
Broadband Connect and Clever Networks

A response from Cisco Systems (Australia and New Zealand) to a Discussion Paper from the Department of Communications, Information Technology and the Arts

January 2006



1: Introduction

The Department of Communications, Information Technology and the Arts (DCITA) has published a discussion paper seeking comments on two new initiatives, Broadband Connect and Clever Networks (November 2005). Both programs are designed to support investment in sustainable broadband infrastructure.

This response from Cisco Systems (Australia and New Zealand) is a response primarily to the Clever Networks initiative.

1:1 Cisco Systems

Cisco Systems is the worldwide leader in networking for the Internet. Today, networks are an essential part of business, education, government and home communications, and Cisco Internet Protocol-based (IP) networking solutions are the foundation of these networks. Cisco hardware, software, and service offerings are used to create Internet solutions that allow individuals, companies, and countries to increase productivity, improve customer satisfaction, strengthen communities, increase the range and access to entertainment and personal services and improve competitive advantage.

Over the past few years, Cisco Systems has played a key role in the development of Australia's broadband policy framework, including membership of the Australian Government's Broadband Advisory Group. We have worked closely with policy agencies in the development of technical and policy models for broadband development. We have also advised agencies at both state and federal level on the design and implementation of Internet business solutions and network architectures and applications that improve service delivery, productivity and community engagement and participation.

This response to the DCITA discussion paper reflects and reinforces our commitment to work in collaboration with governments and communities to maximize the value of new investments in network capability so that people, communities and businesses can connect, communicate and collaborate.

1:2 Summary of key points

- The policy debate has to move away from a concern with "provisioning broadband" to embrace the challenge of "provisioning connectivity". It is evolving into a more complex discussion about the relationship between infrastructure, the quality of connectedness between people and within communities and new applications and services.
- Providing broadband connectivity to the Internet is only a piece of the puzzle, which also has to integrate how citizens, teachers, doctors, businesspeople and whole communities need to work, learn and play in the network society.

People don't access infrastructure. They access, and in most cases pay for, services they value. They generally don't care what brand of technology it is or whether it is old or new. They care about reliable delivery of good value services that do what they need with a minimum effort and money to achieve those ends. They want their needs and service requirements met and their problems solved as quickly, conveniently and securely as possible. The technical issues are important, and Cisco can provide advice about how best to approach them. But the real focus should be about connecting people and communities to valuable services.

- The value of investing in new broadband network capacity is a function of the useful things that those who are being connected on the network can now do to make their lives easier and more rewarding. That requires a project design and implementation process grounded in the requirements and expectations of users and consumers. It also requires regular reality checks to ensure that the ambitions and imagination of those who are professionally fascinated by the potential of the technology they know so well doesn't obscure the focus on what ordinary people need, what they will use, what (in some circumstances) they will pay for and what makes sense for them.
- Broadband deployment is part of the response to new policy and service challenges. Connecting people and businesses and communities with fast, secure and increasingly robust communications networks is turning out to be a key to rising service quality, community strengthening and new opportunities for economic growth and resilience.
- Simply providing broadband connectivity – "fatter pipes" for a faster Internet, in other words – is not going to be sufficient, especially to meet the demanding expectations that DCITA has set out in the discussion paper.
- Delivery of "single use/service" networks, e.g. voice or Internet only, or single service provider solutions will not deliver the service diversity that the Clever Networks program wants to achieve. Design of rural and regional networks with support for multiple service types and multiple service providers is imperative for Governments and citizens alike. The focus now has to be on insisting that service providers deliver on the services to the TOTAL or WIDER community, and then making sure that is what is actually delivered. The transition to higher bandwidth AND higher Quality of Service is entirely possible if the correct underlying infrastructure is provided from the start. Subsidising single service networks is clearly not what the Clever Networks is about.
- It is difficult, if not impossible, to deliver the indispensable attributes of robust networking – security, resilience, quality of service etc – if they haven't been factored into the design of the networks from the start. Retrofitting poorly designed networks to try and give them these attributes has turned out to be both technically and financially disastrous.
- When it comes to building these new networks of communication and collaboration, design matters. Investing sufficient time and expertise in high quality architecture and network design, and doing it at the front of the process, will be a threshold requirement for success in the Clever Networks program.
- The focus of Clever Networks should be on delivering new capabilities for people to connect, communicate and collaborate. The provision of high-quality broadband infrastructure is simply a means to that end. People and businesses and communities will then start to interact with that capability, identifying innovation and new service capabilities that reflect their values, interests and motivation. Trying to predict where that might come from and therefore to limit the focus of this program is likely to be a mistake.
- To achieve maximum service flexibility, product offerings and minimum service costs for subscribers, it is vital that multiple communications service providers can use the common access infrastructure to compete in the provision of telecommunications services.
- Alignment of Government demand to Ethernet and IP transport infrastructure will provide the best assurance of integration of new technologies over the life of the program.
- The sustaining value of programs like Clever Networks lies in the ability to focus as much on applications and services as it does on the design and delivery of better connectivity.

2: Investing in sustainable broadband infrastructure

The \$113 million Clever Networks initiative "will support the rollout of new broadband infrastructure networks and innovative applications to improve the delivery of health, education and other essential services in regional, rural and remote areas".¹ The initiative is also designed to support Broadband Connect by generating demand and new infrastructure that will extend the reach of competitive broadband solutions.

Clever Networks has a dual and complementary focus on both new broadband network infrastructure and the applications which it will enable. This reinforces the simple, but important point that new network capacity matters only because of what it allows people and communities to do more productively and more effectively.

What we have witnessed in recent years is an interdependence between demand for richer, more complex and faster interactions between citizens and governments at all levels and the provision of robust, secure connectivity to make that possible.

As technology, and especially the networked and interactive capacity of the Internet itself, has pervaded all aspects of the way we live, learn, play and work, its potential has fuelled a rising demand for new levels of service and quality that it has also helped to meet. Clever Networks represents an important new investment opportunity to extend the interdependent relationship between rising citizen and consumer demand and new technology into Australia's regional, rural and remote communities.

Clever Networks combines several distinct, but related **policy objectives**, including:

- Improving terrestrial broadband for unserved users, that is communities either outside the reach of ADSL or too small to attract ADSL
- Create a situation under which regional infrastructure can improve network reach and competition within a more coherent and commercially sustainable environment
- Support development and use of innovative broadband applications that deliver improved health, education and other services
- Assist communities to development skills and capabilities to realise the social and economic benefits broadband can provide.

The access and connectivity that high-quality broadband networks deliver are the key to improving the flow of services and information into regional and rural Australia. But just as importantly, these regions have knowledge, experience and information that are vital for Australia's wider and social economic development.

Think about issues like crop monitoring, weather reporting and analysis, aviation, defence and communications capabilities, gathering and sharing information for space research and other high-end scientific research. These are all functions that increasingly rely on information coming out of rural and regional Australia. So, while the focus of the broadband debate has tended to focus on getting services and information into regions, it needs to evolve into a more complex and sophisticated analysis of the best way to enable a rich two-way traffic in ideas, knowledge and experience.

Also, the search for a more balanced pattern of settlement and population growth across Australia won't be successful without the basic building block of ubiquitous and reliable connectedness.

¹ Discussion Paper, page 4

Recent news coverage of the success of some regional towns and cities in building sustainable growth in their communities reinforces the value of providing top-class communications services as an increasingly central part of the package that attracts Australians to remain in, or relocate to, regional and rural communities.

3: A Cisco perspective

Cisco Systems and our partners bring a long record of successful engagement with governments and communities around Australia and around the world to design and deliver robust, secure and highly-scaleable broadband networks.

In particular, we have invested significantly in the development of "next generation" IP-based networks capable of delivering a rapidly growing mix of economic, social, entertainment and public services anywhere, anytime on a converged networked architecture that carries data, voice and video. Cisco works in the space where new technology and new capabilities in networking impact on, and are influenced by, rising expectations from individuals, governments and businesses for rapid and secure access to new services characterized by deeper, secure and value-adding interactions.

3:1 Broadband for Government

Local and regional government administrations are looking to high speed networks to foster social and economic growth in metropolitan and developing areas in order to create balanced, thriving communities.

Governments are embarking on plans to create fully connected communities which allow their countries to become more competitive in the global marketplace. Policy makers are starting to recognize that "high speed broadband for all" is an essential building block for a knowledge-based economy. This is also helping governments design their services and programs around people's lives and needs.

The first stage was about deploying broadband infrastructure in urban areas to improve the way governments serve citizens – putting more government services online. The next phase is about investing in the fibre optic networks and wireless access technologies to pave the way to more advanced services and to create social and economic parity by extending high speed access to developing areas for both residents and businesses.

Developing broadband solutions involves:

- *Technology Considerations:* Governments need to be able to accommodate highly diverse geographic landscapes, from densely populated urban areas to developing regions, including low population density areas which require different network topologies and low-cost last mile options.
- *Regulatory Considerations:* Governments need to contend with regulatory issues around spectrum allocation policies and operator access which influence technology and partnering options in certain communities.
- *Social Considerations:* Governments need to create a favorable climate for broadband usage by educating residents and businesses about the benefits of broadband, including improved health, education and e-business resources which will raise the standard of living.
- *Economic Requirements:* Governments need to determine the best private-public partnering (PPP) models and funding options to deploy and operate broadband networks.

Market Trends: Governments Upgrading and Extending High Speed Broadband Infrastructure

Governments are investing in broadband, fibre-to-the-home (FTTH) and wireless technologies to upgrade their networks and to extend high-speed Internet and communications access.

Governments are continuing to invest in broadband infrastructure in urban areas which have enriched the lives of citizens and businesses by providing online e-government services, as well as advanced communications, entertainment, e-commerce and e-business services.

- Total worldwide broadband CAGR is 21.5 %
- The Republic of Korea is the world leader in broadband uptake.
- Europe has the highest revenue CAGR of 21.5%.
- Denmark, Belgium, the Netherlands, Sweden and Switzerland as the front runners in Western Europe, according to an IDC 2003 study.
- Across Western Europe, DSL lines are expected to grow from 18 million in 2003 to 74 million in 2008, while cable lines are expected to grow from 5 million in 2003 to 20 million in 2008.
- In the US, broadband accounted for \$34.3 billion revenue in 2003 and is expected to reach \$90.7 billion in 2008.

Governments are starting to upgrade their current copper backbone in urban areas to fibre optical networks in order to future proof their networks to support more advanced applications. Japan, China and Korea, as well as progressive European countries like Sweden, Italy, Denmark and the Netherlands are leading the pack in deploying optical fibre networks to take advantage of unlimited bandwidth and low cost maintenance.

Fibre to the Home "future proofs" the network and paves the way for the emergence of advanced applications, including IP communications, entertainment, education and information services.

Governments are now starting to invest in wireless broadband initiatives to extend networks to suburban and developing areas to provide access to e-education, e-health and other vital e-business resources to citizens and businesses and to enable these communities to flourish.

3:2 Our commitment to Clever Networks

Our commitment to contribute to the Clever Networks initiative is fuelled by four distinct perspectives.

A new business model for government: putting people and communities at the centre of responsive networks of knowledge, service, trust and accountability

The pervasive impact of the Internet and other networked and interactive information and communication technologies, including especially wireless and mobile technologies, is part of a new business model for government. The functional silos in which government functions have traditionally been funded and delivered are breaking down in the face of the more complex, rapidly changing and interconnected challenges they confront. Increasingly, effective government draws its strength from capabilities that emerge in the spaces between agencies and programs and in the way in which they are combined and tailored to the needs of individuals and different communities.

Whereas once the hallmark of a government's relationship with citizens was a function of more or less discrete interactions with particular agencies or levels of government, now people and communities are at the centre of responsive networks of knowledge, service, trust and accountability.

Where particular services and programs come from is less important than whether they can deliver value – information, ideas, services, a sense of trust and confidence in the process and probity of government and accountability for results and performance.

At the heart of the gradual evolution of that new business model are the same new communication and networking capabilities that are also driving the changes. The paradox is that networks of communication and collaboration are helping to solve the challenges in whose emergence they have played such an important role.

The growing impact of broadband on economic and social development

Our second perspective comes from wide and practical experience working with agencies and governments around the world who are investing in broadband networks to speed dramatic improvements in economic and social development.

Consider these initiatives for instance:

- In the Italian region of Brescia, after implementing a VoIP solution, the regional authority is now Wi-Fi enabling 170 libraries as first step of wider WiFi Provincial program
- Cisco is talking with the English regional city of Derby which, in common with many other cities in Europe, is actively engaged in plans to wi-fi enable the whole city, confronting issues including network infrastructure, matching applications and services to new broadband capabilities and different potential funding and payment regimes.
- Almere is one of the most innovative cities in the Netherlands with reference to Broadband Government. Cisco has been working with the City and with UNET (the local Service Provider) for the last 3 years to launch an innovative broadband program. A first pilot phase is complete, with about 1700 families and 500 SMBs connected through a triple-play-based² ETTX solution³. A full rollout to the whole city (approx 180,000 inhabitants and growing to 400.000) is expected to happen within the next few years.
- In the Eastern Goldfields Division of General Practice, centred on Kalgoorlie in Western Australia, a "medical grade" network is up and running to connect GPs, hospitals and clinics across this vast region to improve secure communication between doctors and health specialists and dramatically reducing the time and cost involved in providing patients with quick access to highly skilled medical resources across the region. An outline of the project is presented at **Attachment 1**.
- Similarly, the South Western Alliance for Regional Health in western Victoria has built a broadband-enabled health services and information network bringing unprecedented connectivity for doctors and patients to the best quality health care, regardless of their often remote locations. Consisting of 46 members working from 77 sites, the broadband network that has been built over the past few years supports a range of services including VoIP (supporting up to 3000 extensions), virtual consultation services (leveraging a network of over 50 web cameras), telemedicine capabilities, virtual clinical assessments as well as the core services of email, internet and intranets.

² "Triple-play" is the communications industry label for a converged (onto a single access network) Voice, Data (Internet and/or business Virtual Private IP networks) and video service.

³ ETTX – "Ethernet To The X", where "X" may represent the kerbside, home, basement, apartment. An access infrastructure based on Ethernet technology that connects from the Access Service Provider to the consumer site – typically extending to the basement.

- Education and community capacity building projects that Cisco has contributed to in Ethiopia and Jordan, just to pick two recent ones, are providing rapid and dramatic evidence of the way in which broadband enables programs and initiatives that change lives and offer new opportunities for learning, regional development and economic sustainability that were previously hostage to distance and disconnection.
- In Canada, the Alberta Supernet project has pioneered new models of broadband network infrastructure provision that meet multiple objectives – robust and secure broadband connectivity to lift service provision and economic development, economic sustainability and a business model that relies on a mixture of public and private investment.

Driven by Axia, a Canadian company that provides broadband networks and e-learning applications, the Supernet solution is working with Internet and other Service Providers to connect them to an ultra-high-speed broadband IP network that provides Real Broadband Services to 429 communities, and direct connectivity to 4,200 provincial and municipal government offices, libraries, health care and education facilities. Internet, telecommunications and application Service Providers receive fair and equal access to the Alberta SuperNet, enabling them to reach business and residential customers throughout rural Alberta (http://www.axia.com/projects/alberta_supernet.htm). The solution provides practical evidence of the interdependence of new technology capability and new demands for equity in the design and delivery of outstanding programs and services.⁴

What these examples illustrate is the increasing rate at which broadband deployment is part of the response to new policy and service challenges. Connecting people and businesses and communities with fast, secure and increasingly robust communications networks is turning out to be a key to rising service quality, community strengthening and new opportunities for economic growth and resilience.

Design matters: building networks that meet new demands for connection, communication and collaboration

The third perspective that Cisco brings to the Clever Networks initiative is considerable experience and expertise in designing IP-based broadband networks.

Our experience has reinforced two insights. The first is that simply providing broadband connectivity – “fatter pipes” for a faster Internet, in other words – is not going to be sufficient, especially to meet the demanding expectations that DCITA has set out in the discussion paper.

As people and communities demand the kind of innovation that the paper suggests should be one of the key outcomes from the Clever Networks investment, they learn about the characteristics of the connectivity that supports that outcome. Some of the issues are obvious – high-speed and robust connections are important, as are solid levels of security, privacy and reliability. But as these networks are called on to support multiple, and often competing demands, including very often new types of Voice and Video over IP applications, the “quality of service” supported by the network also becomes crucial.

⁴ The SuperNet model in Alberta is one that is well worth considering in the context of Clever Networks. Leveraging Cisco’s next generation converged IP networking technologies, the SuperNet solution provides high speed broadband access to government agencies and communities throughout the province, creating competition at the network and application layer that leverages an infrastructure that is sustainable and scaleable. The solution was built by a consortium of partners, led by Axia, and including Cisco, Bell and Microsoft. Keys to the SuperNet success have been provision of standardised network, access and transport capabilities, eliminating the rural/urban disparities, adopting next generation IP-based networking solutions and driving an aggregated buying model. Cisco can draw on Axia’s significant successes in Alberta and elsewhere in the design and delivery of similar broadband network solutions for Clever Networks.

Delivery of "single use/service" networks, e.g. voice or Internet only, or single service provider solutions will not deliver the service diversity that the Clever Networks program wants to achieve. Design of rural and regional networks with support for multiple service types and multiple service providers is imperative for Governments and citizens alike.

The second insight is that it is difficult, if not impossible, to deliver these indispensable attributes of robust networking – security, resilience, quality of service etc – if they haven't been factored into the design of the networks from the start. Retrofitting poorly designed networks to try and give them these attributes has turned out to be both technically and financially disastrous.

In that very fundamental sense, when it comes to building these new networks of communication and collaboration, design matters. Investing sufficient time and expertise in high quality architecture and network design, and doing it at the front of the process, will be a threshold requirement for success in the Clever Networks program.

User involvement and participation: what do they want and how will they use it?

The experience of some of our recent work in the health sector, including the Kalgoorlie medical grade regional network, has reinforced the importance for successful technology deployment of working closely from the start with users and consumers. It sounds so basic and even a little corny, but the truth remains that unsuccessful technology projects founder, among other issues, on their poor engagement with the people who are supposed to use the solution that is being developed.

The value of investing in new broadband network capacity is a function of the useful things that those who are being connected on the network can now do to make their lives easier and more rewarding. That requires a project design and implementation process grounded in the requirements and expectations of users and consumers. It also requires regular reality checks to ensure that the ambitions and imagination of those who are professionally fascinated by the potential of the technology they know so well doesn't obscure the focus on what ordinary people need, what they will use, what they will pay for (in some circumstances) and what makes sense for them.

In the case of Clever Networks, entrenching this principle as a cardinal design requirement will turn out to be a significant investment in improving its prospects for sustainable success.

3.3 Response to specific Discussion Paper questions

The DCITA discussion paper includes a wide range of questions, some of them very general and others quite specific. The questions provide a focus for feedback to the paper.

This paper presents a view from Cisco Systems that addresses some of the broader questions. Our views on some of the other specific questions, which we have grouped under three headings – policy, funding and technical – are briefly set out below.

Policy questions

Are the current demand aggregation models appropriate and should demand aggregation be focused on areas that have yet to receive terrestrial services under HiBIS?

HiBIS gave funding for single use/service quality networks, e.g. Internet for GPs. We would argue that Internet for GPs is fine, but it would be preferable (and possible) to insist on Internet delivery over an infrastructure that allowed others to gain access to other service types, i.e. business grade VPNs & VoIP.

That would have meant that only service providers offering Internet on infrastructure capable of supporting other services to a wider user base should have been selected for panel procurement under HiBIS.

The focus now has to be on insisting that service providers deliver on the services to the TOTAL or WIDER community, and then making sure that is what is actually delivered. Subsidising single service networks is clearly not what the Clever Networks is about.

Should uptake of broadband be targeted towards specific groups and, if so, which ones?

The role of government should be to provide broadband services where there is market failure. Broadband capability delivering new communications services and solutions is rapidly becoming a basic utility or service, like water or electricity.

The real focus is not determining target groups, but understanding broadband as a catalyst for service innovation and delivery. Today's carrier access technology allows for multiple access service types concurrently over a single infrastructure. Tenant services of Internet, data VPN and Voice services are "table stakes" for residential, business and government users alike.

Government subsidies should target the specific need required, e.g. GP connectivity to the Internet, but should be conditional on residential and business Internet access capabilities being provided as well. Indeed, there are no technical impediments to providing access support for VoIP and IP VPN services over the same infrastructure, offering residential users Internet and VoIP services and business and Government users Internet, IP VPN and VoIP services.

Are health, education and emergency services and local government the appropriate services to be targeted?

These are the obvious "tenant" customers, but as mentioned above, subsidies or purchases of services to these tenant customers should occur only from access service providers willing to offer residential, business and other Government customers access to Internet, IP VPN and VoIP services as well.

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

The focus of Clever Networks should be on delivering new capabilities for people to connect, communicate and collaborate. The provision of high-quality broadband infrastructure is simply a means to that end. People and businesses and communities will then start to interact with that capability, identifying innovation and new service capabilities that reflect their values, interests and motivation. Trying to predict where that might come from and therefore to limit the focus of this program is likely to be a mistake.

Application and sector development is largely dependent more upon service demands than communications service capabilities today. Those demands, which should be the key driver of innovative services and new capabilities, can be met if broadband access to rural and regional Australia meets certain performance requirements.

It needs, for example, to offer:

- Reliable high speed access networks supporting differentiated Quality of Service (QoS), sufficient to support best effort and guaranteed data services, STS quality VoIP and in future Video over IP service types
- Service/access virtualization (to support the delivery of multiple simultaneous service types, e.g. Internet, multiple IP VPNs, VoIP, services).

Special consideration might be required for service mobility in rural and regional Australia. Today the emphasis is mainly on voice mobility. As citizens, businesses and Government organisations increasingly rely on "always-on and connected" data and even VoIP and Video over IP services into the future, consideration of mobility subsidies being linked to mobile voice and data will be vital.

Funding questions

What strategies could be incorporated into the program design to ensure that investment under Clever Networks provides the greatest holistic community benefit?

The key will be to determine infrastructure investment on a scale that makes economic sense. Trying to do this piecemeal will not be sustainable and is likely to be very costly. Where the Government could win is by developing the proper connected architecture, and then scaling it across the country to get the benefits of supply.

Also, Clever Networks should support only those investments that can deliver multi-service infrastructure that has immediate service offerings to citizens, business and government entities.

What key strategic investments in broadband infrastructure have the potential to provide the best outcomes?

In the end, Clever Networks should not focus on investment in broadband infrastructure, although that is clearly the delivery mechanism. The real opportunity is to invest in "connected community" infrastructure. Increasingly, the debate has to move away from the distraction of a tactical, short-term focus on giving communities the Internet on a bigger pipe.

By contrast, a strategic investment program should concentrate on these kinds of delivery capabilities, for example:

- Multi-service access over the existing or upgraded copper access infrastructure, i.e. ADSL - ADSL2+ and G.SHDSL for multi-user, multi-service access.
- High speed optical access to rural communities;
- Wireless data access from regional/rural community copper/optical terminations to extend multi-service broadband reach and provide data mobility services to an otherwise tethered communications user base.

To achieve maximum service flexibility and product offerings and minimum service costs for subscribers, it is vital that multiple communications service providers can use the common access infrastructure to compete in the provision of telecommunications services.

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

DCITA could establish an Innovation Fund that specifically targets the development of innovation around connectivity. One example is the UK Digital Challenge initiative, part of the Digital Strategy released in March 2005. The Digital Challenge website describes the initiative as providing a unique incentive for a region, city or similar sized area to drive forward the use of technologies to better meet the needs of its local community and individual citizens. Any local authority, in partnership with other authorities, public sector organisations, industry, intermediaries and the third sector, can take part in the Digital Challenge competition.

This fund, perhaps leveraging private and community sector investment, would be a complementary funding source. Its primary value would be to provide a source of financial support to give community-based, locally-grounded innovation proposals.

Technical questions

What is the right balance between infrastructure and applications? Would proposals be improved if encompass both infrastructure and applications?

The debate about broadband is evolving into a more complex discussion about the relationship between infrastructure, the quality of connectedness between people and within communities and new applications and services. It can't be simply a discussion about "pipes" and infrastructure.

While there are some ideas that could form the basis of early proposals (and we have included some later in this paper), the program should allow room for government agencies, businesses and community organisations to come up with ideas that reflect their needs and circumstances.

As far as possible, applications should be encouraged to test the boundaries of quality and service for people and communities across high-quality broadband networks. The interdependence between what people want to do and the value they want to get from new levels of interaction and connection, and the increasingly intelligent, high-capacity networks over which those interactions will take place, form a natural link that should be encouraged.

More specifically, the broadband infrastructure in which Clever Networks will invest should support Internet, IP VPN and STS class VoIP traffic classes as mandatory.

Should there be specified minimum broadband specifications (eg bandwidth, latency etc)? What are they and how should they be determined?

The specifications should not be around broadband. They should be around the need by the community for the true connectivity they desire. In this next phase of the broadband build out, the focus is increasingly less on the size of the pipe, the speed of connections or levels of encryption (all of which remain important considerations). What matters more is the Quality of Service attributes that determine what people can reliably assume they can do on the networks.

The challenge is about ensuring that the right information gets to the right place at the right time. And different people and groups in the community will have needs that should be reflected in different QoS requirements.

Rural and regional access infrastructure should reflect the service requirements of residential, business and government needs. As outlined earlier, the minimum service requirements for Rural and Regional users are Internet, IP VPN and STS class VoIP traffic.

A set of technical notes at **Attachment 2** describe some basic traffic class requirements that should form part of broadband specifications.

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

In our view, the real focus should be on transition to higher bandwidth AND higher Quality of Service, which is entirely possible if the correct underlying infrastructure is provided from the start. Most Cisco equipment now allows for features to be turned off at the beginning, and progressively turned on. If equipment is deployed (as it has been in the Broadband for Health roll out) that does not incorporate this migration path, it will undermine the value of the investment.

The first priority for broadband deployment in regional/rural and remote communities is to secure the availability and cost of wholesale optical bandwidth from these remote communities back to the Service Provider service centres located in the major capital cities. Fair access to wholesale long distance bandwidth and access to copper local loop-terminating exchanges will allow equivalent competition and broadband services for dense regional and rural communities to that which is occurring in Australian capital cities today.

The second priority deployment of multi-service access equipment (e.g. DSLAMs with ADSL2+, G.SHDSL and POTS to VoIP services) which supports a mixture of services and media for multiple target customers (residential, business and government) must be made a priority over any single-purpose (e.g. Internet over ADSL) or single-service (POTS voice) equipment.

The third priority deployment is the implementation of multi-service⁵ supporting data radio access extensions from the copper/optical terrestrial network to extend broadband reach around regional and rural centres. For those remote customers where terrestrial or radio extension access networks cannot economically reach, satellite access will need to be deployed. As with terrestrial technology deployments, satellite services that support multiple service types over a common IP packet data transmission should be promoted in preference to dedicated voice or TDM circuit bearer infrastructures.

How should the program ensure integration of new technologies over the life of the program?

In some ways, this is an impossible question, a little like making a car upgradeable forever into the future. No-one is in a position to determine those kinds of longer-term issues. There are, however, some basic principles that can be used as part of the design process, such as the use of non-proprietary, standards-based technology, which should be a given.

The business world, service provider infrastructure and now the residential networking and entertainment markets are converging onto Ethernet access with Internet protocols and technologies to enable and deliver services. Any government service demand, grant or subsidy should mandate Ethernet as the customer network user interface (or a media that terminates to IP over Ethernet, e.g. DSL ATU-R) and TCP/IP protocols as the transport delivery mechanism for all rural and regional network deployments. In addition, Clever Networks should consider mandating support for:

- Access transport virtualization – i.e. support for multiple services over a common access infrastructure (to prevent a "truck role" and access media per service), and the support of multiple service providers on common wholesale access infrastructure.
- Four base service classes (QoS) – i.e. Realtime, Bursty-High Priority, Bursty Low Priority and best effort queuing for all access equipment.
- Internet, IP VPN and VoIP (where voice services are requested).
- IP multicasting for future Video over IP broadcasting.

Alignment of Government demand to Ethernet and IP transport infrastructure will provide the best assurance of integration of new technologies over the life of the program.

Should there be specified minimum infrastructure access arrangements for parties other than infrastructure owners, such as a wholesale-rate for backhaul?

As outlined above, one of the key barriers to rural/regional and remote access to broadband services is the cost effective availability of bandwidth from capital city services infrastructure to rural/regional communities.

A challenge will be to use the Clever Networks investment program as a catalyst for services competition. That will depend on the extent of, and the cost of access to, wholesale backhaul availability. Absence of wholesale transport availability or backhaul capacity will allow monopoly control of service availability which, in turn, will translate into higher prices for residential and business subscribers.

⁵ Government grants and subsidies should strongly support multi-service infrastructures in preference to any single-service access infrastructure equipment.

4: Maximising the value of Clever Networks

Cisco believes that both Broadband Connect and the Clever Networks programs should invest in projects that deliver three outcomes.

The first is to develop robust, secure and sustainable networks and communication infrastructure that **supports innovation in the design and delivery of government services**. The innovations should leverage multi-service communication capabilities that support a range of services within agencies, especially the larger agencies like health, education and police/emergency services. They should also be able to support services across different agencies, adding to the asset and infrastructure base available to all government services and not being locked in to one or two departments.

The second outcome is to ensure that any new communication and network capabilities **support wider, whole-of-government service delivery strategies**. In particular, they should contribute to new 'channels and access' platforms that are being developed by many State and local governments.

These platforms are being developed around a range of projects to improved agency and whole-of-government citizen service capabilities. They include customer research and analysis, service and channel integration and a range of infrastructure and enabling investments in functions such as security, privacy and identity management and authentication.

Clever Networks offers the opportunity to secure additional investment in some of the core infrastructure enabling elements on which the wider channels and access priorities will rely. Projects should be integrated with, and help to extend, current and emerging government strategies that entrench Internet and other communication capacity as a core element in wider service improvement strategies.

Further, opportunities should be explored to **extend the demand aggregation model** to integrate business and community consumers who might also contribute to funding. Putting together those wider cross-sectoral aggregations of users and potential funders is likely to be easier said than done. It will require considerable time and effort to build coalitions of network users who will need convincing to trade off their natural interest to secure simple, best-price network solutions for an opportunity to contribute to creating a regional asset which could service their needs and the needs of other interests and organisations in the region.

The third outcome for Clever Networks investment should be to **contribute to community capacity building**, creating new opportunities for communication and collaboration within and between towns, villages and communities in rural and remote locations.

4:1 Some project ideas

As an indication of the kinds of projects that Clever Networks might support, these are some suggestions that reflect Cisco's experience of, and contribution to, a wide range of broadband projects both here and around the world⁶:

- Providing the network capacity to support new, more complex "connected health" models in rural and regional Australia, drawing on the successful design and deployment of similar models in Kalgoorlie and South West Victoria.

⁶ These are only brief sketches of possible projects, intended to give a flavour of the range and scope of applications that the Clever Networks investment might enable. Once the formal program guidelines are available later in the year, and in collaboration with other key players, we will provide more detailed project proposals.

- Look at some of the examples of broadband-enabled home care now being trialed and use that experience to design new networks and simple applications that give older people, or those suffering from chronic conditions, greater independence and remote support/advice through in-home health monitoring and remote connections to nurses and doctors.

The demands of aged and chronic care are becoming an increasingly dominant health and community care policy challenge, which will only grow in significance and intensity in the next 10 to 20 years. Clever Networks provides an opportunity to design a sustainable investment program that extends simple, but innovative applications, relying on broadband networks, that afford people greater capacity to stay at home and in their own communities, without having to trade-off access to quality care and personal, sometimes intense medical and social support and advice.

- Creating robust and secure connectivity between clusters of schools in regional and rural Australia to improve their capacity to share data, specialist resources and knowledge and also as the basis for new "shared service" models to improve 'back office' support functions for student administration and school management.
- Establish video and other links between rural/remote schools and resources that are located in Sydney or other larger centres that students might get to visit occasionally or perhaps never, but which can offer them a level of engagement and ongoing connection.

One example is the network of Environmental Centres around NSW, which typically host one-off site visits as day outings from schools. With a small investment in some simple web cameras and a robust, secure broadband network, those teachers and students could stay in touch with the Centres and draw on their resources and expertise as a continuing part of their school work over an extended period.

- Look at ways to extend the use of the Internet as a way to give students in remote and regional schools access to scarce specialist resources or experiences (concerts, musical tuition, dancing lessons, tuition in topics that could not be economically justified because of the lack of a critical mass of students who are interested in those subjects, tours of major international art exhibitions at the Art Gallery of NSW or the National Gallery for example).
- Using simple videoconferencing applications to create mentoring and professional development opportunities for those providing services in remote locations (eg teacher professional development, GP continuing education or more informal mentoring or advice from other colleagues and specialists etc).
- Using the Clever Networks investment to develop demonstration projects in nominated regions that implement some of the wider "channels and access" strategies for improved service within and across levels of government in a particular location – secure Intranet for government agencies, using broadband to create regional services directories and publications/information index...
- Drawing on the best of local and international experience in the use of new broadband networks for citizen engagement/participation, design new models of interaction between people and community groups, as well as between citizens and governments, to encourage wider debate about local policy and service issues relevant to different communities.

Key to success in this area will be to link up with organisations at a local, state or national level already active in leveraging communication technologies to provide new forms of participation and connection. The youth site Vibewire, for example or the Internet-based youth counseling and support service from the Inspire Foundation are two well-established and successful social enterprises with a wealth of experience in Internet and communication-based service provision.

Clever Networks projects should seek out these organisations and bring their ideas into the mix, providing an opportunity to harness the new investment streams to people and organisations whose credibility and standing derives from their local knowledge and long experience.

Building into the design of Clever Networks the requirement to ground proposals in this kind of local knowledge will be crucial to not only the search for projects that will work and add real value but also the imperative for innovation. If you want to encourage innovation (whether it is doing things differently or doing different things), the best place to start is with people already engaged in communities providing all sorts of services, including entertainment, government services or a range of e-business and 'connected community' services.

Very often, these people and organisations have a clear idea about what they would like to do and how they would like to improve the services they can offer. They can boast terrific local intelligence about what their markets and communities value and would like to be able to do. Harnessing that knowledge, and architecting that sense of local value into the design of the new networks, will be a significant investment in their long-term value and sustainability.

- The problem of literacy deficiency, especially in rural and remote communities and especially in indigenous communities, is now well documented. Approx 20% of Australia's population is behind in reading ability, and in indigenous communities the problem is significantly worse. These problems have been highlighted by the recent national Enquiry into Reading commissioned by Education Minister Brendan Nelson.

Part of the problem is that there simply aren't enough trained teachers to teach literacy skills. They just don't exist in any meaningful numbers outside the metropolitan areas. Even there, the number of qualified professionals is low. Developing new services to create real "connected learning" by leveraging the specialists into rural and remote Australia, using new broadband networks, would make a significant difference to the capacity to confront the literacy challenge.

- Another potential project might focus on demonstrating the value of wireless "mesh" networks, which take advantage of technology innovations capable of delivering secure, robust broadband wireless connectivity over large open spaces. In line with examples from other countries, projects might look at ways to deploy these new wireless networks for towns and regional cities.

They could work with local government, business groups and community groups to develop new, local applications that use the new capabilities for connection and collaboration – community engagement in major local debates and decisions, a local sports and community organisation information service that provides 'push' information to mobile phones about local events and activities for example.

An area of obvious concern is around emergency services and "first responder" challenges for those involved in dealing with major natural disasters or other public safety events. Equipping police, fire and ambulance services with wireless capabilities that allow them more effectively to share information quickly and easily in the heat of the moment could be a major focus. An example from the US, taken from a recent press story, is included at **Attachment 3** to illustrate the scope and value of what might be done in such a project.

5: Conclusions

Cisco Systems brings considerable expertise and experience as the basis for collaboration with State Governments, local authorities, telecommunications providers and rural and regional communities themselves to design innovative applications that use, and extend, increasingly sophisticated broadband networks. A brief review of Cisco's rural broadband initiative is provided at **Attachment 4**.

We can't stress enough the importance of grounding the search for innovation in applications and services in the people and communities that these new networks are designed to serve. Certainly, there will be ideas and examples from other parts of the country or other countries that we should exploit. But the sustaining value of programs like Clever Networks lies in the ability to focus as much on applications and services as it does on the design and delivery of better connectivity.

The investment from Clever Networks should be part of a shift in thinking away from "fast Internet" and "more broadband" and towards the creation of a new capability for connection and collaboration that sustains social and economic development.

Properly designed and carefully architected, these new networks can support a wide range of services and applications across the range of government services. They can also offer people and communities new opportunities to connect to each other and to replenish and extend their traditional capacity for community engagement and development.

Attachment 1

Eastern Goldfields Regional Reference Site (the "Kalgoorlie Connected Health Project")⁷

The 2003-04 Department of Health and Ageing Budget allocated \$9.2 million in funding over 2 years to the Access to Broadband Technology initiative, which has since evolved into the \$35 million Broadband for Health Program.

The aim of the initiative is to provide GPs in rural and remote areas (RRMA 4-7) with access to broadband technology, which will provide the infrastructure to support a range of services to improve health care delivery.

As part of the initiative, a regional reference site is being implemented in the area serviced by the EGMDGP to test, measure and demonstrate the benefits to health care providers of having high-speed, continuous, higher quality broadband through which they may effectively and securely access a range of relevant information and communication applications.

The telecommunication provider IP Systems have developed a high-speed Virtual Private Network (VPN) that provides secure and managed connectivity with a guaranteed Quality of Service (QoS) for phone, data, and video applications.

Phase One of the project, which was launched in March 2005 involved connecting 20 GP Practices including GP homes, 4 medical specialists, 2 Aboriginal Community Controlled Health Services (ACCHS) and the EGMDGP.

A major regional, a district hospital, an additional ACCHS, the Rural Clinical School, 4 local Pharmacies, 2 local Aged Care Facilities, radiology and pathology providers and the RFDS will also be connected to the VPN as part of Phase Two of the Project which is anticipated to take place early in the 2005/2006 financial year.

The EGRRS project is to run until the 30 June 2006 with participants provided the following services;

- Access to a secure broadband connectivity to participants with the EGRRS from both their Practice rooms/office (via direct cable connection or satellite technology, depending on location) and the private residences of GPs;
- Provision of a secure email service including spam filtering;
- Secure Internet access, including firewall, antivirus and filtering services;
- Remote access capability from sites within the VPN;
- Desktop videoconferencing capability;
- Voice over IP (VoIP);
- The ability to use HIC Online; and
- The ability to receive electronic Radiology and Pathology reports

⁷ This is taken from the ERRG website (12.01.06) - http://www.egmdgp.com.au/Eastern%20Goldfields%20Regional%20Reference%20Site/eastern_goldfields_regional_refe.htm

In addition to this, the EGMDGP received a grant from the DoHA to undertake an 'Expression of Interest' process to identify a series of 'Additional Applications' to implement on the network. This process was undertaken in March 2005, and the applications identified include the following;

- Electronic Discharge Summaries
- Electronic Reports from Specialists
- Online Education applications and peer support
- Online therapeutic guidelines, journals, resources and information services
- Clinical applications (ie Teledermatology)
- New technologies and small business tools that demonstrate the value of broadband

Attachment 2

Traffic class requirements: technical notes

Data

Data traffic cannot be categorized in a single traffic profile. Different data applications have different traffic characteristics. Even different versions of the same application can have different traffic characteristics. In general, data traffic can be smooth or bursty, benign or greedy, it is usually drop and delay insensitive and typically incorporates a retransmission capability/protocol (e.g. TCP) to recover from end-to-end packet loss.

While traffic requirements for data vary by application, service requirements for data subscribers could be categorized as:

- Minimum 1 Mbps / 256Kbps asymmetrical communication for residential Internet customers;
- Minimum 1 Mbps symmetrical communications for business customers;
- Business data traffic requires a separate priority class queue from realtime voice traffic or best effort Internet traffic (supported by a separate best effort priority class queue).

Voice

Voice (and interactive video) traffic has a profile which is smooth, benign, is drop sensitive and delay sensitive and requires a real time priority class queue for voice bearer traffic. The end-to-end service requirements for a single VoIP session are typically:

- one-way Latency \leq 150 ms, Jitter \leq 30 ms and packet loss \leq 1%
- 17–106 kbps guaranteed priority bandwidth per call (depending upon VoIP codec used)
- 150 bps (+ Layer 2 overhead) guaranteed bandwidth for Voice-Control traffic per call
- CAC (connection admission control) must be enabled.
- Interactive Video bandwidth requirements will differ depending upon the video codec, rate of video transmission and video quality desired. Entry level video requires approximately 384Kbps bandwidth, while high quality video requires in the order of 2Mbps of bandwidth in each video transmission stream (direction).

Residential voice customers should be able to support a minimum of two simultaneous voice calls (two voice or one voice and one fax call). The asymmetrical return path bandwidth for residential customers is the limiting factor for the number of simultaneous voice conversations. While residential Internet customers may be content with 256Kbps of Internet return bandwidth today in a largely Internet data-centric usage pattern, as the penetration of residential VoIP increases the requirement for "sufficient" bandwidth for realtime voice as well as Internet usage will drive access return-path bandwidths higher – expect demands for 384Kbps to 512 Kbps return bandwidth to become the new baseline for residential Internet in a multi-user/multi-service residence in the near future.

Business voice customers will require symmetrical access rates in the order of 2Mbps to support multiple VoIP conversations and/or VoIP plus Internet/business data simultaneously.

Video

Video broadcast traffic has a profile which is smooth, greedy, drop sensitive, delay insensitive and typically requires its own non-real time priority class queue. The end-to-end service requirements for Voice over IP are typically:

- Jitter \leq 30 ms and packet loss \leq 1%
- Traditional MPEG-2 Codecs require 3 to 8 Mbps to provide broadcast grade TV. More recently MPEG-4 and H.264 codecs are reducing the required bandwidth for broadcast video down to 2Mbps
- Access networks require efficient IP multicast support (especially IP Multicast control plane speeds) to provide equivalence to broadcast TV
- Access aggregation networks require sufficient (optical IP) bandwidth to carry the number of simultaneous video feeds to satisfy a large video user base – typically in the order of 1 Gbps.

The base QoS service model for new packet based access is a minimum four queuing class model. With the four traffic class types being:

- Realtime (with Low Latency Queuing)
- Bursty-High Priority (with Class-Based Weighted-Fair Queuing with Weighted Random Early Detection)
- Bursty-Low Priority (with Class-Based Weighted-Fair Queuing with Weighted Random Early Detection)
- Best-Effort (with Weighted-Fair Queuing with Weighted Random Early Detection)

Voice and Interactive-Video should not both be assigned to a common Low Latency Class Queue on slow-speed (<768 kbps) links due to serialization issues. An optimal link-speed for combining VoIP and Interactive Video into LLQs is \geq 2Mbps..

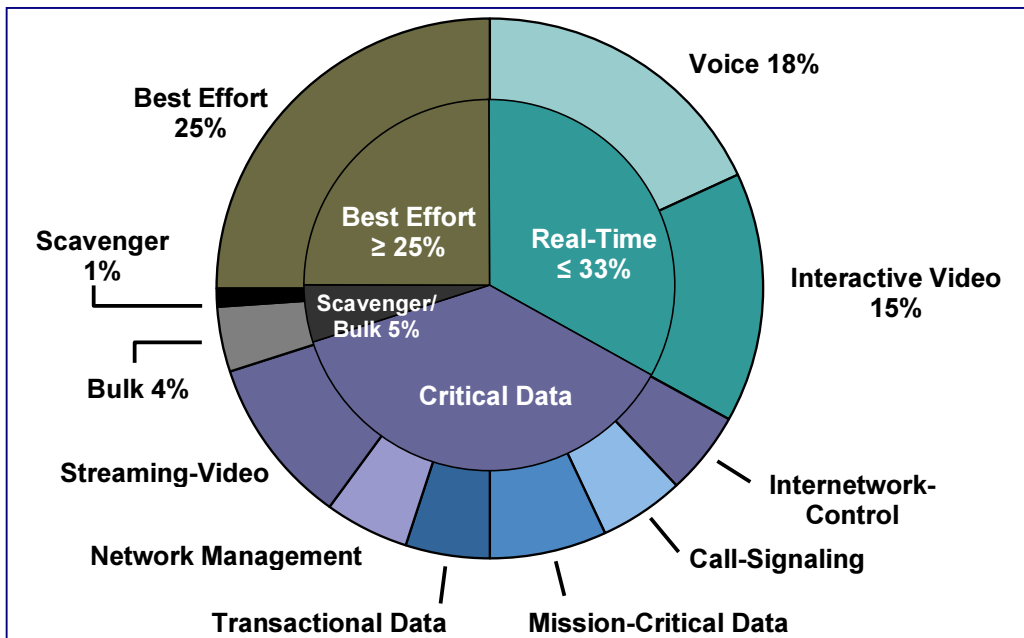


Figure 1

Figure 1 depicts the various communication types in modern packet telecommunications networks and their suggested mapping to four base traffic class types/queues. Real Time traffic should not exceed 1/3 of the available bandwidth in order to preserve the low latencies required by this class of traffic. Also, in mixed services networks a minimum of 1/4 of the available bandwidth should be made available for best effort traffic.

Thus the requirements for Rural and Regional residential subscribers are a minimum of 1 Mbps / 256Kbps asymmetrical communication for residential Internet-only customers, evolving to a minimum of 1 Mbps / 384Kbps asymmetrical communication for residential Internet and VoIP multiservice customers.

The requirements for Rural and Regional business & Government subscribers, operating Internet, VoIP and business data (as IP VPN) will be a minimum of symmetrical 2 Mbps (without interactive video). Expanding to 2-4Mbps for business and government subscribers that require interactive video conferencing.

Broadcast video equivalence services over broadband are the same for those in Cities, i.e. asymmetrical 2-4 Mbps/256-512Kbps return for the customer access link (assuming a triple-play take-up of Internet, VoIP and IP Video), with service provider aggregation network bandwidths in the order of 1 Gbps.

Attachment 3

Handheld Devices Come to First Responders' Rescue

By Neil Versel, contributing editor

More than 20 first-responder organizations in Washington state, including hospitals, fire and police departments, and decontamination units, now are able to track patients in disaster areas and transmit critical information to healthcare providers via a mobile, electronic communications system.

The agencies, mostly in the Seattle-Tacoma area, are the beneficiaries of a new partnership between mobile computer manufacturer [Hand Held Products](#) (Skaneateles Falls, N.Y.) and Seattle-based software company [lomedex](#), maker of a system called Mobile Incident Response Information System (MobileIRIS).

The first responders are using MobileIRIS on Hand Held's Dolphin 9500-model computers, which essentially are ruggedized Pocket PC-based personal digital assistants with color touch-screens and alphanumeric keypads, according to Hand Held chief technology officer Mike Ehrhart.

The devices have integrated barcode readers, image-capture functionality, and long battery life - a minimum of 10 hours under what Ehrhart calls "very rigorous conditions." They include three wireless technologies, including Bluetooth, Wi-Fi, and cellular Internet access, so users can send and receive data over short and long distances.

This flexibility will greatly enhance triage during a mass-casualty incident, according to Capt. Anthony R. Siebers of the Washington Army National Guard's 791st Chemical Company, who heads a joint Army-Air Force mass casualty/decontamination/triage unit from his base at Camp Murray, Wash., near Tacoma.

Even in full hazmat suits with thick gloves, members of the decontamination task force can operate Dolphin 9500s with a stylus. With the MobileIRIS system, the unit can process at least 100 people per hour.

"Are we looking at serious casualties or are they just walking wounded?" Siebers says. "Our idea is to get 'em clean and get 'em off to a hospital."

Users take a digital photo of each patient for identification purposes and only have to enter part of the person's name, saving time. "It moves them along," says Siebers. "Vitals are being taken all along the line," he adds. In a 10-minute triage process, members of the decontamination unit try to take vitals at least three times, he says.

All the information goes into a computer system, which generates barcoded wristbands for patients. At a hospital or other treatment point, the next healthcare provider simply has to scan the barcode to pull up demographic and vitals data.

Facilities without the software can log on to www.webiris.com and enter the barcode number. "It can be integrated immediately," Siebers says of the automated triage.

The devices are allowing first responders to phase out oversized, handwritten triage tags that typically hang off patients' wrists. "I imagine by the end of the year, they will be gone," Siebers says.

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Attachment 4

Cisco Rural Broadband: Collaborating with Partners to Deliver High Speed Access to Developing Areas

Cisco recently launched Cisco Rural Broadband, a service provider program for attracting a broad base of service providers who can assist governments in deploying broadband networks in regional and developing areas.

The program continues to attract the leading mobile, fixed and satellite operators around the world who work with local and regional governments to deploy the best solutions given geographic requirements.

Cisco's Rural Broadband program is designed around a scalable access-agnostic broadband wireless infrastructure which provides much greater operational efficiencies based on faster, easier and less costly deployment of residential and business services from a single network, while providing new service revenues.

Regional Environments: Fibre in Backhaul with wireless/DSL Access

Regional authorities in smaller cities and suburban areas are investing in high-speed networks as a way of leveraging fewer resources across a broader population to create more competitive economic centres. They are deploying a broad mix of broadband solutions due to different topologies.

Many are implementing regional fibre-based backbone rings not only through direct investments, but by setting up PPPs in situations where the company or government organization already owns existing dark fibre in the ground. In terms of access solutions, administrators are deploying everything from fibre in highly populated cities to unbundled DSL in suburban areas and wireless access in more remote or mountainous regions.

Rural Environments: Wireless Wi-Fi, Wi-MAX and Satellite Access

Public administrators responsible for rural communities are primarily investing in standards-based wireless broadband solutions, namely Wi-Fi based on its proven performance. They are also investing in solutions combining wireless LAN and emerging non-standards-based high-speed wireless WAN technologies, including WiMAX (802.16e and d), 802.20 and other WAN radio access technologies. Cisco works with administrators to determine the best partner mix for enabling a seamless broadband infrastructure.

Beyond Broadband to Triple Play on the Move

Cisco is building on its broadband foundation by delivering the IP-based Next Generation Networks which will provide a broad sweeping transformation of service providers' entire network and business models.

This is based on the ability to not only offer an intelligent broadband wired/wireless infrastructure, but the Service Exchange Framework to help operators take advantage of "Triple Play on the Move" which combines data, voice and video to create advanced entertainment services, communication services, home management services and security and data services.

Entertainment services (Video Gaming, Video on Demand, Music on Demand, Internet Radio)

Advanced Communication Services (VoIP, Video Telephony and Mobility)

Home Management Services (Security, Monitoring and Utility Management)

Security and Data Services (VPNs, Firewalls and Parental Controls).

Operators can deliver these advanced services to any residential or business subscriber, over any network, to any device --- and to any location.

Cisco Service Exchange Framework is based on an open, standards-based architectural approach to service deployment. It includes an IP Multimedia Subsystem (IMS)-compliant SIP core that enables service providers to deploy ubiquitous converged IP multimedia services that combine voice, video and data applications in differentiated and personalized ways.

Examples of such services include: Push to Talk over Cellular (POC), presence-enabled voice/video communications, mobile video/telephony, video content sharing, multimedia messaging, etc.

Cisco Service Exchange Framework embraces and extends IMS standards by providing unmatched service delivery intelligence derived from access, application and subscriber awareness of powerful network resources. This allows operators to continually take advantage of added network functionality, performance and scalability to provide a differentiated portfolio, as well as a superior individual customer experience, while supporting millions of simultaneous sessions.