

Comments from CSIRO on
DCITA's Broadband Connect and Clever Networks Discussion Paper
Issued 17th November 2005

The CSIRO ICT Centre recognises that DCITA has vast experience and has had many successes in stimulating regional development through its investments in ICT infrastructure and support programs. We are highly supportive of the intent of the Connect Australia program to use ICT as a foundational driver of regional community development.

We note, however, that infrastructure is a tool and not an end in itself; therefore we suggest that the program (particularly the Clever Networks program) to have a much stronger focus on networked applications, their respective adoption methods/processes, and the evaluation of outcomes, in order to support decisions on choice of infrastructure access.

The following comments are offered herewith for your consideration:

Key Comments to section 3 – contribution of ideas for consideration in Broadband Connect (question by question)

Q1 How can the design and delivery of Broadband Connect be optimised to achieve long term sustainable quality broadband solutions for regional, rural and remote Australians?

The investment in Broadband needs to take into account the increasing bandwidth which will be required in the future. Whereas currently Broadband is defined as 256kBit/s, the higher speeds of 1 MB/s will be necessary for some applications and will increase to 25MB/s in 3 to 4 years. At the same time competitive pressures and technology development will force the adoption of the higher speeds. Therefore Broadband infrastructure must take the seamless and economical provision of higher bandwidth into account to achieve long term sustainable quality solutions for regional, rural and remote Australians.

Q3 How can Broadband Connect funding be structured to provide the best incentives for investment?

A suggestion is funding may be made conditional on economical provision of high bandwidth (eg 25MB) as required to match future applications requiring this high bandwidth.

Q4 Is terrestrial or satellite the most appropriate means of delivering broadband in regional, rural and remote areas?

It is obvious that satellite provides excellent coverage for the regional, rural and remote areas. While that is the definite advantage, the problem with using satellite for delivering Broadband is that it is asymmetric. The upload bandwidth is very low. This imposes severe restrictions on some applications such as tele-presence hubs and such use for connecting SMEs in rural and remote Australia to global opportunities. The terrestrial solution with identical upload and download speeds is, in some cases, necessary.

Q10 How can the high cost of some technologies be reconciled with increasing customer expectations for higher speeds and usage allowances especially in more remote areas?

We envisaged that initially the high cost may need to be covered through Government subsidies (Local, State and Territory), and ultimately the applications based on higher speeds together with the infrastructure provides the ease to tap into vast resources in the remote areas, which will deliver economical benefit and pay off the infrastructure cost in the long run.

Q11 Should it be mandatory for program participants under Broadband Connect to provide additional information as listed below as a condition of registration?

- intended future service areas (with approximate dates of commencement of supply;
- the viable geographic reach of broadband services from central transmission points for service delivery;
- technical barriers limiting the application of providers' technology in regional communities;
- the capacity of providers' technology to support varying types of broadband traffic and use;
- the range of service speeds providers' technology would be able to support;
- the capacity of providers' technology to provide services now and to accommodate new developments such as increased speed , usage and applications in the future;
- the particular relevance of the technology to other communication services (for example, capacity to be used also for supporting mobile telephony services);
- a summary of the broad nature of technology they employ; and
- anticipated timing and target areas for their technology deployment in regional Australia.

Yes to ensure that service provided is compatible with future needs

Q12 On what basis would you argue that certain specific technologies will have the most impact on the delivery of regional broadband services in the next three to five years?

On the basis of the requirements of future applications.

We have the following observations:

- (i) New (next generation) applications and/or services in regional/rural/remote communities will be an important factor in the consideration of the choice of technology platforms to be built and bandwidth provided.
- (ii) There is a lead time for infrastructure construction. If by the time the chosen network infrastructure is built it is already outdated in terms of the applications it can support, the investment may not be able to deliver impact.

We therefore suggest that the consideration be placed on the range of applications that the regional/rural/remote community will need to support the social economic development intended for that community/area as planned by the Local/State government.

Key Comments to section 4 – contribution of ideas for consideration in Clever Networks (general)

CSIRO, through its Sustainable Ecosystem and ICT Centre has a high level of interest in supporting regional community development.

In our experience through research work conducted in regional and rural areas, we realize the limitation on wide deployment of useful applications (already developed) due to lack of bandwidth availability. We note, also, that through further studies and research to be conducted in specific communities, there may be needs yet to be uncovered and new applications yet to be developed.

We certainly feel that access to health, education and government services are very basic and essential requirements (to lift the quality of life in regional/remote/rural areas). At the same time, there are more requirements above that to bring in the socioeconomic impact to these communities based on their specific needs.

In general, we suggest the following five key areas of consideration in the design of the Clever Networks program:

1. Adding focus to novel/experimental applications and services

We suggest that the Clever Networks program to put in some focus on specific areas of common community interest (for example farming communities), development of, and experimentation on, novel applications/services to address these community interests. If experimental applications/services achieve success and acceptance in one area of community interest, it will provide invaluable learning and input into future infrastructure investment strategies.

2. Consider building of social capital as a key aim

We suggest consideration in the use of ICT to ease the issue of isolation in regional/rural/remote Australia. We note that a lot of the work happening around the use of technology in community development is in supporting social networks, communities of practice, inclusion, etc leading to better community outcomes and enlarging (in some cases creating) virtual communities. We have elaborated with some examples under question 10.

3. Consideration on adoption methodologies (both technology and applications)

We suggest that adoption methodologies are no less important than the choice of applications. The cleverness of the Clever Networks program resides in the appropriate consideration of the specific community capacity to adopt and apply both infrastructure and applications. Based on CSIRO's past experience working with rural communities from our CSIRO Sustainable Ecosystem, we have identified various aspects of social dynamics. While some lead communities are nurseries of novel applications, there are others communities that can only accept mature and well adopted applications.

4. Human factors in brokering model

We suggest that human factors are very important in the brokering model. Our view on the brokering model can be summarized as follows:

- Support the role of brokers beyond technical push. Effective use strategies mapped to community needs is crucial. Geographically based brokers participating in existing governance structures (CMA's, ACC's, ROC's, etc).
- Brokers should be providing input and participating in a broader agenda regarding addressing regional/community specific challenges and opportunities. No one size will fit all – rather the broker capability should be generic to a degree and then fit within the defined needs/models of each specific region/community.
- CSIRO has experience with Community Brokers in past projects developed and delivered under CSIRO's Sustainable Community Partnerships initiative. CSIRO would welcome exploring partnering opportunity with DCITA in this context. These projects will help inform and develop appropriate engagement models for other regions and integration models across government programs.

5. Support the inclusion of evaluation as part of the Clever Networks program

We strongly support that the Clever Networks program to include an evaluation component that will assess the degree of benefits versus the level of investment, such as

- effectiveness of brokering model,
- technology effectiveness,
- applications choice,
- community benefit
- social acceptance.

We believe that it is evaluation that provides the insight into future strategies, and improvement to national competitiveness. CSIRO has recent evaluation experience in the new application known as the Virtual Critical Care Unit (ViCCU™) through an intensive clinical trial (supported by DCITA). Please see Insert B for the summary of our experience on the relative cost of this evaluation.

Specific contributions to questions raised in the Paper (question by question)

Q5 Should uptake and effective use of broadband by specific groups be targeted and, if so, which ones?
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We suggest that specific groups which are representative of the regional/rural/community be targeted. For example, if a considerable percentage of the businesses are SMEs, then SMEs should be used as a target group.

Q8 Are health, education, emergency services and local government the appropriate services for Clever Networks to target?

Absolutely, as these are the very basic services that will lift the quality of life in the regional/rural/remote areas.

For education, we would like to suggest that education be defined in a broader sense, such as the opportunity to students to participate (remotely) with a greater group (over multiple locations in virtual classroom environment); access to information and learning material in national facilities (e.g. libraries, museums, national collections, digital content archives etc).

Q9 Should there be priorities within this group?

Our view is that this may depend on the most urgent need of each community, as well as the planned economical development for the region concerned. That will form an important element for “service brokering”. For example if there is a desperate need to retain young talents and SMEs in a particular region, then the needs of these groups may become the priority.

Q10 What other sectors, if any, should also be considered?

We note that target sectors (services/applications) should be prescribed by the circumstances and needs of each community (agricultural production, NRM, tourism, Aboriginal arts etc), with health, education and government services forming a part of this.

In general, we suggest consideration in the use of ICT to ease the issue of isolation in regional/rural/remote Australia.

For example, consider services that potentially may enlarge an existing community, such as SMEs in a particular region (who can form a social or economic network to aggregate their economic clout through a network of “telepresence hubs” using a “Trusted Broker Application”).

Consider services using applications that potentially may create a virtual community for mutual support, for example, virtual farmer’s group connecting farmers over a distance to share experience and improvement on decision making.

Consider development of centralized portal to permit national digital information access by all parts of Australia (e.g. providing the experience of virtual museums).

Applications such as the “Trusted Broker Application” which support developing and maintaining social networks can become examples of social capital building through connectivity.

Another example is provided in Insert A (at the bottom) on an application developed by CSIRO Sustainable Ecosystem which addresses needs of farmers in rural communities.

We see that services that create, expand and enable community groups are very important to the rural and remote areas. Every community is dependent on trade and business. The latter is crucial for the financial well being and survival of communities and could be regarded as being very important and should be considered.

Q11 Should there be a focus on particular applications/sectors which will require and drive network or industry capabilities?

The focus should be on essential applications which are not replicated through conventional alternatives.

Q13 Is there an ideal balance between infrastructure and applications streams and, if so, how can it be identified?

We suggest that this balance should be region/community dependent. Identified regional needs should drive infrastructure/application decisions. To identify the regional needs and therefore decide on investment split may require up front investment in community engagement and work on investment prioritization. We believe this extra step will lead to better overall outcomes through higher engagement, understanding and stimulate uptake of technology, and integration of solutions. Our suggested approach views infrastructure and applications as tools to serve communities needs and strategic priorities rather than being an end in themselves.

Q7 Are there complementary sources of funding/contributions which should be considered in developing the guidelines for the Clever networks program?

Additional funding for Clever Networks may come from regional development programs (both State and Federal Government). In kind contribution and IP (intellectual property) contribution through development of applications, trials and local community participation in experiment and evaluation are important forms of contribution which will benefit the wider remote communities. Ideally an integrated funding program model may suit best (e.g.: Sustainable Community Partnerships initiative model).

Prior experience in studies and engagement with rural communities can also be leveraged.

Q18 Should there be specified minimum broadband specifications (eg. Bandwidth latency etc.) for Clever networks and, if so, what should they be and how should they be determined?

Yes there should be minimum bandwidth and latency specifications which take into account future applications. The minimum broadband specifications should be determined on the basis of the minimum requirements of the key applications.

Q19 What steps/mechanisms can or should be incorporated, if any, into Clever networks to enable regional, rural and remote communities progressively to transition to high/higher bandwidth networks?

We see the answer to this question is closely linked to the “service roadmap” for a particular region. Ultimately the service to be delivered will decide on the bandwidth it will require. The connection points such as routers must be capable of handling the higher bandwidths up to 30MB/s which will be required by future applications so that the infrastructure does not become obsolete.

Q20 New technologies are showing considerable promise in providing broadband access to users well outside the current DSL limitations. What strategies should be adopted to encourage and support deployment of these new technologies, and to ensure newly emerged technologies are not precluded during the lifecycle of the program?

The use of broadband outside the current ADSL limitations will be driven by applications which mandate the higher bandwidth, such as the previous example given on the telepresence hubs in combination with the “Trusted Broker Application”. The setting up of such hubs will drive the deployment of such new technologies.

Q21 What supporting information should be required in Clever networks proposals in order for their sustainability beyond the life of the program to be evaluated effectively, and what factors should be considered in determining sustainability?

No comment

Q22 For any new infrastructure created or made available, should there be specified minimum infrastructure access arrangements for parties other than infrastructure owners, such as a wholesale-rate for backhaul?

No comment

Q23 How realistic is such a requirement, and how tangible are the likely benefits of the approach?

No comment

Q24 How can an appropriate charging regime for such access be determined?

No comment

Q25. What other program activities should be taken into consideration in determining Clever network program eligibility and entitlement?

Our opinion is that the questions 18-25 are closely related to each other, and will be best addressed by the development of an architectural framework which includes consideration of the socioeconomic context and the existing infrastructure as well as the infrastructure development programmes of the carriers. For example the new generation of point-to-multipoint radio systems and applications based on ViCCU™ and tele-presence hubs can be considered in the answers to questions 19-20.

Q26. Having regard to the possible diversity of the activities under Clever networks, what strategies can/should be considered?

Project assessment and program evaluation – there are lessons to be learnt and existing models that can be applied to assist DCITA with respect to this area. CSIRO, through our experience in evaluation undertaken by the ICT Centre and the evaluation framework developed for DoTARS Sustainable Regions program, is happy to assist further in exploring this aspect. Please refer to Insert B where we would like to summaries some of the experience in the evaluation of ViCCU™.

Insert A – CSIRO Sustainable Ecosystem’s experience with Agricultural Productivity Simulator

The profitability of rural industries producing traded commodities such as grains, wool and meat fluctuates with commodity prices and exchange rates. The overall trend in terms of trade has been one of costs rising faster than returns. CSIRO has conducted much research on farming systems that extends from traditional grain-grazing systems through to new commodities and enterprises (eg. new crops, native products, bioenergy, and timber). Activities include design and assessment of mixed farming options (eg grazing leys, agro forestry, crop-livestock-forestry systems, and rotations) to increase flexibility and sustainability. This research has included the design, construction, maintenance and support of a number of software tools for the simulation of farming systems. For example the **Agricultural Productivity Simulator (APSIM)** is structured around plant, soil and management modules. These modules include a diverse range of crops, pastures and trees, soil processes including water balance, N and P transformations, soil pH, erosion and a full range of management controls. **APSIM** resulted from a need for tools that provided accurate predictions of crop production in relation to climate, genotype, soil and management factors while addressing the long-term resource management issues.

APSIM has been used in a broad range of applications including: support for on-farm decision making; farming systems design for production or resource management; assessment of the value of seasonal climate forecasting; analysis of supply chain issues in agribusiness; development of waste management guidelines; risk assessment for policy making; and as a guide for research and educational activities.

However, the widespread utilisation of decision support frameworks such as **APSIM** is often affected by limitations such as the need for investment and lack of suitable broadband capacity to make the tools available to rural communities. Without a reasonable size uptake, the ability to evaluate the Simulator and further improvement into the tools will be limited.

Insert B – ICT Centre's experience with evaluation of ViCCU™

Many major initiatives in application-oriented communications result in pilot demonstration projects in which advanced technologies are incorporated into implementations designed to demonstrate benefits in domains such as health, social/community or the arts. Too frequently, such demonstrations are regarded as self-evidently successful, without a more formal process of quantifying the benefits achieved through such projects. Formal evaluation of the success or otherwise of such projects needs to be factored in to the overall plan for demonstrations of technology in application domains.

Ideally, evaluation should begin with baseline studies done before the introduction of new technologies, and can use both qualitative and quantitative methods to evaluate such issues as the acceptability, usability and suitability of the technology, organisational and social issues, benefits achieved (e.g. improved clinical outcomes in a health-based application) and cost-benefit analysis.

The need for such analysis is exemplified in the Virtual Critical Care Unit (ViCCU®) project implemented to provide high-bandwidth telemedicine support for emergency medicine in Sydney West Area Health Service. The budget for evaluation was approximately 20% of the overall budget of around \$1M, and undertook to answer questions of effectiveness in three major domains, i.e. technical suitability, clinical effectiveness and cost-effectiveness. The results of these three assessments will be used by NSW Health in making decisions about further investment in this technology. Unfortunately, the baseline study needed to be done retrospectively, and future studies would benefit from doing such a study before the introduction of new technology.

There are many research units in Universities and elsewhere (e.g. the Centre for Health Informatics at the University of New South Wales who did the ViCCU® Clinical Study) as well as Human Factors groups working alongside technology developers in organisations such as the CSIRO ICT Centre. Such groups need to be involved in the design and evaluation of major demonstration projects in order to both demonstrate and evaluate new technologies, and evaluation needs to be factored in to the overall budget and planning process of such projects.