

Working Group on
ICT Development
for the Senior
Officials Working
Group

Pan-Northern Minimum Broadband Standard

A report prepared for the Northern Development Minister's Forum, which proposes a pan-northern minimum broadband standard of 9 Mbps across the North and the development of redundant capacity in every major community.

July 2013

Introduction

Canadians are becoming more reliant on information communication technology (ICT) in every aspect of their lives. In this modern context, all Canadians including, governments and businesses require access to reliable, affordable ICT infrastructure to fully realize 21st century opportunities. In many places in Canada, this is a reality. As technology evolves, the North, however, struggles to keep pace and the current situation reflects an ever increasing ICT service gap between urban centres in southern Canada and many rural and Northern communities.

By and large, ICT networks in southern Canada were developed by the private sector, given the large population bases and profit potential. In the North, however, small populations and a lack of basic infrastructure mean that potential profits are low and the cost of development and maintenance of such networks are high. These barriers are disincentives to private sector investment. ICT infrastructure in the North remains underdeveloped – services tend to be unreliable, expensive for the consumer and the quality of service is often inferior to similar offerings in southern Canada.

This North-South service gap has very real consequences for Northerners. Harsh climatic conditions combined with the remote characteristics of northern communities underscores the importance that connectivity to the outside world has on the region's ability to attract and retain a diverse, productive work force. Restricted access to ICT also increases the cost of providing government services and stunts business growth and innovation in a number of other areas. These limitations constrain potential growth in strategic northern industries such as mining, tourism and the knowledge sector which in turn impacts the Canadian economy as a whole

As these impacts become increasingly apparent, governments are acknowledging that, in the medium to long term, the economic cost of limited ICT access in the North is ultimately higher than the cost of development. Access to a basic level of ICT infrastructure is now perceived as an essential service. This may require government support and regulation to ensure services are available.

Accordingly, the Northern Development Ministers' Forum (NDMF) has conducted a review of current broadband access in the North. This report proposes a pan-northern minimum broadband standard which will be presented for Ministers' discussion at the 2013 NDMF in Fort McMurray, Alberta.

The proposed standard is based on current and forecasted economic development needs of Northerners, as expressed by regional representatives, government documentation and academic literature. A bandwidth speed of 9Mbps was chosen because it is currently adequate for accommodating multiple applications even in most heavy usage fields, like health and education.

This report does not, however, address in-depth technical issues related to the implementation of such a standard, as there are others working on these aspects. It is hoped this document will provide a basis for discussion and future planning of a strengthened broadband network across the North.

The achievement of long term northern development goals must recognize the need to regularly revisit this standard, to ensure it will keep up with demand for service, and should strive for a long-term standard of parity with Southern Canada.

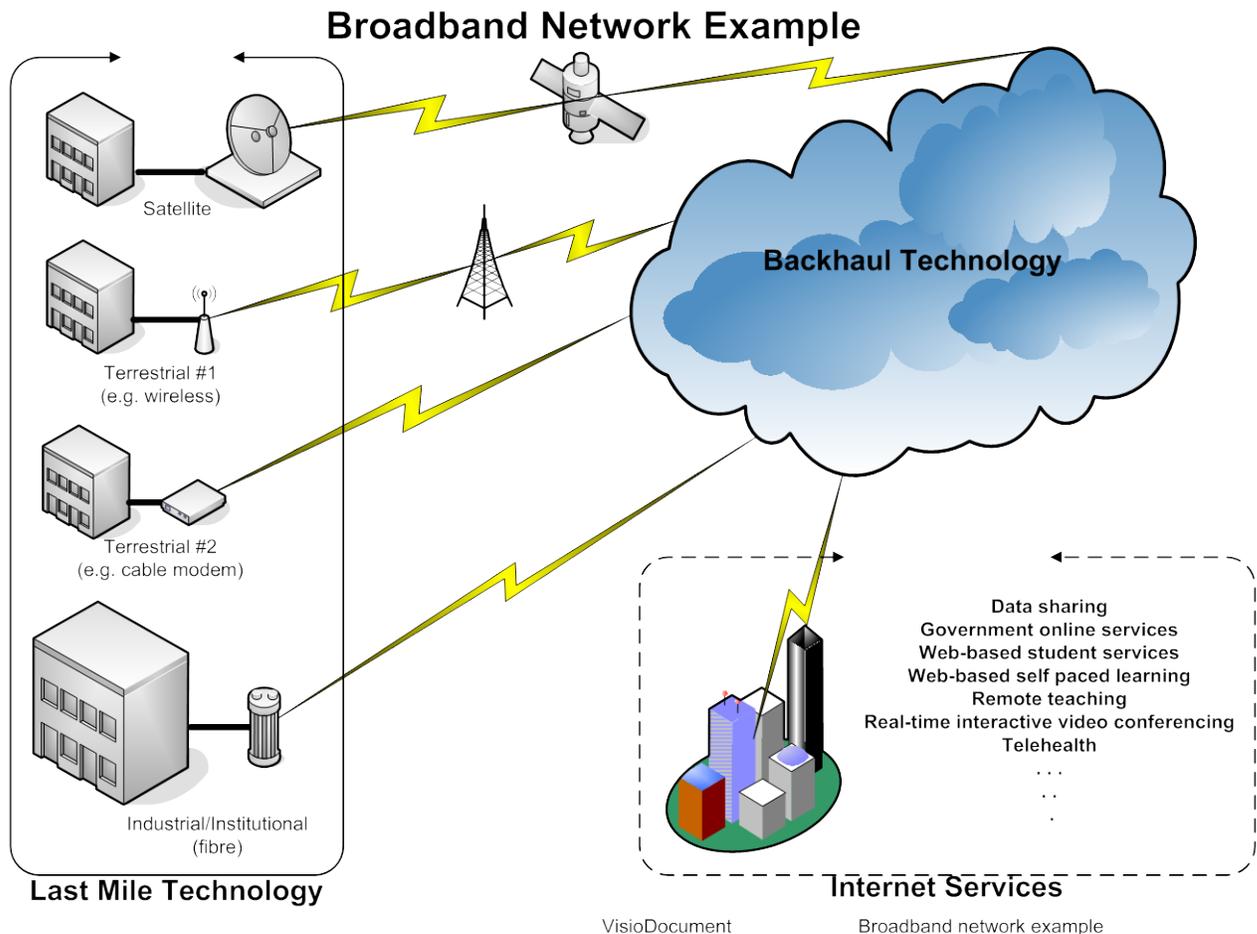
What is Broadband?

Connectivity Characteristics Table¹			
Connectivity Characteristic	Consumer Broadband		Industrial/Institutional Broadband
	Satellite	Terrestrial	
Capacity	1.0Mbps – 4Mbps	≥ 1.5Mbps	Typically 10 Mbps or greater
Cost - onetime	Moderate	Moderate	High to very high
Cost - operational	High	Moderate	High to very high
Last Mile Technology	C band direct to home or business satellite systems	xDSL, cable modem, fixed wireless, HSPA, cellular data, T1	Fibre-optical communications, Ethernet switching

¹ Aboriginal Affairs and Northern Development Canada, *Data Methodology and Connectivity Glossary of Terms*. <http://www.aadnc-aandc.gc.ca/eng/1343229993175/1343230038242>

Backhaul Technology	C band satellite system transponder hubs	Copper based cable or licensed microwave	End-to-end fibre
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- **Satellite Broadband** (space based communications) is a mature service technology that has limitations, but may be sustainable in some business cases due to the high cost of other broadband solutions.
- **Terrestrial Broadband** (land based communications) is a collection of well proven technologies widely deployed in urban and many rural areas.
- **Industrial/Institutional Broadband** supports applications that an institution would typically expect to use. These applications require infrastructure with capabilities beyond what an individual would require for personal use.



Current state of broadband access in Canada's North

The vast majority of northern Canadian communities have access to internet. However, the delivery infrastructure is very different from region to region resulting in varying levels of service. Currently, the Canadian Radio-television Telecommunications Commission (CRTC) has set a minimum national bandwidth standard at 1.5Mbps, but many northern communities are failing to meet this standard.

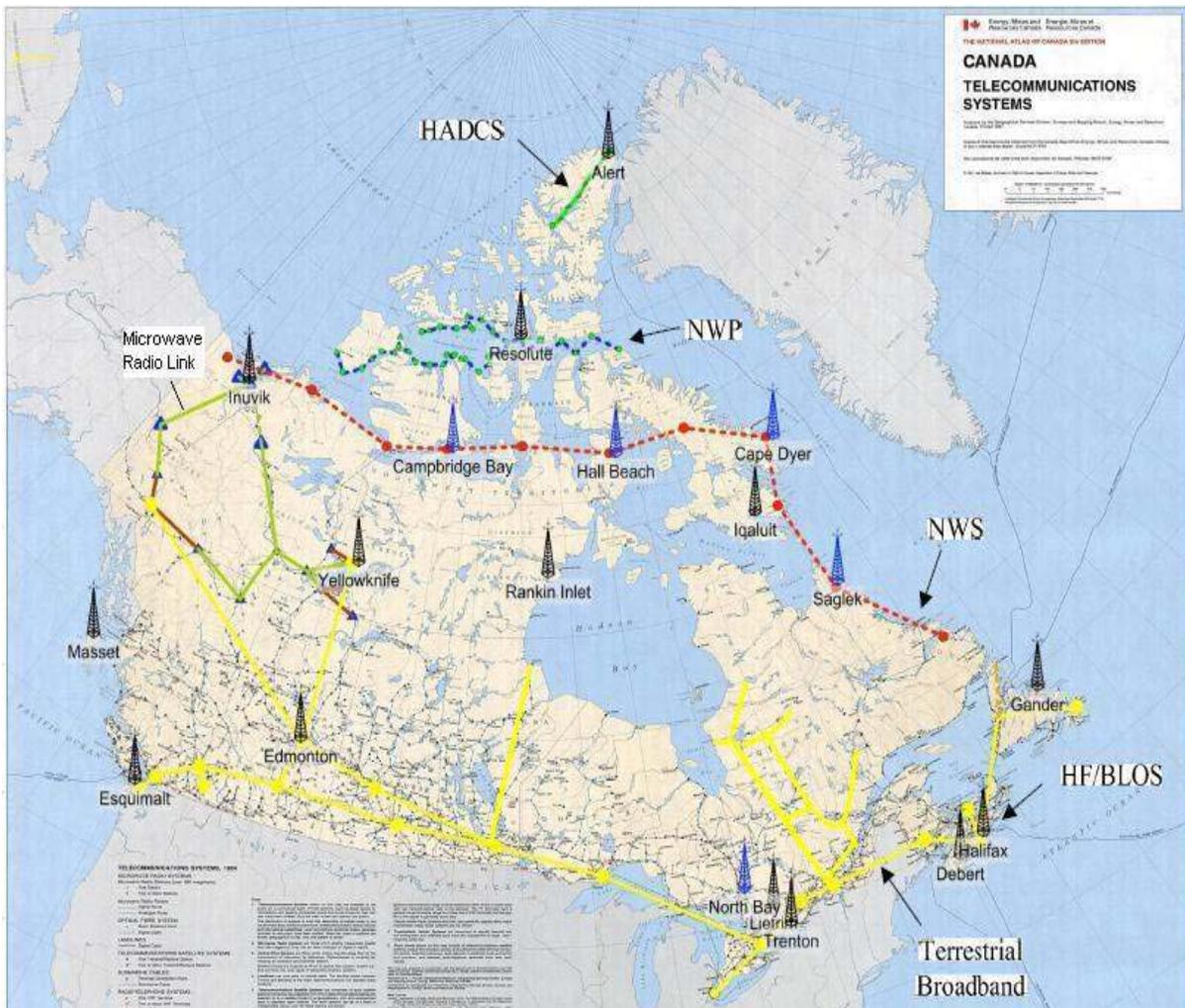
- In 2011, the CRTC (Canadian Radio-television and Telecommunications Commission) established a universal broadband Internet access target download speed of 5 Mbps.

To put this bandwidth speed in perspective, consider the following international goals:

- Finland aims at having a household minimum standard of 100Mbps by 2015;
- The State of Alaska aims to reach the same goal (100Mbps) by 2020;

- The European Union has set a goal 30Mbps by 2020 and;
- Australia has set its target at providing 97% of its population with 100Mbps via fiber optic cable and providing the remaining 3% with 12Mbps via satellite within the next few years.

It is important to note that as other jurisdictions continue to make increased bandwidth capacity a priority, technology developers will almost certainly increase the sophistication of their technologies to follow this trend. In other words, technology which currently requires 1.5Mbps may in the future require significantly more bandwidth because the global average user would have the bandwidth capacity to support an increased level in technological sophistication. Given that the global trend is dramatically outpacing Canadian standards, this represents a very real threat to our ability to compete in almost every sector as it limits our ability to take advantage of emerging technology.



This map depicts Canada’s broadband backbone: red is satellite, yellow is fiber and green is microwave towers. From: Northern Communications Information Systems working group (NCIS) presentation on the Arctic Communications Infrastructure Assessment Report (ACIA Report).

In addition to the disadvantage Canada faces in terms of international competition, three primary areas of concern have been identified related to Canada’s current broadband system that directly affects northern residents, governments and businesses:

1. **Affordability:** There are several factors which contribute to the high cost of internet in the North, including: a lack of competition among service providers, small isolated markets, difficult topography leading to high construction and maintenance costs and the use of alternative delivery infrastructure such as satellite.

This high cost of internet in the North restricts the ability of Northerners to get maximum value out of the technology. For example, services taken for granted in Southern Canada - such as *YouTube* and *Skype* - are often out of reach of Northerners because of high usage fees and high overage fees which are charged to individual users who exceed the allowable bandwidth outlined in their contracts.

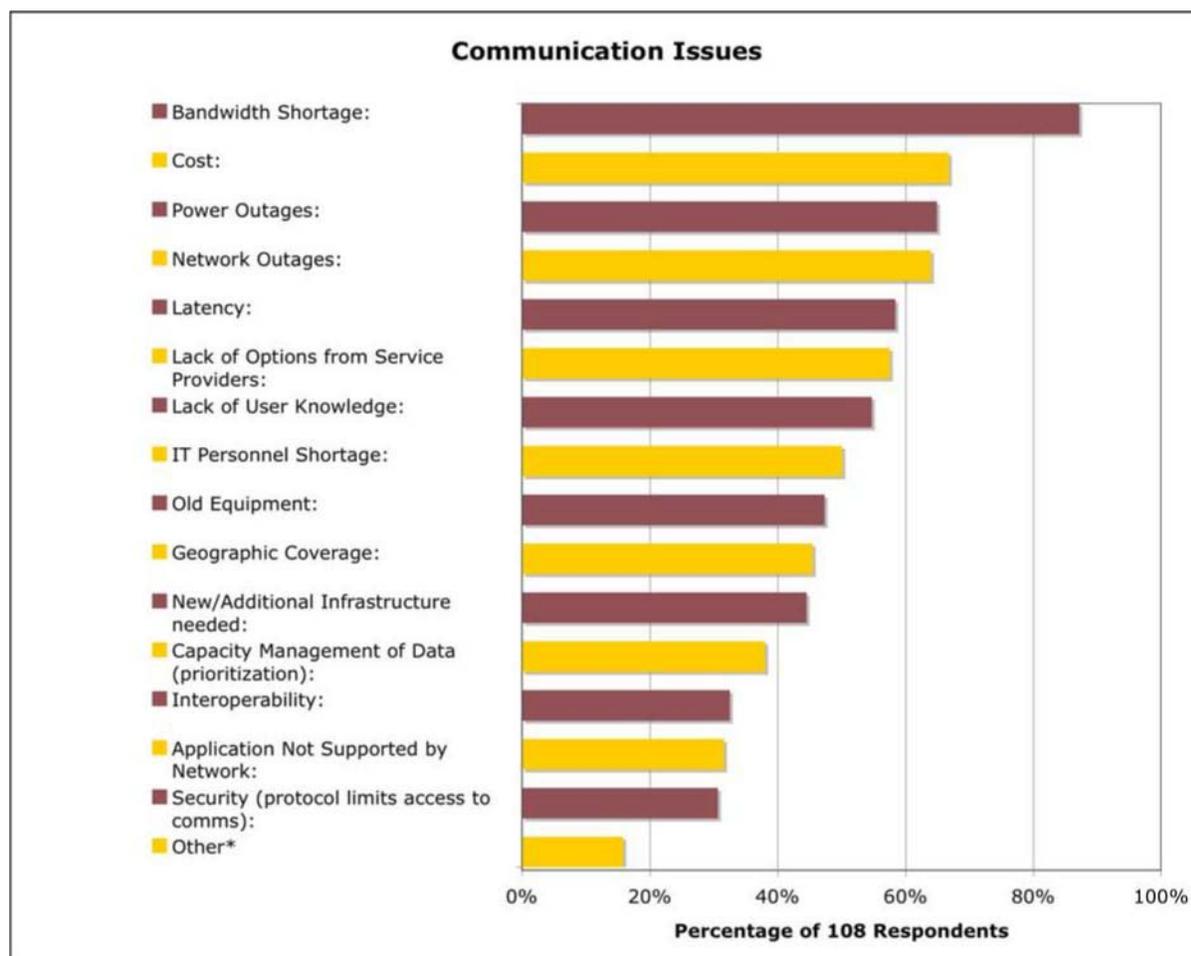
2. **Current infrastructure capacity/service quality:** The current broadband backbone going into many northern communities simply does not have the storage capacity to meet the growing demand locally. As a result, many northern communities experience slow service speeds and occasional service outages, especially during peak hours. This is an issue across the North, but it is particularly severe in regions which rely on microwave technology or satellite.

Beyond being an inconvenience to private consumers, this lack of capacity means that government is often unable to provide services important to isolated northern communities, such as e-classrooms, remote health consultations, and remote legal aid and court services. Instead, significant government resources are spent transporting individuals to and from such communities.

3. **Lack of redundancy:** The lack of redundant broadband infrastructure across the North makes the entire region extremely vulnerable to system failure. For example, in the summer of 2012, a road construction project accidentally cut the broadband cable entering Whitehorse, Yukon. The resulting internet outage effectively shut down access to many of the territory's government online services and shut down the operation of many businesses for a period of several hours while the damage was being repaired.

Alongside these three primary areas of concern, the figure below, published in the 2011 ACIA Report, highlights a number of additional issues in greater detail, based on a

survey of over one hundred ICT program managers from across the three territories. It is anticipated that northern regions within the provinces would mirror these concerns.



Baseline requirements of a common broadband standard

Around the world, access to quality internet is now a key element of almost every activity of our daily and professional lives, from banking to socializing. Digital services have decreased waiting times, reduced costs and increased social mobility. This is true everywhere; however, it has the potential to be even more important in Canada’s North where transportation infrastructure is often underdeveloped and many services which are taken for granted in the South have traditionally been unavailable. As a result, access to broadband perhaps has a greater impact on Northerners than it does on their southern counterparts.

The following five service areas have been identified as essential considerations in the development of any new broadband minimum standard if Northerners are to participate fully in the economy and as equal members of Canadian society:

- Remote judicial and court services
- Remote healthcare services
- Remote education services
- Affordable bandwidth capacity (at parity with southern Canada)
- Infrastructure redundancy in all major northern communities

In addition, it is important to note that over 50% of Northerners and the vast majority of northern communities are Aboriginal. Better access to broadband services locally will assist in the delivery of services by Aboriginal governments while at the same time act as an important conduit to maintaining and renewing local culture and language development. For example, access to services, like online language programs, play an important and increasing role in strengthening local communities and preserving cultural identity.

Recommended Pan-Northern Minimum Broadband Standard

It is recommended that a minimum broadband standard be established in the North which takes into account the unique challenges associated with living in remote northern communities. Such a standard needs to incorporate infrastructure development and changes to current regulations.

The new standard must be able to satisfy demands for large capacity affordable downloading for functions such as streaming. It must also include the development of bandwidth backbone infrastructure to increase overall capacity. This will enable governments to expand web-based services in the areas of health, education, legal aid and court services. Finally, it is essential that a new minimum broadband standard also address the creation of infrastructure redundancies in order to prevent accidental loss of service.

Based on these requirements, the NDMF ICT working group recommends an initial goal of a minimum bandwidth standard of 9 Mbps across the North and the development of redundant capacity in every major community.

A bandwidth speed of 9Mbps was chosen because it is currently adequate for accommodating multiple applications even in most heavy usage fields, like health and education.

However, the achievement of long term northern development goals must recognize the need to regularly revisit this standard, to ensure it will keep up with demand for service, and should strive for a long-term standard of parity with Southern Canada.

APPENDIX A:

List of key internet functions and their infrastructure requirements

The following table, taken from a 2011 study - *Community Broadband Standards* –by Saskatchewan’s Keewatin Career Development Corporation, lists a number of key internet functions and their infrastructure requirements. This clearly illustrates the need for increased broadband capacity in northern regions. The “bandwidth required for application” column represents the strain that a single application places on the system. It is important to remember that multiple applications compound this strain which results in more bandwidth being required.

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
General	Web reading	Various	1
General	Email	Various	0.5
General	File transfer / file sharing	Various	0.5
General	Instant messaging (text) Voice chat / Internet	Various	0.125
General	Phone	Various	0.125
General	Video Chat	Various	0.375
General	Voice over Internet phone	Various	0.125
General	Videoconferencing / telepresence	Various	1
General	Accounting software	Various	0.25

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
General	Virtual Private Network		0.125
General	Remote desktop / terminal services	Various	0.125
Health	Telehealth - patient access to specialists by videoconferencing	Health Care Centre / Clinic	2
Health	Telehealth - health care provider consultation with doctors / specialists by videoconferencing (diagnostic and/or treatment planning)	Health Care Centre / Clinic	2
Health	Telehealth - health care provider professional development by videoconferencing	Health Care Centre / Clinic	1
Health	Telehealth - patient and/or public education by videoconferencing	Health Care Centre / Clinic	1
Health	Remote interpreter services	Health Care Centre / Clinic	1
Health	Patient monitoring - vital signs (blood pressure, blood sugars, pulse, obstetrical fetal monitoring)	Health Care Centre / Clinic / Long Term Care / Residences	0.125
Health	Patient monitoring and consultation - chronic conditions	Health Care Centre / Clinic / LongTerm Care / Residences	0.5

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
Health	Patient monitoring - medication compliance	Health Care Centre / Clinic / Long Term Care / Residences	0.125
Health	Home delivery of medical services with telesupport Health Care Centre / Clinic / Long (home dialysis)	Health Care Centre / Clinic / Long Term Care / Residences	0.5
Health	Electronic health records patient charts	Health Care Centre / Clinic / Long Term Care / Residences	1
Health	Personal access to medical Health records via Internet	Health Care Centre / Clinic / Long Term Care / Residences	1
Health	Electronic prescriptions	Health Care Centre / Clinic / Long Term Care / Residences	0.25
Health	Diagnostic imagery (including X-Rays and other radiological imagery, Ultrasound imagery, ECG traces, EEG traces)	Health Care Centres	10
Health	Digital lab reporting	Health Care Centres / Clinics / Labs	0.25

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
Health	Telesurgery	Health Care Centres	2
Health	Remote access to diagnostic manuals / medical journals / medical research databases / pharmaceutical manuals	Health Care Centres / Clinics / Pharmacies	1
Health	Billing / reporting applications	Health Care Centres / Clinics / Health Departments	1
Education	Internet-delivered public audiovisual learning resources (YouTube, etc)	School / Learning Centre	6.25
Education	Internet-delivered subscription audiovisual learning resources (Access Learning, etc)	School / Learning Centre	1.25
Education	Internet-delivered learning objects (lab simulators, etc)	School / Learning Centre	1.25
Education	Internet-delivered textual / graphic learning resources	School / Learning Centre	1
Education	Synchronous (live) e-learning	School / Learning Centre	1
Education	Asynchronous (delayed) e-learning	School / Learning Centre	1.5
Education	Learning portals for enrichment of live classes (Moodle, Blackboard, etc)	School / Learning Centre	1

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
Education	Student Management systems (registration, attendance, grading, etc)	School / Learning Centre	1
Education	Social media for educational purposes (Facebook, twitter, YouTube, etc)	School / Learning Centre	1
Justice / Public Safety	Mobile access to criminal records (CPIC) for police	Police station / Individual	0.512
Justice / Public Safety	Mobile access to case files for report entry	Police station / Individual	1
Justice / Public Safety	GPS / GIS mapping support for police / fire / EMS response	Office / individual	1
Justice / Public Safety	GIS profiling for crime	Police station / office	1
Justice / Public Safety	Web-based crime reporting / tips	Individual / Police station	0.512
Justice / Public Safety	Offender electronic monitoring (ankle bracelets)	Individual / Police station	0.256
Justice / Public Safety	Internet access to surveillance / recording systems --also applies to health, education, etc.	Office / individual	0.256
Justice / Public Safety	GIS support for emergency planning (fire / flooding / storm vulnerabilities, etc)	Office	1
Justice /	Emergency communications	Office / residence /	0.64

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
Public Safety		individual	
Justice / Public Safety	Telecourt - videoconferencing for court appearances, pre-trial hearings	Court / Community Office	2
Justice / Public Safety	Videoconferencing access to legal aid / legal representation	Law Office / Community Office	0.512
Justice / Public Safety	Family / community support for incarcerated offenders by videoconference	Prison / Community Office	0.512
Social Services	Mobilized access to case management databases for social workers	Office / individual	1
Social Services	Web-based applications for employment insurance, social assistance, etc.	Office / individual	1
Social Services	Web-based reporting of child abuse / neglect or domestic abuse	Office / Residence / individual	0.512
Social Services	Videoconferencing sign-language translation services for hearing impaired	Community Office	0.512
Social Services	Videoconferencing access to counselling services (mental health, addictions, etc)	Community Office	0.512
Social Services	Electronic banking / fund transfers for assistance	Office	0.256

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
	recipients		
Social Services	Web-based information for clientele and the public	Office / Residence / individual	1
Social Services	Web-based employment searching (saskjobs.ca, monster jobs, etc.)	Office / Residence / individual	1
Public Works	GIS support for planning /documenting water, sewer, electrical, telecommunications, transportation, housing infrastructure	Office	1
Public Works	Remote monitoring for water / sewer treatment facilities	Treatment Facility / Office	0.128
Public Works	Professional development for water / sewer treatment operators by videoconferencing	Community Office	0.512
Public Works	Remote monitoring / control for building HVAC (heating, ventilation, air conditioning) systems --also applies to health, education, etc	Facility / Office	0.128
Public Works	Delivery of information to residents (garbage pickup schedules, snow removal schedules, service disruption announcements, etc)	Office / Residence / individual	1
Governance	Videoconferencing for government-to-government	Community	0.512

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
	meetings (INAC, etc)	Office	
Governance	Videoconferencing for community consultations (in multi-community First Nations)	Community Office / Public Halls	0.512
Governance	Electronic data reporting for funding agencies (INAC, etc)	Office	0.512
Governance	GIS for traditional land use / resource management	Office	1
Governance	Web presence for information to stakeholders and public	Office / Residence / individual	1
Administration	Employment / Human Resources recruitment via Internet	Office / Residence / individual	0.512
Administration	Human resource management	Office / Residence / individual	1
Commercial	Promotion via web / Internet (tourism, business advertising, etc)	Office / Businesses	1
Commercial	Product sales via web / Internet (EBay, Craigslist, Kijiji, web stores, etc)	Office / Businesses	1
Commercial	Services via web Internet	Office / Businesses	1
Commercial	Purchasing via web / Internet (web stores, EBay, Craigslist,	Office /	0.256

Sector	Application	Facility / Users	Bandwidth Required for app (Mbps)
	Kijiji, etc)	Businesses	
Commercial	Government to business services via web / Internet (forms, communications, etc)	Office / Businesses	1
Commercial	Videoconferencing for connections with funding agencies	Community Office	0.512
Recreational	Community recreational schedules and information Residential	Residential	1
Recreational	Community recreational fees payments	Residential	0.512
Recreational	Online streaming video	Residential	3
Recreational	Online video download	Residential	5
Recreational	Online streaming audio	Residential	0.256
Recreational	Online audio download	Residential	1
Recreational	Blogging	Residential	0.512
Social	Social web	Residential	0.512
Social	Photo / video sharing	Residential	2

APPENDIX B:***Jurisdictional Review*****Pan-territorial: *A Matter of Survival: Arctic Communication Infrastructure in the 21st Century (Arctic Communications Infrastructure Assessment Report)***

Yukon, Northwest Territories, and Nunavut have vastly different geography, history, demographics, economies and road infrastructure. But these territories all have serious challenges in accessing affordable, reliable communications services.

Three realities that have led to the current state of northern communications infrastructure in Canada were addressed in the ACIA report:

- Geography – The North faces significant economic challenges related to building and maintaining communications infrastructure and service delivery as a result of its vast and varied geography. Without public investment in these areas it is difficult to achieve affordable services that meet the needs of users.
- Investment – The rapid evolution and convergence of communications technologies and services in southern Canada is outpacing the current investment regime in the North.
- Strategy – The lack of a pan-northern strategy to integrate and modernize communications services across and among northern communities.

The ACIA report concluded by making ten recommendations to improve the state of ICT infrastructure in the North:

- Commit to service parity among northern communities, and set minimum connectivity standards for all northern communities that assure service parity to southern urban centres.
- Develop a northern-specific strategy with clearly defined rules that articulates a sustained, multi-year funding commitment for communications network development to meet connectivity standards set by policy makers.
- Ensure there is a redundant connection into every northern community to avoid gaps in the provision of essential communication services.
- Create an inventory of northern communications technology projects and services that aim to connect people from remote locations outside of communities in order to share experiences, best practices, and lessons learned.

- Identify communication services that will be required in a variety of emergency settings, developing protocols with service providers for surge capacity requests and prioritization of public communications networks for emergency responders within communities. Maintain an inventory of what is commercially available in communities.
- Investment strategies for northern communication networks must include provisions for the increasing rate of change of technology, and the continuous introduction of new consumer services and devices.
- Investment models should allow for and encourage competing services in as many market segments as possible, thereby promoting consumer and government choice, and innovation and improved services.
- Government procurement officers should encourage innovation through RFPs that focus on business outcomes requirements and technology neutral RFPs to stimulate innovative solutions from service providers.
- Recognize the reality of community capacity, and design applications and networks that will allow for effective remote service delivery.
- Take advantage of robust networks to deliver training to government workers using new communication tools.

Yukon:

Currently, 98% of Yukon homes and business have access to broadband. The Government of Yukon is currently funding several multi-year initiatives aimed at supporting innovation, commercialization, training in Internet-based business skills and public access to the Internet and cell phone service in rural communities. The ICT sector's contribution to Yukon's GDP has grown slowly relative to the Canadian average. Lemay-Yates recently concluded²:

- Compared with average Internet download speeds elsewhere in Canada, Yukon experiences speeds that are 33% lower (35% lower at peak usage times). Likewise, compared with average Internet upload speeds Canada-wide, Yukon's are 47% slower (over 50% at peak usage times).
- Customers in Yukon experience a great discrepancy with regards to prices and

² Lemay-Yates Associates Inc. "Yukon Telecommunications Development Final Report." Prepared for the Government of Yukon, Department of Economic Development. Dec. 2012.

services when compared to other Canadians. To wit, compared to 10Mbps at \$54 per month, it costs an additional 40% per month for 5Mbps service in Yukon. Overage costs, when customers exceed their designated basic usage, are also higher in Yukon, ranging from three to five times more expensive than other areas in Canada. The discrepancy is even greater in relation to commercial usage. Per month, Yukon businesses pay eight times more for 50Mbps IP-backbone service than their southern competitors.

- The trend is evident in mobile services as well, costing more than twice as much as elsewhere in Canada but with much less geographic and highway coverage and lower usage limits. Northwestel currently provides 5Mbps service in all communities except Old Crow and in a recent release committed to improving the service to 15 Mbps.
- On account of a single fibre optic link providing the backbone of all service in the territory, Yukon's service is particularly vulnerable to disruption. There is also a lack of redundancy in the links to several communities. When they occur, which is not altogether infrequently, disruptions in service are felt acutely throughout Yukon for all users. Commercial users are especially affected as a result of point-of-sale failures.

The Government of Yukon recognizes the importance of growing its ICT sector in order to further diversify its economy and has made working with industry to develop a stronger ICT sector a priority.

Manitoba:

Historically, Manitoba has relied almost exclusively on the private sector and market forces to drive ICT development. As a result of high cost and small potential profit margins, many rural communities are left under serviced or are entirely un-serviced. This is particularly true in Manitoba's First Nation communities. The majority of the province's 64 First Nations and dozens of Aboriginal communities are located in remote areas without a significant infrastructure base. Due to this remoteness, affordable access to telecommunications infrastructure and bandwidth is a major issue in these communities. In addition, these communities make up a significant proportion of Manitoba's overall population; this shortfall is reflected by Manitoba's track record in affording ICT access when compared to other Canadian jurisdictions. For example, according to the November 2011 *CRTC Broadband Report*, remote First Nation community populations are the largest factor contributing to the number of only 89% of Manitoba citizens having access to broadband.

One initiative the Government of Manitoba has supported to help address this issue is the Broadband Communication North Inc. (BCN), a non-profit organization established in partnership with the provincial government in 2005. BCN's mandate is to build a broadband network connecting First Nation communities. Through ICT infrastructure and consultation, BCN assists communities in addressing their community development needs. Although the process is slow, overall the initiative has been met with great success and has vastly expanded the number of First Nation communities with access to broadband.

As a result of programs like BCN, job creation and increased economic growth and development in remote northern communities have led to the following benefits:

- Increased access to government funding: First Nations people will have readily available access to government programs and services through online mediums. Previously, the lack of broadband technology limited information consumption and transfer.
- Collaborative networking: The broadband network bridges the distance between academic, business, government and organizations within BCN's catchment area to the outside world. This breaks down communication barriers and reduces feelings of isolation.
- Increased tourism: Individuals can enjoy the natural resources, unique culture, history and beauty of Manitoba's First Nations communities yet continue to access broadband telecommunications networks that enable voice, data and video traffic.
- Increased investment potential and economic development: Communities no longer feel disconnected from the world and therefore are more likely to participate in the knowledge economy by pursuing activities related to business and commerce. Tourism and adventure travel is likely to increase dramatically, which is a primary industry for investment potential. Other areas of investment and trade potential include arts and crafts, traditional healing and spirituality, resource development and corporate hospitality. Additionally, money that is traditionally spent outside of the community can be recycled locally, strengthening community capacity and viability.
- Increased employment opportunities: Technology greatly increases employment potential in many industries, primarily in government services, social services and the private sector.
- Education resource accessibility: Many students must leave their communities, families and friends at a young age to access education. Additionally, those interested in pursuing higher education are limited in their home communities due

to an inability to access distance education. With the existence of a broadband network, access to formal education resources for primary, secondary and post-secondary learners is greatly increased. Additionally, self-directed, informal learning opportunities will be accessible where, without broadband, would be otherwise unavailable.

- Improved access to health care: Most Canadians consult a doctor when they are unwell. However in most of the northern communities covered in the BCNI catchment area, nurses are the primary health care provider. Access to doctors is generally limited to once or twice a month, and for the most part, these doctors are general practitioners. Citizens requiring specialized care must leave the community and go to an urban center for health care consultations and treatment. This is a heavy burden on the public health system resulting in high transportation costs to transport patients and escorts to and from visits. This is also a heavy burden on patients having to undergo stressful travel. Broadband will increase access to doctors through tele-medicine and provide northern citizens with equivalent access to health care that is enjoyed by those residing in urban centers. This can potentially redirect travel costs into a more responsive, preventative health care system which will increase the health and well-being of northern citizens.
- Skill out-migration: First Nations communities have high rates of nursing shortages, doctor shortages and educator shortages. Access to broadband will make remote living more attractive as health care and education professionals will be able to access distance learning in remote communities. This will address the skill shortages, specifically in relation to essential services.

Ontario:

Ontario's northern communities generally have adequate ICT access, boasting 90% broadband coverage (95% if Evolved High-Speed Packet Access cell networks are included). One of the most significant factors enabling Ontario to outperform other northern jurisdictions in ICT infrastructure development is the presence of existing transportation infrastructure. This reduces the cost associated developing and maintaining ICT networks in remote communities.

However, despite Ontario's current access, there is room for improvement in remote First Nation communities in the northwestern region of the province. One major initiative to address inadequacies is the North-Western Ontario Broadband Indicative (NWOBEI). NWOBEI is a \$108M project that will connect 26 remote First Nations communities through a high-speed fibre-optic network. The project is in partnership

with Bell Aliant and is broken into five separate development phases. In the end it will cover approximately 2,500kms. To date, 1334kms are covered.

Although the cable has been deployed along the existing winter road network, some challenges still exist. Difficult terrain as well as the need to address First Nations' concerns has resulted in higher than originally projected cost.

Saskatchewan:

In Saskatchewan more than 80% of northern communities encompassing over 98% of the North's population already has access to high speed internet, with most ranging from 1.5 to 5.0 Mbps. The key developments of this service took place in the early to mid-2000s, relying primarily on funds from senior governments.

The development and operation of this infrastructure is primarily being managed by the Crown corporation, SaskTel, which aims to ensure the quality of internet service in the North will be similar to that found elsewhere in the province. The exception is a number of remote fly-in communities in the Athabasca Basin region, where service will continue to be restricted. Should the demand arise, communities have the ability to upgrade their infrastructure to handle speeds up to 10Mbps without the need for new fibre to be laid.

Currently, a number of projects are underway with the aim to increase the access to high speed internet in the North both by traditional means, as well as possibly through a new LTE fixed-wireless product to facilitate broadband access in rural locations. A trial project of a LTE-TDD fixed wireless is under way and scheduled for completion in August 2013.

Alberta:

The Government of Alberta believes that access to broadband is essential to full economic participation and competitiveness. It has also become essential to sustaining communities of place. Accordingly, rural and northern communities have the most to gain from broadband enablement.

Until recently, inefficient facilities-based competition between closed networks slowed the growth of ICT-based industries in rural Alberta. This problem is being addressed through government investment in open and capable broadband networks that enable remote access to health, education and other essential services from rural homes and businesses. It is the opinion of the Government of Alberta, that through partnerships with community and private interests that stand to profit from network expansion,

regional governments can dramatically broaden the frontiers of economic and social opportunity in rural communities and drive return on investments in networks.

To date, Alberta's ambition to increase broadband capacity in rural communities has taken the form of two distinct programs:

1. **SuperNet:** a major infrastructure project carried out in partnership between the Government of Alberta and a private ICT company Axia's NGN Solutions. SuperNet is a Community Interconnect Grid which expanded broadband access in rural Alberta - connecting 429 communities and providing direct connectivity to about 4,000 government, learning, health, library and municipal facilities.

Prior to Alberta's SuperNet, which has been operational since 2005, only seven local access providers operated outside of Alberta's two largest metropolitan centres. Today, the SuperNet has 89 Service Providers in 318 communities.

2. **Final Mile Rural Community Program:** consists of a \$5 million initiative to fund projects that enable high-speed Internet access to un-serviced locations in rural Alberta. Un-serviced locations include Alberta households that do not have access to high-speed Internet service at a minimum speed of 1.5 Mbps download.

Newfoundland and Labrador:

As is the case with most Canadian provinces which have large rural and isolated northern communities, providing services comparable to those found in urban areas is a challenge which impacts Newfoundland and Labrador's ability to attract and retain rural residences. To support the Government of Newfoundland and Labrador's commitment to building strong, innovative and sustainable rural communities, the provincial government has introduced the Rural Broadband Initiative (RBI). The Government of Newfoundland and Labrador strongly believes that in the 21st century, broadband access is a fundamental component of social and economic development. The RBI program will assist industry to provide equitable and reasonable access to broadband network services to communities throughout the province so that citizens can avail themselves of the Internet to pursue higher levels of education and training, healthcare, cultural, social and economic opportunities.

The objectives of the program are to:

- enhance industry's capacity to provide reasonable broadband access to primary residences and businesses;
- support and improve citizen access to public services such as healthcare and education;
- improve the capacity of provincial businesses to pursue local, national and international business opportunities;
- reduce the access gap between urban and rural communities with respect to Internet connectivity;
- encourage innovation and economic development in rural communities;
- create a platform for rural innovation; and
- improve the sustainability of rural communities.

Through the RBI, the provincial government is seeking innovative and customized broadband solutions from industry. Deployment options include fibre optics, satellite and wireless technologies. Funds under the RBI initiative will largely be used to help improve the business case for service providers to expand coverage to more communities. The Department of Innovation, Business and Rural Development will provide a maximum of 75% of eligible project costs, in line with the other funding programs offered by the department.