



**Submission on broadband solutions for rural
and remote areas**

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ATUG welcomes the opportunity to make a submission on policy and funding initiatives to provide enhanced broadband to rural and remote areas as part of Australia's NBN planning.

ATUG claims confidentiality on the detailed attachments outlining solutions in rural and remote areas, until we receive confirmation from the project leaders that they are willing for this information to be released publicly.

ATUG REGIONAL ROADSHOW FINDINGS

ATUG has conducted Regional Roadshows since 2003, visiting 56 towns and speaking to over 2000 people interested in bringing broadband services to regional, rural and remote end users. ATUG has worked with Federal, State and Local Government officials during these events. The Summary Reports from the 2007 and 2006 Roadshows are attached for to provide the background from which ATUG makes a number of suggestions for consideration. ATUG's summary of the issues arising from the 2007 Roadshow in Powerpoint format is also attached.

It is important to understand that rural and remote end users have seen a number of Funding Programs start, stop and change over the last few years. **Whatever solution is developed now for bringing advanced broadband services to ALL Australians needs to be long-term, sustainable and relevant to rural and remote areas.** If more time in the planning and co-ordination phase is needed to achieve this outcome, that time should be taken.

ATUG supports the direction of Government policy that all Australians should have comparable broadband outcomes and that these should be benchmarked against the outcomes of the National Broadband Network.

THIS IS NOT A TECHNOLOGY PROBLEM

From ATUG's perspective the problem is not technology, nor the capability to provide these services. Many companies have the technology and capability to provide cost effective advanced broadband to remote communities. Solutions could include a mix of fibre, wireless, satellite, mobile technologies. ATUG would encourage the provision of fibre backhaul services as far into remote areas as economically feasible on an ongoing basis.

The more difficult parts of providing remote communications lie in:

- developing a sustainable "business" case,
- the need for co-ordination and commitment of ongoing communications spend – all levels of Government and across agencies such as health, education, police, family services, indigenous community services among many others,
- effective project leadership

THE BUSINESS CASE - SUSTAINABILITY

The business case for Rural and Remote NBN will only exist if all Government agencies serving these areas link their needs and spend to support the network. This may mean separating the communities spend of these agencies into two “buckets” – metro and regional, and rural and remote. The communications spend of Government agencies plus Special Purpose funding for Infrastructure from DBCDE should be combined to develop a business case for long-term service provision.

ATUG prefers explicit Government funding for provision of services to remote end users. This eliminates the need for cross-subsidy from other users and reduces the potential for conflict in access price setting where shared infrastructure must be used to achieve competitive outcomes for end users.

A REGIONAL SERVICES TASKFORCE – LONG-TERM SOLUTIONS

ATUG suggests the Government establish a Remote Services Taskforce to look at the needs, applications and options for rural and remote end users and their myriad service providers in a holistic way. The Remote Services Taskforce should report to COAG.

The Regional Telecommunications Inquiry Review process (independent review, 3 year cycle, report to Parliament, Government required to respond) should continue to be supported. The recommendations from this process would inform the decisions of the Regional Services Taskforce on priorities along with input from relevant Government agencies.

SERVICE PROVISION MODELS

In considering a competitive process for the choice of service providers, the Government has its own service provider, AARNet, with a network of tremendous reach and capability. The role of AARNet in the provision of services to remote communities should be considered when planning solutions for these end users. AARNet is currently focused in its activities educational institutions. In ATUG’s view this remit should be broadened to include remote communities starting with those linked to education and research activities.

Another model of how a focused infrastructure provide can address rural and remote markets is that of Axia Media in Alberta, Canada and provincial France. A copy of a presentation at ATUG 2008 outlining this model is attached.

SPECTRUM ALLOCATION

Spectrum must be made available on a licenced basis to ensure quality of broadband services for end users in rural remote areas. This spectrum should not be allocated on an upfront licence fee basis but on the basis of a per-service connected contribution after financial viability targets have been achieved

PROJECT LEADERSHIP and COORDINATION

Examples of programs funded under the Co-ordinated Communications Infrastructure Fund provide examples of what can be achieved with co-ordination, co-operation and local knowledge. The Ngaanyatjarra Lands project undertaken by the WA Government with CCIF funding is one example of what can be achieved using this model. Information on this project is attached.

Another example of project leadership is the Victorian South West Alliance of Rural Health Service project where a unique funding arrangement was developed based on "capacity to pay". Information on this project is attached.

Other examples of rural and remote broadband projects are attached to indicate what is possible using local need and knowledge, in some cases combined with Government funding, whether State or Federal.

These projects provide models for the successful coordination of effort between levels of Government and sometimes across agencies. This important role of local knowledge and engagement with the end user community is highlighted in the success stories. These experiences should provide a model for developing effective broadband solutions for rural and remotely located end users.

AUSTRALIAN BROADBAND GUARANTEE

This program provides an important safety-net for end users who are not connected to broadband yet and for whom the NBN, whether for regional and metro users or for rural and remote users, is some time away. ABG funding is important to encourage Australians to begin their own broadband journey – over time as end users understanding of the value of broadband access in their own circumstances, the business case builds for advanced services. ABG funding needs to be increased to meet the needs as they are identified if sufficient funding has not been made available through the 2008-2012 as outlined in the May 2008 Budget.

The planning for transition from ABG funded services to NBN Remote funded services will need to be carefully managed to ensure continuity for end users balanced with viability from an ABG service provider's perspective.

ATUG REGIONAL ROADSHOW - KEY FINDINGS 2006

- Roadshow attendees seemed to have a general lack of information when it came to the various broadband technologies available to them, however were keen and interested to find out when and how these technologies could be available in their specific areas and in a local capacity.
- Few home user Roadshow attendees had a great understanding of the Government funding programs available to them and the bigger picture which these funding programs support.
- Local providers had a good grasp of the Government funding programs available in regional areas, however were concerned about the cease in HiBIS funding and interested to learn what the Broadband Connect funding would offer for local Broadband solutions.
- There seemed to be considerable apprehension concerning the new Telstra 3G network, some of which was directed at Government representatives on the roadshow as there is a strong instilled recognition with Telstra and the Government regionally.
- A considerable amount of Roadshow attendees had the view that Telstra was the only option in their area. Many Roadshow attendees were under the impression to receive Broadband they needed ADSL and believed this was only possible through Telstra.
- There is a major concern and lack of understanding in regional areas about metro equivalence and it was expressed that unrealistic expectations are being created in regards to this issue.
- While it has been identified that there is a general lack of information for regional end users when it comes to technologies such as satellite, wireless, ADSL and ADSL2+ there is even more concern about 3G. It's likely that 3G is the least understood technology and is being pushed as regional Australia's only solution. This seems to be end users greatest concern with the CDMA switch over approaching.
- There seemed to be a lack of knowledge about the Broadband for Health funding scheme, however there was a lot of interest both from people in the health industry and general community about this scheme.
- It was noted that many attendees were looking for much more localised information. There was a need for personal home/business situations to be analysed case by case with one on one attention and advice.
- It was noted by a supporter of the Roadshow that ATUG are on the right track with applications being a major focus for regional end

users.

- Critical information needed was identified as applications that use Broadband to 'value add' to businesses.
- It was identified that SMEs tend to be their own worst enemies when it comes to information sourcing due to the demands of a small business.
- Local information on 'what is available now in my area?' and 'how much?' were amongst some of the feed back attendees from the roadshow provided.
- Many regional attendees benefited from one on one time with participants on the Roadshow.
- Delegates were interested and encouraged to hear of new developments from providers like Austar in regional areas and are waiting in anticipation for such choice in their area.

ATUG REGIONAL ROADSHOW - OPPORTUNITIES 2006

- There is an opportunity for a wider variety of operators to be more involved locally in regional areas as in many regional areas Telstra is perceived as the only option.
- The variety of Broadband access technologies available should be made available in an information model to regional areas. There is an opportunity for industry to push this agenda as regional consumers are ready now after understanding the benefits of broadband to engage in this dialogue.
- There is a need for local providers and councils to have the resources to inform locals about Government funding programs for them on a local case by case basis. This would also raise awareness of alternatives to Telstra and provide a locally based competitive advantage for end users.
- The HiBIS funding was a usable and accessible option for many local providers and is now seeing momentum. News from one Roadshow sponsor, having now implemented a local channel partner after the ATUG Roadshow in Kyneton has been very positive with around 40 new services installed in one month. By partnering with a local company, they have been able to grow business and inform end users of alternative solutions to Broadband access. They have since been hosting small information meetings on satellite technology to locals and hope to continue this format to Ararat and Lakes Entrance. This all came about as an end user was unsatisfied with their current service provider and after the ATUG Regional roadshow was able to make contact with a greater variety of providers. Now others in this local area are also benefiting from the relationship built and the information and technology provided.
- There is a need to provide regional users information on metro equivalence, weighing up the benefits of Broadband in line with its cost. It would be beneficial to provide some information locally on the averages prices being spent in metro areas.
- There is a great opportunity and need for all Broadband technologies to be explained in an informative and non sales like approach. The greatest uncertainty seems to be surrounding 3G and some information on this technology inline with the CDMA change over would be very useful to many regional end users.
- There has been feedback to ATUG that the next Roadshow should look at multiple technologies and equipping end users with the necessities to make their own informed decisions. Rather than listening to one vendor with one solution there needs to be a total clarity on product offerings at local level.

- An opportunity for next years Roadshow was identified as looking at the way we deliver information on applications. The most successful approach could be a local case study example from a credible source in each town. Business owners are interested in hearing how they can value add to their business through Broadband.
- It was identified that 'hands on' demonstrations on the various broadband technologies available would help to better explain them to end users.
- Given the restrictions on SMEs and their interest in attending this event it would be well worth giving councils and carriers as much notice on these Roadshows as possible.
- There is an opportunity with next year's Roadshow to provide attendees with some general market research on average prices with Broadband and speeds
- From the feedback ATUG received from Roadshow attendees there seems to be an opportunity for industry to better provide information locally on what's available currently and what other options and pricing plans are available.
- Networking and relationship building are a key part to the ATUG Roadshow with many opportunities for all attending to follow up on. ATUG facilitated where necessary to forward relevant contacts we meet to the right people in industry and Government during the Roadshow.
- During the Nowra Roadshow many residents from the Kangaroo Valley were previously told they were in a black hole for Broadband availability. Due to the ATUG Roadshow many alternative providers were able to speak among these residents of the other technologies that may present opportunities to them given their geographical situation.

ATUG REGIONAL ROADSHOW KEY FINDINGS AND OPPORTUNITIES 2007

- The importance of communications becomes absolutely clear travelling from one side of Australia to the other, from the Top End to the Great Ocean Road. What is also clear is that end users in regional centres like to have choice just like their metro cousins – choice of providers, of technologies, of pricing plans.
- Event attendees have been very interested to understand Connect Australia, the OPEL developments, WiMAX technology, Broadband over Powerline and Triple Play services.
- Regional users are very realistic about how far we can stretch copper networks, how fast we can build fibre networks, where wireless is the answer, where mobiles matter and where satellites are suitable.
- The door is wide open to new technologies in regional areas to help fill the digital divide. Telstra is not seen as the only option for regional Australia.
- Regional users are very focused on the affordability of services. Services that are available but not affordable will not meet the needs for effective communications.
- Government funding opportunities have been widely publicised and Road Show attendees were both aware and excited about the opportunities this could potentially mean for broadband connections and business.
- Roadshow attendees would like to see OPEL extended to address the needs of business as well as home use.
- Government funding needs to complement and work with existing infrastructure where possible. Much progress has been made in many regional centres and the time frames for the OPEL build out are considerable given the demand.
- There was much interest and debate on WiMAX, what the technology can do and what its limitations are. Attendees appreciated the even handed information presented by Airspan on the technology side. Education on this technology is critical to its success.
- Interest on spectrum allocation and planning was considerable given the hype about WiMAX, having an ACMA representative was extremely valuable in offering information to attendees on the spot.
- Telstra's NextG has arrived! Some users are extremely happy with their services while others struggle with inadequate services. The switch to NextG from CDMA is a top of mind issue for users in

regional areas at present. For many their current experience is not of “equivalent or better” coverage for voice services.

- ATUG tried the NextG mobile data service from Bendigo to Portland and then to Geelong – with not much luck. The CDMA Minimax worked reliably almost all the way.
- ATUG has been advising end users experiencing problems with their Telstra 3G service to talk to Telstra in the first instance. Many have already done this and are working through their coverage issues, although delegates in some areas reported less than satisfactory assistance from Telstra. ATUG widely promoted both the Government and Telstra help/feedback lines on NextG. ATUG feels strongly that this transition needs to be closely monitored until all users are experiencing equivalent or better coverage.
- Specific information on 3G handsets and additional aerials needs to be more forthcoming when end users are purchasing equipment and signing contracts at retail level for specific regional use.
- Mobile coverage on major freeways and roads in regional areas is still a big issue that needs addressing. Users are still troubled by this especially in Western Australia.
- Residents of Esperance and Geraldton were very concerned that their centres have been left off the OPEL coverage map. Although the coverage maps depict the picture of ADSL availability the situation on the ground in is often quite different with exchanges at their limits in these booming areas and residents on waiting lists.
- Esperance attendees seemed very frustrated with exchanges in the Castletown area full and new housing developments under way. With Telstra and Westnet being their only options for services there had been no indication for further ports to be created. Esperance attendees also noted concerns over slow telephone line repairs and NextG coverage. The frustration in the town was evident after ATUG’s visit with follow-up articles in their local papers.
- Geraldton and Esperance, both booming townships with housing, mining and shipping infrastructure being deployed everywhere you look need sufficient communications infrastructure to match. With populations expected to double being left behind as far as OPEL and sufficient communications infrastructure deployments are concerned is an area of contention. Local councils are concerned at being able to attract residents to WA for employment without offering such facilities.
- Geraldton residents felt that they were always the 1% of the population being left behind. With the SKA project plans potentially due to bring close to 150 scientists and their families to the area.
- Backhaul is the hot topic in Western Australia at present and

reasoning behind lack of communications investment, efforts from WA State Government should be supported.

- Analogue to digital television switch over was of great interest to many delegates. The ACMA brochures on this topic were very popular handouts at all Road Shows.
- Delegates, mayors and development bodies in all regional areas are now well aware of the benefits broadband can bring to sectors like health and the inroads being made in these fields.
- Kadina noted many retirees in the area are avid users of broadband in many regional communities.
- Port Augusta voiced concerns about the lack of technical training colleges in SA, hence making it difficult for computer companies in the area to gain and then retain staff in this tight labour market. These concerns were taken up with Don Basso SA State Government.
- Bendigo Road Show had great support from their local ICT cluster and announced some community based website awards at the Road Show event. ATUG were thrilled to be a part of this innovation competition.
- Bruce Winzar, Chair of Bendigo ICT cluster delivered a passionate and insightful opening address commenting on health advancements, which are very close to his heart and retaining young people in areas like Bendigo and the role broadband plays in both aspects.
- NextG experience in Bendigo was reportedly patchy.
- Portland was reported by delegates as another area receiving patchy NextG coverage. Residents in Portland felt that broadband was a tool to connect in a fast manner and service quality and affordability were high on end users minds.
- Townsville delegates were very disappointed with RawNet as the wireless provider had previously engaged with James Cook University with the view to further extend James Cook's network out to the residents of Townsville.
- Townsville delegates were also concerned as many of RawNet's customers were students at the local university and had been left stranded with no warning.
- Bundaberg delegates were very concerned with NextG service issues and had reported bad experiences when trying to report their issues through their local Telstra branch.
- The township of Goondiwindi has recently developed their own

technology centre where ATUG was able to hold the Roadshow. This centre is currently providing many computer courses for local residents and is looking to further their program offerings.

- Goondiwindi could see direct benefits for OPEL plans as they were set to amalgamate with two councils situated 150kms each side of them. Strong needs for service and support were identified here by delegates.
- The Lismore event was very well supported by local business people and residents who were all very interested and eager for information presented by ATUG and sponsors. Of great concern was the proposed CDMA switch off in January 2008 and issues related to NextG service. Lynne de Weaver from Northern Rivers Regional Development Board officiated at the first NSW event outlining local issues with attendees and sponsors.
- Moree provided lively discussion on CDMA, NextG and Opel coverage. The Mayor Mike Montgomery was well versed in local issues representing these to DCITA, NSW Department Commerce, ACMA and sponsors. One local business woman was most irate that there was not the opportunity to change providers or purchase a handset without travelling to a larger centre.
- Roger Norton, Mayor Cooma Monaro Shire Council welcomed ATUG, Sponsors and attendees. The lack of reasonable coverage in this area (Opel does not cover this area) was of great concern to all attendees who were grateful for the opportunity to discuss these issues with DCITA, NSW Department Commerce, ACMA and sponsors.
- ATUG's experience with NextG was better in Queensland due to our shift from a NextG Max PC card to a NextG Turbo PC card, with the proviso that at the moment NextG does not interface with Vista. The Optus Mobile Broadband product does interface with Vista.
- The issue from the users perspective is that our priorities are connectivity FIRST and then capacity. When users experience patchy coverage they will trade off speed for consistency.
- Information needs to be easily accessible and easy to understand on the Australian Broadband Guarantee (ABG). Delegates seem to be aware of OPEL announcements but not of the ABG offerings. Suggestions could be to extend information through local IT clusters, ACC's and councils.
- Feedback suggests regional users are still hungry for information based presentations such as these in their areas. Many were pleasantly surprised at the skill and expertise of the speakers.

Initiatives such as these are greatly appreciated by residents.

- The largest attendance numbers came from local business. This highlights the importance and reliance of Broadband to business and everyday life as an effective communication tool.
- The next logical phase for the Roadshow now all Australians can/will have access to affordable broadband is to look at SME business applications. ATUG have been running SME events in Parramatta, Newcastle and Chatswood this year and believe this is what main regional centres are hungry for given their business can now operate on a global stage...the sky is the limit!
- Broadband Managers in State Governments should be supported and encouraged to continue their good work. Much can be gained from their local experience and knowledge.
- Overall more than half of the total attendance is currently using Broadband services. However there is still a significant percentage using dial up which has not changed a greatly since 2006.
- Being on the road also raises questions about Universal Service and the need to update the definition and the program. ATUG will be holding member workshops to discuss the DCITA Issues paper on USO during September. One example of the new issues is the question of whether Universal Service should extend to mobile services. ATUG members in WA, Queensland and South Australia have said that there are many major roads in those States with coverage blackspots for mobile services. Certainly the interest by communities all over Australia in access to broadband services suggests users want broadband to be a universally available communications service.
- Discussions with users at Roadshow events emphasised the range of applications from precision farming to business, education and health services. Access to entertainment and information services by younger members of communities is seen as important in developing and growing regional centres. Queensland, like WA, is experiencing very prosperous times and attention is focused on the role of communications in extending the boom – delivering greater productivity, access to markets and tourism dollars.

PROJECT LEADERSHIP – CASE STUDIES

Title/Company/Product/Application: Department of Industry and Resources, WA

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Which industry is this example being used?: Government Other: education, health, etc

State: WA

1. What was the process before Broadband?: Ngaanyatjarra Lands is one of the most remote regions in Australia covering approximately 250,000 square kilometres roughly the size of Victoria (or 10% of Western Australia). It is located on the border of WA, SA and NT and bounded by the Gibson Desert, Great Sandy Desert and the Great Victoria Desert; The region is home to 2,800 residents who suffer almost third world conditions. Before the introduction of broadband, telecommunications was delivered via radio and satellite infrastructure that was designed primarily for voice communications and frequently suffers from constant outages, echoes and call dropouts making reliable communications difficult. Due to poor communications, the Ngaanyatjarra Lands residents were not able to receive equivalent vital services to support economic, health, education and social development in contrast with other regional communities in Western Australia due to its isolation. For example, residents requiring urgent or outpatient health services had to travel considerable distances to nearby towns to seek help. Another example, is no child in Ngaanyatjarra Lands attends school beyond year 8 and most only achieve year 7, this is due to inadequate teachers as well as educational materials that would normally be accessible online through the Internet by students in Metropolitan areas.. The isolated location of Ngaanyatjarra Lands also affects other basic services provided by the State and Commonwealth Governments in terms of law enforcement, justice administration, community development, etc . The lack of proper communication to larger population centres where social services are located also makes co-ordination difficult between different departments, leading to sub-standard services provided to these communities.

2. Describe the effective use of broadband: The Department of Industry and Resources has just completed the rollout of Ngaanyatjarra Lands Telecommunications Project which involves running approx. 400 km of optic fibre and transmission, and provision of DSL and last mile copper distribution network to the six communities of Ngaanyatjarra Lands. For the first time, government agencies, not-for-profit organisations and commercial entities of the Ngaanyatjarra Lands region will be able improve their services bringing significant social, economic and health benefits to the region. Police and

Justice agencies can update and share databases and implement programs designed to reduce incidence of crime. Morbidity and mortality are reduced as health and health-affiliated agencies can efficiently access updated patient information for correct diagnosis, reducing a need for time-consuming travel between communities. Twelve schools in the Ngaanyatjarra Lands will enjoy parity with other regional schools, improving knowledge sharing, access and curriculum development. Other not-for-profit and commercial entities also enjoy benefits through access to data services leading to substantial community and regional development.

3. Describe the outcomes/benefits achieved by the use of broadband:

Previously, none of the residents in this region has any access to “always on” Broadband Internet. Since the completion of Ngaanyatjarra Lands Telecommunications Project Stage 1, ADSL 1 broadband is now available in 6 communities’ in the region, covering approximately 60% of the Ngaanyatjarra Lands population. Pending the commencement of Ngaanyatjarra Lands Telecommunications Project Stage 2 in 2008, broadband coverage will increase by an additional 6 communities in the region through with better satellite coverage and wireless hotspots, enabling the entire community in the Ngaanyatjarra Lands region to access broadband through telecentres and community halls. The Ngaanyatjarra Lands Telecommunications Project now completed by the Department of Industry and Resources, not only improved the telecommunications within this region, it has also significantly improve Government service delivery and provided benefits in public health and medical services, youth and community development, arts and cultural development, education and learning, law enforcement and crime prevention, justice administration and social welfare. The network infrastructure and services provided by the project has been the key driver and tool to enable investment attraction and regional economic development, in terms of increased efficiency in mining exploration and mine establishment activities that would lead to increased local employment for indigenous resident, improved vocational skills training, and youth development.

4. Describe any lessons learned about the implementation process :

- Effective project management, financial control and coupled with good technical knowledge has been the major driver to the successful implementation of the Ngaanyatjarra Lands Telecommunications Project;
- Commonwealth, State and Local Government cooperation and willingness to work together has been the key in the creation of this project and is also a vital contributor to the ongoing sustainability of the project;
- Telecommunications has been proven as one of the main contributing factor and enabling tool for regional economic and social development;
- There is a need to focus more on improving government service delivery; efficiency and viability of these services can only be achieved if adequate telecommunications infrastructure and services are in place; and
- Government initiatives needs strong support from the industry and the community otherwise, the impact of these initiatives would just fizzle out and wasted.

5. Who is the ISP/Service Provider/Application Developer and describe how their expertise has contributed to the effective use of broadband:

The project is a joint initiative by the Commonwealth, State and Local Government and was managed and implemented by the Department of Industry and Resources, the contracted ISP is Telstra Corporation. The project was conceptually developed by the Department of Industry and Resources through in-house engineering and technical expertise and project management capability. The project manager was able to develop a very good solution despite inadequate funding and low economic sustainability for the project. The project manager was able to work effectively with Telstra and come up with an innovative solution to deliver broadband infrastructure and services to remote communities within the funding available to the project. Because of the remoteness of Ngaanyatjarra Lands, it has made logistic deployment extremely difficult and construction of network infrastructure not economically viable; initially, the industry estimated that the project will cost up to \$15 million, but the funding provided to the project is only \$4 million, and the lack of adequate funding has been the major problem to this project. However, because of the project manager's prudent and sound financial management capability, the department was able to implement the project on budget at \$4 million through effective negotiation with Telstra and strict financial management. At the same time, the project was implemented without any additional funding assistance and was completed ahead of schedule despite the difficulty in transporting equipment, and the harsh environmental condition of working in the Ngaanyatjarra Lands.

6. What is your vision for broadband in your organisations over the next 5 years?

My vision for broadband is to continue to explore for opportunities that will enable government agencies, industry and the community to work together cooperatively in delivering and expanding broadband coverage to more regional and remote communities. Due to positive outcome achieved from the Ngaanyatjarra Lands Telecommunications Project, I was able to prove that State Government can play an active role in implementing major telecommunications broadband project. This has given us the confidence to continue developing major government telecommunication initiatives that will deliver broadband infrastructure to more regional and remote communities and improve government service delivery as well as improved the economic and social development of the communities. My vision and hard work is slowly being realised with the new broadband telecommunications project initiative that I have developed recently namely the Emergency Connect WA and the Bush Medivac WA project, these project were developed to improved government service delivery in the areas of health and emergency services, it is also developed to private organisations like the St John Ambulance, Royal Flying Doctor Service, and the Surf Life Saving WA. Overall, the project is likely impact up to 50,000 community volunteers in regional communities with improve and effective use of state-of-the-art broadband technology now available through the industry.

7. How can the communications industry help you achieve your vision?

The industry can assist our vision by providing more innovative and cost effective solutions and also by working together with government agencies. The cooperation between government and industry is the key to achieving this vision for the future. The industry needs to be more creative in providing affordable and value added solutions; and participate in providing skills

training and local employment in regional communities to drive down the cost of broadband services and contribute towards the ongoing sustainability of network infrastructure and services in regional and remote areas. The industry needs to work together instead of engaging in unfair competitive behaviours. The industry need to look at forming consortium partnership and complementing each other to further expand their infrastructure and service coverage. Instead of simply focussing solely on short term profit-driven incentives or 1 year return on investment, it also needs to look at long term profit that can be achieved through continued presence and growth in regional and remote communities for continued profit sustainability.

Title/Company/Product/Application: South West Alliance of Rural Health

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Title/Company/Product/Application: South West Alliance of Rural Health

Which industry is this example being used?: Health Other:

State: VIC

1. What was the process before Broadband?: This application of broadband supports Virtual Services and relates to the assessment of patients with eye injuries by specialists in a distant location. Prior to the project, the South West of Victorian community had limited access to eye specialists. If a client sustained an injury, he/she would present to the emergency department of one of the 4 regional hospitals for care. The client would be examined by the doctor on call and frequently, given limited availability of specialist expertise; the patient was sent to Melbourne for a diagnosis. Just as frequently, the patient returned to their home as specialist treatment was not required. This meant an 8-10 hour trip for reassurance only.

2. Describe the effective use of broadband: This project built on the existing broadband capability of the SWARH network which supports voice, video and data transmission in a Quality of Service context. The project involved integration of IP based videoconferencing, specialist slit lamp software and network sharing software enabling a remote specialist to directly see the eye of the patient on their workstation. The project included; - establishment of an additional high speed broadband link from the SWARH network to the Royal Eye and Ear Hospital in Melbourne (linking agencies in the South Western region of Victoria with Melbourne) - upgrade of specialist eye equipment and videoconferencing equipment within rural agencies – specifically: 1. A number of Slit lamps suitable for high level clinical diagnosis were installed 2. The slit lamps' output was displayed/controlled using dedicated workstations 3. The slit lamp was seamlessly integrated with an intuitive user interface 4. The Workstation display was shared across the network using specialist network sharing software in conjunction with IP based video conferencing session 5. The communications were made compatible with the SWARH network. - establishment of both technical and clinical practice protocols between the local agencies and the specialist facility. The initiative has enabled the provision of a specialist remote service 24hrs a day / 7 days per week. At the VISP project launch in August 2005 Premier Steve Bracks said "It (Virtual Services) will have a profound impact not only on the rest of Victoria but on the rest of Australia," Mr. Bracks said. "Clinicians in one town, in one hospital area, who might have a speciality, can

assist a clinician who is dealing with a patient in another town."

3. Describe the outcomes/benefits achieved by the use of broadband:

Direct benefits from the community perspective are seen in being able to access specialist services locally. These benefits range from timely access to health advice or intervention (improving community well being) to saving on time and transport costs. Indirect benefits can be measured as savings on Government subsidized transport costs and Ambulance services costs. Additional demographic benefits relate to improvement in community confidence, which in turn can assist in the retention of people in regional communities. Overall the successful deployment of this specific project will validate the SWARH virtual services model, a model which is sustainable, scalable and transferable to all regions within Victoria. This VISP model is now being validated by Melbourne University under a 2007- 2009 ARC grant.

4. Describe any lessons learned about the implementation process :

The clear lesson for Virtual services is not related to achieving technological success but the challenge of business reengineering. The difficulties of achieving change in a clinical environment relates to organisational culture, which is both risk averse and litigation sensitive. Conceptually, Virtual services (and specifically Virtual Ophthalmology) are well supported by CEOs and clinical staff however, practically, there are huge challenges in adding innovative practices into the established service delivery mix. SWARH has a history of driving innovation and change. The major benefits are delivered to the patient/client and the community. These benefits need to be recognised by Government and established within clinical practice in all health agencies. SWARH feels that projects of this type offer hope for regional Australia, particularly in relation to the difficulty of obtaining high quality specialist staff and local clinical support. SWARH is sure that there will be an increasing uptake of virtual services, which rely on identified pools of clinical specialists. SWARH has found that the rate at which participants create change to current business practices is slow. Incentives to provide Virtual services seem to be highly correlated with client demand (through emergency or hardship), rather than provider costs.

5. Who is the ISP/Service Provider/Application Developer and describe how their expertise has contributed to the effective use of broadband:

SWARH itself is the provider of broadband services to the agencies throughout the SWARH network. The broadband services themselves are provided to SWARH by a number of different carriers depending on, for example, the geographic location of the client, however SWARH guarantees a minimum standard of broadband that is adequate to deliver the clients needs. The knowledge & experience acquired by SWARH over the years enables SWARH to deliver the most efficient, in both technical and cost effective terms, broadband service applicable to the particular situation. This expertise has enabled SWARH to deliver connections that provide the technical capability to deliver the required services; e.g. QoS (Quality of Service) is supported to enable the use of videoconferencing or IP telephony as required. The client can then have full confidence that the broadband technology that has been deployed will fully support the services that they require.

6. What is your vision for broadband in your organisations over the next 5 years? SWARH projections indicate that over the next 5-10 years 85% of all broadband traffic will comprise video/multimedia. As a result there will be a steady annual cumulative increase in the rate of demand change. SWARH will contribute to this demand by driving business change towards virtual services. Those services use IP based video conferencing to connect providers and patients (consumers) in a virtual consultation (Ophthalmology being a specific example). The offsetting of travel costs and travel time is the primary business driver to enter into a virtual consultation. As the Health budget experiences increasing strain, rural health providers will need to offer consultative services as a virtual service. These services include face to face encounters as well as remote monitoring. Non-patient related services are tracking towards IP based video surveillance, keyless biometric based door access and further centralisation of 24 x 7 services. The newer broadband network dependent services will co-exist with traditional data applications and cover IP telephony (VoIP), RFID and bedside systems for patients. Bedside systems will replace the ubiquitous TV with intelligent converged touchscreens providing TV, Internet, email, information, movies, clinical system access, telephony, food services etc driving the demand for responsive networks into the future.

7. How can the communications industry help you achieve your vision? Achieving the Vision outlined above will require more cost effective, flexible broadband networks in regional Australia. The range of broadband options should scale from the standard ADSL Internet access to the ADSL based VPN which supports the inherent quality of service (QoS) required for voice and video. The current GWIP model offered by Telstra offers a 'point to point' high cost, high reliability model with QoS. New developments enabling non-Internet traversing ADSL style VPNs will reduce the cost sufficiently to enable the cost effective participation of the smallest Health clinic. Currently the more remote rural sites in very small towns have limited options for high quality participation (QoS). Ultimately the QoS will drive technological development through local telephone exchanges or via reliable mobile and wireless VPN solutions such as offered by NextG, 3G (Optus) and possibly Wimax. Although not stated explicitly, the vision layers mobility over virtual services. The convergence of voice, data and video over mobile networks promises the possibility of personal entertainment funding the infrastructure required to have true mobility for Health care providers. SWARH's goal is that all clinical staff members have a single mobile communications device that meets all their organisational data, voice and video needs. This device should sense the LAN/Mobile network and make least cost decisions for accessing service providers. The high density of Health agencies in provincial centres generates the need to establish more cost effective broadband last mile solutions. The annual cost of a 2 Mbps VPN type QoS link needs to fall to around \$1000pa to ensure effective participation in Health care networks.

Title/Company/Product/Application: North & West Qld Primary Health Care

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Which industry is this example being used?: Health Other:

State: QLD

1. What was the process before Broadband?: Separate offices with individual dialup modems for each user. Entirely paper-based client data systems

2. Describe the effective use of broadband: Main offices connected to the two branch offices, 3 bush clinics and a number of home offices. Electronic health record system being developed to allow 80+ primary health care professionals to enter & retrieve necessary data across 760 000 sq km of regional, rural & remote Qld.

3. Describe the outcomes/benefits achieved by the use of broadband: greater quantity and efficiency of communication flow and better health outcomes

4. Describe any lessons learned about the implementation process: Nothing worthwhile comes easily. Our staff quickly built a dependence on the services provided and disruptions had sizeable ramifications

5. Who is the ISP/Service Provider/Application Developer and describe how their expertise has contributed to the effective use of broadband: Most recently, Pacific Internet is the company providing our Private Network links to our branch offices. We are developing the clinical application software in-house based on a commercial package owned by Intrahealth.

6. What is your vision for broadband in your organisations over the next 5 years? We plan to incorporate more temporary VPNs using the Telstra's nextG network. Better reliability & monitoring of the network links.

7. How can the communications industry help you achieve your vision? To promote rural, remote & regional Australian's as deserving of telecommunication services as metropolitan Australians

Title/Company/Product/Application: Mackay Sugar Cooperative Association Limited

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Which industry is this example being used?: Agriculture Other:

State: QLD

1. What was the process before Broadband?: Managing the sugar industry supply chain from the farm to the mill used to involve a lot of paperwork and legwork, driving around the district to coordinate harvesting and transport operations, collect data for the mill's computer systems and distribute information to farmers and harvester operators. This took considerable manpower; communications and data flows were very inefficient; and information outside the mill's internal computer systems was generally limited to printed reports that were often a week or more out of date. Since 2000, faced with rising costs, falling sugar prices and declining crop yields, Mackay Sugar began investing in ICT infrastructure to address these inefficiencies and connect the members of the supply chain to each other and to the information they needed, when they needed it.

2. Describe the effective use of broadband: Mackay Sugar established a central database of shared industry information, a web portal and other purpose-built computer applications, and a communications network to provide access to the data where and when it was required. The database is updated by Mackay Sugar's computer systems, as well as other sources including web-based entry by growers and harvesters, telemetry direct from in-field systems, and satellite imagery. The communications network includes broadband and dialup access for the web portal, as well as mobile broadband using CDMA-1X to connect cane harvesters and locomotives. The web portal provides textual and graphical reports of harvesting operations, crop yields, transport schedules, and the tonnage and quality of cane delivered to the mill. It includes an interactive mapping interface that allows growers to view maps of their farms overlaid with aerial photographs, soil and contour maps, satellite images showing crop estimates and any other GIS data available. Mobile GPS tracking and data units on cane harvesters relay position, speed and operating data such as engine on/off, cutting / not cutting, and extractor fan speed back to the central database via the CDMA-1X mobile data network, enabling real time monitoring of harvesting progress and extensive performance reporting for the operators. The same units have also been fitted to the locomotive fleet for traffic monitoring and collision avoidance purposes. They have been further enhanced by the addition of a Windows-based touch screen that computerises the running sheets for the daily schedule and

confirms the time and accuracy of delivery of cane bins to harvesting groups.

3. Describe the outcomes/benefits achieved by the use of broadband:

Broadband communications and the systems Mackay Sugar has built on it have revolutionised the way that the members of the supply chain work and interact with each other, and is enabling a whole of supply chain approach to managing the industry that would previously have been impossible. Growers and harvester operators can monitor their operations in near real time, and make decisions based on accurate, timely information. Mobile data communications in particular is opening up opportunities to coordinate and manage harvesting and transport operations as never before. Improved communication and information are also facilitating cooperation between the members of the supply chain. Awareness of the impact of their operations on the industry as a whole is increasing, and payment and management strategies that reflect this approach and encourage industry best practice are being adopted. Significant direct cost reductions have been achieved. For example, the technology has sustained a 50% reduction in the number of field officers since 2000 by using the web for information exchange, and automating tasks like crop estimating using satellite imagery and web-based maps.

4. Describe any lessons learned about the implementation process:

Technology is important, but people factors are the biggest factor in the success of an implementation such as this. Mackay Sugar worked hard to engage and involve all parties. Much of the development work was done in partnership with Cane growers Mackay, Queensland Mechanical Cane Harvesters Association, Bureau of Sugar Experiment Stations (BSES), and the Sugar Research and Development Corporation (SRDC). Training of people was also very important. Mackay Sugar organised training programs for all stakeholders, and also arranged bulk purchase of computer equipment to help its members get on line and maximise the benefit they could derive from it. When people are involved and consulted, are shown the benefits they can achieve from technology, and are given assistance to understand and use it, they will generally accept the changes and assist the process, rather than resisting change and trying to derail it.

5. Who is the ISP/Service Provider/Application Developer and describe how their expertise has contributed to the effective use of broadband:

Telstra Country Wide is Mackay Sugar's primary telecommunications and broadband provider, and has been an effective partner in helping to get members connected, and in developing the mobile network. Mobile GPS tracking and data units were obtained from MT Data in Melbourne, who worked with Mackay Sugar to develop the communications protocols and on board software for harvesters and locomotives. Most of the development has been done by Mackay Sugar IT and technical staff, with assistance from a number of external developers, and in close consultation with users across the supply chain that helped design, install, test and refine the various systems and technologies involved.

6. What is your vision for broadband in your organisations over the next 5 years? The possibilities for this technology in managing our supply chain

are now really limited only by the access of our members to it. On line, centralised communications with harvesters and locomotives will allow the development of "just in time" scheduling. Growers will be able to detect soil deficiencies through remote sensing, use the web to order chemicals and GPS systems to apply the delivery where it is needed. The list goes on. The supply chain will be connected, cooperating and competitive.

7. How can the communications industry help you achieve your vision?

Affordable broadband in regional Australia is the basic requirement for agricultural industries to capitalise on the technologies now available to them. All we require is modest bandwidth in all homes, and widespread mobile coverage for voice and data. We are getting there, but we need to recognise the economic benefits that can be realised by accelerating the process and invest in that last few percent so that solutions such as Mackay Sugar's are not held back by lack of basic infrastructure.

Title/Company/Product/Application: Kadina Medical Associates

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Which industry is this example being used?: Health Other:

State: SA

1. What was the process before Broadband?: Before our internet system was implemented we had communication issues at nursing homes, hospitals and also our branch clinics. Our clinic provides medical services to local rural patients in an environment where there are no salaried hospital doctors, hospital after hours is shared by three neighbouring practices, which leads to multiple demands on GP time and creates an administrative nightmare. Any Nursing homes requests for prescriptions were phoned through to our receptionists by the nursing home nurses. These requests were often originally generated by a fax from the Pharmacy who when packing Webster's realised that further scripts were required. The Pharmacy would generate a fax to the nursing home and then the nursing home would forward this fax to our clinic, which was wasteful double handing and created an opportunity for lost paperwork. This message/request was written out by hand by reception staff and the paperwork passed to the Doctor. The Doctor would either organise for a visit to the nursing home or write the repeat prescription. The script would then be sent to the chemist. If there were any questions with the script then the process would be repeated. Multiple requests for the same scripts were often received. This was a very labour intensive and inefficient system with many opportunities for the system to breakdown. Our practice has multiple branch clinics. Before our broadband access patient's medical records continually had to be taken from one branch surgery to another for appointments, any patients who arrived at short notice did not have their medical records on site and copies would have to be faxed over to the Branch surgery.

2. Describe the effective use of broadband: With the widespread introduction of broadband services in this area, we have successfully established our own "health network" between our 3 practice branches, local nursing homes, Chemist and Hospital. A real time connection now links the health services in this area.

3. Describe the outcomes/benefits achieved by the use of broadband: Our new system allows requests for scripts or visit requests to be directed to individual doctors. All requests are logged at the point of origin with date and time as well as details of person making the request and the receiving computer logs date and time of receipt. This meets best practice for

accreditation standards. Doctors can dial in from any external sites and access all patients' records, messages and effectively communicate with any other user on the network as if they are in their own office. We have successfully cut down the number of interruptions to their consultations because of phone calls from Pharmacists and Nursing staff at Hospitals and nursing homes, as they will now send an intra mail directly to the doctor. We are also able to use common electronic medical records, appointment bookings and accounts for all 3 of our Branches in "live time". This live access to our clinic records by our doctors has cut down duplication of requests saving time for both our staff and the requesting staff. Nursing homes also report reduction in their medication issues due to doctors being able to access their clinic notes and having the ability to print scripts and drug charts at the nursing home when they visit, rather than remember to do this when they return to the clinic and forward them to the nursing home. This represents both time saving and best practice for our clinic, the nursing homes, hospital and pharmacy which assists us in delivering safer health care.

4. Describe any lessons learned about the implementation process: Do your homework and do not be afraid to ask "stupid" questions, often they are not that "stupid". Through close Liaison with the Yorke Peninsula Division of General Practice and Zedmed (medical software company) we were able to turn an idea into reality. You do not need to be a multinational firm or Government department with budgets of millions of Dollars to make an idea a reality. For less than a \$1000 we have created a "health Network" that is reaping benefits for Doctors, patients and other health providers.

5. Who is the ISP/Service Provider/Application Developer and describe how their expertise has contributed to the effective use of broadband: Our improvements were made through implementing existing services once they were made available locally. Our ISP/Service Provider had very little impact on our systems changes, and we did not require an Application Developer, as we utilised existing components of our practice management and clinical software across a broader intranet. Our challenge was to allow authorised external access to our system whilst maintaining high levels of physical security and protecting our patient's privacy where access was not authorised.

6. What is your vision for broadband in your organisations over the next 5 years? When legislation catches up with technology, our vision would be for doctors to be able to print scripts at the pharmacy (which we can do now, but legislation requires a physical signature rather than an digital signature), also doctors with the ability to print long term drug charts at both the hospital and nursing homes from their clinic rooms (or any other secure location) with a digital signature. Doctor shortages require us to seek and develop new ways of using existing technologies to reduce GP travel time and increase their consulting time to allow them to service the expanding number of patient's requiring their skills. Current technology would allow doctors to provide videoconference consultations (via broadband) at remote sites and our previous trials of this were extremely successful. However with no Medicare payment for electronic consults, it was not financially viable for us to service disadvantaged (by distance) patients in this innovative way. A change to

Government regulations would allow us to deliver a safer home visit in a more cost effective way.

7. How can the communications industry help you achieve your vision?

By extending broadband coverage to all areas and keeping it affordable, allowing equitable access for all.

Title/Company/Product/Application: BreastScreen Victoria

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Which industry is this example being used?: Health Other:

State: VIC

1. What was the process before Broadband?: BreastScreen Victoria has a mobile screening Van that visits rural and regional sites in Victoria. The Van is usually stationed in a regional town for a period ranging from one week to a few months. Prior to the arrival of the Van in a regional area women over 50 years of age are contacted and a screening appointment is offered. The Van used to have an analogue x-ray mammography machine that captured x-ray hard copy films without film processing facility available on the Van. As a result the radiographers in the Van were not in a position to judge the quality of films. These films were couriered each day to a fixed assessment centre site in the city which at times was up to 350kms away from the Van. The availability of broadband and emerging digital technology prompted BreastScreen to investigate better way to capture, transmit and store soft copy images.

2. Describe the effective use of broadband: In March 2006 BreastScreen Victoria installed a digital mammography screening modality in the Van. Digital mammography generates high resolution soft copy images averaging 250Mb per woman. The Van screens between 40 – 60 women every day generating approximately 10GB – 15GB worth of images. BreastScreen Victoria had two choices regarding transfer images from the Van to the Assessment centre: 1. Export images to a hard drive which could then be couriered to the Assessment centre and imported for viewing; 2. Use broadband technology to transfer images over-night once the day of screening on the Van had been completed. BreastScreen worked collaboratively with Telstra Country Wide to trial broadband infrastructure to send images from the Van to the Assessment Centre. Images are currently transferred to the assessment centre site by 512/512 ADSL broadband connection. The images are compressed in loss less format and they take approximately 6-8 hours to transfer. BreastScreen is also currently trialing Telstra's Next G wireless broadband to transfer images. Overall the tests have been successful with the exception of transfer duration which we believe can be overcome with further tests and refinement. We hope to make use of this new technology early in 2007.

3. Describe the outcomes/benefits achieved by the use of broadband:
The use of broadband has particularly helped to achieve a better outcome for

women in regional Victoria. If women are recalled for additional testing, they have supplementary mammograms taken. Previously this had meant that women had to travel (often a long distance) to an assessment centre for the additional mammograms to be taken. The digital images are viewed by a radiologist who advises the local radiographer (on the Van) about what extra images are needed to obtain the best views of the abnormality. Now with broadband technology some women can return to the Van (which is closer than the assessment centre) to have further images taken. Images are sent 'real time' over the broadband network to the radiologist to view. The radiologist then uses this information to come to a decision on whether the women need to have additional testing will be required or if the test results are clear.

4. Describe any lessons learned about the implementation process: 1. Moving to a new technology means contingency planning is required! We have not needed to deploy our contingency plans to-date but due to the remote location of the Van, we identified early that a contingency needed to be set if the network failed. 2. As our van moves regularly throughout Rural Victoria – we need to relocate the fixed broadband service every few weeks. A central point of coordination from Telstra is essential to install the PSTN landline and relocate the Broadband Service when the van relocates. This has been well managed by Telstra to-date.

5. Who is the ISP/Service Provider/Application Developer and describe how their expertise has contributed to the effective use of broadband: Telstra Country Wide is our partner and they have collaborated with us at every stage of the project. Telstra have worked hard to understand our operational requirements (such as the Van constantly moving to new locations). Their collaboration has been valuable to the project. Telstra are also working closely with our IT teams to test the Wireless connectivity. As this is a new technology the network capability/testing phase is learning process for BreastScreen and Telstra!

6. What is your vision for broadband in your organisations over the next 5 years? Through the use of high speed broadband we plan to develop tele-radiology where images can be transferred in real time to radiologists across Victoria. This will assist us with workforce issue of shortage of radiologists by optimizing their time reading and reporting on images and reducing their travel time from one site to another. With high speed IP managed network across Victoria we can be in a position to transfer client records and the mammography images in real time.

7. How can the communications industry help you achieve your vision? The digital mammography images are very large and due to the challenge of transferring we had to architect our image management solution across Victoria based on the cost and speed constraints of the broadband. We are waiting for the day when extremely high speed broadband will be available at an affordable price so we can restructure our image management solution.

Title/Company/Product/Application: Precision Farming saves water, lifts

productivity

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Which industry is this example being used?: Agriculture Other:

State: VIC

1. What was the process before Broadband?: Before the introduction of new precision Controlled Traffic Farming (CTF) Australian farmers have been unable to precisely manage their farms resulting in damaged crops, overlapping and underlapping spraying of crops wasting fertiliser and water, and compacting the soil with heavy farm machinery tracks which further reduces the yield and further impedes water retention and efficiency. Big problem? You bet, with more than a million hectares across Australia under some form of CTF are at the vanguard while previous systems of the process (prior to this broadband solution via satellite) are not delivering optimal performance. With millions more hectares not under CTF missing out completely on the benefits, the gap between peak CTF performance as evidenced by this new Precision Farming System (PFS) and the previous one, and none at all is tens of millions of dollars of yield and wasted water resource annually. Many farmers traditionally drove their farm equipment where their fathers did, had paddock fences where it suited outmoded forms of agricultural practice, and accepted the losses to crops from machinery damage and inaccuracies. Little did they even consider soil compaction as a water waste hazard.

2. Describe the effective use of broadband: During more than 10 years research by the Spatial Information Infrastructure agency, vast improvements in Differential and Real Time Kinematic GPS services has led to a proliferation of new GPS applications that now demand instantaneous, robust, high accuracy results. SII's GPSnet, a State of Victoria registered business name and trade mark, has been enhanced to stream real-time correction data over the broadband internet. Generally real time users access the internet positioning services from a mobile phone with GPRS. However, a mobile broadband internet connection from the GPRS network is not always a practical solution in rural and remote areas where mobile coverage is sparse and is likely to remain so. Satellite then becomes an integral delivery mechanism and enables the latest in GPS technology to revolutionise broad acre agriculture processes. The PFS in Victoria components used include the following: GPSnet: VICpos and MELBpos correction services ISP (NewSat satellite services) On-site PC acting as a Virtual Reference Station and running free software (GNSS internet radio) for delivery of high accuracy GPS

corrections Pair of UHF/VHF data radio modems One dual frequency GPS receiver – for the tractor. A clever combination of readily available low-cost items creates the link. Connection with the internet is via two-way VSAT satellite (either fixed or mobile via NewSat) A software application is available free on line and converts the user's own pc/laptop into a virtual GPS reference station to receive GPSnet data. The data is then fed from the computer via standard serial cable connection into a UHF/VHF radio and rebroadcast locally where it can be picked up by a second radio connected to the roving GPS equipment farm machinery (e.g. tractor) The farmer doesn't need to set up his/her own GPS base station or have mobile coverage in the area.

3. Describe the outcomes/benefits achieved by the use of broadband:

CTF, under PFS, can reach farmers in remote Australia, where broadband internet is not otherwise available. This alone eliminates the need for a base station at a cost approximately \$20,000 per farmer (estimated annual national cost to farmers \$10,000,000). Also, the precision and therefore the beneficial effects under PFS are increased by a factor of 10 fold over previous OmniStar and Starfire options, and from 20 metres accuracy to 2 centimetres when compared to "traditional" GPS system delivery. The latter is so inaccurate as to be ineffective. The former now being a clear industry leader which can pin point the delivery of water, fertiliser and pesticide, can seed and harvest with unparalleled accuracy. The reduction in heavy duty machinery traversing the paddocks is a major saver for soil compaction and with that releases the water retention and efficiency benefits. In a time of drought and general recognition of the importance of sustainability of resources generally this aspect of precision farming is critical to its enhancement of farming outcomes. In summary: this system delivers

- where terrestrial and other communications can not reach
- does away with the costly up-front GPS base station requirement
- delivers pin point accuracy at least ten times better than previous systems
- reduces from 20 metres to 2 centimetres the accuracy compared to traditional GPS outcomes
- saves water
- allows for more effective use of water in soil
- diminishes overlapping (up to 8%) when ploughing, seeding, treating and harvesting – saves fuel
- diminishes gaps or underlapping during the same processes
- enables farmers to spray at night
- reduces operator fatigue
- as a result provides better crop yields (up to 15% or more according to Rural Solutions SA) Farmers can significantly save on seed, fertiliser, pesticide and fuel. Improvements are to be found in crop yield and profitability Precision farming also helps the environment because farmers don't need to blanket spread pesticide and fertilisers over entire paddocks.

4. Describe any lessons learned about the implementation process:

Lessons learned in the implementation process included: The preferred option for this system and purpose of telecommunications is a high bandwidth, low latency system that permits direct TCP/IP configuration and remote management. Initial tests showed that correction packet latency and packet consistency are major factors which impact of high performance. When latency exceeds one second the accuracy of the data at the user's end can be affected adversely. PFS achieves average latency down to eight one hundredths of a second (800 milliseconds) thereby avoiding any latency problems. Researchers in similar data delivery systems in Europe and Japan

have achieved latencies of between 1.8 and 2.5, so this PFS outcome may be a world first. The satellite and radio re-broadcast model was validated through field testing. The involvement of first class partners contributing world class technology was one of the reasons that the technology break-through was possible for SII and NewSat.

5. Who is the ISP/Service Provider/Application Developer and describe how their expertise has contributed to the effective use of broadband:

The partner group was lead by SII (DSE) and NewSat. The research team members are: Australian Controlled Traffic Farming Association NewSat Limited (ISP) CNG Systems Micronics GPS C.R.Kennedy Leica Geosystems Ultimate Positioning Trimble Navigation Victorian State Government Department of Primary Industries Victorian State Government Department of Sustainability and Environment (Spatial Information Infrastructure: key application developer)

6. What is your vision for broadband in your organisations over the next 5 years?

The system's vision is to implement further research to drive the technology to broader utility and wider acceptance. Broadband delivery is critical to these activities. Broadband is central to the communications activity of SII with its continuing focus of GPS technology etc. Broadband is central to the delivery of services by NewSat. NewSat owns and operates two teleports (in Adelaide and Perth linking two dozen antennae to eleven satellites for a range of government, and major enterprise clients: all of whom use and will continue to use broadband internet communication as the core of their connectivity.

7. How can the communications industry help you achieve your vision?

Research funding into applications of this already highly evolved technology application for instance into mining and the extractive industries would produce positive and beneficial application outcomes in major business sectors which high dollar values. Further testing on dynamic machine guidance under varying operational conditions to determine optimal standards and procedures for data transfer would also have great utility for a range of new applications. Funding for this research is required, too. Other developments will include: Testing the correlation between packet metrics and positional accuracy Equipment upgrade (progressive) to be compatible with Global Navigation Satellite Systems such as modernised GPS (I2C and L5), GLONASS (Russian Federation) and Galileo (European Satellite Navigation Systems) signals. In addition further research into quantifying CTF in detail and especially the effects of soil compaction limiting oxygen, macro-porosity and property (paddock) design. Broadband delivery by satellite to remote farmers will be critical in their ability to maximise their land and assets in these times of heightened focus on sustainability and preservation of resources, especially water and especially in a time of drought. These research factors are vitally important because operation typically occurs in the most harsh and very remote areas whereas most funding in broadband investment goes to infilling terrestrial communications gaps and extending that reach into regions and the fringe of the rural and remote Australia. This technology applies in a critical fashion affecting both water resources and the farmer's bottom line (and exports) from broadband delivery via satellite: beyond most existing

funding budget limitations.

