Accelerating Broadband Enablement in Rural Alberta

ALBERTA ECONOMIC DEVELOPMENT AUTHORITY

Alberta Economic Development Authority
Sustainable & Regional Development Committee

April 2010

Acknowledgement & Thanks

The following were responsible for this report:

AEDA Sustainable and Regional Development Committee Members

Mr. Fred Estlin, FCA (Chair)
Dr. William Cade
Mr. John Brodrick
Mr. Craig Corser
Mr. Al Hyland
Mr. Subhash Karkhanis
Mr. John Kolk (Vice Chair)
Mr. Bern Kotelko
Mr. Corey Marshall
Mr. Bill McAlpine
Mr. Tom Shields
Mr. Bob Tarleck
Mr. Michael M. Wilson, P. Eng

Project Staff Team

Duane Pyear – Alberta Finance and Enterprise
James Cleland – AEDA
Judy Eng-Hum – AEDA

AEDA also thanks the following for their participation:

Dennis Mudryk – Service Alberta
Ron Popek – Agriculture and Rural Development
Robert Hornbrook – Agriculture and Rural Development
Paul Gervais – Agriculture and Rural Development
Alberta Urban Municipalities Association (AUMA)
Alberta Association of Municipal Districts and Counties (AAMDC)

Consultant

James van Leeuwan - Taylor Warwick

taylorwarwick
CONSULTING LIMITED

Message from Board Chair and the Sustainable and Regional Development Committee

Alberta Economic Development Authority (AEDA) is pleased to deliver the report, ***Accelerating Broadband Enablement in Rural Alberta.***

The issue of improving rural connectivity was first identified as an opportunity for Alberta in a report completed by the Committee in 2008. This report continues to examine this issue and how broadband can enhance Alberta's competitiveness by improving connectivity.

It has been recognized that communities that cannot plug into the high-speed digital economy cannot attract new businesses that rely on basic services such as electronic invoicing, cloud computing, internet conferencing and large digital file transfers. Many communities and nations around the globe that have embraced broadband as an essential utility are benefitting and this report acknowledges that Alberta needs to move in this direction.

The benefits of competitive broadband enablement are identified in this report and three recommendations are put forth to government to review. AEDA offers to continue to be part of this process and seeks to assist the government in moving this initiative forward.

Sincerely,

Robert G. Brawn, P.Eng.
Chair, Alberta Economic Development Authority

Fred Estlin, FCA
Chair, Sustainable and Regional Development Committee

Executive Summary

Lines of communication comprise the basic infrastructure of economies, communities and societies. Broadband technologies greatly expand the economic and social utility of lines of *telecommunication*, and the economic and social horizons of enabled individuals and communities. These technologies are power tools for building more diverse, inclusive, innovative and productive communities, enabling more efficient and effective production, communication and leveraging of knowledge, ideas and information.

Throughout the developed world, today's youngest generation of wealth creators has grown up with broadband. For this first *Net Generation* and all that will follow, the accessibility, capability, reliability and affordability of broadband services and amenities will be key factors in choosing places to live, work, travel, invest, and raise families. Competitive broadband enablement has now become essential to full economic participation and competitiveness, and to sustaining communities of place.

Broadband enablement has become a high priority in forward-thinking communities and nations around the globe, and many have embraced broadband as an essential utility. This is driving public and private investment in networks, services, digital literacy, and regulatory reforms, including reforms that create structural, arm's-length separation between network operators and service providers. By opening access to networks and unleashing the full power of competition in markets for services, these reforms accelerate innovation and investment in services; improve market efficiencies; and lower costs for vendors and consumers. This drives further investment in open, capable networks and other infrastructure needed to build competitive economies based on knowledge, information and innovation.

Smaller communities have the most to gain and offer from broadband enablement, but inefficient facilities-based competition between closed networks has led to widespread market failure outside of major urban centres in Canada. The SuperNet backbone has improved penetration of broadband networks into rural Alberta, but for the most part remains seriously underutilized. So far, there is no indication that Canada's federal government recognizes the true cause or extent of the market failure, which also accounts for Canada's declining competitiveness in broadband service provision compared to other developed nations. This is a strategic liability to Canada's economic and social development.

Regulatory reforms could help to dramatically accelerate broadband enablement throughout Canada, but they are not essential. There is a sound business case for senior governments to invest in open and capable broadband networks that enable remote access to health, education and other essential services from rural homes and businesses. Through partnerships with community and private interests that stand to profit from such networks, senior governments can dramatically broaden the frontiers of economic and social opportunity in rural communities and drive returns on investments in networks. Rates of return will depend most strongly on the depth and breadth of digital literacy and community leadership in broadband, and senior governments can play central roles in fostering both.

Investments that foster broadband leadership and digital literacy are the most valuable and important investments that government can make, as there is a critical need for all of Alberta's communities to become progressive, productive and competitive participants in the emerging economies and societies of the 21st century. Without this, Alberta's communities and the province as a whole face an increasingly difficult future. To best 'leapfrog' in broadband enablement and finally reap the full benefit of Alberta's visionary investments in the SuperNet, it is recommended that the Alberta government:

1. **formally recognize broadband as an <u>essential</u> utility;**

2. **actively foster digital literacy and community leadership in broadband enablement, and;**

3. **provide technical and financial support that enables a small number of pilot communities to deploy open access broadband networks.**

Table of Contents

What Is Broadband?

BROADBAND = BROAD UTILITY

In today's vernacular, the term 'broadband' connotes a group of evolving technologies that are rapidly expanding the capabilities and utility of electronic telecommunication. Technically, the term relates to the breadth (carrying capacity) of a band of carrier frequencies (channel) used for telecommunication. The broader a channel, the greater the number, diversity and sophistication of services the channel is able to support. In the most practical terms, 'broadband' means 'broad capability' or 'broad utility'.

Broader channels are analogous to broader roads. Both can carry greater volume and diversity of two-way traffic (number and diversity of services), especially when carrying capacities are symmetric (equal in both directions). The similarities between transportation and telecommunication systems can help in forming an intuitive understanding of broadband, and will be exploited further in this document.

CAPACITIES, CAPABILITIES AND TECHNOLOGIES

The carrying capacity or 'bandwidth' of a telecommunication channel is the principal limitation to its capabilities. Bandwidth is measured in kilobits per second (1 kb/s = 1000 bits per second), Megabits per second (1 Mb/s = 1000 kb/s), or Gigabits per second (1 Gb/s = 1000 Mb/s).

Wireline telecommunication technologies use optical fibre, co-axial cable and copper wire as their transmission media. Wireless technologies like WiFi and WiMax use unguided electromagnetic fields. The following tables list channel capabilities (services) in relation to channel capacities (bandwidth):

5 – 10 Mb/s

- Telecommuting (converged services)
- File Sharing (large)
- Multi-channel IPTV (SD[1])
- Switched digital video
- Video on Demand (SD)
- Broadcast video (SD)
- Video streaming (SD, 2-3 channels)
- Video download (HD[2])
- Telepresence (low definition)
- Gaming (basic)
- Medical file sharing (basic)
- Remote medical diagnostics (basic)
- Remote education (basic)
- Building control and management
- Smart Grid applications for power mgmt.
- Basic Triple Play service bundle (SD video; VoIP; 3 - 4 Mb/s asymmetric Internet)

[1] SD = standard definition
[2] HD = high definition
[3] VoIP = Voice over Internet Protocol

10 – 100 Mb/s

- Telemedicine (advanced)
- Remote education (advanced)
- Broadcast video (SD & some HD)
- Multi-channel IPTV (HD)
- Gaming (complex)
- Telecommuting (high quality video)
- Telepresence (HD)
- Surveillance (HD)
- Building control and mgmt. (intelligent)
- Advanced Triple Play service bundle (HD video; VoIP; 10+ Mb/s symmetric Internet)

100 – 1000 Mb/s

- Telemedicine (HD, multi-source)
- Remote education (HD, multi-source)
- Broadcast video (full HD)
- IPTV (full channel support)
- Video on Demand (HD)
- Gaming (immersive)
- Telecommuting (immersive)
- Remote server services for telecommuting

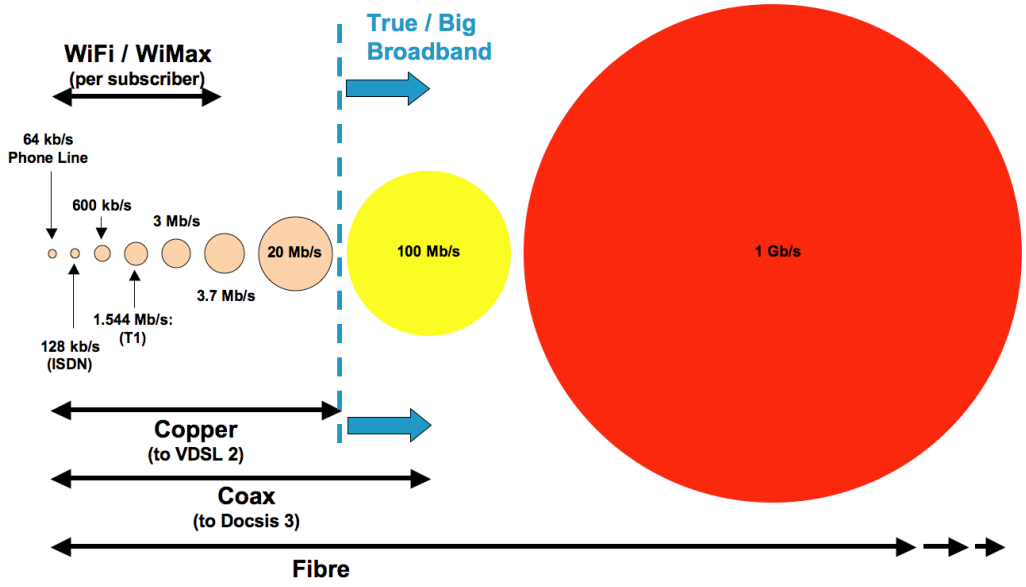
1 – 10 Gb/s

- Research applications
- Telepresence with multiple HD streams
- Digital cinema streaming of live events etc.
- Remote manipulation of scientific and medical instruments
- Interactive remote visualization and virtual reality
- Movement of Terabyte datasets
- Remote supercomputing

(Adapted from *The State of Connectivity*, CBTF 2008-01)

Today's most capable commercial technologies enable 100 Gb/s transmission on a single optical fibre, over distances of more than 100 km. This peak capacity figure is doubling every 18 months, such that commercial Terabit-per-second (Tb/s) fibre technology is expected in five years (1 Tb/s = 1000 Gb/s). In 2006, industry researchers in Japan achieved a transmission rate of 14 Tb/s over a single optical fibre 160 km in length. The cost of lower-capacity optical fibre technologies is steadily falling, such that optical fibre technology is now less expensive to deploy than traditional twisted-pair copper technology. Fibre technologies also cost much less to operate than other technologies.

The following diagram compares the capacities of today's commercial broadband technologies. Optical fibre technologies offer the greatest capacity, capability, scalability and durability, and are therefore the most future-proof. They also have the lowest cost of ownership and operation per unit of capacity.



(Adapted from *FTTH*, FTTH Council, 2007-02)

THE NEW DIGITAL DIVIDE

Devices, networks and services for commercial broadband telecommunication have been evolving and proliferating for over fifteen years. Throughout this period, **the capacity required for state-of-the-art broadband services has doubled every two years on average**. This growth in capacity requirement will persist, and will outpace the capacity growth of most wireline and wireless technologies. Also, as high-capacity fibre networks proliferate, the growth could accelerate even further.

Today's popular broadband services include streaming of live and recorded high-definition (HD) video content, which requires a download capacity of roughly 5 Mb/s per channel. Live streaming of high-definition stereoscopic (3D) content is the emerging state-of-the-art, and requires download capacities of 20 Mb/s or more per channel. High-definition multi-channel

videoconferencing is also state-of-the-art, and requires combined download and upload capacity or 'throughput' of at least 20 Mb/s. At today's rate of development, capacity required for state-of-the-art services will exceed 100 Mb/s before 2015.

Because of its strong advantages in scalability and operating cost, optical fibre has become the solution of choice for 'last-mile' networks that support broadband service provision into homes and businesses. As highly capable fibre-to-the-premise (FTTP) networks drive development of high-bandwidth services, a new *digital divide* is growing between communities served by fibre networks and others served by less capable networks. This new digital divide compounds the existing digital divide between communities having some measure of broadband enablement, and those having none.

To formulate sound strategies for overcoming these digital divides, it is critically important to account for projected development of devices, networks and services. Leapfrog strategies leading directly to fibre enablement involve higher up-front capital costs, but optimize service capabilities while minimizing operating and opportunity costs. China's leapfrog strategy has led to almost a quarter of its 87 million Internet subscribers being served over fibre, and an annual compounded subscriber growth rate of 7%.

Basics of Broadband Enablement

Broadband enablement requires devices, networks, protocols, services, knowledge and skills.

DEVICES

Clients are personal, household, public and commercial computing appliances equipped for broadband telecommunication. These include handsets (smart phones), netbooks, tablets, laptops, desktops, game systems, 'thin client' terminals, kiosk terminals, set-top boxes, televisions, and other appliances. These devices are analogous to bicycles, motorcycles, cars, buses and other mobility devices that enable a person to access people, places, goods and services via transportation networks.

Servers are computing appliances that enable provision of commercial and other services, usually positioned within networks to enable reliable and cost-effective provision of services. Servers and the facilities that host them (data centres) are analogous to shops and commercial centres. Service providers can build and operate their own stand-alone server facilities or rent facilities as if renting space in a shopping mall or commercial park.

Routers are devices that enable routing of traffic on telecommunication networks. They also function as gateways that enable traffic to flow between separate networks. Routers are analogous to road/highway intersections, airports, train stations, subway stations, border stations, ferry terminals and other facilities that facilitate flow of traffic within and between transportation networks.

NETWORKS

Local area networks connect devices that are confined to a commercial, residential or other locale. A LAN is analogous to a network of roads serving a single property, e.g. a condo complex, and the router in a LAN usually functions as a gateway to one or more *access networks* that serve the property.

Access networks are often called 'last mile' networks, and are analogous to municipal road and street networks. Within a community, an access network connects properties to one another by way of a central office (in the case of a wireline network) or an access point (in the case of a wireless network). The CO or AP routes local traffic and connects the access network to one or more *backbone* networks.

> ***Backbone networks*** like the Alberta SuperNet carry traffic between access networks. These are analogous to highway networks.

PROTOCOLS AND SERVICES

Protocols govern how devices communicate with each other, and how traffic is routed and managed. They are analogous to rules of the road, and are essential to efficient, effective and ubiquitous provision of services. Plain Old Telephone Service (POTS), programmed television, Internet service and virtual private networking (VPN) are common services. Internet service enables access to the vast and expanding array of services built around the Internet Protocol (IP), which include Voice over IP (VoIP) services and IP television (IPTV) services. Internet service can dramatically expand the economic and social utility of any network that has sufficient capacity to accommodate IP-based services. The greater the capacity, the broader the range of IP-based service capabilities and the greater the network's utility.

KNOWLEDGE AND SKILLS

To access broadband services and realize their potential economic and social benefit, people must be able to operate client devices. This is analogous to being able to operate motorized vehicles. Also, service providers must be able to develop, manage and operate services. This is analogous to developing, managing and operating bricks-and-mortar service enterprises. These human capabilities are now collectively referred to as *digital literacy*.

Trends in Broadband Enablement

UNIVERSAL ACCESS

"… the great infrastructure challenge of our time is the deployment and adoption of robust broadband networks that deliver the promise of high-speed Internet to all Americans." [FCC Chairman Julius Genachowski, Nov. 2009]

Lines of communication are the fundamental infrastructure of economies, communities and societies. Broadband technologies are revolutionizing the economic and social utility of *telecommunication* lines, and dramatically expanding the economic and social horizons of enabled individuals and communities. For this reason, broadband enablement has become a central priority in nations around the globe:

- In November 2008, the Saskatchewan government announced a $129 million Rural Infrastructure Program to bring broadband Internet access to 100% of the province before the end of 2010. This objective has now been met, with the help of partnerships between Crown-owned SaskTel and several ground-based and satellite-based wireless Internet service providers.

- In February 2009, the Korean government announced that it would upgrade its nationwide Broadband Convergence Network to enable 1 Gb/s access via optical fibre and 10 Mb/s access via wireless by 2012, at a cost of $24.6 billion USD. The government will invest $0.94 billion, and the rest will come from telecom operators. Korea leads the world in broadband enablement with over 94% of households served at speeds up to 100 Mb/s, at an average cost to consumers of only $0.93 USD per Mb/s. Average cost in Canada is over $28.00 USD per Mb/s.

- In April 2009, the Australian government announced that it would build a National Broadband Network to enable 100 Mb/s access via optical fibre for at least 90% of Australian homes, schools and businesses and advanced wireless access for the remainder within 8 years, at a cost of $38 billion USD. Up to half of this investment will come from the government, and the remainder from private investors.

- In June 2009*,* the government of the United Kingdom confirmed its intention to enable broadband access of at least 2 Mb/s for every household in the UK by 2012. The following month, the government announced that it would invest $2.4 billion USD to stimulate deployment of optical fibre networks that will enable 100 Mb/s access from as many as 10 million British premises.

- In October 2009, the government of Finland enacted a law making broadband access of 1 Mb/s a legal entitlement for all citizens. This is an intermediate step in the Finnish government's plan to make broadband access of 100 Mb/s a legal right by 2015.

- In November 2009, the government of Spain announced that all Spanish citizens would be legally entitled to broadband access of 1 Mb/s from their homes by 2012, at a regulated rate.

- In March 2010, the U.S. Federal Communications Commission tabled its National Broadband Plan, building on a presidential campaign commitment by Barack Obama. The Plan proposes solutions for universal service of 4 Mb/s, which build on successful

programs to implement universal electrification and telephone service in the 20th century. The Plan also focuses on a '100-Squared Initiative' to bring 100 Mb/s connectivity to 100 million homes by 2020.

This trend towards universal broadband access and service will continue to accelerate, driven by growing recognition that broadband telecommunication has become essential to full economic and social participation and productivity; competitive and sustainable economic development; progressive community and cultural development; and reducing the environmental and social costs of economic activity and development.

Broadband telecommunication has become an *essential* utility.

OPEN ACCESS

The essence of broadband networks and transportation networks alike is that they enable people to be of greater service to one another, by way of the devices that use these networks. The central challenge in broadband enablement today is to drive development of networks that enable people to realize the full economic and social utility of present and future generations of broadband-enabled devices.

Today's devices are increasingly accessible, affordable, reliable and prolific, and already have service capabilities that far exceed the capabilities of most networks except optical fibre networks. This is analogous to the proliferation of motorized vehicles a century ago, when revolutionary new devices with huge capabilities (automobiles) could not be fully utilized for lack of good road networks. The history of today's capable road networks may be useful in guiding development, operation and regulation of capable broadband networks, if the goal is to fully realize the latter's economic and social utility[1].

Today's portable devices come equipped for wireless telecommunication at rates exceeding 100 Mb/s, while fixed devices come equipped for wireline telecommunication at 1 Gb/s or more. More significantly, device capabilities are evolving in lockstep with the capacities of integrated circuits (computer chips), which continue to double every two years on average (Moore's Law). Computer chips are to devices as motors are to automobiles, and the more powerful these 'engines' become, the more capable the infrastructure that is required to accommodate device capabilities.

---

[1] Alberta's SuperNet is the broadband analogue of a publicly controlled highway network, and the community-controlled fibre-to-the-premise network proposed by interests in the town of Olds, Alberta is analogous to a municipal street network. Also, the principle of *common carriage* was originally developed for regulating providers of canal, railway and other transportation infrastructure and services, and has been a cornerstone of telecommunication regulatory systems in Canada and the U.S.

Besides improving the extent and capabilities of broadband networks, it is critically important to improve *access* to networks. As with transportation, the economic and social utility of telecommunication is optimized when networks are *open*, and all people are able to use networks either for provision or utilization of services. This condition is essential to driving competition, innovation and investment in services and optimizing market efficiency, which reduces costs for both providers and consumers and drives further investment in open, capable networks and other essential infrastructure. In what amounts to a virtuous circle, this in turn drives more competition, investment and innovation in services.

Open access is a disruptive change from the closed-access 'walled garden' business paradigm that has long prevailed among incumbent network operators, who have little incentive to migrate to an open access paradigm. However, open access is fundamental to realizing the full economic and social utility of broadband networks at the lowest possible cost, by way of the virtuous circle described above. This is driving several accelerating trends in regulation, development and operation of broadband networks:

- ***Regulatory reforms*** that disrupt and prevent network monopolies by introducing arm's-length separation between network operation and service provision (structural/functional separation);

- ***Community networks*** controlled by community or co-operative interests and operated on an open access utility model, to minimize user costs and optimize economic and social utility[2];

- ***Symmetric access*** that enables network users to become service *providers* as well as service consumers, by providing equal capacity in both directions (upload speed = download speed). The new requirement is for 2-way communication vs. consumption of preprogrammed content.

Broadband Enablement in Rural Alberta: Key Opportunities

RESTORING DEMOGRAPHIC BALANCE

The British Commission for Rural Communities has found that almost 200,000 youth aged 15 to 29 are leaving rural Britain every year; that lack of broadband is a "significant factor"; and that "failure to act will put the future

[2] *"We don't charge you to walk on our sidewalks. Why would we charge you for broadband?"* Mayor Brad Woodside of Fredericton NB, commenting on Fredericton's *Frede-zone* public access WiFi network (www.fred-ezone.ca).

viability of our rural communities at risk".[3] A similar story is unfolding in rural Canada.

Reversing the accelerating trend of youth out-migration is paramount to restoring demographic balance and economic sustainability to Canada's rural communities. The values and interests of today's younger generations are cause for hope. Compared to older generations, today's youth tend to place less value on material wealth and security and greater value on quality of life, quality of work, and personal, social and environmental health. Reluctant rural émigrés as well as many young urbanites would readily trade the stress, indifference and pollution of cities for the greater calm, community, health and affordability of rural living, especially for raising children. Their destinations of choice will be creative, inclusive and forward-looking communities that offer the means to make a living, which now include capable, reliable and affordable broadband networks.

Today's youngest generation of wealth creators has 'grown up digital', and for many, broadband has become essential to fulfilling economic and social needs. For this first *Net Generation* and all that will follow, the accessibility, capability, reliability and affordability of broadband services and amenities will be key factors in choosing where to live, work, visit, develop enterprises, and raise families. For themselves and for their children, they will demand equal access to the rapidly expanding universe of social, educational, commercial, vocational, recreational and entrepreneurial opportunities that broadband telecommunication makes available to them.[4]

Broadband enablement will play a central role in reversing the demographic and economic fortunes of aging and declining rural communities. Like expansion of railway networks in the 19th century, expansion of capable broadband networks will bring a wave of young, creative, entrepreneurial people to Alberta's rural regions. Besides helping to restore demographic health to rural communities, these new pioneers will help to meet the most pressing needs of Alberta's rural economies.

IMPROVING ECONOMIC DIVERSITY, INNOVATION AND PRODUCTIVITY

While the highly innovative and diversified growth economies of the Information Age unfold in cities around the world, most of rural Alberta remains mired in the ebbing economies of the Industrial Age. Production of natural gas and conventional oil are in irreversible decline; input costs for agriculture and forestry continue to rise; and global competition continues to

---

[3] Rural Advocate Report 2010, British Commission for Rural Communities, March 2010.

[4] *"There will be plenty of good jobs out there in the flat world for people who have the right skills, knowledge, ideas and self-motivation to seize them. But there's no sugar-coating the new challenge: Every young person today would be wise to think of himself or herself as competing against every young Chinese, Indian, and Brazilian."* Thomas Friedman in The World is Flat.

steadily weaken prices for agriculture and forestry products. For most industry-based communities in Alberta, economic prospects are poor.

Deployment of capable broadband networks will enable migration of knowledge workers young and old into rural Alberta, while enabling incumbent rural communities to access an almost unlimited range of training and education services for knowledge-based vocations. Most importantly, these networks will provide instant and affordable access to local, national and global markets for related products and services. For aging and declining communities, initiating and investing in this economic and social change will likely mean the difference between prosperous, sustainable futures or sustained decline.

REDUCING TELECOMMUNICATION SERVICE COSTS

Broadband and other telecommunication services in Canada are among the most expensive in the world, mostly because of outdated regulations that foster wasteful 'facilities-based' competition between closed incumbent networks. *"Canadians continue to face a market oligopoly comprised of a very limited number of powerful incumbents. As a result, they live in the worst of both worlds, enjoying neither the benefits of real competition nor the benefits of an industry regulated to serve the public interest".*[5]

Operated as an open utility, capable broadband networks can greatly reduce the costs of providing telephony, television, Internet and other telecommunication services into rural communities, while improving competition and innovation among service providers. This can reduce costs to rural residents and business operators by hundreds or even thousands of dollars a year, while dramatically increasing the depth and breadth of services available. These networks can also greatly expand entrepreneurial opportunity for rural residents, and improve access to markets and services for established enterprises.

Common residential telecommunication services include Internet access, telephony (dial tone) and television. The following table compares monthly pricing from Alberta and elsewhere for a 'triple play' of services including Internet access, basic telephony and premium television services.

[5] Longford, G., Moll, M., & Shade, L. R. (2008). From The "Right to Communication" To "Consumer Right of Access": Telecom Policy Visions from 1970-2007. In M. Moll & L. R. Shade (Eds.), *For Sale to The Highest Bidder: Telecom Policy in Canada* (pp. 3-16). Ottawa: Canadian Centre for Policy Alternatives.

Residential Market	Service Provider(s)		Prices* ($CAD/mo)	Internet Performance‡ (Mb/s)		Traffic Included (Gb/mo)
Rural Alberta (anywhere)	Telus Telus	dialup Internet; phone & satellite TV	$26.95 $125.00	0.04↓	0.04↑	unlimited
	XplorNet Telus	satellite Internet; phone & satellite TV	$59.99 $125.00	1.0↓	0.1↑	unlimited
Rural Alberta (countryside)	Platinum Telus	wireless Internet; phone & satellite TV	$59.99 $125.00	2.0↓	1.0↑	unlimited
	GPN Wireless Telus	wireless Internet; phone & satellite TV	$59.95 $125.00	2.5↓	1.5↑	35
	Tough Country Telus	wireless Internet; phone & satellite TV	$49.95 $125.00	4.0↓	2.0↑	80
	Telus Mobility Telus	mobile 3G+ Internet; phone & satellite TV	$85.00 $125.00	21.1↓	5.7↑	5
Urban Alberta (towns & smaller cities)	Telus (bundle)	copper DSL Internet phone & satellite TV	$161.00	15.0↓	1.0↑	100
	Shaw (bundle)	co-ax cable Internet, digital phone & TV	$142.90	10.0↓	1.0↑	100
Metro Alberta (Calgary & Edmonton)	Telus (bundle)	copper DSL Internet, phone & TV	$156.00	25.0↓	1.0↑	100
	Shaw (bundle)	optical fibre Internet, digital phone & TV	$246.90	100.0↓	5.0↑	400
Metro U.S. (New York, Chicago, LA)	Verizon FiOS (bundle)	optical fibre Internet, digital phone & TV	$125.00	35.0↓	35.0↑	unlimited
Urban U.S. (Lafayette, LA)	LUSFiber (bundle)	optical fibre Internet, digital phone & TV	$208.00	50.0↓	50.0↑	unlimited
Metro Japan	J:COM (bundle)	optical fibre Internet, digital phone & TV	$134.00	106.0↓	10.0↑	unlimited
Metro France	Orange (bundle)	optical fibre Internet, digital phone & TV	$91.00	100.0↓	100.0↑	unlimited

* Prices from service provider websites, March 1, 2010.
‡ Advertised peak performance. Performance varies with network and server congestion.

IMPROVING MANAGEMENT OF LAND, WATER AND ENERGY USE

The Alberta government's innovative Land Use Framework is intended to enable better communication, participation and outcomes in development-related decision-making, especially in rural regions of the province. Effective implementation of the framework will require efficient and effective communication and consultation among stakeholders, especially the landholders and communities most directly affected by development decisions. Broadband will be an indispensable tool for coordinating and executing the many information-related tasks and processes required under the framework, including collection, communication and discussion of development-related data across all key stakeholders.

Data will include geospatial imagery and computer-generated imagery that enables *a priori* visualization and assessment of development-related impacts and cumulative effects. Alberta is already recognized as a leader in developing and applying the computer modeling tools required for such visualization and assessment. Broadband access to these powerful tools will enable development proponents, communities, governments and other stakeholders to collaborate far more efficiently and effectively. While helping to expedite and improve development-related decisions, rural broadband will also help to build the capabilities and reputations of the institutions and enterprises that develop and apply these tools, further strengthening Alberta's reputation as a leader in this critically important area.

Alberta's *Water for Life Strategy* will also benefit from deployment of rural broadband networks, through improved monitoring of water supply and management of domestic, commercial and industrial water consumption. The same applies to consumption of natural gas and electrical power, which can lead to significant reductions in consumption of non-renewable energy resources and production of related emissions. Teleworking via broadband networks can have the same effect, by reducing demand for mobility. Australian Prime Minister Kevin Rudd has recently claimed that his government's proposed National Broadband Network will enable a 5% reduction in Australia's carbon emissions.

IMPROVING MUNICIPAL REVENUES AND SERVICES

Rising operating costs and flat or declining municipal tax revenues have left rural communities struggling to maintain municipal service levels. Many have been forced to close facilities and reduce or eliminate services, making these communities less attractive to new businesses and residents.

By enabling progressive and sustainable economic and community development, capable broadband networks can help to strengthen a community's municipal tax base. Operated as municipal utilities, networks can also generate profits that become a new source of revenue for municipal coffers. Also, broadband can dramatically improve ratepayer access to municipal services, employees and elected officials, and also enable effective remote participation in municipal council and committee meetings.

IMPROVING EFFICIENCY AND ACCESSIBILITY OF GOVERNMENT SERVICES

Capable broadband networks can revolutionize provision of health, education and other public services in rural communities, while reducing related costs. Broadband service provision reduces the need to build and operate bricks-and-mortar infrastructure for provision of services, saving potentially billions of dollars while improving accessibility, efficiency and quality of services. These can include sophisticated remote monitoring and diagnostic services that better enable seniors to 'age in place', rather than relocate to expensive and unfamiliar facilities for extended care.

The greatest impact of broadband networks will be to vastly improve access to resources and services for elementary, secondary and post-secondary education, as well as resources and services for vocational training and professional development. Such access will be essential if present and future generations of Albertans are to realize their creative and productive potential in today's and tomorrow's economies and societies, which will be strongly driven by knowledge, innovation and communication.

To be economically competitive in the 21st century, learning must be a strategic priority.

IMPROVING SECURITY, SAFETY AND EMERGENCY RESPONSE

Broadband networks can improve security of people, places and property by enabling inexpensive remote video monitoring of public, residential, commercial and industrial property. This can include remote surveillance of homes and businesses; roads, parking lots and other high-traffic public spaces; well sites, pipelines and other remote industrial facilities; and calving barns and other livestock facilities.

Vehicle accidents remain a leading cause of injury and death in Alberta, especially among rural youth, and remote monitoring and management of roads and traffic can reduce accident rates. When accidents do occur, wireless broadband can improve the effectiveness of emergency response services at accident sites and en route to hospitals, by enabling audiovisual communication between emergency response personnel in the field and emergency room personnel in the hospitals.

These communication capabilities are exceptionally valuable in the critical few minutes immediately following a vehicle accident, when the only people on site are usually vehicle occupants and passers-by with little or no training in emergency response. Today's handheld smart phones are already capable of two-way audiovisual communication, and are a becoming a standard personal accessory.

IMPROVING PROMOTION AND TOURISM

Alberta's natural, cultural and recreational attractions include five of Canada's fourteen UNESCO World Heritage Sites, and rank among the province's most durable and valuable economic assets. These attractions are located for the most part in rural regions of the province, meaning that rural communities will have the most to gain from tourism-related economic development. Rural broadband networks will enable live and interactive audiovisual promotion of Alberta's attractions to prospective tourists around the world, along with related services and amenities. Such promotional capabilities will be essential to realizing the full economic potential of Alberta's countless tourist attractions, as the rest of the world grows accustomed to accessing service providers and amenity operators through broadband.

IMPROVING UTILIZATION OF ALBERTA'S SUPERNET

Most of the above applications of broadband telecommunication will require highly capable 'last mile' access networks, and all of these access networks will require connectivity to one or more backbone networks. Building access networks that enable these and countless other applications will enable Alberta to finally realize the full utility of its SuperNet backbone, which now languishes for lack of traffic.

REBUILDING ALBERTA'S SOCIAL CAPITAL

Trust, co-operation and interdependence are cornerstones of resilient communities and societies. In communities throughout Alberta, these cornerstones have been slowly eroding for more than half a century. Meanwhile, intellectual and ideological divides have steadily grown between urban and rural populations. By opening more efficient and effective lines of communication within and between all communities in Alberta, broadband can play a key role in rebuilding capacities for social enterprise and for advancing the Alberta government's regionalization strategy for economic and policy development.

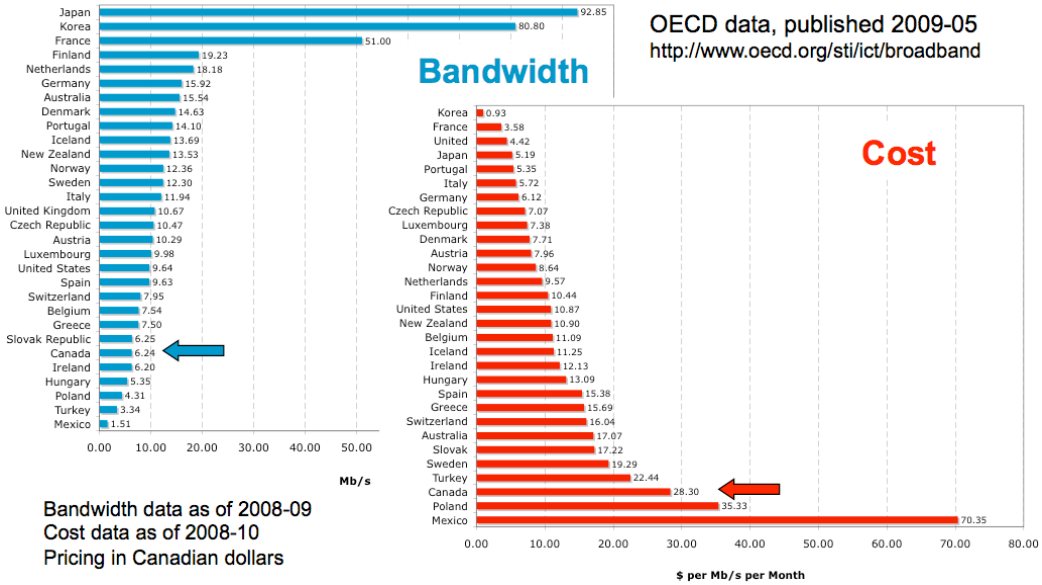
DEFINING AND STRENGTHENING THE ALBERTA BRAND

Alberta faces growing threats to its national and international reputation. To protect and strengthen confidence in and goodwill towards Alberta's people and enterprises, the province must commit to participating fully and competitively in the knowledge-based economies and societies of the 21st century. Broadband telecommunication brings to the 21st century what motorized transportation brought to the 20th century: A revolution in economic and social enablement for individuals, this time based on leveraging of mental effort rather than manual effort. Few if any initiatives would be more effective in strengthening Alberta's brand than a decisive commitment to universal, competitive broadband access.

Broadband Enablement in Alberta: Critical Needs

LEADERSHIP AND LITERACY

Canada's telecommunication regulations strongly restrict foreign control of networks and services, and therefore restrict access to capital for developing either. These regulations also encourage and support *facilities-based* competition between independent private networks, which strongly biases investment of limited capital towards network development at the expense of service development. This perpetuates a deeply entrenched but grossly inefficient business paradigm rooted in *owning* market share rather than *earning* it, and also accounts in great measure for Canada's rapidly declining competitiveness in performance and pricing of broadband services compared to the rest of the developed world:



Canada's entrenched paradigm of facilities-based competition is especially costly to rural communities, where market failure in broadband service provision is common. Each service provider must bear the costs of building and operating their own network infrastructure, but operating returns offered by many rural markets are too weak to cover these costs for anyone other than high-cost, low-capability service providers operating via satellites. Also, many rural markets that offer better returns are not strong enough to support robust facilities-based competition, and are therefore vulnerable to monopolization.

Rural Canada, if not the entire country, would be best served by far more efficient *services-based* competition over capable, shared (open) networks that support all user devices and all competing service providers. However, this would require disruption of the entrenched closed-access business paradigm that prevails among Canada's incumbent network operators. The incumbents have shown no interest in embracing or leading such change, even though an open access paradigm would open new areas of highly

profitable business opportunity for them. Contrary to industry rhetoric, open access would be beneficial to communities and incumbents alike.

There is presently no clear indication that Canada's government recognizes the true cause and extent of its rural market failures and flagging global competitiveness in broadband, or that it is preparing to lead the nation in a better direction. Indeed, recent government decisions indicate an intention to further entrench the status quo of facilities-based competition. Leadership will have to come from elsewhere.

For all of rural Canada including rural Alberta, leadership in broadband enablement will have to come from rural communities themselves, ideally with encouragement, guidance and material support from senior governments. Also, to drive returns on investments in broadband networks, rural communities and governments must encourage and support residents, businesses and entrepreneurs in using them. Residents and business operators must adequately understand the economic and social utility of broadband networks and services, and how to access and operate devices that enable utilization and provision of services. These capabilities comprise what is commonly referred to as *digital literacy*, and they are essential to reaping the economic and social benefits of broadband telecommunication.

TECHNICAL AND FINANCIAL SUPPORT

Most rural communities lack the technical and financial means to build their own broadband networks, and will therefore require technical and financial support from external sources. Financing options for Alberta's rural communities are limited. Canada's telecommunication policies restrict access to foreign capital, and domestic capital is relatively scarce. Canada's private capital tends to be captive to established and familiar industries, even when these industries are no longer generating the most competitive returns. Furthermore, closed rural wireless networks have a poor track record for return on investment, mostly because of higher than expected costs and chronically weak revenues. This has poisoned an already shallow well of private capital, by reducing investor confidence in rural broadband.

Community-controlled open access networks are an unfamiliar and unproven investment opportunity in Canada. They can generate competitive returns, but attracting capital is proving to be very challenging[6]. A community network can instead be operated on a closed-access model, allowing the operator to monopolize service revenues. This requires the operator to develop or procure services to deliver over the network, a formidable challenge given Canada's regulatory requirements and its poorly developed ecosystem of competitive non-incumbent services. The closed access model also builds on Canada's wasteful and unsustainable status quo of facilities-based competition, and is

[6] Community volunteers proposing a community-controlled open access fibre-to-the-premise network for the town of Olds, AB have been working to raise capital for more than five years.

therefore subject to a considerable degree of regulatory risk[7]. These factors all serve to weaken investor confidence.

For as long as Canada remains committed to facilities-based competition, it will remain difficult or impossible for senior governments to subsidize development of networks. To avoid creating competitive biases, governments must subsidize all competing networks equitably or subsidize none at all. Lacking the financial means for the former, governments are generally restricted to the latter.

Technical support, loans and direct financial support that enable pilot communities to prove the business case will therefore be essential to drive deployment of open and capable broadband networks in rural communities, and this is where senior governments have key roles to play. Building technical expertise for deployments in pilot communities will facilitate deployments in other communities.

Public debt financing has been critical to development of energy and water utilities in rural Alberta, and will be no less important to developing this new utility. Up-front costs will be high, and networks for smaller population centres may need to achieve take rates (service penetration) of 50% or more to operate profitability and begin attracting private capital. This can take several years, and the first handful of communities will require public debt and direct support to reach this milestone. Networks that serve the countryside will require longer-term financing.

[7] While Canada and the U.S. invest in their status quo of facilities-based competition over closed networks, most developed nations are committed to enabling service-based competition over open networks. This is creating a serious competitive disadvantage for both nations; see http://www.fcc.gov/stage/pdf/Berkman_Center_Broadband_Study_13Oct09.pdf

Broadband Enablement in Alberta: Key Recommendations

FORMALLY RECOGNIZE BROADBAND AS AN ESSENTIAL UTILITY

The economic and social utility of broadband telecommunication is immense and growing by the day. It is now also essential to economic resilience and competitiveness. Rural communities have yet to begin reaping the benefits of competitive broadband enablement, but they will ultimately benefit the most.

By imparting the status and importance of transportation, energy and water utilities to broadband networks, the Alberta government can bring a wealth of established knowledge, experience, policy and process to bear in supporting development of competitive broadband enablement throughout Alberta.

ACTIVELY FOSTER COMMUNITY LEADERSHIP AND DIGITAL LITERACY

There is little justification for public or private investment in broadband networks in rural communities that lack capable and committed leadership. Without digital literacy, communities and their leaders will be neither capable nor committed, and the economic and social value of broadband cannot be realized.

Resilient and prosperous rural communities are the foundations of resilient, prosperous societies, and it is in the best interests of all Albertans that government actively foster broadband leadership and digital literacy throughout the province.

PROVIDE TECHNICAL AND FINANCIAL SUPPORT THAT ENABLES A SMALL NUMBER OF PILOT COMMUNITIES TO DEPLOY CAPABLE OPEN ACCESS NETWORKS

Driving deployment of capable broadband networks in rural Alberta will require a solid foundation of technical knowledge and expertise, as well as access to capital. A practical near-term strategy would be to support a vanguard of committed and capable rural communities in deploying such networks and demonstrating their profitability, thereby enabling other interested communities to attract private capital.

To mitigate risks and optimize returns on investment, provision of technical and financial support should be restricted to deployments of open, capable, future-proof networks that optimize the present and future utility of broadband telecommunication. Also, wherever possible, the Alberta government should eliminate obstacles and create incentives for private investment in capable networks.

Finally, policies that require simultaneous placement of telecommunication conduit in conjunction with government-financed infrastructure for water and other essential utilities will expedite deployment of capable broadband networks while greatly reducing costs of deployment.

Conclusion

For all communities in Alberta, competitive broadband enablement has become essential to full and competitive participation in the economies and societies of the 21st century, and to maintaining or restoring demographic and economic health. Broadband can therefore be regarded as an *essential* utility for all communities, but it is rural communities that will have the most to gain and the most to offer from competitive broadband enablement.

Leadership in broadband enablement must come from communities themselves. Otherwise, there is little justification for public or private interests to invest in development of the capable, open networks that are essential to reaping the full economic and social benefit of broadband. Community leadership and digital literacy are the most critical needs in accelerating broadband enablement, and government can provide material support for building these capacities. Government can also provide a handful of pilot communities with technical and financial support to build capable networks and demonstrate their profitability, thereby enabling other communities to attract financing and support from private sources.

Disclaimer

This report was prepared by Alberta Economic Development Authority (AEDA). Neither AEDA nor any of its employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favouring by AEDA.

AEDA

ALBERTA ECONOMIC DEVELOPMENT AUTHORITY

McDougall Centre
455 - 6th Street SW
Calgary, AB T2P 4E8

Tel: (403) 297-3022
Fax: (403) 297-6435

www.aeda.alberta.ca