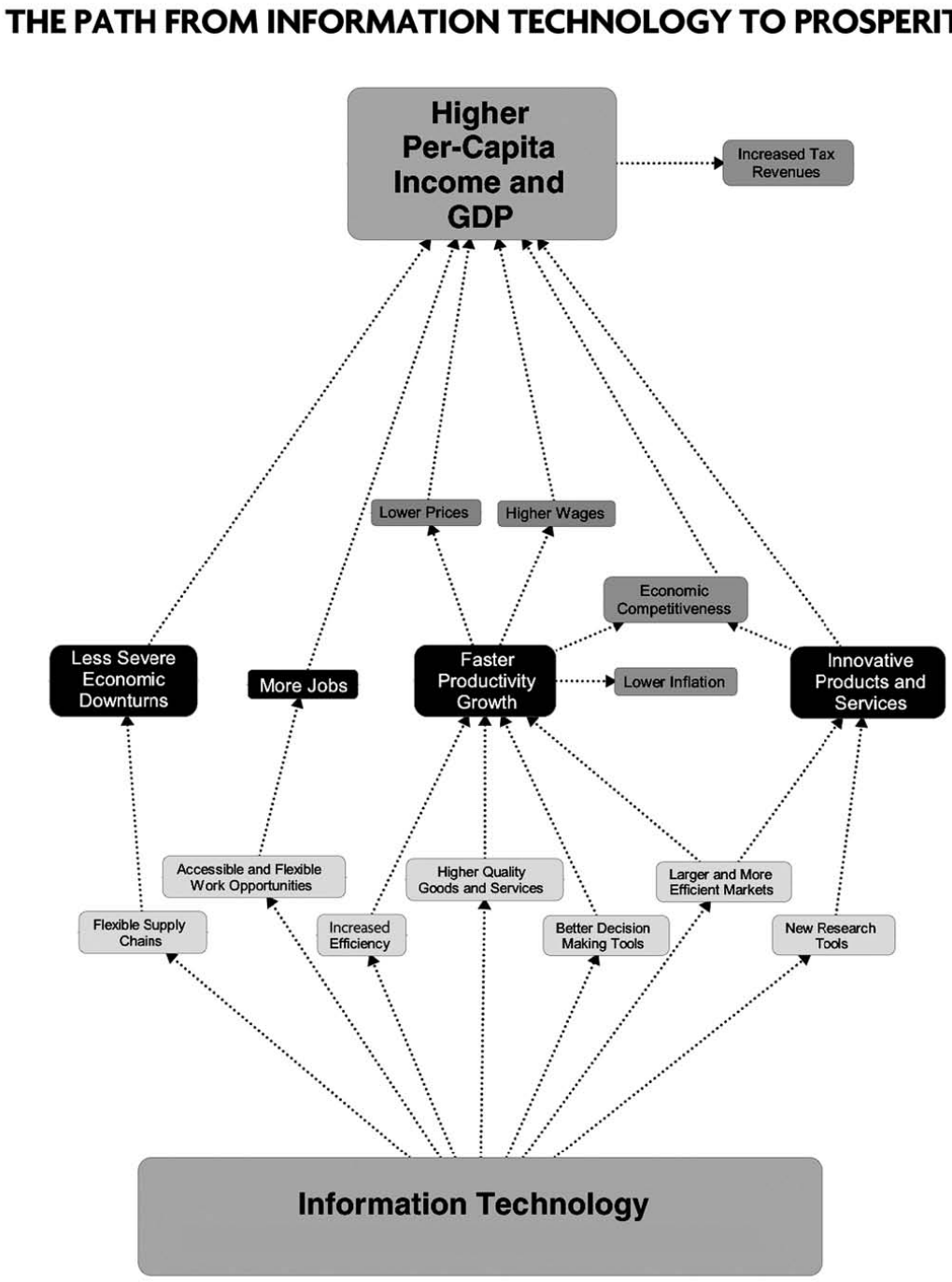
[10] Robert D Atkinson and Andrew S McKay, The Information Technology and Innovation Foundation, March 2007



The report's authors comment (page 4 of the report) that:

The reality is that while the benefits of new technologies are often exaggerated at first, they often turn out to exceed initial expectations in the moderate-to-long term. This is exactly what has happened with the digital revolution. …The digital economy is more than fulfilling its original promise, with digital adoption rates exceeding even the most optimistic forecasts of the late 1990s. The integration of IT into virtually all aspects of the economy and society is creating a digitally-enabled economy that is responsible for generating the lion's share of economic growth and prosperity."

Closer to home, and lending additional weight to that framework, the Allen Consulting Group in Australia concluded in a 2003 study of the economic impacts of "true" broadband that "the overall message of the analysis is that there are substantial net economic gains available to the region in

the analysis, and probably many other major urban areas in Australia from the development and use of a true broadband network." The report went on to suggest that "these gains far exceed the initial investment costs required to finance the network." (True Broadband: Exploring the Economic Impacts, September 2003)

In Victoria, consultants estimated that the combined productivity and employment benefits of broadband investment would add $AUS2.5billion to gross state product off the back of a 5% growth in employment across the State. (Economic Impacts of Broadband Adoption in Victoria, ACIL Tasman, June 2004)

Similarly a 2005 study by IDC and the Economist Intelligence Unit found that if broadband diffusion in New Zealand was accelerated, by whatever means, to a level of 50 broadband subscribers per 100 of population within 10 years, nominal GDP would increase by NZ$314 million (AUD$283 million) by 2010, NZ$2,740 million (AUD$2,468 million) by 2020 and NZ$7,215 million (AUD$6,500 million) by 2030. More recently, a Carnegie Mellon study of broadband's economic impact claimed that:

> Even after controlling for community-level factors known to influence broadband availability and economic activity, we find that between 1998 and 2002, communities in which mass-market broadband was available by December 1999 experienced more rapid growth in (1) employment, (2) the number of businesses overall, and (3) businesses in IT-intensive sectors. [*Measuring Broadband's Economic Impact*, MIT and Carnegie Mellon, January 2006]

The study concludes by admitting that its analysis was necessarily preliminary and drew attention to the need for additional data and experience with broadband investments. It finishes though on a positive note – "…the early results presented here suggest that the assumed (and oft-touted) economic impacts of broadband are both real and measurable."

In the United States, a major study of the potential economic benefits of accelerated broadband deployment to older Americans and Americans with disabilities [*Great Expectations*, Robert E Litan, New Millennium Research Council, December 2005) looked at three types of benefits from broadband deployment and use. They included lower medical costs, lower costs of institutionalized living and the additional output generated by more seniors and individuals with disabilities in the labour force.

Considered together, the study estimates the three benefits to accumulate to at least $927 billion in cost savings and output gains in 2005 dollars over the 25 year period, 2005 to 2030. This amount is equivalent to half of what the United States currently spends annually for medical care for all its citizens ($1.8 trillion).

The study points out that, large as these benefits may appear, they are line with previous estimates for the benefits of broadband for the population as a whole. If, as a policy priority, more broadband was rolled out to these populations, the benefits would rise considerably, by cumulative amounts ranging from $532 billion to $847 billion (depending on the wages earned by the additional working seniors). The study suggests that "total cumulative benefits, under the right set of policies, could exceed what the United States currently spends annually for health care for all its citizens."

The search for hard and 'soft' evidence of the social and economic benefits enabled and accelerated by broadband, and the applications and services that broadband delivers, will continue. At the same time as jurisdictions search for the strongest evidence to justify what are often very large investments of both public and private money in these new technologies, it is also clear that leading governments recognize that these investments are basic "table stakes" to successful engage in global economic competition and national development. It's not so much a question of finding the economic and social payback for these investments. It's more a question of worrying about how the prospects for economic and social resilience will be adversely impacted by failure to make these investments.

In the area of economic development, the cities of Amsterdam and Almere (at the heart of The Netherland's creative arts, media & gaming district) have recently announced the development of a broadband infrastructure, including fibre-to-the-home, covering the entire population and small and medium enterprises. This strategy is aimed at providing SMEs in the software development and creative arts sectors with the necessary telecommunication flexible infrastructure.

The city of Almere launched a Broadband Fibre Pilot last year and witnessed the creation of 400 new jobs (as result of high tech companies such as IBM and Samsung relocating to Almere) and the retention of 200 jobs, coming from media and gaming companies who were planning to leave Almere due to the limited broadband availability.

A recent report suggested that an increasing number of Dutch towns have opted for municipal fibre networks to create a computer-grid system. The idea is to combine municipal FttP with the combined computing power of business and residential subscribers for research calculations, and taking advantage of the computers' free hard disk space. The scheme was touted as developing a supercomputer city. Several distributed computing grids exist worldwide, but the geographic concentration at Almere helps combat latency, while the participating computers are linked to a 100Mb/s network to optimise data sharing. Indeed, Almere is one of 18 projects of the EC's BEinGrid research program to assess the possibilities of grid computing.

The report goes on to suggest that some practical applications have emerged to take advantage of the collective power of multi-computer processing. These range from complex 3D designs, image searching and retrieval, weather predictions, and crunching medical research data. This last area illustrates the booming business in online medical applications and advice, whether from established cottage hospitals and surgeries, or even clairvoyants.

Many councils and hospital trusts are saving money by relying on online medical care, achieved through web cams and interactive units managed by people at home. The grid network is allowing research to be undertaken using the resources of PCs and thus saving the high cost of data storage and specialist computers. Rotterdam's Erasmus Medical Centre is just such an example: a study on bone aging requires scans of up to five gigabytes each. These are done by computers on Almere's grid, and are then uploaded to the hospital.

Transferring data on this scale requires fibre networks, and the fact that it can be done in conjunction with computer grids opens the door for innumerable commercial applications. The report concludes that The Netherlands' experience strengthens the argument that in coming years jobs, prosperity and a range of social benefits in Europe will follow where broadband infrastructure is strongest.

That story illustrates what happens when broadband becomes part of the groundwork for innovation and growth. New ideas emerge for value-adding services, impossible without the connectedness of real broadband, which speak directly to big policy priorities, in this case in health.

The policy insight here is the central part broadband plays in a policy mix that creates an environment for innovation. As Internet pioneer Vint Cerf commented in the context of lamenting America's failure to match the experience of Japan especially in driving new levels of broadband performance, "Once you have very high speeds, I guarantee that people will figure out things to do with it that they haven't done before".[11]

Tackling social and digital exclusion is another area of focus for governments investing in broadband. The availability of a broadband network is the main prerequisite in the development of social inclusion programs around cities in Europe. Inclusion initiatives aimed at enabling disadvantaged citizens to gain access to ICT and online services, backed up by training and community-based support services, cannot be implemented without the presence of a flexible, low cost access infrastructure.

In the Dutch community of Nuenen, near Eindhoven, a local broadband initiative, called OnsNet ("our net") is structured around a 9,000 users-owned fibre cooperative of citizens, many of whom are elderly people, who use the network mainly for social purposes.

Video services are mostly used, while Internet connectivity is much more of a peripheral benefit. Video based services such as a Local Community TV, video communication between the GP, the health provider and patients, video links between elderly people and volunteers and "video circles" for community safety watch are the main services enabled on the infrastructure. Connecting to the local pastor and being able to "attend" church services when they can't make it there in person are other important services.

Internet access and web surfing are not really the 'killer application' in this context, but the same underlying broadband capability is being adapted to suit the needs of this particular community.

In the area of efficiency of the public administration, the Italian Province of Brescia has focused in the past 3 years at developing a number of provincial services across its intranet. The launch of an internal communication and collaboration initiative is providing the local government with the opportunity to save about 8,2 Million Euros within the initial 5 years of operation, leveraging on traditional intranet self service tools (employee directory, online expense reporting, shared calendaring, etc) as well as on mobile communication solutions. Politicians, high level civil servants and field workers use mobile devices to streamline communication.

The Province is now making those internal services available to municipal organizations within its territory, developing a large shared services regional center. This initiative is linked with the launch of the regional broadband access infrastructure.

The success of Fastweb in Milan (now expanding into other cities and regions in Italy) is based on a public-private partnership to provide bundled broadband services to a range of different customers.

Fastweb's success is based on the capability to provide to users bundled services, which might include:

- For large business parks, a mixture of storage, video transfer, disaster recovery mega Internet, Web hosting, email, branch office VPNs, IP telephony and storage and content delivery capabilities.
- For local schools, hospitals and other public institutions, the services might include "mega Internet", Web hosting, email, high definition images, telemedicine, an IP Phone on each teacher's or doctor's desk to save money and improve collaboration, surveillance real time
- In Milan restaurants, bundles of broadband-based services include streaming IP video of football and other sport, free IP telephony between the restaurant and its suppliers and supply chain management services to improve communication and collaboration. Internet services might often be either a minor part of the package or perhaps not included in the package at all.
- For residential customers, the Fastweb package might include Internet, mailboxes, free or cheap voice services, a "captive" service portal, video on demand, video broadcast and gaming.

The important lesson is that if you focus simply on broadband as the outcome, it will mask the reality that what makes the new broadband capabilities potentially valuable is the differentiated bundle of services they can support. That means different customer segments can be targeted with a range of services that reflect their needs and circumstances.

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[11] http://www.washingtonpost.com/wp-dyn/content/article/2007/08/28/AR2007082801990_pf.html

The result for Fastweb is 500,000 fibre-to-the-home customers across Milan, making it the largest and most successful fibre project of its type in Europe. It now faces the prospect of a rapid expansion of its services into other Italian cities and regions

Traffic and transport management is another important area in which local government is developing broadband solutions. Traffic monitoring and parking management systems, RFID-enabled applications for intelligent transport management are some of the examples available.

> *The city of Paris' RATP transport company is in charge of buses and underground transport. The RATP has recently developed a wireless infrastructure on top of which mobile customer care services such as travel planning, real time connections & timetables, traffic disruptions monitoring, site information, fare information and customer surveys are being offered. In addition to these, the city and RATP are also focusing on other services such as emergency calls management, homeless care management, controller applications, station and bus stop management, staff management and equipment maintenance.*

What these examples illustrate is that the only meaningful way to assess "how fast is fast enough" is to focus on the capabilities needed to support what people and businesses and communities want to do (the user-demand approach). It is becoming less convincing to claim broadband success by comparing performance to internal or even external standards while people and businesses an communities don't experience the broadband capabilities they need to support the activities that matter most to them.

With something of a rush, broadband has moved from the technology edge to the policy centre. In the process, it is being reframed (correctly) as a debate about services and capabilities, not about the underlying technologies. It has new political currency and is assuming its rightful place as the defining infrastructure of a connected world.

The main reason is that people and communities are discovering and, in some cases, inventing new services and applications that impact every aspect of their lives that will only work if they have access to affordable, high-speed and reliable broadband networks that help them to connect, to communicate and to collaborate.

Broadband has become the inescapable infrastructure platform for success in the digital, networked society. The growing evidence from around the world is that the real significance of next generation broadband capabilities is the impact on three interrelated outcomes:

- The first is **economic resilience** and the capacity for cities, regions and countries to compete successfully in the global knowledge economy; real broadband is rapidly becoming a core utility for the networked age, providing a platform without which large companies and small and medium enterprises will not be able to create and access the investment, skills and services they need to deliver sustained economic growth and development.
- The second is **strengthening social networks and inclusion,** creating new opportunities for people to become engaged and connected not only with each other in the communities in which they live and work but also with key resources and expertise in the wider world. In that sense, broadband becomes an enabling technology for a human network that invests in both 'bonding' and 'bridging' social capital, dramatically lifting the quality and reach of connection and collaboration on which strong and resilient communities rely.
- And the third outcome is a sense of **personal "agency' or empowerment**, the ability for people to be confident about their ability to manage their own lives and do things for themselves, everything from shopping on line, dealing with government, staying in touch with family and carers so they can stay active and independent into their older years or perhaps managing the effects of a chronic illness.

To twist William Gibson's famous aphorism a little, when it comes to broadband, the future has already arrived. It's just that it's not very evenly distributed. Fixing that will be the policy work of the next few years in Australia.

Appendix C – Industry Benefits

By Ross Yelland

Above all else we believe a holistic approach to communications encompassing social, industrial and commercial requirements rather than individual technical and financial investigations enables real broadband connectivity to the premise to be fully appreciated *when followed through to the national account "bottom line"* as opposed to "narrower" individual company bottom lines.

Education
Real Broadband will raise our education standards - including tertiary standards. The connectivity proposed would provide the bandwidth necessary to expand beyond pre-recorded classes and lectures to include tele-presence based classes and future immersion based technologies.

Our understanding is that a supplementary budget allocation will be made to provide schools with connectivity in excess of 100Mbps. This is the potential bandwidth that we believe needs to be made available to *all* premises, even if not immediately provisioned. We also believe the provisioning of this educational connectivity is too long overdue and must be a national priority. It is thus strongly suggested that any network built to our education institutions be incorporated into the national infrastructure and placed at the core of any request to industry to build a national infrastructure. Practically we can see the education network being the seed for the national NBN infrastructure.

As a side bar – some of the contributors highlighted the additional facilities that would be needed at schools for them to fully benefit. An enabling of local school communities, and direct support, both from government and even by way of a condition of the Request to industry for a limited number of the more disadvantaged communities would be required.

e-Health
Real broadband provides an avenue to meet the likely costs of mandatory high quality health services especially with our disadvantaged and aging populations. As an example the Netherlands has initiated e-Health services to promptly address aged patient needs to allay aches and pains concerns without hospital visits.

Appendix H provides further input into e-health. Given the very high bandwidths envisaged for e-Health it is suggested at least health facilities down to a certain level of clinic be core to any request for infrastructure. Rural facilities are also likely to have sufficient accommodation for peering points.

Environmental
The revolutionary impact of a widespread real broadband service to the premise on the environment should not be understated. While the literature points to a definite negative impact in terms of increased power consumption from a multitude of additional servers and personal computers[12] it appears as if real broadband will be an enabling technology for far greater benefit. Cases[13] cited are;

- Enabling an energy service environment through smart utility grids. This is a distributed model that is market driven requiring real time communications between all elements;
- The ability to finally manage a large number of geographical and temporally distributed energy services, where these could be local micro energy generation facilities such as consumers selling solar energy back to the national grid, through to load shedding and load shifting technologies;

[12] Pg 28.9, The Role of Broadband in the Quest for Environmental Sustainability, Tracey Dodd, Department of Further Education, Employment, Science and Technology, South Australian Government
[13] Broadband Communication Enables Sustainable Energy Services, Mike Dennis and Haley M Jones, The Australian National university, Telecommunications Journal of Australia, Volume 57, Number 2 & 3, 2007, Monash University Express

- Real time visibility of electricity consumption being vital to reducing greenhouse gas emission;
- Real time downloading of weather forecasts and optimizing of house energy consumption by for example predicting likely heating/ cooling and hot water requirements, and taking appropriate action (some foresee most houses eventually having an energy gateway capable of such control). 25% savings in energy are predicted;
- By[14] enabling proper teleworking, massive savings in greenhouse gas emissions (17% for Sydney), road maintenance, accidents, car material costs, motorists time and fuel costs. In Sydney it is suggested these would be in the region of $3300 per household annually. This state saving would exceed the cost of the provision of a typical FttP connection estimated at US$1500!.
- By enabling online shopping;
- The ability for groups interested in environmental issues to collaborate productively, and to share environmental information and best practices;
- The convergence of electronic goods by enabling people to access television and radio channels and movies over the internet;
- By reducing the usage of paper by the sharing of electronic documents and even photographs;
- An underpinning of the systems required to measure emissions and carbon sinks for a national inventory system;
- A reduction in potential multiple “eye-sores” as a plethora of additional cables will not be required under an equal and open access model;
- Economic benefits

By establishing a unified physical platform for a broad range of communications, e-learning, e-health, smart utilities grids and entertainment services a faster activation of new services for consumers is possible.

These in turn will also increasing the average revenues per user (ARPU) for the telecoms industry. New applications and services means new revenue opportunities and by reducing the capital investment required to deliver multiple services, there will be a lower costs of operating networks (fewer outdoor electronics, remote management).

In addition it is expected it will boost Australian industry involvement though economies of scale or even forced through a local content requirement (taking into account possible economic distortions), enabling a wide range of local and exportable products, resulting in a return on investment to the Australian economy.

Amongst other benefits this will also significantly increase e-commerce, already a major new element of the national economy.

Local Community benefit

The NBN will provide superior communications to our local communities; enhancing the efficiency of local business services through these superior communications and thus delivering additional economic advantage for that community. Superior local communications capacity will also allow distributed communication models, potentially releasing backhaul congestion to major cities for activities such as off-site data storage and promote regional development.

In addition it expands local government’s ability to serve and connect with their residents leveraging broadband services such as video, interactive meetings etc. Greater two-way communication with all levels of government would recognise community organisations as contributors of content to governance, improve accountability and encourage more cost-effective volunteering by people who are highly-skilled but time-poor. This is the case with many European and North American cities where cable operators are compelled to deliver video of open council meetings and such community events as local football matches

[14] Broadband Telecommunications and Urban Travel, RJ Nairn, Telecommunications Journal of Australia, Volume 57, Number 2 & 3, 2007, Monash University Express

Appendix D – Australia Internet and Broadband Statistics

(This is an abstract from reports published by BuddeComm)

1. INTRODUCTION

Australia is rapidly closing the broadband gap between itself and its leading trading partners. There is still some way to go, but we can release the panic button and start more properly planning for the future. Broadband is not just high-speed Internet access; as an essential infrastructure it is critical for developments in e-health, education and energy savings. All this requires proper planning and government and industry debates. Within the next two to three years most Internet households will be based on broadband. However, it will not be until other broadband devices are available, over true high-speed networks - over the next five years - that broadband will spiral beyond the Internet households.

2. Subscriber statistics overview and forecasts

BuddeComm predict that the total number of broadband subscribers would reach 5 million towards the end of 2008. Despite a rapidly increase in broadband penetration, annual growth still stand at around 18%. The market is beginning to approach the natural broadband subscriber ceiling of around 5.5 million subscribers. Beyond that new applications such as e-health and e-learning are going to drive broadband penetration to close to 100% over the next decade. This will most certainly include other user access devices than PCs.

Table 2 – Broadband subscribers – 2002 - 2008

Service	2002	2003	2004	2005	2006	2007	2008 (e)
	Subscribers mid-year						
Telstra ADSL	85,000	185,000	350,000	550,000	1,000,000	1,500,000	1,800,000
ADSL retailers	57,000	174,000	374,000	1,057,200	1,744,100	2,057,700	2,400,000
ADSL total	**142,000**	**359,000**	**724,000**	**1,607,200**	**2,744,100**	**3,557,700**	**4,200,000**
Telstra Cable	0	0	77,000	200,000	283,000	336,000	430,000
Optus Cable	54,500	102,000	141,000	227,000	289,000	350,000	390,000
Cable total	**54,500**	**102,000**	**218,000**	**427,000**	**572,000**	**686,000**	**820,000**
Other*	10,000	20,000	50,000	90,000	120,000	140,000	160,000
Total	**206,500**	**481,000**	**992,000**	**2,124,200**	**3,436,100**	**4,383,700**	**5,180,000**

(Source: BuddeComm)
Note: Other includes: TransACT, Neighbourhood Cable, Unwired, PBA, regional wireless.

3. Household statistics

We prefer to measure fixed broadband penetration on a household basis. In most situations these subscriptions are household rather than individual based. In most western countries Internet penetration is around 70% of households, this reflects the addressable broadband PC markets. Overtime when other devices, namely the TV will be linked to broadband, BuddeComm estimates broadband penetration will climb towards the 100%, this will happen before 2015.

Personal wireless broadband penetration, once these services become more affordable will also reach 100%, very much along the lines of the current mobile penetration.

While the current limited digital TV services can't yet be earmarked as Nextgen services, digital TV has the potential to play an important role. However, Free-to-Air (FTA) broadcasting seems to be out of the equation as the current government policies makes it impossible to use this platform for new services for most of this decade. The Foxtel monopoly on digital cable TV also makes this network an unlikely contender for innovative new services as it will not be allowed to compete with Telstra's broadband services. While some changes here will occur during the 2008/09 period, it will be a long time before TV services will be able to deliver a full range of true broadband services.

It is interesting to note that by mid 2007 there were more than twice the number broadband subscribers than pay TV subscribers in the country.

Table 3 – Number of Australian households and technology penetration – 2007

Service	Units (million)	Penetration
Total HHs	7.8	
PC HHs	5.8	74%
Online HHs	5.8	74%
Broadband HHs	3.4	43%
Digital TV capable	2	25%

(Source: BuddeComm)

Table 4 – Broadband component of Internet households – 2005 - 2010; 2015

Year	BB percent of Internet HHs
2005	32%
2006	53%
2007	60%
2008 (e)	70%
2009 (e)	75%
2010 (e)	80%
2015 (e)	98%

(Source: BuddeComm estimates)

Table 5 – Percentage use of the Internet according to location – 2005 - 2006

Category	Home	Work	Neighbour, friend or relative	Public library	TAFE or tertiary institution
Sex:					
Male	58%	31%	23%	7%	9%
Female	55%	28%	22%	9%	10%
Remoteness area:					
Major cities	59%	32%	24%	9%	11%
Inner regional	52%	25%	19%	7%	^7%
Outer regional	50%	25%	21%	^7%	^7%
Remote	^54%	^30%	^24%	*5%	*2%
Region:					
Metropolitan	59%	32%	24%	9%	11%
Ex-metropolitan	51%	24%	20%	7%	7%
Total	**57%**	**29%**	**23%**	**8%**	**10%**

(Source: ABS report Household Use of Information Technology, 8146.0, 2005-06)
Notes: ^ Estimate has a relative standard error of 10% to less than 25% and should be used with caution.
Notes: * Estimate has a relative standard error of 25-50% and should be used with caution.

4. Regional vs. Metro

Location has an impact on Internet take-up, but it had a greater effect on the type of access technology.

Table 6 – Internet take-up by metropolitan/non-metropolitan area – 2007

Internet service	Metro	Non-metro	Total
Broadband	64%	48%	58%
Dial-up	16%	23%	18%
Both	3%	3%	3%
All Internet connections	80%	71%	77%

(Source: ACMA survey, Telecommunications Day, 2007)

An ACMA focus group perceived that lack of availability was a factor influencing broadband take-up in non-metropolitan areas. However, the survey found there were also a number of other demographic factors which influenced broadband take-up in non-metropolitan areas.

For example:

- The proportion of survey respondents aged over 61 was higher in non-metropolitan areas (29% of the respondents in non-metropolitan areas compared with 18% of respondents in the metropolitan areas). The age group had the lowest rate of broadband take-up.
- The proportion of survey respondents in higher income occupations, such as managers and professionals, was lower in non-metropolitan areas (21% of respondents in non-metropolitan areas compared with 32% respondents in metropolitan areas). This occupational group has a higher rate of broadband take-up.

5. Australia's broadband ranking – mid-2007

By September 2004, Australia had reached the one million subscriber mark, a doubling of the numbers from the beginning of the year. While this certainly was a good result, regrettably it was happening at the cost of competition. A further aggressive price campaign was launched in 2005 which of course had a further positive effect on broadband growth in Australia, which by 2007 was amongst the highest growth within the Organisation for Economic Co-operation and Development (OECD).

Despite the turnaround in the number of subscribers, Australia remains at the bottom of the international ranking and it will take at least two to three years for the country to catch up with its trading partners, but the gap is rapidly closing. The missing dynamic remains competition between telcos and cable TV operators. This, according to the Federal Communications Commission (FCC), has been the driver behind the broadband uptake in the USA. With Telstra owning both the telco and the cable TV network these dynamics still don't exist in Australia.

Table 7 – Broadband access among Internet households – selected countries – 2001 - 2007

Country	BB penetration in Internet Households						
	2001	2002	2003	2004	2005	2006	2007 (e)
Australia	1.50%	5%	7%	25%	32%	54%	60%
Austria	13%	25%	27%	35%	51%	74%	86%
Belgium	7%	22%	63%	65%	69%	75%	88%
Canada	14%	32%	40%	64%	67%	77%	86%
Denmark	8%	15%	48%	52%	74%	87%	95%
France	4%	16%	35%	55%	70%	83%	96%
Germany	8%	11%	25%	29%	42%	54%	63%
Hong Kong	8%	45%	65%	72%	76%	79%	82%
Japan	15%	25%	41%	56%	62%	64%	67%
Netherlands	15%	25%	48%	55%	72%	85%	96%
New Zealand	0.50%	1.50%	3%	8%	23%	32%	45%
Singapore	7%	35%	53%	63%	68%	70%	72%
South Korea	65%	76%	85%	87%	89%	90%	91%
Spain	8%	15%	37%	45%	54%	69%	79%
Sweden	10%	15%	30%	40%	51%	69%	80%
Switzerland	6%	14%	20%	36%	72%	83%	96%
Taiwan	13%	28%	44%	51%	60%	67%	70%
UK	2%	10%	21%	35%	52%	68%	72%
USA	17%	23%	35%	44%	46%	67%	81%

(Source: BuddeComm)

Notes: In every country in this table, 60% to 70% of all households have Internet access.
2007 figures for Western European countries account for anticipated growth in Internet access as well as Broadband access. Come 2008, several countries will reach a 100% share, as dial-up services will be discontinued. This has already happened with some European providers (TeliaSonera), while some Austrian ISPs are also beginning to discontinue dial-up.

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Appendix E – A Comparison of FttP & FttN Technologies

FttH/P
The concept of Fibre-to-the-Home/Premise, (referred hereon as FttP) has been largely established for the last ten years.

Within the context of this paper FttP is defined as:

> *A network capable of a passive (dark) single fibre tail to a Premise (either home or business) with an accessible interconnect point at the kerb via an industry standardised connector for a service cable directly to the dwelling.*

The electronics and the final service cable are not necessarily seen as being part of this initial deployment.

It is important to note that there are two interpretations of FttP. The first is every dwelling passed is connected with an optic service cable. The understanding by professional telecommunications engineers is that FttP is a network designed and built to allow the majority of dwellings passed to be connected by an optic service cable and that patch points when eventually required. As part of this solution the final connection could then be provided by the customer's selected service provider making use of the FttP termination point.
From responses received it is apparent that there is widespread Australian industry conviction that a FttP open network will create incentives based regulation.

While a completely rolled out FttP solution, including service cables is seen as the ultimate technical solution it has been argued it can carry an unproductive cost in terms of seldom-utilised fibre tails.

A view now emerging though, and the viewpoint presented within this paper is that a holistic view incorporating social and economic rate of return needs to be taken to arrive at an acceptable medium.

From latest estimates based on US deployment figures the cost to deploy a FttP network and fully connect with a service cable (presumably in a residential area) is now, according to Verizon, around US$1500 per home passed. In this example, the deployment is based upon overhead cables across the majority of Verizon's network. The additional cost of undergrounding varies from area to area because of the variable costs associated with the presence of rock, sand, clay etc and with different lot frontage requiring longer or shorter trenching to pass each home. As an indication, the cost of undergrounding can add between a few hundred and $1500 per home passed.

FttN
Within the context of this paper, Fibre-to-the-Node (FttN) is defined as:

> *A fibre to a communications node, typically a street cabinet incorporating electronics, with the final access being provided via intermediary electronics by other stepping stone technology such as wireless, VDSL2, Powerline etc.*

For example the understanding of the proposed Telstra implementation would see fibre to existing nodes (potentially replacing existing copper from the node to the exchange) and then utilising VDSL2 technology over the existing copper to provide the final customer access. FttN deployments can be engineered to meet a required level of capability and reliability.

FttN in the NBN
In considering the various FttN proposals during the NBN bidding process, the Government is encouraged to establish clear guidelines that define the desired levels of reliability and capability and that these levels are incorporated into the evaluation criteria.

Concerns Regarding FttN

At a competitive level, FttN is viewed with concern as this approach can be promoted by the incumbents to enhance their positions and retain or re-establish a long term monopoly of the access network. Such a monopoly is seen to create an environment which stifles industry development and ultimately creates economic disadvantage. A recommendation to address this issue, is to establish a clear national bitstream standard, with clear points of interconnect that will ensure that the NBN is deployed with a clear multi-service capability (as described in Appendix H).

If a FttN network is engineered to barely satisfy the Government's 12 Mbs guideline, it is practically inevitable that consumer demand for ever faster broadband access will exceed this capability in the short to medium term. As described earlier in this paper it is strongly recommended that the government set a higher NBN standard than 12 Mbs as this will only deliver basic capabilities and even fails to meet the needs of higher end consumers today.

To ensure that higher than 12 Mbs capability using FttN technology can be achieved, will require reengineering of some of Australia's copper access network. This is to ensure that more nodes can be deployed using shorter access lines. For example, a performance of 25 Mbs could be assured using VDSL2 based FttN if the Copper Access Network is re-engineered to guarantee maximum line lengths of around 700 metres.

The cost of re-engineering the copper network needs to be contrasted with the alternate cost of deploying FttP. In many areas, it would be preferential to deploy FttP than to re-engineer the copper as FttP is more scalable and capable of serving the community in the long term.

From a customer satisfaction perspective, there is evidence to indicate that customers are comparatively more satisfied with a FttP solutions (96%) than with a FttN solution (70 – 73%). About 70% of the consumers that were unsatisfied with their FttN system rated it as offering an inferior video service to their previous supplier.

Appendix F – Next Generation Broadband Network (NBN) – Example Deployment

(The following information is provided to illustrate one method of deploying a FttP solution)

In order the maximise the benefits of the government investment and taking into account that there is little (economic) room for Australia to overbuild networks, it is essential to look at deployment of the outside plant network on power poles owned by the utility companies. This concept is already used in some cases in Australia and is already been deployed on a massive scale in the US (Verizon) and its make up as a “plug and play” system also enable two government supported initiatives to be combined into one; smart utility grids and NBN.

Technologies developed for such deployment are also highly scalable so it can be built and scaled to meet a complex set of metrics to meet the needs of NBN and Smart grids (eg reach, demarcation points and costs).

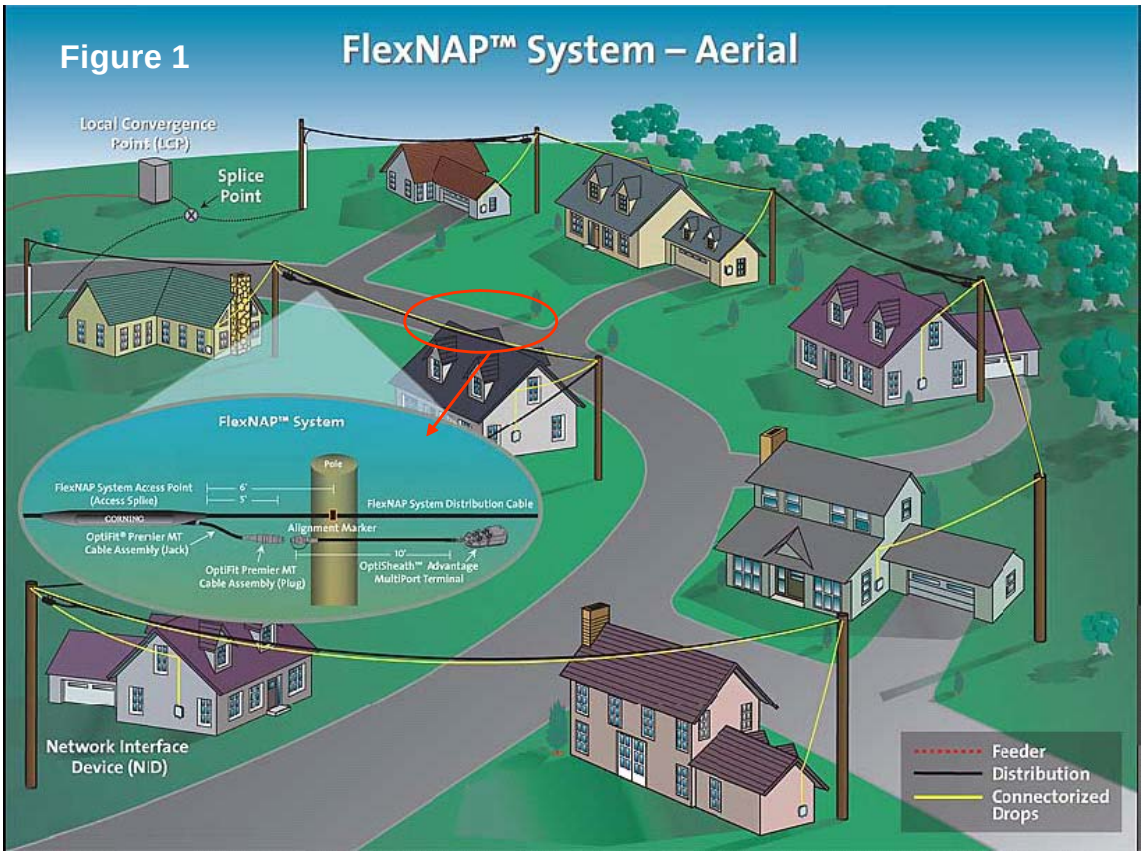

Figure 2: FlexNAP – Combined FTTH/Smart Grid Option

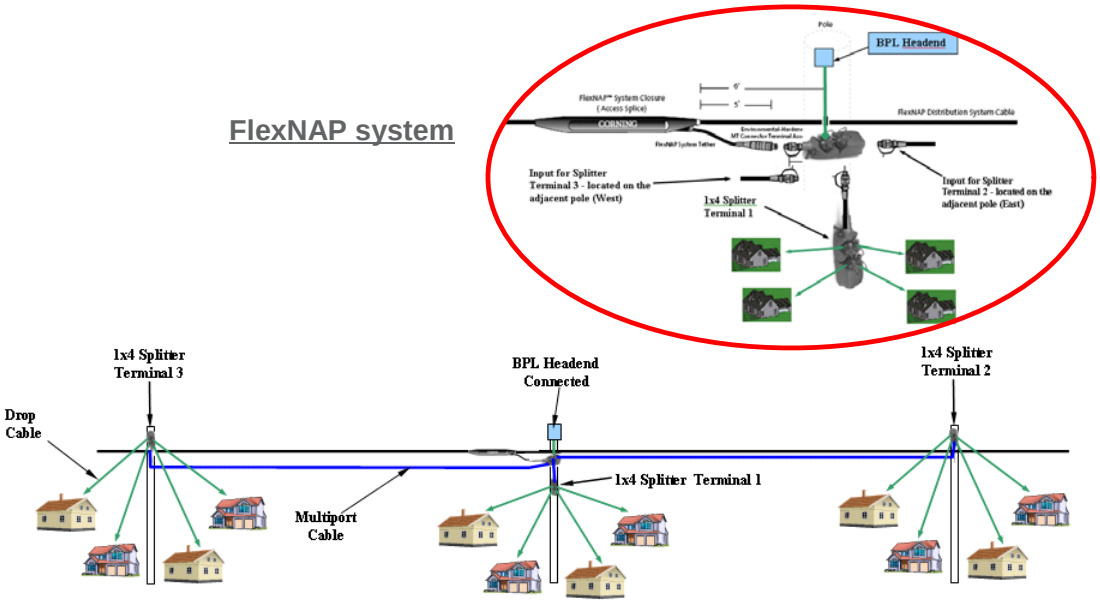

Figure 3:FlexNAP outside plant fibre distribution system- key FTTH enabler

- No splicing required in the field
- No skilled labour required
- Rapid speed of deployment – up to 10 times faster.
- Quality & reliability assurance
- Small footprint - virtually no visual impact
- Proven technology – Verizon since 2004, also made in Australia.
- No change in install practice –as per cable install.

Appendix G – Standardising FttH Solutions

by the FttH Special Interest Group

The introduction of any new technology must form an investment that is future proof and will allow interconnection with other technology (service providers) as seamlessly as possible. To ensure that no technology provider may influence the carrier with a certain selection of equipment and therefore potentially limiting the interconnection to other services providers there exists today several groups that have done the ground work in defining the physical layer, data layer, up to the control layer.

One of the leading working groups in development of standardised solutions in the transmission techniques and associated implementation topologies for the local loop and access environments for optical networks has been "Study Group 15" (SG15).
As part of the ITU Telecommunications forum there have been 3 study periods.
ITU-T Study Group 15 (Study Period 1997 - 2000)
ITU-T Study Group 15 (Study Period 2001 - 2004)
ITU-T Study Group 15 (Study Period 2005 - 2008)
SG15 have defined how FTTx networks should look like, the topologies and provided the input for the transmission to internet protocols

G-Series: Transmission systems and media, digital systems and networks
I-Series: Integrated services digital network
Q-Series: Switching and signalling
R-Series: Telegraph transmission
V-Series: Data communication over the telephone network
X-Series: Data networks, open system communications and security
Y-Series: Global information infrastructure, Internet protocol aspects and next-generation networks

http://www.itu.int/ITU-T/recommendations/index_sg.aspx?sg=15

Over 90% of the worlds traffic that is generated and terminated is Ethernet/IP based, moving forward with deploying a FttP network this is no different. For this reason any solution should be based on Carrier Ethernet, which is the adaptation of Ethernet used by telecommunication carriers to deliver Ethernet throughout their networks.

One such body driving the standards of Carrier class Ethernet networks and services is the Metro Ethernet Forum (MEF). Widely adopted globally industry alliance comprising more than 120 organizations including telecommunications service providers, cable operators, MSOs, network equipment, test vendors, labs and software manufacturers, semiconductors vendors and testing organizations.
It has three main objectives[15]

1 Build consensus and unite service providers, equipment vendors and end customers on Ethernet service definition, technical specifications and interoperability.
2 Facilitate implementation of existing and new standards, Ethernet service definition, test procedures and technical specifications of the MEF to allow delivery of Ethernet services and make Carrier Ethernet-based core, metro and access networks truly carrier class.
3 Enhance worldwide awareness of the benefits of Ethernet services, enabled applications and Ethernet based networks.

The primary priorities of the MEF are to define:

a. Ethernet Services for metro transport networks
   - Such services shall be delivered over native Ethernet-based Metro networks and could also be supported by other transport technologies.
b. Carrier-class Ethernet-based metro transport technologies by:
   - Specifying architecture, protocols and management for Ethernet-based metro transport networks
   - Supporting such Ethernet Services

[15] http://metroethernetforum.org/page_loader.php?p_id=15

The secondary priorities of the MEF are (when deemed necessary) to define:

a. Work to be done by other organizations on other transport technologies
b. Non-Ethernet interfaces, if not defined by other organizations.

Not to lock out any supplier, carrier and maximise the benefit for this country any solution should be based on these principals as a minimum.

Appendix H – Bitstream and Multiservice Capabilities of the NBN

By the FTTH Special Interest Group

Standardising a bitstream definition will mean that consumers will be able to easily change access or application providers; it means that application providers will be able to more easily reach all consumers in a given service area, regardless of the particular access provider individual consumers have chosen to use. By overseeing the development of an appropriate bitstream definition, the Government can ensure compatible bitstream is eventually implemented across all future broadband access deployments not only the forthcoming NBN.

Having defined the bitstream capabilities for the NBN, (whether ultimately wireless, fixed or both), the NBN will be capable of supporting 'multiservice' – the simultaneous availability of formerly independent applications such as telephony, Internet, Pay TV, games, movies, home security, conferencing and so on, on one network connection.

Multiservice capabilities will set the NBN widely apart from today's current generation broadband access that is designed solely for High Speed Internet access. By comparison, today's networks are highly contended compared with a well engineered multiservice network. Today's networks are neither capable of assuring Quality of Service (QoS) nor of assuring differentiated behaviour between different applications. There are important ramifications for the reliability of the network and its resilience to fault or attack. Appropriate QoS implementation will protect 'important' applications such as a remote medical monitoring application or lifeline telephony, even if other applications such as internet access are experiencing abnormal and unexpectedly high traffic levels.

'Multiservice' will allow all applications to be concurrently accessed on any device connected to the network – whether fixed or wireless. Concurrency, for example, it will make it possible:

- for 'broadcasters' on the NBN to provide click-through connections to their sponsors,
- for Australians in different households to interact with each other while they're playing the same games, surfing the same web sites or watching the same movies,
- to reduce hospital stays, using multiservice broadband to accelerate and remotely supervise patient recovery, relocating patients to their preferred environments,
- to achieve a better work life balance for many Australians who manage the care of dependent children or elderly family members
- to access a rich variety of education programmes from home, providing advanced retaining and wider workforce participation opportunities
- for Government and Corporations to fully leverage broadband access to facilitate and encourage environmentally sustainable work practices such as videoconferencing thereby reducing business travel, road congestion etc.

There will be many other potential innovations we have not yet begun to conceive but none will be possible without a bitstream standardization that enables the full multiservice capabilities of the NBN and other interconnection broadband networks.

Recommendations regarding Bitstream standardisation

There are several effective actions that can be taken to ensure the problems resulting from a lack of standardization of a bitstream definition are adequately addressed and that universal guidelines or standards can be developed. These include the following:

Common access-neutral interfaces
An 'Access Boundary' is required in the customer premises. It should be specified independently from the access technology. The FttP paradigm assumes this will be the passive fibre service lead connection.

Access providers should be solely responsible for some aspects of an end-to-end service. Application providers should be solely responsible for other aspects. Without clear responsibilities, Access and Application Providers are more likely to be in dispute.

A standardised physical interface, standardised frame formats using defined protocols. This will simplify the process for a consumer to change their access provider. It will simplify the process for application providers to offer uniform services to all consumers.

A common Point of Interconnect for each access region
A 'Point of Interconnect' is required at a peering location. The peering location is the place where application providers interconnect their networks with the access providers. The Point of Interconnect should also be specified independently of access technology.

By establishing a single Point of Interconnect per region (a dissenting view to other views wishing Points of interconnect as close to the customer as possible), application providers will be further encouraged to offer uniform application offerings per region.

Clear technical specifications
Comparison between alternate NBN proposals will be facilitated if contenders offer plain English commitments for (a) contention ratios, (b) per subscriber peak and per subscriber sustained throughput, (c) technical clarification of how Quality of Service will be implemented.

Specifying performance parameters both per node and per region and under an arbitrary condition of maximum simultaneous usage in the target market, comparisons between the alternate proposals will be more straightforward than without a uniform context.

It is critical that proposals provide assurance that during times of crisis or natural disaster, important applications such as telephony or remote medical monitoring will be prioritised and protected against less important applications such as video download.

Clear migration strategy
Whoever deploys NBN should explain their approach for migrating from today's Telephony and Broadband access to the new platform. Ideally, NBN investors should strive to provide seamless migration, with minimum inconvenience and disruption for existing consumers.

Recommendations regarding Industry and Government participation in Multiservice Capability discussions:

- Encouragement of broader participation of industry and Government must start with an acknowledgement of the importance of the NBN having a true multiservice capability. To facilitate this it is recommended that the Government establish a controlling body such as a **Broadband Commission** with a mandate to:

- Identify and engage with all industries and government bodies that stand to benefit from Australia's NBN. Encouraging broader discussion will help identify impediments that could arise as new alliances and structures start to form.
- Identify key applications, including those applications outside the traditional telecommunications industry scope.
- Develop recommendations for maximising the benefits of the NBN for all Australians.
- Identify policy, legislative and regulatory aspects likely to impede stakeholder collaboration establishing NBN applications; recommending alternative approaches.

Appendix I – Regulatory Involvement in Encouraging Fibre Developments in Europe[16]

(This is a report published by BuddeComm)

REGULATORY INVOLVEMENT IN ENCOURAGING FIBRE DEVELOPMENTS IN EUROPE

Several European countries now top global league tables for broadband penetration. A number of factors have led to this success. Fundamental among them is the role of governments and regulators in ensuring fair access to incumbent networks and in removing obstacles to infrastructure investment.

Regulatory determination will prove critical to bringing about further large-scale changes to the European telecoms landscape in coming years. These changes will especially be seen in the context of local loop unbundling (LLU), structural separation, and fibre networks. In addition, the regulatory-sanctioned open use of spectrum released by the digital dividend to 2012 will also see some of the world's most liberal applications of spectrum for a range of technologies, particularly mobile broadband.

REGULATORS' VISION CHANGING THE LANDSCAPE

Unbundling loops

Access to the local loop is paramount for the development of the broadband market in Europe. LLU provides for infrastructure-based competition where alternative competing platforms are not viable. Incumbent operators have a competitive advantage through owning most of the existing local networks and the 'last mile' to end users, but effectively enforced regulation has enabled competitors to operate on equal terms. As a result, LLU has been a considerable success in many markets, and by early 2008 fully unbundled and shared access lines are likely to represent almost 30% of all DSL lines.

Table 8 – LLU and shared access lines – 2004 - 2008

Year/month	Fully unbundled	Shared access	Total
2004	3,345,900	2,250,600	3,893,600
2005	6,172,000	3,786,900	9,958,900
2006 (Sept)	9,281,200	3,893,600	13,174,800
2007 (March)	11,796,300	5,478,400	17,274,700
2008 (e)	14,700,000	7,360,000	22,060,000

(Source: BuddeComm based on ECTA and regulator data)

Prices for both fully unbundled and shared access lines continue to fall, though there is still an uneven picture across the EU. There is a strong relationship between LLU pricing and the strategies adopted by alternative operators: in Italy, where the monthly average cost per fully unbundled line was the lowest in the EU, fully unbundled lines far outnumber shared access lines. By contrast, in The Netherlands, which has the lowest monthly average total cost per shared access line, these predominate. Where the regulators have been particularly active in reducing tariffs, notably in the UK, Germany and Finland, broadband penetration has risen most dramatically.

[16] Regulatory involvement in encouraging fibre developments in Europe, *© Europe 4/03/2008 11:02:00 PM, Paul Budde Communication Pty Ltd*

Table 9 – Proportion of LLU access lines, select countries – June 2007

Country	LLU as percentage of DSL lines
France	34%
Sweden	34%
Germany	29%
Netherlands	27%
Finland	23%
Austria	23%
Italy	22%
Portugal	22%
Denmark	18%
Spain	18%
UK	18%
Slovenia	16%
EU average	**23%**

(Source: BuddeComm based on ECTA data)

Structural separation

Both the European Commission (EC) and national regulatory authorities (NRAs) will fine-tune their policies on structural separation in 2008. The move towards structural separation was instigated by Ofcom in 2005. It is now in advanced stages in Ireland, Italy, and Poland. In January this year the Swedish incumbent TeliaSonera launched its new infrastructure company, closely following the BT model. In Ireland, the incumbent eircom plans to its sell off its retail division entirely later in 2008, rather they retain it as a separate division as per BT.

There is now clear evidence that in those countries which have made structural changes (the UK, The Netherlands, Sweden, Denmark) both the incumbent and competitors have profited, while there is far higher level of investment and competition.

Guaranteeing equal access to networks through LLU and structural separation has also provided enormous benefits to consumers. Broadband is now very cheap. With less scope to reduce prices further, operators are forced to attract new customers by providing more content, including a wide and growing range of IP-delivered content. This allows players to differentiate offers by developing bundled products, but also pushes the need for fibre to deliver that content. Thus the emphasis in Europe has progressed beyond concerns for broadband penetration (currently approaching 20%) to bandwidth and openness to new services.

Exhibit 1 – Structural separation developments – 2008

Name	Position
Ireland	Incumbent eircom requested the regulator to assess structural separation in October 2007. Planned to sell retail operations in 2008 while retaining the lucrative wholesale division and ensuring equal access to its own network for all telcos. Strategy does not legally require government or regulator approval but a sympathetic regulator will likely secure a favourable pricing regime.
UK	The model for regulatory-inspired structural separation. BT in January 2006 created its Openreach wholesale division providing competitors with equal access to BT's networks. The move secured regulatory clarity and helped propel the UK as one of the most competitive and vibrant broadband markets in Europe.
Poland	Regulator UKE considered functional or structural separation of the incumbent TPSA from late 2007. The move follows a number of measures to improve competition

	in bitstream access, wholesale line rental and naked DSL services.
Sweden	The government in 2007 began selling of its stake in the incumbent TeliaSonera preparatory to splitting the company into separate infrastructure and services divisions. The wholesale business is responsible for rolling out FttC and managing the bitstream and LLU assets. TeliaSonera forestalled legislated functional separation by establishing its wholly-owned infrastructure company TeliaSonera Skanova Access in January 2008, modelled on BT Openreach. It sells wholesale services over copper and other networks on equal commercial terms to rival operators and its own retail division.
Italy	Functional separation of Telecom Italia planned since June 2006, with procedures to split Telecom Italia's network business from its commercial activities opened in December 2007. A separate network unit is likely to be formed by the end of 2008.
New Zealand	The government set in train structural separation in May 2006 The incumbent has since taken advantage of the opportunities of separate wholesale and network divisions and planned to invest $1.4 billion in broadband infrastructure, much of it in fibre.

(Source: Buddecomm analysis)

Fibre networks

In 2008 NRAs will have an enormous influence on Europe's fibre networks. This is timely, and follows several years in which the fibre market was slow to develop and so attracted little regulatory attention. Many of the largest incumbents, including BT and France Telecom, were confident that their ADSL2+ and VDSL networks would be sufficient to cope with anticipated bandwidth demand, and deferred serious investment in fibre until demand was more pressing.

The few key private operators (Iliad, FASTWEB) took a different approach than did the incumbents. Their commercial successes have helped to propel the market forward, largely on the given that the first operator in an area is guaranteed the largest share of the market – up to 70% market share is normal. This competitor pressure has created a sea-change in the strategies of incumbents as they respond by expanding their own FttH and FttN investments in major urban centres.

Fibre is the optimum solution for Europe's Next Generation Network (NGN) ambitions. The model involving VDSL deployment from street cabinets to end-users may be relatively cheap for incumbents but they would soon face capacity constraints, while the additional investment demanded of competitors may oblige them to rely on incumbent networks. The Passive Optical Network (PON) model (FttB) creates further unbundling issues and potentially strengthens incumbents' control. This leaves FttH as the optimum route, future-proofing bandwidth demand and allowing a fully open access regulatory regime.

Regulating access

The role of regulators in promoting fibre in coming years relates principally to providing open-access and a regime sympathetic to investment. As a result, billions of euro will be spent in coming years in a number of markets. In the UK, the regulator Ofcom launched a consultation in late 2007 on how the country could develop a nationwide fibre network that would require an investment of up to £15 billion. France assessed its national fibre network as costing up to €10 billion to cover 40% of the population and €30 billion to cover the entire country. Similar national fibre networks are in progress in Italy, Ireland, Denmark, Sweden, and The Netherlands. In promoting an effective fibre regime regulators are in turn supported by governments conscious of the socio-economic benefits of fast broadband networks, and the consideration that such networks are vital to national infrastructure.

Although the cost of FttH deployment is falling, it remains a disincentive for all but a few providers (notably in France and Italy). This has focussed attention on open-access schemes initiated by numerous municipalities (the standard-bearers are Stockholm and Amsterdam, among many others). These deployments are commonly public-private partnerships in which municipalities make owned-ducts available to fibre operators. Access to fibre is then leased to service providers. In this model municipalities have opted for a long-term return on investment while securing fibre for rate-payers.

Examples of open access

Paris represents one of the largest fibre deployments in Europe, with the involvement of France Telecom, neuf Cegetel and Iliad. Legislation provides public authorities the right to build, subsidise and develop passive telecom infrastructure and transfer them to carriers or independent local users, build open networks, operate open telecoms networks and provide telecom services to end users. In 2007 the regulator, ARCEP, mandated access to rights of way, poles, ducts, and existing sheaths, and on the sharing of the terminal part of fibre networks. It has developed a fibre framework which applies symmetric regulation to all operators – whoever is first to construct within a building is required to provide shared access to competitors. Inter-connection also ensures 'any-to-any connectivity', while pricing is also regulated.

In Sweden and The Netherlands the involvement of a number of municipalities in fibre roll-outs has been cleared by the EC as compatible with EU State aid rules: in December 2007 the investment by Amsterdam in a city-wide fibre network was approved on the basis that it operated on the same terms as would a market investor, and so no market-distorting state aid was involved.

On a wider level, co-operation between governments and telcos has effectively managed the investment costs and avoided potential financial difficulties. The Netherlands has also demonstrated that fibre networks can be built from the ground up without government subsidies: the FttH network in Hillegom built by a commercial company challenged the previous cost models which presumed that such developments would be too expensive without public money. Its success has encouraged many similar initiatives in cities and towns across the country, in turn stimulating the larger broadband players to step-up their own FttH plans.

Regulators have also promoted the wholesale access model, used so successfully with DSL networks. Where a fibre developer can secure the lion's share of the consumer market by being the first-entry operator, competitors can either choose between building networks in non-fibred towns or pursue a wholesale agreement with the new local incumbent.

SUMMARY

Together, these strategies show how effectively regulators, once determined on their course, have pushed the fibre market forward. By removing obstacles to investments, and by promoting open-access and wholesale models, Europe has within a year become a key region in FttH investments and deployments.

Henry Lancaster
Senior Analyst Europe BuddeComm

Appendix J – FttP in New Residential Communities

Bruce Duyshart, Lend Lease Communities

Next Generation Broadband Networks in New Residential Communities

Introduction

This paper provides a brief background to some of the most significant challenges currently being encountered by developers in Australia for the implementation of next generation networks in new 'Greenfield' residential developments.

Internationally, it is widely recognised that in new residential developments where a new telecommunications infrastructure has to be laid from an exchange, that a FttP solution offers the most scalable and long term cost effective method for the delivery of services to residents.

Today, there are a significant number of successful implementations of FttP technology in Japan, South Korea, USA, the Netherlands and elsewhere, where residents are able to enjoy significant bandwidth (100Mbs+) to their home. With the high availability of bandwidth in these environments, residents are able to potentially connect to a wide range of services such as high-speed Internet access (30Mbs+), telephony, VoIP, PayTV, FTA TV, educational services, medical services support, home security etc. over one fibre infrastructure. Traditionally, many of these services may have been delivered over various infrastructures such as copper, cable (HFC) or Satellite and only where these services have been available to residents.

In Australia, the introduction of FttP technology has been regarded as an ideal solution to address the challenges faced in developing residential communities being built on Greenfield sites where no previous telecommunications infrastructure has existed. The use of FttP is able to address the large connectivity distances, relative geographical isolation and growing demand for services equivalent to services that are readily available in inner urban areas.

Technologically, the introduction of FttP replaces the use of a traditional copper based infrastructure. However, with the introduction of FttP technology, a myriad of new legislative, commercial and technical issues have also emerged that are setting challenges for governments, developers and carriers alike.

Consumer Demand for Services

- The ongoing use of digital, Internet and entertainment technologies is driving the demand for reliable and high speed telecommunications infrastructures to be available everywhere.
- Today, the consumer expectation of residents moving into new developments is for the availability of the following services: telephones, (fixed and mobile), high speed Internet, Free to Air TV and Pay TV. In some cases there is also a demand for specialist television (usually foreign) television channels.
- There is also demand for a broad range of additional Internet based services that require increased bandwidth capacity such as: Internet gaming, music (eg. iTunes) & video downloads (eg. YouTube), social networking (eg. Facebook), network computing, Voice

over IP (eg. Skype), online storage (eg. Xdrive), high definition video downloads and IPTV (eg. Joost).

- User-generated content, is not only driving the need for overall increased bandwidth, but it is also confirming the requirement for high speed uploads as well as high speed downloads (symmetrical services).
- In new Greenfield residential developments, there is an increasing use of community portals which provide local Web-based content for residents as well as links to other on-line services.
- One future network application for residents is the monitoring and recording of water, gas, electricity and grey water usage for demand management using so-called ‘smart-meters’.
- In many new Greenfield residential developments there is a strong emphasis upon lifestyle and a common feature of many dwellings is a home office from which to work. This, in turn leads to an expectation of excellent broadband capabilities to be widely available in the development.

A Typical FttP Solution

A Fibre to the Premise infrastructure in a Greenfield site is relatively simple implementation. The most common model in Australia is a Passive Optical network (PON) comprising of:

1. Fibre optic equipment located in a telecommunications exchange.
2. The exchange connects to various network services content such as the Telephone service, Internet backbone, PayTV and Free to Air TV. Alternatively, some of these services can be injected at a community ‘head end’ control room.
3. A series of in ground pits and pipes are laid out around the development to carry fibre past each dwelling.
4. An optical distribution network (ODN) of fibre cables is passed down all streets and split into 16, 32 or 64 fibre end points, with one point being assigned per dwelling (eg. A house or unit).
5. Each dwelling requires an optical network termination (ONT) point that splits the signals from the various services into usable ports for each service eg. Telephone, Ethernet for Internet access, Coax for PayTV & FTA TV.
6. Typically, the ONT also has a small ancillary UPS system to provide a base level of power backup in the case of a power outage.
7. Adjacent to the ONT will be a cable distribution system that is used to manage the patching and distribution of data, voice and video signals to various points around the dwelling.

Depending on the type of PON technology deployed, residents or small business owners can expect to have bandwidth availability of between 100Mbps to 1Gbps. A range of services provided by the carrier and other Internet based services can make use of this bandwidth.

The Challenge for Developers

In the planning of residential community developments, the telecommunications infrastructure needs to be considered today, as equally important as all other utilities such as power, water, gas, roads, street lighting and storm & waster water.

Traditionally, the telecommunications infrastructure implemented into new developments was provided at no cost to developers under the provisions of the Telecommunications Act and the USO. Essentially, all that was provided was a basic telephone service. However, over time, this infrastructure has also been expected to also deliver broadband services.

Over the last few years as demand for broadband services has risen significantly and developers have now become acutely aware of customer demand for broadband as well as PayTV. It was soon realised in the development industry that the traditional approach to implementing a telecommunications infrastructure was no longer viable due to the limitations of copper and the remoteness of their development.

As a result of these changes in the industry a whole new set of challenges has emerged for developers including:

1. A general **education for developers** as to the benefits, risks, costs, technology options and legal framework surrounding FttH technology.
2. The need to understand the **pros and cons of various technology options** such as copper, fibre, wireless, mobile, cable, satellite and BPL .
3. An understanding of a developer's regulatory obligations under the **Telecommunications Act** or other related regulatory requirements.
4. An understanding of **open network access options**. Are there anti competitive or third-line enforcing issues associated with providing only one carrier for a development?
5. **Costs.** Developers need to incorporate the cost of providing a FttP infrastructure into the overall commercial assessment of the residential development. Traditionally, developers have paid no costs towards the telecommunications infrastructure and today, FttP solutions require an additional investment of between $2500 and $4000 per dwelling. This can be a serious challenge for many affordable housing developments.
6. **Selecting alternate providers to Telstra**. An understanding of the developer's rights if they select a carrier other than Telstra. eg. Does Telstra have a right to 'over build' if they select a different 'Last Mile' Provider? Can Telstra pass up their obligations under the USO if another provider has built the primary telecommunications infrastructure?
7. **Carrier selection criteria.** In Australia there are a very limited number of FttP providers who are capable of building, owning, operating, supporting and managing the supply a range of services to a development. Therefore, the process of selecting a suitable FttP provider requires a large range of considerations to be assessed including:
    - Suitability of the technology being offered
    - The carriers industry and local experience
    - The range of services on offer
    - Customer support
    - Marketing support
    - Long term commercial viability
    - Quality of management
    - Competitive pricing
    - Contractual considerations
    - Financial stability
    - Customer service track record etc.

Today, the total range of these topics is quite a considerable undertaking for any developer to easily understand to the same level as other utilities they are more familiar with.

A Government and Regulatory Perspective

Federal, State and Local agencies should play a role in facilitating the implementation of FttP infrastructures on new residential developments.

Currently, there is a mismatch between the current level of knowledge surrounding FttP networks and the regulatory framework and planning laws used to control their implementation.

A number of recommendations for Government and regulatory authorities in the implementation of FttP solutions include:

1. Governments need to **encourage or mandate the deployment of FttP technologies** on all new Greenfield development sites to promote the implementation of 'future proof' next generation networks.
2. A need to increase the level of **co-operation between Federal, State and Local agencies** to assist in long-term planning and access to backhaul infrastructures.
3. Councils need to provide **basic advice for developers on the availability of local infrastructure** that might be available to the community.
4. Councils need to **advise developers on the 'Last Mile' Carrier** options they face. Many developers refer to this form as a Telstra form. There needs to be an education of Councils and developers that there is a choice.
5. There is a need to **review the USO** in Australia and how it is to be handled, particularly now that there are choices of 'Last Mile' Providers.
6. There needs to be an **update to the Telecommunications Act** to reflect the use of telecommunications infrastructure other than copper.

Conclusion

It is now widely acknowledged that FttP technology offers the most scalable and long term cost effective solution for the delivery of services to residents in new residential communities. There is also a strong vision to provide these next generation broadband networks on all *new* Greenfield Residential developments in Australia.

In order for this vision to be achieved there are four key issues that need to be addressed by Developers, Carriers, Regulatory Authorities and all levels of Government in Australia.

1. To widely **promote and educate developers and councils** in the use of FttP solutions on all new Greenfield developments;
2. To **update the Telecommunications Act and USO** to reflect the use of telecommunications technologies other than the traditional use of copper;
3. To provide legislation to promote an **open access regime** for carriers and service providers on FttP networks;
4. For the Federal Government to **fund contributions** towards the implementation costs of FttP networks in line with funding for the FttN network.

In addressing these issues, it is envisaged that the deployment of FttP technologies will become the standard for all new residential developments in Australia and that the attributes, features and benefits of these networks will lead to social, economic and sustainability benefits for all Australians.

Appendix K – Industry Education for a National Broadband Network

by Members of the Communications & Information Technology Training (CITT) FttH SIG

There are a large range of considerations for the training of telecommunications technical and trade personnel in the context of a national broadband rollout. Some of these considerations have been outlined in the following points.

Training and Skills for Broadband
Although outside the immediate parameters of the broadband vision paper, the current skills circumstances in the telecommunications industry warrant a mention and will require attention from government, as part of the drive to better skill Australia in the future. The broadband rollout will be severely impacted if the skills available are not up to the required standard.

In the current environment, *there are no major enterprises or training institutions, who have in place significant, nationally consistent, structured training programs for telecommunications.* This contrasts with the scenario when PMG/Telecom Australia/Telstra was a virtual monopoly with a "social" training role where many graduates from the various enterprise training programs moved to the private sector, on graduation, or, over time. Privatisation of most electrical, gas and transport statutory authorities, who also trained staff in telecommunications and related fields, has exacerbated the skills shortage problem.

Added to this, is the fact that reliable *statistical data* on training is *not available* at the national level due to the methodology used. Accordingly, much of the industry information on current skills shortages is anecdotal, however, there seems to be a general consensus that there is a problem. The growing use of the 457 visa system is also an indicator.

Additional Skills Requirements
The broadband rollout will require a significant amount of attention to ensure a smooth transition and as has been stated in other papers, the best technology in the world is useless if the last few metres of the network, are not up to standard.

As the industry is not organized as well as say, manufacturing or retail, reliable, data-backed feedback to government on industry skill needs will take some time to gather. The industry will need time to mature in the more open environment today, given that there is a huge range of players from Telstra through to the sole trader, with overseas based vendors and contractors all playing a part. The just in time philosophy and common use short duration contracts exacerbates the problem.

In the recent past, most telecommunications technical training was centred on the skill needs, technical standards and modernization programs of the main telecommunications carrier/s. *This situation has changed fundamentally and the broadband rollout will require a revised approach* to skill needs.

The Future Shape of the Telecommunications Environment
As is well known, industry analysts predict massive future changes in the shape and nature of the Australian telecommunications environment. These changes will impact directly on the training needs for telecommunications technical and trade personnel.

As is well documented, falling costs/prices and increased data rates will see a huge growth in the use of broadband.

Even at the most basic level, these new broadband applications will alter many of the practices used by network contractors, technicians and engineers. These skill needs should be reflected in the national training packages available for the various certificate levels and also for the top-up training programs, to facilitate the rollout.

Fields of Activity Involved for Broadband Rollout

There is some evidence that the higher end of the skill sets needed in telecommunications field may be satisfactory for the near future, although in the longer term, given the time frame needed to produce higher level technical/engineering skills, this issue will also need to be addressed at some time, perhaps as part of the overall government strategy currently being put in place.

For broadband, it appears that the two main areas of skilled technical staff activity needing attention are:

- the access network – often known in the industry as the CAN (Customer Access Network) on the carrier side of the network boundary point. This commonly uses contract labour, with carrier staff involved in management and higher level roles.

- customer premises cabling and equipment – often known as CPE (Customer Premises Equipment) - which is undertaken on the customer side of the network boundary point.

Some enterprises prefer staff to be multi-functional and on the payroll. Others only use sub-contractors. However, there are particular skill short falls in the access network (CAN) as a result of growth, industry re-structuring and the application of contracting in lieu of a permanent carrier workforce. There is an ongoing need for national, structured training programs to be expanded.

Maintenance in rural areas and upgrades are a particular area of need and the recent use of the 457 visa system to top up the skilled staff pool is an indictment on the previous government. There is an urgent requirement to ensure the core infrastructure of the network can support the roll out of broadband and the new applications of technology.

Skill Sets

With widespread contracting in place, a consequence is that currently there is a pool of approximately 6,000 technical staff that move between the carriers, customer premises equipment and cabling providers, cable TV providers, data, alarm and other ICT services.

The already identified skill shortages affecting many mining, manufacturing, technical and engineering areas within Australia, are common to ICT, not just the telecommunications sector.

Recognised areas of difficulty include:

- ageing of the workforce
- loss of skilled staff to other work areas for a variety of reasons
- difficulties for regional areas in retaining skilled staff when salaries and conditions are usually better in the main city centres and
- often there are *image problems* with young people and potential new entrants not being attracted to the telecommunications technical and engineering career streams.

Active redundancy programs in Telstra and some other key players also contribute to the perception of a “no future” industry.

Training Needs Summary

Existing Staff – As many existing technical staff are made up of previously trained staff from Vendors; Telstra, Optus and other telcos; electrical/electrician; alarm and data cablers; and related industries, there is a need for some “re-training” and up-skilling to achieve reasonably common skill sets and good work practices for enterprises involved in the broadband rollout.

Also, for installation and servicing of customer premises equipment (CPE) and cabling, a registration is needed under the Telecommunications Act as applied by the ACMA called ACMA Cabling Provider Rules (CPR), to encourage technical standards compliance, safety and OH&S and national consistency in quality of service.

However, the CPR/CPE staff group, which numbers more than 60,000, will also probably require re-training, or, refresher training in the following areas:

- **OH&S.** Construction sites and new techniques.
- **Fibre Optics**. Basic principles eg splicing, applications and safety.

- **Co-axial Cable**. Basic applications and safety.
- **Antennae/Satellite**. Basic applications, installation practices and safety.
- **Power Safety**. As power infrastructure eg. electricity company poles, is often used for telecommunications equipment mounting, this is an area of growing need. Exchange-fed power to certain equipment types is also an issue of concern.

New Entrants
New entrants may already have some basic skills, however, experience shows that it is common for a program to be required which includes OH&S, basic electrical theory, basic telecommunications principles, hand and power tools and regulatory requirements. Enhanced fibre, Coaxial Cable, Antennae/Satellite and Power Safety programs are often required to round off capabilities. This may be addressed by the Australian Apprenticeship, Traineeship and Cadetship programs

School Based Training
Increased co-operation between the Commonwealth and States is essential for this to be effective and the training needs identified above can be included in existing school-based programs that are usually AQF certificate based.

Skill Sets
In many circumstances, Australian industry would be better served by school, or, industry based programs around skill-sets, rather than certificate based programs. Subjects such as OH&S, basic telecommunications and electronics theory and hand and power tools are a common need. From a social perspective, a large number of students now live in single parent and apartment environments, without the opportunity many enjoyed in the past, to pick up a number of basic hand/technical/life skills at home. Gaining core technical skills would also enable students to make more informed career choices in technical/engineering roles and some fast-tracking could apply on employment in apprenticeships, cadetships and traineeships.

Migrants
Although some countries have well structured programs in place there are a number of migrants who need up-skilling for broadband and in particular, training in Australian aspects of the environment, telecommunications and OH&S.

The earlier identified areas of training need would usually apply to this group in addition to the “refresher” training. The 457 Visa system for short term alleviation of skills shortages appears to be growing, although accurate data on telecommunications is difficult to obtain due to nomenclature inconsistencies. Extra training to meet Australian standards is usually needed for 457 Visa staff, but often delivered on an “induction” basis rather than in-depth.

Telecommunications Industry Image
As an aside, the ICT industry and in particular telecommunications, currently has job security “image” problems, often as the result of extensive restructuring that has occurred over the past 10 years, or, so. This needs to be addressed through the career advisory system - usually state and territory based - but with a more co-operative federal approach perceptions of a no future industry can be turned around. More new entrants from school leavers need to be attracted to the industry.

Employment in the Industry
With the changing nature of employment and the high use of mainly short term contracts – typically two years with options of extensions - short term planning due to contract lead in and phase down times, means training is often not taken into account. Recruitment from the existing pool of staff, has worked reasonably well up to recent times, however, it is now widely recognised that the pool is shrinking.

Industry Data on Telecommunications is Inaccurate

There is very little accurate, detailed information relating to actual numbers of telecommunications tradespersons, technicians and engineers and what statistical data is available on telecommunications and IT is not accurate. Proposed changes to be made by the ABS on telecommunications and IT nomenclature will not become effective for several years.

Currently, telecommunications data used to make a number of policy decisions in the government departments is mainly assembled, initially at least, at state and territory level and is often buried in, say, services, electro-technology and trades categories, where there is no real relationship to the telecommunications industry.

The issue here is that current data gathering methodology does not give us a clear understanding of the size of the population that would potentially require (re)training for broadband.

Action points and recommendations for consideration

Industry could be encouraged to employ new entrants through enhancing and streamlining existing employer and employee incentive systems and government programs, national apprenticeships and traineeships. Many of the current government training support programs are too complex and involve a mix of federal requirements, state and territory policy and rules and human resources administration and company time inputs, turn many potential employers away from the current programs, helping to create long term shortfalls in skills.

Some objectives could be:

- Simplify bureaucratic processes on training programs.
- Use a “carrot and stick” approach to get more enterprises to use Australian Apprenticeships, Traineeships and Cadetships.
- Contract specifications to include training obligations
- Address the “thin markets” problem in non-metropolitan areas through additional incentives to support training for telecommunications upgrade activities, such as the broadband roll-out in the remote and regional areas.
- Assist enterprises to mentor and work more closely with new entrant staff as part of the telecommunications up-skilling program.
- Provide additional support to identified, telecommunications “focussed” group training companies.
- Recognise the reality of the continuing problems with ageing of the workforce and loss of skilled staff to other work areas.
- Ensure broadband training is better integrated into existing telecommunications training programs and the training package system.

Additional Information Sources

- Industry Employment Outlook - Communications Services - 2007 (DEWR)
- NCVER statistics
    - Apprenticeship and Trainees completions Dec 2004 - Dec 2005.
    - Number of student in selected training packages - 2002-2006
    - Students by parent training package 2002 - 2006 Course enrollments by Training package.
    - Top twenty training packages 2006
    - Commencements Dec 2005 - Dec 2006
    - Subjects Completed by parent training package 2000 - 2005
- Australian Jobs 2007 (DEWR)
- Industry Survey: Radio Technician training - 2007 (CITT)
- Radio Technician Recruitment - 2005 - (Radio communications consultative council)
- Skills shortages and training needs 02 08 kf

Appendix L – Members of the FttH Industry Special Interest Group

These are the companies who are represented in the FttH Industry Special Interest Group.

3 Australia
3 E Property Pty Ltd
3M Australia Ltd
ActewAGL
Active Broadband Networks Inc
Acuity Ventures Pty Ltd/Ausanda Communications Pty Ltd
ADC Communications (Australia) Pty Ltd
ADC Krone (Australia)
Agile Communications/ Internode
Alcatel - Lucent Australia Ltd
Agility Management Pty Ltd
Alinta Asset Management
Allied Telesyn Int. (Aust)
Alpha Global Partners
Ambrose Dean
Anritsu Pty Ltd
ATUG (Australian Telecommunications Users Group)
AWA Networks
BADJA Interconnect
Baulderstone Hornibrook
Broadcast Australia
Broadcast Engineering Services Australia
Callpoint Pty Ltd
Capsicum Corporation
C-COR Broadband Australia Pty Ltd
CEOS Pty Ltd
Cheiron Pty Ltd
Chime Communications
Cisco Systems Australia
Communication & Information Technology Training (CITT)
Communitas Pty Ltd
Community Telco Australia Ltd
ComTel Network Solutions
Connell Wagner
Consultel
Converging Trails Pty Ltd
Corning Cable Systems
Corning Noble Park Pty Ltd
Corning International
Country Energy
Creator Tech
Destra Corporation Limited
Digital Distribution Australia
EDS Australia
Elders Telecommunications
Elton Consulting
Emtelle Australia Pty Ltd
Endeavour Connect P/L
Energex Limited
Energy Australia
Ericsson Australia Pty Ltd
GDI Consulting
Global Connect Communications
Global Reach Telecoms Pty Ltd
Google Australia
Hills Industries Ltd
Horizon Broadband Communications
Huawei Technologies (Australia) Co Ltd
IBM Australia
IceTV Holdings Limited
Integral Energy
Intel Corporation (Intel Australia)
International Information Security Consultants Pty Ltd
Internet Community Networks (ICN)
ISPhone Australasia Pty Ltd
Itron Australasia Pty Ltd
John Fairfax Limited
Kingfisher International
Lend Lease
M2/WCG
Madison Technologies Pty Ltd
Market Clarity
Matchmaster Communications
MCB T Group Pty Ltd
Motorola Australia Pty Ltd
Multimedia Victoria
NEC Australia Pty Ltd
Nextep Broadband
NewSat
Nextgen Networks

NICTA
Nokia Siemens Networks
Nortel Australia Limited
Opticomm
Optimal Cable Services Pty Ltd.
Optilinx
Optus Pty Ltd
Orion Satellite Systems
Pacific Broadband Networks
Pivit
Power & Water Corporation
Powerlink Queensland
Primus Telecommunications
Qualcomm Incorporated
Schneider Electric (Australia) Pty Ltd
Senko Advanced Components
Service Elements
Silk Telecom
Smart Home Networks
Swinburne University of Technology
Teligent
Tellabs Australia
Titan Recruitment & Consulting
TransAct Communications Pty Ltd
Transgrid
TR Corporation/Telecom
Unifier2 Pty Ltd
United Customer Management Solutions (UCMS)
Universities Australia
Unwired Australia
Vanco Australasia
Vermast Business Partners BV
VicUrban
Visionstream
Westnet
Wireless Broadband Services Pty Ltd
xiB/OSS
Yokall.Com Pty Ltd

Observers:

Australian Competition & Consumer Commission (ACCC)
Australian Communications and Media Authority - ACMA
Brisbane City Council
City of Whittlesea
Department of Finance & Deregulation
Department of Further Education, Employment, Science and Technology - Science, Technology and Innovation Directorate
Department of Industry & Resources
Department of Public Works, Information Economy Queensland
Department of Public Works, Information Economy, Sport and Recreation Queensland
French Trade Commission
Wyong Shire Council