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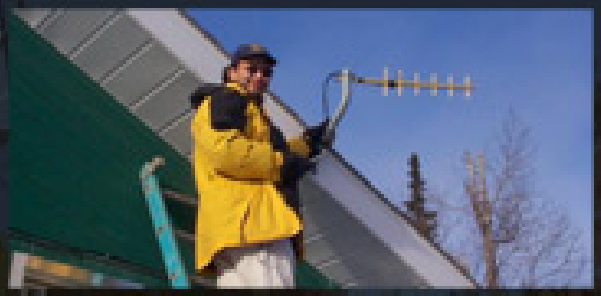
Putting the 'last-mile' first: Re-framing Broadband Development in First Nations and Inuit Communities



Simon Fraser University

University of New Brunswick

Keewaytinook Okimakanak

Atlantic Canada's First Nation Help Desk

First Nations Education Council

First Nations Technology Council

December 2010

Putting the 'Last-Mile' First: Re-framing Broadband Development in First Nations and Inuit Communities

December 2010

This report is based on a study conducted by Simon Fraser University and the University of New Brunswick in partnership with Keewaytinook Okimakanak in Ontario, Mik'maw Kina'matneway / Atlantic Canada's First Nation Help Desk in Nova Scotia, the First Nations Education Council / Conseil en Education des Premières Nations in Quebec, and the First Nations Technology Council in British Columbia. The study was funded by a Knowledge Synthesis Grant on the Digital Economy awarded by the Social Sciences and Humanities Research Council of Canada (SSHRC file #412-2010-2016). The views expressed are those of the authors.

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Request for feedback!

The research team and partners welcome your feedback on this draft report. Please feel free to offer corrections, additional information, ideas and opinions.

The **deadline for your feedback is 1pm on November 25, 2010**. After that, we will be preparing the final draft for submission to the government on December 1.

Here are the options for giving us your feedback.

1. Send an email to Rob McMahon at Simon Fraser University: rma29@sfu.ca

2. Participate by online chat and webstream, audio (phone) or videoconference in a national virtual meeting to discuss this draft report. This 90-minute meeting will take place on **November 17, 2010 at the following start time: 10am Pacific / 11am Mountain / Noon Central / 1pm Eastern / 2pm Atlantic**.

To schedule your participation at the meeting, contact the Lyle Johnson at KNet: lyle.johnson@knet.ca

In advance of this meeting, the draft report will be available Nov. 15 from the website: http://www.sfu.ca/cprost/tacs.html

3. **Give the authors your feedback in person in Ottawa on Thursday, November 25**. We will be at the Delta Hotel 361 Queen St. at Bay St., in the Cartier room on the ground floor. You can drop in anytime between 9am and 3pm to discuss this report with us.

Acknowledgements

The authors would like to acknowledge and offer our sincere thanks to everyone who participated in the study by providing information, suggestions and ideas. We interviewed 22 key informants and gathered information from another 1 key informant through an online survey. Those who consented to be named are:

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- Tim Whiteduck, Technology Coordinator, First Nations Education Council, Wendake, Quebec

The authors of this report also thank all the authors cited in this report for publishing their work. 181 publications, presentations and websites are cited and listed in the annotated bibliography. Many of these authors have acknowledged people who contributed to their publications and research. We

cannot list everyone named in the publications so we offer a general thank-you to everyone who contributed to the research discussed in this report.

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Executive Summary

This report paints a picture of First Nations and Inuit community-based broadband and information and communication technologies in Canada. It highlights the very different levels of broadband infrastructure and connectivity that exist across the country. Even at the end of the first decade of the 21st century, many of these communities remain unserved when compared to their neighbours in urban Canada. But despite a lack of abundant broadband infrastructure and robust connectivity services, in many cases these communities are planning, administering, managing and, sometimes, owning digital networks and technologies. They are also applying these technologies to deliver broadband-enabled public and community services in areas like health, education, government, culture and language. Despite decades of innovative, community-based work in this area, to our knowledge this is the first comprehensive study and record of these activities.

The report is based on empirical research, including: a review of the literature and overview of federal initiatives, interviews with key informants about broadband infrastructure and connectivity in First Nations and Inuit communities across Canada, and stories of successful community use and development of broadband and ICTs.

Our research found that some First Nations and Inuit communities and their organizations and partners are taking a leadership role in developing, maintaining, supporting and innovating with digital networks and ICTs. Their experiences, experiments and successes date back more than a decade. They have built a strong network of communities, organizations and projects that have survived and thrived.

Our research also found that federal leadership and strategy in this area is lacking, coherent policy on Aboriginal connectivity is non-existent, current programs are deficient and flawed, and funding is at levels far below what is needed. Unfortunately, rather than building on the successes of community-based development initiatives that have been in place more than a decade, government initiatives are lurching from one project and short-term funding cycle to the next. Given the Government of Canada's recent endorsement of the United Nations *Declaration on the Rights of Indigenous Peoples*, there is an opportunity here for government to build on existing successes of First Nations and Inuit communities in the area of broadband infrastructure and connectivity development, while further demonstrating its stated commitment to uphold the rights of indigenous peoples.

Ideally, every First Nations and Inuit community in Canada would have: locally owned and/or managed broadband infrastructure and related technologies capable of supporting clinical telehealth, GIS files and any other public and community service application required to support strong First Nations

governments; qualified, affordable, accessible connectivity support; community members familiar with using technology to support their goals; tools of governance such as electronic document management systems; and operating dollars to support and sustain these tools and services.

This vision is widely shared by First Nations and Inuit communities across Canada. Our study supports this vision by presenting and developing the concept of 'First-Mile'-oriented development. This concept emphasizes that broadband infrastructure and connectivity development emerges from the needs and contexts of local communities. It is positioned in contrast to traditional 'Last-Mile' approaches which typically follow a top-down, industry-driven development model.

Put differently, it is not enough for a community to simply be 'connected'; a community must also be connected in ways that support sustainable, locally-driven development and operational practices. In our research we found many First Nations and Inuit communities are building comprehensive broadband infrastructure and articulating connectivity strategies that reflect 'First-Mile' approaches, and presenting them to government (examples include the Assembly of First Nations' *e-Community Model*).

Our research describes First Nations and Inuit community connectivity in two distinct, but interrelated, areas: Broadband Infrastructure and Connectivity. At present government agencies and funding programs tend to conflate these two areas and functions into a single concept of 'broadband connectivity'. For example, the First Nations Infrastructure Fund administered by Indian and Northern Affairs Canada (INAC) recently incorporated 'broadband connectivity' into its funding mandate. However, this Fund is only designed to support one-time capital builds (Broadband Infrastructure). This leaves out consideration of ongoing network sustainability and broadband-enabled public and community service applications (Connectivity). This report argues that any comprehensive 'broadband connectivity' development strategy must include support for both broadband infrastructure (i.e. the pipe into the community and distributed connectivity to all community buildings); and ongoing support to 'use' (i.e. monthly connectivity costs) and maintain (i.e. qualified, affordable, accessible technicians) those networks.

Broadband Infrastructure refers to the physical infrastructure that forms the core of a network. It includes the construction work and technology required to deliver connectivity to support broadband-enabled public and community service applications. Broadband infrastructure includes the following elements:

- Backbone networks, delivered through terrestrial fibre or satellite. These physical networks are typically provided by private sector telecommunication companies, (except in exceptions discussed in this report, such as the Northern Indigenous Community Satellite Network and

the Eeyou Cree Network). Local 'First-Mile' networks connect to these backbone networks to access most online applications.

- Local 'First-Mile' networks, or community network infrastructure, delivered through wireless or fibre cables. These physical networks support community-based, broadband-enabled public and community service applications and can be owned and managed by the community.

A robust 'First-Mile'-driven approach to 'Aboriginal connectivity' in the area of broadband infrastructure would provide support for First Nations and Inuit communities to:

1. Build or upgrade the physical (backbone and 'First Mile') broadband infrastructure required to serve each community's local and regional needs.

2. Have the option to own and operate this physical (backbone and 'First Mile') broadband infrastructure.

3. Receive equitable access to the full range of network services available in other parts of the country (ie. Unmanaged / managed circuits).

Connectivity Services refer to the abilities of community-based service providers to deliver the broadband-enabled public and community service applications made possible through broadband infrastructure. This includes the technical teams that manage the bandwidth that service providers require to do their work, and the operations and maintenance of the broadband infrastructure once it is in place.

A robust 'First-Mile'-driven approach to 'Aboriginal connectivity' in the area of connectivity would include support for First Nations and Inuit communities to:

1. Secure equitable access to technologies, funding and local capacity to support sustainable broadband-enabled public and community service applications, including tools for government, health, education, economic development, and culture and language.

2. Build and operate an aggregated community network connectivity delivery model that enables access to affordable circuits and services, if that is the community's choice.

3. Secure resources to support qualified, affordable, accessible local technical support services, accompanied with the development of local capacity, economic and employment opportunities.

This report develops these core themes in seven chapters. The report introduction (Chapter one) sets the context for this study. Chapter two demonstrates how

communities are applying broadband-enabled technologies for a range of public and community service applications, in areas like health and wellness (2.1), education (2.2), culture and language (2.3), economic development (2.4), and government (2.5). This chapter joins community stories located throughout the report to demonstrate how communities are already developing and delivering broadband-enabled public and community services.

Chapter three focuses on how some communities are planning, administering, managing and, in some cases, owning 'First-Mile' broadband infrastructure. Despite decades of innovative work in this area, to our knowledge there are few comprehensive, national-level scholarly reviews of these local initiatives. Inuit and First Nations communities have created an array of innovative, efficient network designs in challenging geographic environments, for relatively low cost.

Examples of 'First-Mile' Broadband Infrastructure and Connectivity Projects

Name	Section
History of National Connectivity Initiatives Led By the Assembly of First Nations	3.1
First Nations IT Regional Networks	3.2
Northern Indigenous Community Satellite Network	3.3
The Eeyou Cree Network	3.4
Fort Severn First Nation's Community-Based Local Network	3.5
Nunavut Broadband Development Corporation and the Qiniq Network	3.6
The Community Access Program (CAP) in Nunavut	3.7
IsumaTV's Northern Indigenous TV Network (NITV)	3.8

The fourth chapter offers a regional overview of existing levels of broadband infrastructure in First Nations and Inuit communities, and also highlights examples of 'First-Mile'-driven design, administration and maintenance of network connectivity.

Chapter five gives a history of federal government initiatives designed to support First Nations and Inuit broadband infrastructure and connectivity development. There is a historical pattern of declining federal government support for community-based Inuit and First Nations development. Too often, government initiatives have been employed in an ad hoc, short-term basis. This lack of support has contributed to an uneven path of broadband infrastructure and connectivity development. Our research found that there is no concrete federal strategy or policy for First Nations or Inuit broadband development. This uncertainty contributes to restrictions in the ability of individuals and communities to build and sustain 'First-Mile' broadband infrastructure and connectivity projects, despite widespread evidence of the successes of existing projects, as noted by both government and academic sources.

In chapter six, the report describes the challenges faced by individuals and organizations working in First Nations and Inuit broadband infrastructure and connectivity development. Information is drawn from interviews with key informants, and existing research and reports produced by government and First Nations and Inuit organizations.

Challenges with Existing Government Initiatives

Challenge	Section
Lack of Support for Community-based Broadband Infrastructure and Connectivity Projects	6.1.1
'Siloed' – Not Holistic	6.1.2
Federal Government's Definition of 'high-speed' Internet	6.1.3
Increased Responsibilities for Connectivity without Increased Funding	6.1.4
Canadian Government Defaulting to Private-sector Telecos	6.1.5
Lack of Community Input in Broadband Infrastructure Design and Connectivity Services	6.1.6
Ignoring Program Evaluations that Demonstrate Efficiencies and Effectiveness of Community-Based Broadband Infrastructure and Connectivity Projects	6.1.7
Short-Term Funding Models	6.2.1
Project-based Funding Models	6.2.2
Unrealistic Requirements by Funding Bodies	6.2.3
Communities Competing for Funding	6.2.4
Funding Evaluation Frameworks	6.2.5
Canadian Government Defaulting to Lowest-Cost Technical Solution	6.2.6
Human Resources Capacity	6.2.7
Need for Separate Funding to Support Both Broadband Infrastructure and Connectivity Services	6.2.8
Political Uncertainties	6.3.1
Jurisdictional Issues	6.3.2
Lack of Community Participation in Policy Development	6.3.3

The report concludes with a set of discussion themes that re-frame broadband infrastructure and connectivity initiatives to support 'First-Mile' projects. While these initiatives must be unique to local communities, they do share a common cause: the recognition that federal policies must involve the local organizations engaged in designing, maintaining, administering, and in some cases, owning broadband infrastructure and connectivity.

The Canadian government has a responsibility to provide First Nations and Inuit communities with support for broadband infrastructure and connectivity. One reason for this is because of the public and community services it makes available to rural and remote communities otherwise unable to access them. Broadband infrastructure should be framed as core infrastructure, like roads and water

utilities. Viewed this way, it becomes a holistic tool that communities can adapt to their local connectivity needs, and employ in multiple broadband-enabled public and community service applications. Community-based 'First-Mile' projects utilize broadband networks and technologies in ways that promote local capacity while achieving efficiencies of scale -- but only if challenges in other priority areas like health, housing and education receive specific support for broadband infrastructure and connectivity.

A second discussion theme focuses on the formal incorporation of First Nations and Inuit communities in a strategic planning process for federal broadband infrastructure and connectivity development policy. This was one of the principles the AFN and its partners put forward in their 2010 submission to Industry Canada's recent *Digital Economy Consultations*. Concrete institutional reforms can support broadband infrastructure and connectivity development. For example, a First Nations and Inuit broadband development office housed in a federal department like Indian and Northern Affairs Canada or Industry Canada might facilitate 'First-Mile' driven broadband infrastructure and connectivity initiatives. Rather than a top-down, centralized model, such an office can support the work the communities are already doing. This approach mirrors recent reforms in the United States, where the federal government recognized and supported Native American formal involvement in the development of the draft *National Broadband Plan* released in March 2010, and subsequently created an Office of Tribal Affairs housed in the Federal Communications Commission.

Finally, our research pointed to considerations of how the federal government can facilitate 'First-Mile' broadband infrastructure and connectivity. There is a need to re-frame the Government of Canada's existing technical definition of 'high speed' broadband, which was set almost 10 years ago at 1.5 Mbps. This re-definition must recognize and support levels of broadband infrastructure and connectivity that enable community -- not just residential -- broadband-enabled public and community service applications, and an understanding that 'related technologies' will be required as broadband is implemented (i.e. up-to-date computers). Partnerships between commercial, government, and First Nations and Inuit organizations are another core component of broadband infrastructure and connectivity. To function most effectively, government policy designed to support such partnerships recognizes the complex policy and funding environments that First Nations and Inuit must negotiate, and be designed in a way that enables communities to share resources, rather than compete with one another. This approach is necessary for communities and regions that cannot support an independent business case for private-sector broadband development. By sharing resources, building partnerships and developing the skills to support and use the technologies, First Nations and Inuit communities benefit from the resulting economies of scale, as is apparent in examples like the National Indigenous Satellite Community Network.

Discussion Themes to Support First-mile Oriented Broadband Infrastructure in First Nations and Inuit Communities

Discussion Point	Section
Establish Broadband as Core Infrastructure that Enables the Delivery of Public and Community Services	7.1.1
Employ a Holistic Approach	7.1.2
Create Institutionalized Support for First Nations and Inuit Broadband	7.2.1
Support Local Engagement	7.2.2
Recognize Remote and Rural Community Realities	7.2.3
Ensure Development is Driven by Community, not Technological, Needs	7.3.1
Support Partnerships with Commercial and Government Organizations	7.3.2
Support Resource-Sharing Between Communities	7.3.3
Establish Sustainable Funding Frameworks	7.3.4

1 Introduction

Broadband networks and information and communication technologies (ICTs) are universally seen as linked to innovation and cultural, economic and community development. Given that First Nations and Inuit communities are among the most economically disadvantaged communities in the country, it seems important to consider how these communities are using ICTs and broadband networks. Given the Government of Canada's recent endorsement of the United Nations *Declaration on the Rights of Indigenous Peoples*, there is an opportunity here for government to build on existing successes of First Nations and Inuit communities in the area of broadband infrastructure and connectivity development, while further demonstrating its stated commitment to uphold the rights of indigenous peoples.

To date there has been little attention to how local First Nations and Inuit communities are developing and using these technologies. This is despite many examples of community-designed, administered, and in some cases, owned, broadband infrastructure and connectivity projects across Canada. While there is evidence of decades of innovative work being done in and by communities in this area, there are few national-level scholarly reviews of such projects.

Three questions guided this study and review: How can we highlight the leadership shown by rural and remote First Nations and Inuit communities in their development and use of broadband infrastructure and connectivity? What can we learn from their experiences? And in the context of an emerging federal First Nations and Inuit connectivity strategy, can we highlight priority themes?

Our research describes First Nations and Inuit community connectivity in two distinct, but interrelated, areas: Broadband Infrastructure and Connectivity. At present government agencies and funding programs tend to conflate these two areas and functions into a single concept of 'broadband connectivity'. For example, the First Nations Infrastructure Fund administered by Indian and Northern Affairs Canada (INAC) recently incorporated 'broadband connectivity' into its funding mandate. However, this Fund is only designed to support one-time capital builds (Broadband Infrastructure). This leaves out consideration of ongoing network sustainability and broadband-enabled public and community service applications (Connectivity). This report argues that any comprehensive 'broadband connectivity' development strategy must include support for both broadband infrastructure (i.e. the pipe into the community and distributed connectivity to all community buildings); and ongoing support to 'use' (i.e. monthly connectivity costs) and maintain (i.e. qualified, affordable, accessible technicians) those networks.

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Connectivity refers to the abilities of community-based service providers to deliver the broadband-enabled public and community service applications made possible through broadband infrastructure. This includes the technical teams that manage the bandwidth that service providers require to do their work, and the operations and maintenance of the broadband infrastructure once it is in place.

Views diverge on 'community-based' broadband infrastructure and connectivity development. This report highlights several examples of different approaches to 'community-based' development. Each approach reflects the local and regional capacity, environment and resources available to communities to develop their broadband infrastructure and connectivity services.

One approach to community-based development involves the administration and ownership of local and regional broadband infrastructure and connectivity projects. For example, the Northern Indigenous Community Satellite Network (NICSN) and the Eeyou Cree Network locate the management and ownership of broadband infrastructure and connectivity functions within local communities. This is also the approach taken by the First Nations IT Regional Networks, a national group of ICT-focused First Nations-driven organizations. Most of these organizations began their work by delivering First Nation SchoolNet educational services to First Nations communities as RMO's (Regional Management Organizations). Since their beginning, they evolved into a group of interconnected regional networks delivering a range of applications ranging from education to health to justice. Several of these First Nations IT Regional Networks developed Regional Network broadband and connectivity services for their regional partners, and are now the foundation of the Assembly of First Nations' *e-Community Strategy*, a community-driven national development model discussed in detail in Chapter 3.

Another approach to 'community-based' development demonstrates how communities can provide input in network design and maintenance (connectivity),

but partner with external organizations that own and administer the broadband infrastructure. For example, the Qiniq network in Nunavut utilizes broadband infrastructure administered and owned by a private sector organization, SSI Micro, which employs a Community Service Provider in each of the 25 local communities to assist in connectivity functions. The network's development is guided by a not-for-profit organization, the Nunavut Broadband Development Corporation, which has a board of directors elected from local communities.

These examples demonstrate different meanings of 'community-based' broadband infrastructure and connectivity development. But despite their differences, the projects discussed in this report also share commonalities. One of the most obvious to us is the need for development policies and practices to be driven by the unique contexts and local needs of individual communities, rather than defined by a single vision developed by an urban, external source and then applied to rural and remote communities.

This point links to a core concept proposed by our research partners: the need to reframe 'last-mile' broadband infrastructure and connectivity development as 'first-mile' development. The most effective, efficient network designs and applications are those rooted in the specific connectivity requirements of local communities, who use them to deliver broadband-enabled public and community services. Rather than an 'outgrowth' of existing backbone infrastructure and connectivity approaches developed in and extending from urban environments -- whether terrestrial or satellite -- 'first-mile' networks begin at the rural and remote communities they are designed to serve. This illustrates the core argument of this report: that government policies designed to harness the potential of advanced networks must be framed to support the endogenous development of community-driven broadband infrastructure and connectivity models created by and for Inuit and First Nations communities.

> It remains to be seen whether new information infrastructures provide new dependency relationships between Nunavut [and arguably other Canadian regions] and the federal government, or whether the Canadian state responds in a timely way to ensure that citizens' infrastructure needs are met (Alexander et al, 2009, p. 241).

Nearly 10 years ago, the 2001 report of the National Broadband Task Force outlined this tension. The report outlined two deployment models for achieving basic broadband infrastructure and connectivity in Canada (National Broadband Task Force, 2001). The *Infrastructure Support Model* provides government funding to broadband infrastructure builders tasked to increase the supply of connectivity for targeted communities. "Transport networks" link communities to nation-wide 'backbone' networks, and "access networks" link local-level communities together (and to the point of presence connected to the transport network). This model demonstrates a 'last-mile' approach to broadband infrastructure and connectivity development. The focus is on providing public

funding to enable external organizations to connect communities to an already-existing national network, and to one another. But evidence demonstrates that over the past ten years, the hundreds of millions of dollars spent to date on 'last-mile' driven broadband infrastructure and connectivity still leaves the most difficult to reach Canadian communities unserved and underserved when compared to urban communities.

The second model outlined in the Task Force report is the *Community Aggregator Model*. Under this model, government "would invest in user-based demand aggregators to stimulate the delivery of broadband capability" (Task Force Report, 2001, p. 73). The 'bottom-up' approach proposed in this model aims to stimulate locally-driven broadband infrastructure and connectivity development. It proposes 'community champions' to stimulate local interest in connectivity and broadband-enabled public and community services, create partnerships, identify matching funding and make a business case for the delivery of community-based broadband infrastructure and connectivity. An 'aggregator funding' component would provide financial support to aggregators of local demand who build broadband infrastructure that links to external 'backbone' networks (through the deployment of the transport and access networks discussed in the previous model). This model approaches broadband infrastructure and connectivity development from the community level, focusing on stimulating local capacity, as opposed to encouraging externally-provided services. In this sense, it shares affinities with the 'first-mile' concept proposed in this report.

Our study was conducted by university researchers working in partnership with First Nations organizations. These partners collectively have many decades of experience working in First Nations communities and building broadband infrastructure, as well as in developing 'on-the-ground' connectivity strategies built through partnerships with other First Nations and Inuit communities, community-based organizations, governments, and private sector organizations. Their experiences, and those of the key informants and communities we met with while researching this report, suggest that despite the lack of a sustainable funding model to support their work, evidence of a *Community Aggregator Model* that 'puts the last-mile first' already exists in many First Nations and Inuit communities across Canada.

The study methodology included: a literature review; 23 interviews -- in-person, by telephone, or by videoconference -- primarily with people working in the field of First Nations or Inuit community connectivity; developing stories of community-based broadband infrastructure and connectivity projects, including broadband-enabled public and community services; meeting and discussing the project with First Nations organizations and other key informants, and revising drafts of this report together.

In Canada, the traditional territories of Inuit and on-reserve First Nations are primarily located in rural and remote areas (often in economically challenged

regions). A 2008 study by Thiessen and Looker discovered a pattern of structural inequality in ICT use among youth from Inuit and on-reserve First Nations communities (Thiessen & Looker, 2008). Their work demonstrates the dangers of conflating different Aboriginal peoples, and argues for the need to consider population groups (on- and off-reserve First Nations, Inuit, and Métis peoples) separately when making policy decisions. For this reason, this study restricts its discussion to remote and rural First Nations and Inuit communities. Nor are we reporting here on the issues facing non-Aboriginal rural and remote communities.

This report was produced to respond to recent government policy development for a *National Digital Strategy* and Aboriginal connectivity strategy. Thus far, a concrete policy has not yet been articulated in either of these areas. As of late 2010, the First Nations Infrastructure Fund (FNIF) administered by Indian and Northern Affairs Canada (INAC) included broadband infrastructure projects in its mandate. However, our key informants told us this change was not accompanied with any new dedicated funding for either broadband infrastructure development, or ongoing support for the operations and maintenance of this infrastructure (connectivity). There is a need to clarify whether INAC has sole responsibility for developing an Aboriginal broadband infrastructure and connectivity development strategy, or whether it is working with other departments, such as Industry Canada and Health Canada, that are engaged in parallel projects. Industry Canada's discussions around a *National Digital Strategy* similarly raise questions. Recent consultations held by Industry Canada restricted their focus to a general recognition of 'rural and remote' broadband infrastructure development (Industry Canada 2009). But this approach does not adequately take into account the significant geographic, jurisdictional, political, economic, social and cultural contexts linked to broadband development in Inuit and First Nations communities. Nor does it address the ongoing needs for communities to secure support for connectivity and broadband-enabled public and community services. This report argues that any national-level strategy would be framed most productively by supporting the many local 'first-mile' development projects already underway in communities.

Many of the findings in this report will not surprise anyone familiar with broadband infrastructure and connectivity issues in First Nations and Inuit communities. Several of the themes put forward have been discussed elsewhere, in forums like the *Report of the National Broadband Task Force* (2001) and the *National Aboriginal Connectivity and E-Services Forum* (2006). Public statements from organizations like the Assembly of First Nations (2009) and the Nunavut Broadband Development Corporation (2010) also frame community-based broadband infrastructure and connectivity development as a key component in furthering the objectives of First Nations and Inuit Peoples. Yet despite this evidence and a history of consultative feedback, significant implementation has yet to reach many of these communities. As the AFN writes:

> Many First Nation ICT providers and networks were interested in taking ownership of the hardware and bandwidth in order to better meet community ICT needs…To date, there have been few opportunities for First Nations to own broadband technology; in most cases First Nations only use and distribute it (AFN Chiefs Committee on Economic Development, 2010, p. 15).

We are grateful for the opportunity provided by the Social Sciences and Humanities Research Council's Knowledge Synthesis Grant for a Digital Economy, and hope this report will be useful for the wider federal consultation on Industry Canada's new *Digital Economy Strategy*. We hope that it is useful to First Nations and Inuit organizations and communities already working to propose and implement their own broadband infrastructure and connectivity projects -- whether at the national, regional or local level. We also hope our study proves useful to Indian and Northern Affairs Canada, Industry Canada, and other federal departments working towards a national strategy for next-generation digital networking. To our knowledge, this report contributes the most comprehensive national-level analysis yet produced on broadband infrastructure and connectivity in remote and rural First Nations and Inuit communities.

Community story: Raising the Children Program in Memory of Lorraine Kenny (1955-2010)

By Jason Woodman Simmonds

Honouring those whose journey on this earth is over is an important traditional value respected by First Nations. When Lorraine Kenny's work was completed on this earth, her family decided to honour her memory by making the Raising the Children Native Parenting Training Manual available online so everyone could benefit from her work.

The Raising the Children Program works with Aboriginal parents to ensure the happiness and well-being of their children. The training manual was first published in 1994 and continues to be an important resource for Aboriginal parenting facilitators across Canada. The manual provides a gateway to understanding and appreciating the resiliency of First Nation people and their strong relationship to this land that they refer to as Turtle Island.

The program is a response to the need for culturally appropriate parenting material for people who grow up in Aboriginal communities. Many Native people living and working in remote First Nations suffered through residential school experiences, and their children are being raised in an atmosphere where racism and other negative attitudes are common. Raising the Children provides a parenting training experience with information that can be applied in their lives.

As one First Nation leader states in the manual, "Using the inner strength of our people, we can insist that we want to have a say in the lives of our children. We

want to be able to give them every opportunity they need, so that they can become healthy, useful citizens of society. We can take a pro-active approach, rather than waiting for somebody else to come along and do it for us. We as parents have to take the initiative and start doing the basic work that is needed to lead us to a more healthy family lifestyle."

As stated on the web site (http://raisingthechildren.knet.ca), Lorraine Kenny's family wants to help Native families "by providing an open access manual for facilitators and teachers, all of whom are welcome to be partners in our work of helping parents and children. Together we have been using this program and learning with and from parents since 1990."

The web site provides a virtual meeting place where teachers, parents and facilitators can meet to learn from each other and to continue to develop the program.

The Raising the Children Program is dedicated to the late Lorraine Kenny (1955 - 2010) who developed and wrote the program in partnership with many colleagues, parents, communities, and her family.

2 How First Nations and Inuit Communities are Using Broadband Infrastructure and Connectivity Services

There are many examples of First Nations and Inuit communities employing broadband infrastructure and connectivity for a range of innovative applications. These broadband-enabled public and community services did not develop in areas that benefit from an abundance of already-existing infrastructure or connectivity. In fact, quite the opposite: they enable the delivery of core public and community services in spite of the challenges of limited, short-term funding for network development and administration, limited access to and amounts of bandwidth, and a lack of local capacity in network management. These examples are a result of local leadership and innovators who want equitable access to services and tools for their communities, to ensure that everyone has the same choices and opportunities as people who live in different locations across Canada.

Successful community-based connectivity projects involve more than broadband infrastructure (Alexander, 2001). They must also ensure that the provision and design of broadband-enabled public and communities services employ "an appreciation of community realities, historical sensibility and renewable infrastructure" (Grossman, 2008, p. 3). Middleton (2010) argues that for citizens to truly benefit from broadband infrastructure and connectivity, they need access to broadband-enabled public and community services:

> Public sector investment in broadband networks is frequently justified by statements about the benefits that can accrue from wide scale adoption of e-health, e-learning, e-commerce, and e-government services. This is likely the case, but to date, here in Canada and elsewhere….very few of these applications are actually in use. There is a big gap between the rhetoric of applications that would actually enable ordinary citizens to fully engage in the digital society in ways that have a meaningful impact (Middleton, 2010, p. 6).

That said, there are many examples of First Nations and Inuit using broadband-enabled public and community services for community development in areas like health, education, culture and language, economic development and government applications. Several comprehensive literature reviews offer an overview of work in this area (see for example Downing, 2002; Grossman, 2008). This section summarizes some of these applications, highlighting the holistic benefits that flow from community access to broadband infrastructure and connectivity (Beck et al, 2005; Downing, 2002; Jarvis-Selinger, 2008; Marlin & Bruce, 2005). The following sections should therefore be viewed not as discrete categories, but rather as interconnected community-driven 'First-Mile' projects.

2.1 Health and Wellness

Broadband-enabled e-Health and telehealth initiatives have been one of the most researched applications of broadband infrastructure and connectivity by First Nations and Inuit communities. Rural and remote First Nations and Inuit communities employ broadband infrastructure and connectivity to deliver core health services. A 2006 report outlined several projects conducted by Aboriginal health administrators, including: Keewaytinook Okimakanak Telemedicine (Ontario); Ikajuruti Inungnik Ungasiktumo Network Telehealth Project (Nunavut); WestNet Telehealth Program (Northwest Territories); and the Alberta First Nations Telehealth Program (Alberta) (Ebare, 2006; see also Coulson & Vermette, 2008; Keewaytinook Okimakanak, 2005; Many Guns & Brown, 2009; and Williams, 2010). Comprehensive literature reviews by O'Donnell et al (2010), Ho and Jarvis-Selinger (2006), the Assembly of First Nations (Gideon, Nicholas, Rowlandson, & Woolner, 2009), and Health Canada (2002) describe these projects in detail.

Community story: Keewaytinook Okimakanak Telemedicine: Supporting Community Wellness

By Kerri Gibson and Heather Coulson

Keewaytinook Okimakanak Telemedicine (KOTM), operated under the Northern Chiefs Tribal Council in northwestern Ontario, is a success story of a community-led and community-driven telehealth initiative. KOTM offers a wide array of services, of which telemental health is one.

KOTM has used videoconferencing for telepsychiatry since 2002. Going back even further, KO was involved in a ground-breaking telepsychiatry pilot project and evaluation in 2001. Since then, many service providers in the field have used video for follow-up, reassessments, regular counseling sessions, education for clients, education for professionals, human resources, case management. All of these projects are related to mental health services. Further, KOTM facilitates family visits where family members living in a rural or remote community can visit with a loved one who is hospitalized outside of the community. In addition, Elder visitations have been found to be very rewarding. Elders gather, enjoy a meal and each others' company, all the while connecting with old friends and engaging in their native languages through videoconferencing. All of these activities have the potential of contributing to mental health, community wellness, and community engagement. Fort Severn, the most northern community in Ontario and one of the KO communities, has been actively involved in KOTM from the very beginning!

Roseanne Miles, the community telemedicine coordinator for Fort Severn, recently travelled to a national Rural Health conference and spoke about the use of telemental health in her community, and the benefits that have been associated with it.

KOTM listens to what the communities want and need for services. One way in which to help the communities decide is to offer a wide range of mental health education sessions to keep them informed. Individuals are directly involved in community engagement and presentations are made to the Elders at the monthly Elders meetings. In addition, the KOTM education coordinator looks for and supports professionals and coordinates with the Community Telemedicine Coordinators to get much-needed factual information to all communities so that they can make requests that address their community needs.

KO Telemedicine's objective is to improve the health for all First Nations communities through a sustainable First Nations telemedicine program that is holistic, community-driven and culturally appropriate. KOTM enhances the existing services available in the communities and looks to fill gaps through partnerships with service providers. KOTM looks for ways to help support that gap, be it in-kind, proposal writing, advocating for program or sharing knowledge of funding pockets that may fit profile of the service. Through KOTM's alliance with other technical programs such as K-Net (KO's network, servicing all of the northern communities in the Sioux Lookout Zone area) and Ontario Telehealth Network, they can offer these collaborative resources to service providers anywhere.

Health-care practitioners employ broadband infrastructure and connectivity to conduct primary and secondary care in areas including: teleoncology, telehospice, teleosychiatry, telestroke, pediatric care, dermatology, diabetes care, education and training (Health Canada, 2002). This is particularly important given the relatively low numbers of health care practitioners in rural and remote First Nations and Inuit communities. A 2008 survey by First Nations Region Longitudinal Health found that almost 20 per cent of adult First Nations Canadians do not have access to a local doctor or nurse (Naditz, 2008). In such locations, regionally-managed programs like Keewaytinook Okimakanak Telemedicine use broadband networks to provide remote health care services (Saqui et al, 2007; Vermette, 2008). In a 2006 study, Hogenbirk et al concluded these two networks, which began with five First Nations communities and expanded to 24, helped address the geographic distances that have, in the past, restricted community access to health information and health services (Hogenbirk, Ramirez & Ibanez, 2006; see also Lavoie & Williams, 2009).

Broadband infrastructure and connectivity also offers increased opportunities for local health care practitioners to engage in professional development. A 2009 presentation from the Public Health Agency of Canada offers an overview of online education programs for public health workers (Bell et al, 2009). Since 2002, more than 3,500 individuals have completed one or more online education modules. In Fall 2007, the Inter Tribal Health Authority in B.C. began offering online health-related educational programming to 51 First Nation communities (Johnston, 2008). In Quebec, a partnership with McGill University allowed

Community Services staff members in Kahnawake to take distance education courses in social work (Ives & Aitken, 2008). Along with offering formal professional development activities, online networks can help reduce the geographic isolation experienced by some health care practitioners living in remote communities (Bell et al, 2009).

Broadband infrastructure and connectivity also helps local communities deliver much-needed health services more efficiently and cost-effectively. Advantages include reduced travel costs, decreased wait times for clinical visits, increased patient satisfaction and increased compliance with appointments. For example, a study on the cost-effectiveness of telepsychiatry found that the cost of flying patients from the community of Nain to secondary care facilities was $1,500 higher than a consultation delivered through a videconferencing system (Jong, 2004). An evaluation of another telehealth project found it helped patients save an average of more than 1.54 hours per visit (O'Connor et al, 2008).

Online forums provide social and medical support for patients by enabling communication and collaboration between healthcare professionals and patients (Molyneaux et al, 2009). For example, the *BC-Yukon First Nations' Health Network* is an online portal project designed, implemented and maintained by First Nations community members (Harper, 2007). Online discussion forums dedicated to Aboriginal health issues can provide emotional support to participants (Donelle & Hoffman-Goetz, 2008; Hoffman-Goetz & Donelle, 2007). For example, the *Honouring Life Network* website, launched in April 2008, offers culturally relevant information and resources on suicide prevention (NAGO, 2009).

Community story: Permanent Studios

By Jason Woodman Simmonds

With fibre-optic broadband infrastructure installed or currently being installed through partnerships with the First Nations Education Council in 13 of their 22 member First Nations communities in Quebec, distributing and sharing digital media becomes more viable for the members of those communities. Permanent Studios is one of many examples where the upgraded networks linking First Nations IT Regional Networks to communities creates training opportunities and raises cultural awareness.

Produced by the First Nations Education Council, the Permanent Studios homepage states that, "[t]he goal of this Website is to sensitize the Canadian public to Native culture via short films and documentaries depicting various aspects of the traditional and contemporary realities of the First Nations of Quebec" (www.permanentstudios.com). To fulfill this mandate, Permanent Studio currently hosts eleven films by young filmmakers from three First Nations, "Atikamekw, Anicinabe (Algonquin) and Innu (Montagnais)" (www.permanentstudios.com).

Six of these films feature a specific community: three of the films are produced by members of the Anicinabe (Algonquin) Nation. These films are about three member communities of that nation, the communities of Kitcisakik, Lac Simon, and Pikogan. There are also three films on the three communities of the Atikamekw Nation: Wemotaci, Opitciwan, and Manawan. The remaining five films cover a broad range of topics, from traditional hunting and trapping to the experience of a contemporary Innu youth surviving and thriving in northern Quebec. Accompanying the video productions are teacher resources for use in Quebec classrooms.

Permanent Studios operates out of two locations, Studio Wapikoni in Wemotaci and Studio Miskwadesi in Kitcisakik. On top of the eleven films featured on its website, Permanent Studios is linked to the Wapikoni mobile project (http://wapikonimobile.com/). With this project, professional filmmakers at the community based-studios operate mobile training facilities, or caravans, that travel to remote communities. From these mobile training facilities, the professionals train community youth on all aspects of video production.

2.2 Education

A large body of research supports the application of broadband infrastructure and connectivity in delivering education in First Nations and Inuit communities. Given the rapidly expanding demographics of these populations, many communities view education as a priority. Several existing literature reviews summarize broadband-enabled education applications. A 2002 report from the Office of Learning Technologies (OLT) offers a Canada-wide survey of projects focused on lifelong learning and the use of ICTs in Aboriginal communities (Downing, 2002). The report highlights the need for projects to be sustainable and inclusive, supported by partnerships between communities and other stakeholders, and address issues of connectivity and access.

Grossman (2008) argues that online educational programs can mitigate some of the inequities in access to education that some communities face due to their remote geographic location by supporting on-site, flexible, locally-based development. In Northern Ontario, Keewaytinook Okimakanak offers several examples of how broadband infrastructure and connectivity might support online education in rural and remote First Nations communities. The Keewaytinook Internet High School (KiHS) provides youth living in remote First Nations communities in Ontario's far north with the opportunity to pursue a high school education without the need to attend school far from their families and communities (Potter, 2010; Walmark, 2010). Burgess (n.d.) documents several e-learning projects, including courses on healthy living, biology, and masters-level courses in education.

Broadband infrastructure and connectivity supports the development and use of educational curriculum created by and housed within local communities. For example, a 2005 report published by the Nunavut Broadband Development Corporation noted the importance of developing a learning culture based on the principles of Inuit Qaujimajatunqangit (Inuit traditional knowledge), "a body of knowledge and unique cultural insights of Inuit into the workings of nature, humans and animals" (Burgess, n.d., p. 3).

Community story: ICT Supporting First Nations Classrooms

By Kerri Gibson

Information and Communication Technologies (ICTs) have great potential to compliment and support the education of our future generations. Fortunately, there are high quality educational programs available that help train individuals, and teachers in particular, on how to creatively integrate ICT into classrooms. The Masters of Education, Educational Intervention Program, is a perfect example of one of these successful programs.

This M.Ed. program was initially offered at the University of Montreal (Université de Montréal). With the support of the First Nations Education Council (FNEC), it has now been tailored and expanded to serve the needs of Quebec First Nations Masters students and educators. The first cohort of First Nations students (which included teachers and a principal) commenced the program in 2007, and since that date there have already been five graduates. A 75-85% graduation rate is expected with regard to the first cohort, but even more impressive is the 100% graduate rate predicted for the second cohort!

The training program is multi-faceted, and according to two evaluations is being very well-received by students. Specifically, the program involves such things as distance learning, the support of tutors, practical opportunities to apply skills, and an "in-person" component where students and their professors unite to connect at the beginning of the program. This initial in-person contact has been found to be incredibly beneficial -- helping build relationships and contributing to on-going motivation. Further, it has helped to build a sense of belonging among students which can help buffer against feelings of isolation, which is one of the challenges of distance education. At the same time, while the students are "on-site" they are able to use the variety of resources and tools available to them.

Students in this program have noted many important lessons that they have learned, including being able to think critically about using ICTs in educational settings, knowing the benefits of using ICT in education, and having the technical skills to implement them. Fortunately, many of these students have gone on to support fellow teachers in their adventures with weaving ICT into the classroom. Above all, students in this program have completed interesting, creative, and important theses -- ranging from an exploration of digital storytelling and how this approach can support Native Language (as well as French and English)

development and fluency, to how ICT influences the motivation of Mi'Kmaq Elementary-school students.

2.3 Culture and Language

In terms of broadband-enabled public and community services for language and culture, Grossman (2008) reminds us that it is dangerous to assume that digital environments are readily adapted to Indigenous language and knowledge. "Participation in the networked world is primarily through languages and symbolic systems that are already structured by the very technology itself" (Grossman, 2008, p. 8).

<Community story: Ktunaxa Nation Network and Four Pillars; presently waiting for community approval>

By Jason Woodman Simmonds

In the 1970s, people in the Inuit community of Igloolik voted against accepting satellite television, deciding instead to wait until Inuktitut-language programming became available (Soukup, 2006, p. 241). This demonstrates the importance that First Nations and Inuit communities place in ensuring that new technologies (including broadband technologies) do not undermine traditional languages and cultures. That said, First Nations and Inuit communities utilize broadband infrastructure and connectivity to articulate their world views, as embedded in their own languages, and in doing so engage in the preservation and distribution of their culture and language (Grossman, 2008). As Alia writes, "radio and the Internet provide the most consistent support for local and global efforts to retain, restore, and strengthen Indigenous languages" (Alia, 2010, p. 18; see Soukup, 2006 for an example from Inuit communities). Breu (2009) argues that communities can use broadband infrastructure and connectivity as tools for cultural protection, self-determination and revitalization -- an example reflected in the Centre for Indigenous Environmental Resources (CIER) Virtual Environmental Library (Breu, 2009). Writing about Isuma, an Inuit film and new media production company with strong ties to Nunavut, Soukup writes:

> Isuma's goal is to find a way through wireless broadband for Inuit artists to return to a thoroughly contemporary nomadism that does not seek to throw Inuit back into the Stone Age, but instead marries tradition with the modern (Soukup, 2006, p. 243).

Another example is the *Nanisiniq Inuit Qaujimajatuqangit (IQ) Adventure Website*, which demonstrates a community-based initiative to support the documentation of Inuit cultural resources. Through the *IQ Adventure Website*: "the Internet is being harnessed as a resource to reclaim and assert Inuit identity

via interactive, online multimedia representations" (Alexander et al, 2009, p. 221).

Several projects utilize broadband infrastructure and connectivity to record and preserve Aboriginal languages. In Northern Canada, IsumaTV created the Inuit Language and Culture Institute, which uses the Internet to preserve, promote and revitalize Inuktituk language and culture (Anderson et al, 2009). The B.C.-based First Voices project, in collaboration with the Ktunaxa Nation Council, developed a Podcast website for local Aboriginal language development (Phillips, 2009; see also Beaton, Fiddler, & Rowlandson, 2004; Jarvis-Selinger, 2008; Rowley, Sparrow & Schaepe, 2009).

Community story: Dear Elders, Atlantic Region

By Jason Woodman Simmonds

The Kisiku'k Wklusuwaqnmuow or Dear Elders Project is an ongoing video archive of Mi'kmaq Elders from First Nations communities in Atlantic Canada, including: Eskasoni; Indian Brook; Lennox Island; Membertou; Eel Ground; Bear River; and Wekoqmaq to name a few. Kisiku'k Wklusuwaqnmuow is hosted on Atlantic Canada's First Nation Helpdesk website (http://www.firstnationhelp.com/). The Helpdesk hosts an archive of Elders discussing, topics such as childrearing, writing, youth, praying, death, war veterans, and Mi'kmaq language. Kisiku'k Wklusuwaqnmuow also provides a venue for videos of traditional storytelling, and music as well as a clip of the monthly Elders meetings made possible through videoconferencing technology.

These archives become increasingly important living documents of the Elders and the knowledge they possess. For example the link titled "Elders Videos" has the late Mi'kmaq poet, Rita Joe, advising youngsters and their parents "I am hoping the children write." After which she directly addresses the youngsters: "and don't let your teacher put your work in the garbage. Save it!" (http://kisikuk.ca/videos/4). Such videos are invaluable resources for Mi'kmaq youth and adults who want to hear from the Elders.

The Atlantic Canada's First Nation Helpdesk also has a video archive of an Elders meeting. Like the soon-to-be built Eeyou Communications Network in Eeyou Istchee and James Bay, Atlantic Canada's First Nation Helpdesk already provides dedicated broadband infrastructure and connectivity services to the remote and rural First Nations communities in Atlantic Canada. On top of the video archives of Elders sharing their knowledge, the network provides a venue for Elders meetings via videoconference.

2.4 Economic Development

Broadband infrastructure and connectivity also supports community economic development, for example in applications like resource management activities. Grossman argues that control of natural resources is dependent on the ability of

communities to define their territories of interest, articulate regional priorities within existing power relationships and forge relationships with governments and industry (Grossman, 2008). Some communities use broadband-enabled public and community services to archive and distribute traditional knowledge for the purposes of natural resource management. For example, in 2007 the Carrier Sekani Tribal Council from B.C. created the Tsilhqot'in Stewardship Planning Portal, an interactive, web-based land use information management and planning support system designed to increase First Nation participation in land and resource management (Lulua & Flannery, 2007).

In another application of broadband-enabled public and community services for natural resource development, the Cheam Band in B.C. used GIS maps and photo-realistic images to engage with technical information (Lewis & Sheppard, 2006). First Nations communities along B.C.'s North Coast helped overcome significant economic challenges in 2002 through the RAIN project, which a created a networked forum of 17 community partners (Community Learning Project, 2009). Broadband infrastructure and connectivity are useful in assisting local First Nations youth find short-term employment opportunities, as demonstrated in the Youth ICT Training initiative, which has been in place in Ontario's Far North for 15 years (Tomkinson, 2009).

2.5 Government

Broadband infrastructure and connectivity supports the effective delivery of First Nations and Inuit government services. Writing about B.C., Smith (2008) noted that as communities currently negotiating treaties move towards self-government, broadband infrastructure and connectivity will increase in importance -- one reason why "both BC and the government of Canada (Canada) have identified ICT as an essential tool for First Nations to meet their government responsibilities under the treaties" (Smith, 2008, p. 12). As Grossman writes: "remote communities are pursuing self-promotion, advocacy and e-government initiatives" (Grossman, 2008, p. 14; see also Milliken et al, 2009). First Nations and Inuit government offices use broadband-enabled public and connectivity services to connect with other geographically-dispersed government offices in ways that enable them to more effectively manage regional issues. For example, northern Ontario's Keewaytinook Okimakanak tribal council employs videoconferencing technology to monitor community water treatment services and mentor local technicians (Gurstein et al, 2009). Local governments can also use broadband infrastructure and connectivity for emergency services, law enforcement and other services (Beck et al, 2005).

> *Many First Nations communities in the Yukon use video conferencing to connect to monthly leadership meetings held in Whitehorse instead of traveling. There is regular communication between the 14 First Nations, including the Council of Yukon First Nations in Whitehorse, and the video conferencing will supports this communication in the form of meetings, presentations, education sessions, Chiefs meetings, and so on. It can*

involve all departments such as Lands, Heritage, Health, and so on. This will be a great cost saving tool as well as there is a lot of time and travel involved between the communities.

- 20, interview

3 Examples of "Community-Based" Broadband Infrastructure and Connectivity Projects

Broadband infrastructure and connectivity in First Nations and Inuit communities in Canada has emerged in a variety of ways: both 'first-mile' (community-driven) and 'last-mile' (externally-driven) processes. This chapter offers examples of 'first-mile' projects based in, and driven by, First Nation and Inuit communities. It also offers an overview of First Nations and Inuit political organizations' own national and regional broadband infrastructure and connectivity development strategies, many of which build on the already-existing successes of community-based projects. McKelvey and O'Donnell write: "First Nations have mobilized, in response to their socio-economic conditions, through political and community projects to push their [broadband] development agenda" (McKelvey & O'Donnell, 2009, p. 2). This chapter is an attempt to map some of these projects.

3.1 National Broadband Infrastructure and Connectivity Initiatives Led By the Assembly of First Nations

This first section outlines a national broadband strategy articulated by the Assembly of First Nations (AFN). This strategy demonstrates how a First Nations-driven broadband infrastructure and connectivity strategy might be developed at the national, regional and local levels. The *e-Community ICT Model* provides evidence of the effective use of federal funding in the creation and administration of a robust 'first-mile' broadband infrastructure that supports connectivity needs, as well as broader development goals in areas like education and health.

Table 1: History of AFN-led Developments in Broadband Infrastructure and Connectivity Development

Year	Description
2001	Calls on federal government support of a community-based First Nations Broadband Network
2002-2009	Passed five resolutions at annual general assemblies related to broadband infrastructure, connectivity and e-communities.
2008	Formed the IT Experts Think Tank to develop a strategic plan for broadband infrastructure and connectivity development
2009	Proposed the *e-Community ICT Model*

The AFN's national approach to First Nations broadband infrastructure and connectivity development is rooted in already-existing, community-based projects. Along with regional and local networks, these include a group of seven First Nations IT Regional Networks that have worked with partner First Nations to develop regional broadband infrastructure and connectivity projects in different parts of the country. In 2001 and 2003, the AFN mapped early plans for a national broadband strategy, but given limited resources and more immediate community priorities, it was difficult for the leadership to maintain the proposal's

thrust (AFN Chiefs Committee on Economic Development, 2010, p. 15). The organization has passed five resolutions (as of 2009) at annual general assemblies stating its commitment to broadband infrastructure and connectivity services (J. Whiteduck, 2010). In July 2008, Resolution 19/2008 called for a *National Framework for an e-Community for First Nations* to "enable the efficient and effective provision of the range of educational, health and other services to and in First Nations communities" (Strachan, 2009, p. 1). The five themes encompassed in the strategy highlight its focus on community development: First Nations capacity development; First Nations broadband infrastructure and connectivity; human resources development; information management; and service delivery and partners.

The AFN presented its *e-Community ICT Model* at the March 2009 Aboriginal Policy Research Conference in Ottawa; it was subsequently published in Volume 6 of Indian and Northern Affairs Canada's Aboriginal Policy Research publication (Whiteduck, J., 2010). Other papers from the conference about First Nations and technology were also published (see White, Peters, Beavon & Dinsdale, 2010). The papers demonstrated empirical evidence of discrepancies of broadband infrastructure and connectivity access in First Nations rural and remote communities and highlighted examples of successful community-based projects. They collectively argued for community control over First Nations broadband development policy -- reflecting arguments for a 'first mile' development approach.

During Industry Canada's 2010 *Digital Economy* consultations, the AFN (in partnership with Atlantic Canada's First Nation Help Desk, the First Nations Education Council and Keewaytinook Okimakanak) outlined four core principles they argue should drive Industry Canada's *Digital Economy Strategy* and Indian and Northern Affairs Canada's Aboriginal connectivity strategy. The four points are:

1. These federal government strategies must work with First Nations leaders and organizations representing First Nations communities. This process should harmonize with work already being done by the AFN and others as described in the *e-Community ICT model*. "The [AFN IT] Think Tank envisions a national First Nations broadband network as an integrated satellite and terrestrial design based on providing broadband access to more than 630 First Nations" (J. Whiteduck, Burton, T. Whiteduck & Beaton, 2010, p. 3).

2. The federal strategies must meet all the connectivity needs of First Nations communities. The Government of Canada's current technical definition of broadband as 1.5 Mbps is insufficient to meet the needs of essential First Nations community services and organizations. Therefore, it must be updated to a minimum of 10 Mbps fibre connection.

3. A broadband infrastructure development model must support First Nations community-owned, managed and sustained connectivity. This includes a requirement that "companies and organizations receiving federal funding for broadband infrastructure must work in full partnership with First Nations" (ibid, p. 4).

4. The federal strategies must ensure ongoing support for a national network of First Nations broadband support organizations. The strategies should build on the successes of the First Nations IT Regional Networks, which can be developed into a cohesive national network.

3.2 First Nations IT Regional Networks

The AFN's *e-Community Strategy* and submission to Industry Canada's *Digital Economy* consultations both proposed that broadband infrastructure and connectivity needs for First Nations communities be delivered by at least the seven First Nations IT Regional Networks. Most of these networks were previously funded as the Regional Management Organizations (RMOs) for the First Nations SchoolNet program. These First Nations IT Regional Networks have collectively been responsible for much of the broadband infrastructure development and subsequent use of connectivity in remote and rural First Nations.

These seven First Nations IT Regional Networks exist at the provincial level (except for the Atlantic provinces, which are grouped together as one region). All but the First Nations Technology Council (FNTC) in B.C. were originally funded by the First Nations SchoolNet program to deliver education, and have a long history of developing and delivering a variety of broadband services to local communities. In B.C., the First Nations SchoolNet program was delivered by the First Nations Education Steering Committee (FNESC), which works in collaboration with FNTC. Fiser highlights the community-based administrative approach of the RMOs, writing "each RMO is a First Nations based organization with strong ties to the constituencies of internet users in the regions they serve" (Fiser, 2010, pp. 5-6). The boards of directors include representatives from local communities, "which further contributes to informing each RMO's close view of internet services and deployment projects" (ibid, 2010, p. 12).

Table 2: Summary of First Nations IT Regional Networks

Region	Organization	Acronym
B.C.	First Nations Technology Council (in partnership with the First Nations Education Steering Committee)	FNTC
Alberta	Technical Services Advisory Group	TSAG
Saskatchewan	Keewatin Career Development Corporation	KCDC
Manitoba	Keewatin Tribal Council working with Broadband Communications North	KTC (BCN)

Ontario	Keewaytinook Okimakanak KNet	KO-KNet
Quebec	First Nations Education Council	FNEC
Atlantic Region	Atlantic Canada's First Nation Help Desk	FNHD

Six of the seven First Nations IT Regional Networks historically received funding from Industry Canada through the First Nations SchoolNet (FNS) program, that was moved to Indian and Northern Affairs Canada (INAC) in December 2006. In 2009, a seventh RMO joined the group. While FNTC is not a formal RMO, it works collaboratively with the regional RMO, the First Nations Education Steering Committee, and with First Nations to take a holistic approach towards ICT and community development (Hanley, 2006). Launched in 1995 to assist First Nations schools to connect to the Internet, FNS funds infrastructure, computer equipment, and technical support, as well as research and development around ICT skills development and e-learning (Fiser, 2010; see also Carpenter, 2009). The program reaches approximately 600 First Nations schools and learning centres, 5,000 teachers and 80,000 students each year. It is set up in a way that enables First Nations communities to guide the development and delivery of FNS-funded services. All the RMOs worked with the private sector and their provincial governments as well as other federal government departments to support their work with their partner First Nations. Several RMOs developed First Nation owned and operated Regional Networks to deliver broadband connectivity to the First Nation schools.

The AFN's *e-Community ICT Model* highlighted the original FNS program as a strong model from which to build a national funding initiative. The AFN argued that if FNS is supported and has its mandate extended more broadly than just education, it can form the basis of federal contributions to a national indigenous broadband network (J. Whiteduck, 2010). The federal government also recognizes the success of FNS, as reflected in a 2009 report from Indian and Northern Affairs Canada that notes the success of community-based program administration (Indian and Northern Affairs Canada, 2009).

Many of the First Nations IT Regional Networks also have a history of shared partnerships and joint projects that can be leveraged by First Nations communities to secure greater efficiencies and economies of scale. For example, First Nations Technology Council in British Columbia is presently working with the First Nations Technical Services Advisory Group in Alberta to share community practices and project information between Alberta and B.C (04, interview). The National Indigenous Community Satellite Network -- discussed elsewhere in this chapter -- is another example of a partnership between two First Nations IT Regional Networks (KO-KNet and KTC-BCN) and one Inuit regional government, the Kativik Regional Government.

Despite positive evaluations and support of the First Nations IT Regional Networks, their future is uncertain due to the provisional (and decreasing) nature

of First Nations SchoolNet funding. Key informants told us that despite the efficiencies and economies of scale that developed from these partnerships, the long-term sustainability of their work is in question.

> *Over the past 10 years, we've faced the end of the [FNS] funding mandate 6 times. We're trying to develop in a very uncertain environment -- it would help if we had a guaranteed funding arrangement.*
> - 10, interview

The following three profiles of First Nations IT Regional Networks are from O'Donnell et al (2010). First, the First Nations IT Regional Network in the most eastern region of Canada is Mik'maw Kina'matneway/ Atlantic Canada's First Nation Help Desk (http://firstnationhelp.com). The Atlantic Help Desk facilitates the development and use of ICT for education, innovation, and creativity. The organization encourages youth to be producers as well as consumers of information. Initiatives include MMTV News (Mi'kmaq/Maliseet TV) and a web site archiving video clips of Elders. Videoconferencing is key to many initiatives including national meetings and sharing student-generated content on legends, social issues, and education. The Help Desk website is an educational resource for First Nations youth and interested students from across Canada (O'Donnell et al., 2010).

Next, the First Nations Education Council (FNEC) is the First Nations IT Regional Network in Quebec (in French: Conseil en Education des Premieres Nations – CEPN) (www.cepn-fnec.com). FNEC, an association of First Nations and communities, aims to achieve full jurisdiction over education. They will do this while "respecting our unique cultural identities and common beliefs, and promoting our languages, values and traditions" (FNEC, 2009, p.3). FNEC's technology department has been very active. FNEC's videoconference services support training and communication via teleconference in all the First Nations communities of the region. In 2008-2009, videoconference activities rose by 40% and utilization hours increased by 50% compared to the previous year. Requests for videoconference meetings are made by the education and health sectors, INAC, and FNEC employees. At least 58 videoconference systems have been installed in the First Nations schools and health centres of Quebec. Certain Band Councils also use this technology (FNEC, 2009). The videoconference sites are all listed in a directory that can be viewed on the FNEC Website. FNEC is also engaged in: fibre optic development for First Nations in Quebec; software creation services; technology training services (including CISCO-ICT training); a "My School on the Web" project; and support for many other technology-related activities (First Nations Education Council, 2009; Whiteduck, T., 2010).

To give a final example, KO-KNet is the First Nations IT Regional Network in Ontario (www.knet.ca). KNet is the broadband services division of the Keewaytinook Okimakanak (KO) tribal council. In 1996, KO-KNet became Industry Canada's First Nations SchoolNet Helpdesk serving Northern Ontario.

The same year, CAP sites (Community Access Points), also funded by Industry Canada, were established in 10 of the First Nations in that region. In 2000, Keewaytinook Internet High School was launched, telephone services were implemented in North Spirit Lake and Keewaywin First Nations, and videoconferencing and high speed data connections were established. The following year, KO-KNet became one of Industry Canada's SMART Communities Demonstration sites and the KOHS-NORTH (Telehealth) Network was launched (TeleCommons Development Group, 2004). In 2005, KO-KNet launched the Northern Indigenous Community Satellite Network (discussed later in this chapter), working with its partners to provide broadband services to remote satellite-served communities in Ontario, Manitoba, and Quebec. KO-KNet remains a leader in broadband infrastructure and connectivity services for remote and rural First Nations in Canada. From its office in Sioux Lookout, Ontario, KO-KNet provides web, Internet, satellite and videoconferencing services, and infrastructure to remote communities in northern Ontario. KO-KNet sees its responsibilities as helping to sustain distinctive and minority cultures, planning and acting on community needs, mobilizing communities, encouraging and supporting individual use of ICT, and providing observations on how to foster and encourage community-based use of ICT for social interaction (Beaton, Fiddler & Rowlandson, 2004; Carpenter, 2010; Fiser & Clement, 2009; KORI, 2005; O'Donnell et. al, 2009).

3.3 Northern Indigenous Community Satellite Network

The Northern Indigenous Community Satellite Network (NICSN) is an example of a jointly managed, inter-provincial partnership between First Nations and Inuit communities in northern Quebec, Ontario and Manitoba. Despite the very different contexts of these organizations, in one key informant's words, through NICSN, "we are proving that the network can be locally and regionally owned, managed, operated and maintained" (5, interview).

> *The 'ownership' of the network equipment, I think, is a very important point to make…In the First Nations we serve, the communities own and are responsible for their own network equipment (management, operation, and maintenance)*
> (5, interview)

NICSN is composed of three organizations: KO-KNet in Ontario; the Kativik Regional Government (KRG) in Quebec; and the Keewatin Tribal Council, which formed Broadband Communications North (BCN) in Manitoba. Due to different jurisdictional contexts and government structures, these organizations have relationships with different funding partners. The two First Nations tribal council authorities governing BCN and KNet work with the federal government to access funding for services like education and health. In contrast, KRG provides services to Inuit villages in the Kativik region through funding acquired from the provincial government of Quebec.

Despite these differences, the three parties built a shared satellite-based broadband infrastructure and connectivity model that serves their collective geographic region. In 2002, the partners met to explore different satellite network management models. The first deployment model used in 2000 involved partnering with Telesat Canada and their research team to deliver broadband connections into three remote First Nations (Fort Severn and Slate Falls in Ontario and Williams Lake in BC). The second model they utilized starting in 2002 was proposed by SSI Micro, the company that designed and implemented the Qiniq network in Nunavut and AirWare in NWT. However, starting in 2004, rather than work with an external organization, NICSN decided instead to establish their own community-owned and managed satellite network.

> *NICSN proposed one big network of 46 villages as more efficient and effective than separate regional networks...NICSN would share management, engineering resources, and so on, and would also enable local-level network management. KO-KNet would manage the gateway from Sioux Lookout…[but] each group managed its own local network gateway...We initially considered locating the gateway in [a large urban centre like] Montreal or Toronto, but are glad we didn't: it's really working well, and has allowed us to expand local capacity.*
> - Interview, 15

The NICSN network was built through two rounds of funding released by the National Satellite Initiative (NSI). In Ontario, Industry Canada's FedNor program invested in the development of the satellite hub site as well as in the First Nation earth stations, over the past ten years. In the first round, (starting in 2002) NSI allocated one Public Benefit Transponder to NICSN to provide service to public institutions in the 43 communities to be served. Building on an already-existing network operated by KO-KNet, the additional transponder space allowed Manitoba (KTC-BCN) and Quebec (KRG) to join the network. The group secured 36 MHz of satellite capacity (31 Mbps of usable bandwidth) through leveraging the Transponder's 'research use/public benefit' requirement, which was a component of the government's license to Telesat. NICSN successfully argued the resulting connectivity would fulfill the 'public benefit' requirement because it enabled the delivery of core public and community services. The group successfully secured bandwidth for 15 years (2005 – 2020), with 100 per cent of costs covered by the Federal government (Industry Canada) and Telesat. In 2005, NICSN launched "the first inter-provincial community-owned and operated broadband satellite network in Canada" (National C-Band Benefit User Group Press Release, Jan 7, 2005).

In 2007, NSI's second round of funding enabled the group to expand residential access through the Government of Canada's Strategic Infrastructure Fund. NICSN used this funding ($27 million from the NSI and other funders) to procure two

more satellite transponders and the required earth station and local access network upgrades for the next 11 years.

The NICSN network is managed from the hub earth station in Sioux Lookout, Ontario (which serves as the Internet gateway and network management centre). To enable local autonomy, each regional partner follows its own network model (albeit with technology standardized across the network). These different support models demonstrate successes in achieving economies of scale, network efficiencies, and strong, long-term partnerships across geographic and jurisdictional boundaries making NICSN a sustainable network operation. That is, NICSN will be sustainable as long as the government continues to recognize the satellite transponders as essential backbone infrastructure that must be funded. The network requires government subsidies to cover the costs to access satellite bandwidth -- if this is secured, the network can cover annual operating costs for connectivity. NICSN argued these satellite transponders must be viewed as one-time capital costs. Since satellite infrastructure (including the transponders) offers the same applications as terrestrial (fibre) infrastructure, it should be framed the same way: as a long-term infrastructure build, not an ongoing administration cost funded on a year-by-year basis.

> *Each region faces different contexts. For example, territorial governments have less resources to spend on connectivity than provinces like Quebec. But we collectively argued that the federal funders should consider satellite capacity as a capital cost for infrastructure -- not an operational cost. We framed it as 'space fibre' that has the same properties as terrestrial fibre. The argument worked. We could 'buy' a transponder by pre-paying for it for 10 years, treating it as a capital cost, just like fibre. This helped establish more stable funding.*
> - Interview, 15

Levels of long-term funding for NICSN seem to be decreasing. One informant told us that the NICSN network is 100 per cent paid for until 2019, but they are unsure of its funding after that year. The NSI Round 1 funding was 100 per cent covered by government, and offered 15 years of secure access to the satellite transponder. NSI's Round 2, in 2007 covered 75 per cent of costs (with provinces covering the remaining amount), and its funding support will end in 2018 for the two additional transponders. The latest upgrade plans, which Broadband Canada will start funding in December 2011, are only pre-paid for five years (and may be extended to a maximum of 5 more years), and the federal government only supplies 50 per cent of funding. In one key informant's words: "The trend appears clear: lower funding for less stable lengths of time" (interview, 15). Furthermore, the way Broadband Canada's application process is currently set up, each region must apply for funding separately, undermining the benefits of the NISCN partnership (such as economies of scale).

3.4 The Eeyou Cree Network

by Hyman Glustein and Alfred Loon

An example of a First Nations community-owned and managed terrestrial regional network is the Eeyou Communications Network (ECN). ECN provides "new technology with a social dimension" to Eeyou Istchee and the James Bay region of Quebec. Centered in the north-western area along James Bay, ECN is a non-profit organization that reaches beyond standard business models to deliver broadband infrastructure and connectivity to all towns and communities in the area, both First Nations and non-First Nations. The network has a capacity to deliver a 10 GB broadband feed. It bases its revenues on users paying a proportion of the operating, expansion and equipment renewal costs.

ECN is a regional network serving the public including 14 local Councils, two regional governments (Cree Regional Authority, Conférence régionale des élus de la Baie James), two school commissions (Cree School Board and Commision Scolaire de la Baie-James), two regional health councils and two hospitals. ECN uses modern fibre optic technologies and supports Quality of Service (QOS) for the delivery of voice, data, video and Internet traffic and ECN will connect the region to diversified service providers and networks.

ECN has developed an expandable and scalable broadband infrastructure network that is dedicated to serving the short-term and long-term connectivity needs of the remote and rural communities in the area. It will enable a full array of connectivity services to communities including nine Cree and five non-Native James Bay communities in the region. (www.eeyou.ca/SyllabusE.pdf)

ECN, a $29 million network, is intended to do more than provide broadband infrastructure and connectivity. It has set out a goal to train and teach regional resources and Cree youth in telecommunications technology. At the network launch, former ECN Chairman and Grand Chief of the Crees Matthew Coon-Come stated:

> These new capabilities (the IP and broadband technologies) will help our young people succeed and serve our own community at the same time. This means communities can develop the local resources and technologies to operate [and] to maintain this network. It also means we can develop jobs, skills and human resources.

Not only will ECN allow for the deployment of new broadband infrastructures, it will also develop training centres to provide quality education in the IT field, to stimulate local capacity to deliver connectivity. The goal of those training facilities is to develop local operators who will remain in their own communities to support the growing demand for connectivity resources and ensure the broadband infrastructure meets the local and specific needs of each community.

According to ECN president Alfred Loon, "We set out with a modest goal: to use the resources at hand to do what is possible. Today with construction crews across the James Bay territory with 1,500 kilometres of fibre, we have surpassed our expectations." The area is currently served by one telephone service with dated microwave facilities. "In August 2011, we will enable the introduction of the latest telecommunications services to our communities," he said.

Startup funding for the broadband infrastructure provided by the Cree Regional Authority, who conducted feasibility and engineering studies, environmental evaluation and business and technical assessment for the proposed network. Under its leadership, the network was created from a number of diverse partners who have traditionally been on opposite sides of the negotiating table: Hydro-Quebec, local non-Native residents and townships, the governments of Quebec and Canada and the Cree communities. Also, combining the technical facilities of Hydro-Quebec and substantial new construction, ECN utilizes a number of innovative advanced broadband infrastructure technologies including the use of very long-haul fibre optic spans of up to 275 km without signal regeneration, lowering costs and increasing reliability. All infrastructures and engineering had to take into account temperatures under minus 50°C.

Current ECN Chairman (and Deputy Grand Chief of the Crees) Ashley Iserhoff notes that the network support connectivity by "connecting the peoples, institutions and businesses of the north and enable a full range of telecommunications services and it will advance the ways the communities work".

Currently, urban-centered telephone systems serve this area of the north with dated technologies. With ECN set to launch in 2011, these northern communities in James Bay will be leading the way in regional broadband infrastructure and connectivity, and consider that their experience may provide guidance for international applications.

3.5 Fort Severn First Nation's Community-Based Local Broadband Infrastructure and Connectivity Model

Fort Severn First Nation operates a community-based local broadband infrastructure and connectivity model that highlights some of the challenges in sustainable management. That community's network began in 2000 after two years of planning. Fort Severn then became a member of the SMART community demonstration project in 2001, during the early stages of NICSN. At that time, Angus Miles, who had recently graduated from high school, was hired by KO-KNet as the Community IT Technician, and worked there for half a decade. The Chief and Council for Fort Severn First Nation, who represent community members in the area, strongly supported broadband infrastructure and connectivity development at that time, due to its applications in delivering health, education and government services.

The community was connected to broadband infrastructure supplied through KO-KNet's regional satellite hub in Sioux Lookout. It is a member of the NICSN consortium. The local network team tested hardware and worked on network administration and bandwidth management. In part as a result of their work, NICSN decided that communities must retain local control and ownership of their networks.

Angus has since moved to the Sachigo First Nation but still travels back to his former home three or four times a year. After he left, the community struggled to maintain the local-level capacity for network administration that Angus provided. While someone was trained to replace Angus, that person left the community and another person had to go through the training and skills development process. Today Fort Severn community member Lyle Thomas is managing local connectivity. Furthermore, in its early days as a SMART community project, there was enough funding to support three people working at connectivity, but once that funding ended, one position was immediately cut. Now there is only one person working there, and all three people originally involved in the SMART project have moved away from the community.

Costs for connectivity in Fort Severn also increased, and the community must continuously be updating its satellite-based broadband infrastructure technology. Increased bandwidth will be made available when Bell Aliant completes its proposed fibre build, which will enable the transition of 12 of the 14 communities in Northern Ontario presently served through the NICSN network from satellite to terrestrial networks. Fort Severn will remain on satellite, but will benefit from the newly available bandwidth.

Angus now works in Sachigo First Nation, which is also a member of NICSN. Local copper circuits are presently used to connect the school, band office and health centre to the satellite network. Two years ago, he began setting up residential satellite Internet services through XplorNet. As first, it was fairly expensive -- equipment, the cost to set up, system access fees and so on comes to around $600, so community members would organize groups who share costs. Angus recently completed a certification program to install the dishes, and recently installed a large number of dishes in a neighbouring community. Sachigo Lake First Nation is now building its local coax cable network to provide internet and television to all community buildings, and follows the same delivery model as the local Fort Seven First Nation network.

While the Barrett Ka-Band XplorNet dishes offer a simpler connectivity model than NICSN to set up and maintain, NICSN is a much stronger community-owned model for broadband-enabled public and community service applications. XplorNet serves individual residents and businesses employing a standardized usage policy based on network demand, so bandwidth ebbs and flows based on usage. In contrast, NICSN manages its bandwidth based on application, so it can be better organized for uses like eHealth or distance education. The NICSN

service is owned by the community and community members pay the local service provider for their internet and television services.

3.6 Nunavut Broadband Development Corporation and the Qiniq Network

Co-written with Lorraine Thomas, former executive director, NBDC

Researchers and network developers working with Inuit communities have also long argued for the need for a strategic approach to broadband infrastructure and connectivity development. As is the case in First Nations communities, ideally such a strategy would unite a disparate, wide-reaching group of communities together in a way that enables them to achieve economies of scale and help solve mutual challenges. Alia (2010) writes that in the early 1980s, "even the smallest Inuit communities were providing equipment, access, and expertise, and soon were developing websites and exploring various options for using the new technologies" (Alia, 2010, p. 73). For example, the INUKSHUK project tested the capabilities of new satellite technology for communication and connectivity (AFN Chiefs Committee on Economic Development, 2010, p. 7). Potential barriers faced by Inuit peoples include the cost of bringing quality broadband infrastructure and connectivity to low population density areas, as well as a daunting array of jurisdictional challenges. The development of the Qiniq network in Nunavut offers one example of how Inuit communities are addressing these challenges.

In 1993-5, the Inuit Broadcasting Corporation conducted a multi-jurisdictional project called *Connecting the North,* which examined the potential benefits of connectivity for Yukon, NWT, Northern Quebec and Labrador. Using live television, community meetings, fax machines and phone-in sessions, hundreds of people participated, and the resulting research and documentation was submitted to the Information Highway Advisory Council, Inuit organizations and the Government of the NWT (which Nunavut fell under in the 1990s) (03, interview).

In the mid-1990s, the Nunavut Implementation Commission (NIC) released a report about the role telecommunications might play in Nunavut. "The NIC claimed that such networks would encourage better contact among the dispersed populations and would insure the cohesion of the new territory" (Savard, 1998, p. 84-5). Alia writes that this report highlighted the economic development impacts of connectivity, arguing "the road to Nunavut is along the information highway", which would contribute to Inuit approaches to government, with power widely distributed and decentralized (Alia, 2010, p. 176).

From 1999 to 2001, the Government of Nunavut convened the *Nunavut Broadband Task Force*. At that time, the territorial government's Department of Sustainable Development led the creation of the Task Force, under the mandate of "stimulating business and economic opportunity" (3, interview). In 2002 the Task Force produced *Sivumuqpallianiq: Moving Forward: Strengthening our Self-Reliance in the Information Age*. The *Sivumuqpallianiq* report was used to support

the creation of the Nunavut Broadand Development Corporation (NBDC), which incorporated in fall 2002 and became operational in 2003. It is a not-for-profit Corporation under the Canada Corporations Act Part II, and is managed by a volunteer board of directors elected from communities throughout Nunavut. The organization's mandate is stated as follows:

> The Nunavut Broadband Development Corporation aims to bring affordable, high speed access to the Internet (broadband) to Nunavummiut in all 25 Nunavut communities by supporting local businesses to deliver broadband and related services. Our focus is to bring broadband services to citizens, municipalities, Inuit organizations, businesses, and others not currently served by the Governments of Nunavut and Canada (Nunavut Broadband Development Corporation, n.d.)

To ensure all 25 Nunavut communities gain equal access to broadband infrastructure and connectivity, NBDC 'bundled' the communities together in a regional business case. Grise Fiord only has a population of 140 people, but it was given the same priority in the proposed network as Iqaluit (03, interview). NBDC reasoned that once large communities are connected, the larger population centres that have more political clout may get complacent and forget about smaller communities (03, interview). The resulting network, instead of connecting small, remote northern communities to large urban centres, instead focused on lateral connectivity within Nunavut.

> *[NBDC] treated the territory as a single community. This was important, as the few larger communities (although small in a southern context) would have to be bundled with the many even smaller communities to get any economies of scale. NBDC founding board member Adamee Itorcheak, argued that all communities must be connected with equal service at an equal price, no matter how small or remote. The phrase "If it doesn't work in Grise Fiord, it doesn't work in Nunavut" became the mantra…We rolled out connectivity to all, at the same time, and needed to stay on course for the full project -- if the strategy changed, it would not have worked.*
> - 03, interview

This approach follows a historic pattern of communications development in the North. Alia argues that in Canada, broadcast media infrastructure and content that originated in remote arctic and sub-arctic communities moved towards urban centres, as seen in the transformation of Television Northern Canada (TVNC) to the Aboriginal Peoples Television Network (APTN) (Alia, 2010, p. 17; see also Roth, 2005). Alia notes that community-driven development often involves the innovative use of technologies: "often, it is the older and simpler technologies – or a fluid mix of old and new, high- and low-tech – that best serve [these communities'] needs" (Alia, 2010, p. 17).

Unlike the approach taken by the AFN and NICSN, NBDC did not advocate that communities own their broadband infrastructure. Their reasoning was that broadband infrastructure should be framed as basic community infrastructure, like roads. NBDC argued that communities need time to develop the capacity to manage connectivity, and should focus on that rather than supply their own funds to build and maintain broadband infrastructure (3, interview). Their approach instead focused on developing local-level capacity in delivering connectivity (through administrating resident modems and being a local contact for Qiniq) through broadband infrastructure that is owned and managed by a regional private-sector organization.

To build the resulting network, Qiniq, NBDC put forward a comprehensive RFP for regional broadband infrastructure development. SSI Micro won the bid, and put together a business plan that outlined how the Qiniq network could be built through a mixture of government funding and customer revenue.

Table 3: History of the Qiniq Network and Related Developments

Year	Description
1993-5	*Connecting the North* project
1995-6	Nunavut Implementation Commission releases report about the role of computer networks in Nunavut
1999-2001	Nunavut Broadband Task Force conducts consultations on broadband infrastructure and connectivity issues
2002	Nunavut Broadband Task Force releases *Sivumuqpallianiq: Moving Forward: Strengthening our Self-Reliance in the Information Age* Meeting with KO-KNet and other partners in Winnipeg to discuss shared use of Industry Canada's Public Benefit Transponder
2002-3	NBDC is incorporated and becomes operational (via SSI Micro)
2003	Elections for NBDC's board are held; 42 people run for seats, 7 are elected
2003-2005	The Qiniq Network (broadband infrastructure) is built by SSI Micro, with guidance from NBDC with Industry Canada's NSI Round 1 funding
2004, 2006, 2008	Training sessions at regional hubs for community service providers (CSPs), who deliver connectivity services in Nunavut
2008	NBDC releases 5-year business plan, *Managing Bandwidth -- Nunavut's Road Ahead*
January 2009	Infrastructure Canada and NBDC sign a 5-year Contribution Agreement which, when combined with matching funds from the Government of Canada and private business, constitutes an investment of $43,202,000.
July 2010	NBDC puts forward a submission to Industry Canada's Digital Economy Consultations

SSI Micro built the Qiniq network between 2003-05 at a cost of almost $10 million for ground infrastructure (satellite dishes, wireless networks, and communication shelters). Funding for the broadband infrastructure was secured through commercial entities, government organizations, and communities. Industry Canada pledged $3.83 million to build the network, but required matching funds in order to fund the building of Qiniq. Debt financing secured from an Inuit Venture Capital firm (Atuqtuarvik Corporation) and the Nunavut Business Credit Corporation made it possible for NBDC to secure matching funds to meet Industry Canada's requirements (3, interview). SSI Micro put in $1.7 million, and other funders included the Government of Nunavut and Indian and Northern Affairs Canada ($250,000) and $230,000 from 23 hamlets, who each contributed $10,000. In addition, Infrastructure Canada's National Satellite Initiative provided approximately $1,000,000 per year in support specifically to help defray the high cost of satellite bandwidth over an 8 year period, ending in 2012. These funds were kept separate from the hardware, and had to be matched by customer revenue each year to qualify for support.

The broadband infrastructure provided by the Qiniq network now serves a population of approximately 29,000 across 2 million square kilometers (there are approximately 4,000 subscribers). It employs a full mesh system to enable multiple sites to link together. The network's satellite backbone is dynamically managed by SSI Micro, which also owns and maintains the terrestrial elements of the satellite infrastructure, the wireless networks, back-end hardware and the billing and management systems. The satellite backbone is owned by TeleSat, and bandwidth is expensive: $6,000 / month for 1 MHz, which is roughly equivalent to 1 Mbps (03, interview). SSI Micro's 2009 offerings to consumers were limited to high speed packages at higher than average prices (Fiser, 2010). Furthermore, "actual inbound rates to residents are less than 256 Kbps due to high demand and limited bandwidth resources" (Fiser, 2010, pp. 32-3). NBDC hopes to conduct a feasibility study on fibre builds, but estimates they would cost billions of dollars (03, interview).

To manage local community networks and deliver connectivity services, NBDC recruited 25 Community Service Providers (CSPs); one for every Nunavut community. The NBDC board advised on the criteria of CSPs, arguing the most important one was to invest in people who will stay in communities long-term (Migone & Henley, 2009). CSPs are compensated by SSI Micro, who pay them 20 per cent of the gross revenue of monthly access fees in exchange for handing out modems, helping customers make payments, and assisting with local troubleshooting. NBDC has organized training sessions for CSPs in 2004, 2006, and 2008 to network and share best practices and challenges. So far, CSP turnover has been low.

In 2008, NBDC released its 5-year business plan, called *Managing Bandwidth -- Nunavut's Road Ahead*. In early 2009, Infrastructure Canada and NBDC signed a

5-year Contribution Agreement which, when combined with matching funds from the Government of Canada and private business, constitutes an investment of over $43 million in the satellite network broadband infrastructure. Called *Infrastructure Phase II*, the project is the result of regional consultations, including 200 survey responses and 50 people who attend in-person workshops. These funds will be used to develop a satellite bandwidth management tool, procure additional satellite capacity, and upgrade the existing terrestrial network for all 25 Nunavut communities. However, funds cease to flow after June 30, 2012, and to date, there is no replacement program. In its recent submission to Industry Canada's *Digital Economy Consultations,* the NBDC wrote that: "without federal investment, the continued operation of the QINIQ network will be at risk and that would put internet access in the majority of Nunavut's communities at risk" (Nunavut Broadband Development Corporation, 2010, p. 2).

3.7 The Community Access Program (CAP) in Nunavut

In Nunavut, the Community Access Program (CAP or C@P) plays an invaluable role in delivering connectivity services to 21 of the 25 Nunavut communities, as well as helping building local capacity in ICT use and administration. The program is funded by a combination of federal and territorial governments. It began in 1994 as an Industry Canada program that aimed to provide Canadians with public access to the Internet, as well as the training and equipment required to use it. CAP has since shifted its focus to bridging the 'digital divide' by targeting groups like Aboriginals and elderly Canadians. CAP sites are typically located in public locations such as schools, community centres and libraries. Our key informants told us Nunavut's CAP sites have the potential to build local ICT management capacity. For example, two CAP site administrators also work as Community Service Providers for the Qiniq network.

> *Our CAP sites are very heavily utilized. There are long waiting lines, and so Internet access is limited to just 15 minutes in many communities. The demand far surpasses our capacity, especially since our broadband isn't very broad. We need access to more bandwidth...I've seen people use CAP sites to set up businesses. Some have invested in video equipment -- there are examples of people going out on the land and making films, working with film production companies like Isuma as photographers and editors out of the CAP sites.*
> - 22, interview

Local CAP sites in Nunavut connect to a satellite-based backbone broadband infrastructure provided by either Qiniq or NetKaster. There are two ways that CAP sites access connectivity. If located in a territorial government-funded organization, such as a school, they can connect to the government system, and in doing so, access bandwidth at no extra charge. Other CAP sites, like those located in community drop-in centres, purchase bandwidth from commercial service providers. Once monthly allocations of bandwidth are used up in these

locations, bandwidth is scaled down to dial-up speeds; we heard that this happens at least a few days at the end of every month at many sites. While the bandwidth provided by NetKaster/Qiniq is faster than the government system, CAP sites in schools can access bandwidth for free, and are usually used at night, when the schools are closed.

> *Qiniq sets bandwidth limits -- so when a CAP site uses up the monthly bandwidth allocation, it goes back to dial-up service. And Youtube and other social networking applications use up bandwidth pretty quickly. The highest service plan is around $450 a month, and for the CAP sites that use it, almost every month there are a few days they go back to dial-up service.*
> - Interview, 22

It has been difficult to expand the CAP program to the remaining four Nunavut communities not yet served with a local site. While more local people can be trained to work as CAP managers, funding is short-time, and for the past number of years, Industry Canada has been reducing its support for the CAP program.

> *We can't expand CAP if we don't know if there is any funding coming in next year. It's a problem -- every year, we don't know whether there is any more funding coming in. Industry Canada recently tied CAP to its $225 million infrastructure fund, but that program ends this fiscal year. After that ends, where do we go to advocate for more funding? There's nowhere left to go.*
> - Interview, 22

3.8 IsumaTV's Northern Indigenous TV Network (NITV)

An example of a community-based local broadband infrastructure and connectivity model in Inuit communities is IsumaTV's Northern Indigenous TV Network (NITV). IsumaTV developed an innovative approach to local connectivity that accesses the broadband infrastructure provided by Qiniq's backbone network, but also secures 'high-speed video in low-speed communities' at the 'first-mile' through local broadband infrastructure. IsumaTV's Northern Interactive Television (NITV) model provides connectivity to 7 communities to wireless local area networks, enabling high-speed access to content uploaded onto local servers via satellite-based connections (Kunuk & Cohn, 2010). In fall and winter 2010, NITV will install local servers in 10 pilot northern communities, with expansion to 50 new communities planned by December 2011. NITV's approach to connectivity enables users to switch between 'high bandwidth' and 'low bandwidth' versions of select media files (including 2,000 indigenous films), which are hosted on a local server (13, interview). NITV is funded through the Canadian Media Fund (CMF's) new 2010-11 Aboriginal Fund Guidelines, and will operate as an experimental digital distributor, offering $500,000 in digital broadcast licenses to up to 10 qualified productions (ibid, p. 7). IsumaTV argued that in order for

Inuktituk-language content to be useful to Inuit communities, it must be distributed in these communities, which is impossible to do adequately without appropriate high-speed broadband infrastructure and connectivity:

> Unable to find conventional TV broadcast or distribution, many Inuit and Aboriginal filmmakers living in southern cities simply upload their films and videos to YouTube…[However] few videos get seen in the low-bandwidth northern communities where Inuit and Aboriginal filmmakers come from and where their friends and families still live (ibid, p. 14).

Community story: Alianait Arts Festival and Isuma TV

By Jason Woodman Simmonds

Alianait is, according to the festival website, "an Inuit expression of joy and celebration". The first Alianait, at least its contemporary version, was held in the summer of 2005. Since then the festival has grown steadily and includes artists from "across Nunavut and around the world" (http://www.alianait.ca). This upcoming summer festival, the theme of which is "Raven Harmonies," will include the Nunavut Olympic Performers, the film White Archer, and the Juno award winning music group, Digging Roots. The festival takes place over ten days, June 21-July 1, in Iqaluit.

Those who cannot make it to the festival but wish to participate in the events can do so via IsumaTV (www.isuma.tv). IsumaTV was started in 2008 when co-founders Zacharias Kunuk and Norman Cohn wanted to provide a means for artists to show their work to remote communities. According to Faye Ginsburg, IsumaTV is "a groundbreaking alternative for indigenous distribution" (Ginsburg, 2009). Furthermore Ginsburg notes that, "Isuma provides a free internet video portal for global indigenous media, available to local audiences and worldwide viewers" (ibid). While IsumaTV started in 2008, the company has had a difficult time getting the streaming video into communities whose Internet connections are often not even fast enough to efficiently play a YouTube clip, let alone a full television or video production. Thus while IsumaTV provides a venue for people to upload and exchange multimedia content, as well as a venue for interactive participation in worldwide Inuit and Aboriginal content, target audiences living in remote communities have not always been able to access it.

As a response to this need, IsumaTV launched an updated social networking platform in 2009. This network, Northern Internet Television Network (NITV), uses local broadband infrastructure and connectivity services to boost IsumaTV videos to "high-speed delivery in low-bandwidth communities with low-speed internet access" (IsumaTV, n.d.). This means that when the Alianait gets going in 2011 people in remote communities will be able to participate even if they cannot actually travel to Iqaluit.

4 Overview of Existing Broadband Infrastructure and Connectivity in and to First Nations and Inuit Communities

This chapter briefly describes some of the existing broadband infrastructure and connectivity in and to First Nations and Inuit communities. The chapter is organized in two main sections: one covering the northern regions; and another covering the provinces. Each of these sections includes several sub-sections highlighting existing regional backbone and local broadband infrastructure, as well as a brief introduction to some of the organizations involved in providing connectivity services.

Backbone infrastructure refers to the core physical network, which is either terrestrial or satellite-based. Individual communities typically connect to a regional backbone through a Point of Presence (PoP) managed by a local Internet Service Provider (ISP). The ISP then services communities through local infrastructure, either wireless or wired -- the 'first-mile'.

In many of Canada's regions, First Nations and Inuit communities do not yet have access to enough useable broadband infrastructure to satisfy their growing connectivity and community development needs. Lack of available bandwidth is a major problem for ICT use in many of these communities, in particular as applications evolve and become more technically demanding. For example, one principal in a remote First Nations community school told one of our partners that:

> *We are really at the point where we cannot go forward with anything that we want to do because this system is completely useless to us. We cannot use our lab for the kids, can't do attendance, we cannot use the computers in the classrooms.*
> - Quoted in 05, interview

The core position in this report is to re-frame the concept of 'last-mile' broadband infrastructure and connectivity development as 'first-mile'-driven. This highlights a community-based approach to broadband development. A 'first-mile' approach re-positions broadband infrastructure and connectivity development strategies as building from local communities and extending out to urban-linked backbone infrastructures. "First-mile" developments support local development, and in some cases, ownership of the broadband infrastructure and connectivity functions, and provide for broadband-enabled public and community services that seldom result from "last-mile", consumer-based approaches. The 'first-mile' approach counters the assumption buried in the term "'last-mile' networking", which sees communities only connected at the 'last' point in a development process. It also harmonizes with 'first-mile' models employed in other aspects of First Nations and Inuit public works projects, such as INAC's approach to funding roads, water, wastewater management, and so on, or Health Canada's efforts to

fund local health authorities. The "first-mile" approach also ensures that communities complete the connection to the backbone infrastructure in ways that adequately address local and regional needs and priorities.

It is difficult to construct a clear divide between northern and southern communities in Canada, and between different Inuit and First Nations communities. Some northern areas are better connected than some southern areas, and vice versa. For example, FedNor provided seed funding that helped develop robust satellite-based local networks in northern Ontario, while in Alberta, some communities are not yet connected to existing terrestrial infrastructure, due to the expense of building a point-of-presence to link them to the backbone (02, interview).

Several recently published articles (O'Donnell et al, 2010; and Fiser, 2010) present a comprehensive overview of existing First Nations and Inuit broadband infrastructure in Canada. Data on this subject is also available on the websites of the various organizations described in this report. Many broadband infrastructure and connectivity mapping projects are also currently being undertaken by First Nations and Inuit groups; such cases are mentioned where known.

Fiser's (2010) report maps broadband infrastructure and connectivity in terms of access, management models and digital divides. Based on data collected in 2009, the report employed the current federal benchmark definition of "broadband" as ≥ 1.544 Mbps. Looking at census subdivisions (CSDs) across the country, Fiser found that of the 978 permanently occupied First Nations, Inuit, and northern CSDs, just over half (59 per cent) could access some form of broadband infrastructure capable of supporting inbound rates of 256 Kbps or higher (Fiser, 2010, p. 10). Less than half of the First Nations CSDs (41 per cent of 866) had residential broadband access (ibid, p. 13). Residential access was significantly lower in Inuit communities: of the 52 Inuit CSDs examined, people in only one community (1.9 per cent of 52) had residential broadband access, although 49 (94.2 per cent of 52) did have residential high speed access (ibid, p. 13). Substantial 'digital divides' persist regionally. For example, while almost 76 per cent of CSDs located in the Atlantic region do have broadband access (defined as ≥ 1.544 Mbps), less than 30 per cent in British Columbia do.

First-mile local broadband infrastructure and connectivity in First Nations and Inuit communities also varies between regions. In terms of connectivity, Fiser (2010) identified three 'indigenous' local (first-mile) network models in his 2009 data set. Local broadband infrastructure was administered (and in some cases, owned) by either: an indigenous entity; an indigenous commercial enterprise; or an indigenous social enterprise. In local networks owned and controlled by a First Nations authority, a municipal-like entity (or regional body) managed internet services and owned the local networking equipment and infrastructure (local loop), typically delivering broadband-enabled public and community services through administrative offices, schools, and health clinics. Sometimes this model

also offers residential and business-related services. The second model, an indigenous commercial enterprise, is when "a First Nation or other Indigenous entity owns the local loops and manages a community network for profit" (Fiser, 2010, p. 26). This model typically offers connectivity services to residents and businesses, with less of a focus on broadband-enabled public and community service applications. Finally, the social enterprise model involves a partnership between a regional not-for-profit organization and other parties, such as the local government, businesses, public and community service providers, or incumbent teleco companies. Partnerships enable the regional First Nation/Indigenous entity to promote a mission, provide community services, and grow a regional market for internet services. Fiser highlights the benefits of the social enterprise model, arguing that it:

> Provides an organizational structure of technical and enterprise components that enable the various actors, which may not normally co-operate when set apart from the whole, to pool contributions and collectively enable forms of broadband access that no individual partner would (or could) establish on its own (Fiser, 2010, pp. 27-8).

4.1 The North

Existing backbone broadband infrastructure in northern Canada is very different than that in the South. In Yukon, all communities except for Old Crow are served by terrestrial infrastructure. In the Northwest Territories and Nunavut, the terrestrial infrastructure is only basic, and given the lack of road access to many communities, satellite-based backbones are the only option for a majority of communities. Approximately one-third of the communities in the NWT are served by satellite-based backbone infrastructure, and all of the communities in Nunavut are reliant on satellites. The result is much lower levels of connectivity compared to the south. Circumstances have changed since 2006, due to the efforts of the Nunavut Broadband Development Corporation and others. However, writing about Nunavut during that year, Soukup noted that dial-up access "has been a slow and unstable means of connecting to the Internet, with connection speeds usually in the 14.4 kbps range that most Southern Internet users experienced a decade and a half ago" (Soukup, 2006, p. 242). More recently, in 2008 the NBDC noted that satellite "is hundreds of times more expensive than bandwidth delivered by fibre networks in the south" (Nunavut Broadband Development Corporation, 2008, p. 2). The situation is similar in the NWT, where connections of 768 kbps cost $400 per month (AirWare, n.d.). Key informants told us when allocated monthly bandwidth levels are exceeded, access drops to dial-up levels (interview, 22; interview, 11). Some community-based ISPs mitigate these challenges by creating innovative connectivity solutions, such as local bandwidth redistribution systems that dynamically manage applications and connections.

In short, satellite-based broadband infrastructure is viewed as a 'necessary evil': while the only option in some regions, it is limited in terms of available

bandwidth, particularly on the uplink. In terms of providing connectivity, this kind of infrastructure is expensive and technically challenging to manage. As well, 'real-time' voice and video applications do not always function well given latency-related 'lag times'.

> *None of the systems in place today support normal broadband or, outside of Yellowknife, are flexible enough to deliver adequate speeds and needed services and applications to the North at accessible costs.*
> (24, interview).

As a result of these challenges, where possible, communities treat satellite-based broadband infrastructure as a short-term solution to be replaced as soon as possible with terrestrial fibre. This is one development in northern Ontario, where 12 of 14 communities presently serviced by the Northern Indigenous Communities Satellite Network's (NICSN's) satellite-based infrastructure will soon be transitioning to fibre-based infrastructure. That said, communities that must continue to rely on satellites have designed innovative and cost-effective connectivity models. For example, NICSN and the Nunavut Broadband Development Corporation (NBDC) offer two different management models for community-driven satellite-based broadband infrastructure. These models are discussed in Chapter 3.

In January 2010, the Northern Communications and Information Services Working Group recommended that a study be undertaken to map the existing communications infrastructure in Canada's North. This information is intended to be used to establish a pan northern communications strategy, including considering options to develop broadband infrastructure efficiencies of scale to address communications infrastructure needs.

4.1.1 Northern Manitoba, Ontario, Quebec and Labrador

The 14 Inuit communities of the Nunavik region of Quebec and First Nations communities in Northern Ontario and Manitoba are served by the Northern Indigenous Community Satellite Network (NICSN). The community-owned satellite-based broadband infrastructure links all communities in the region at a fixed rate, and supports local-level connectivity management and administration. When designing the network, NICSN partners decided that rather than centrally managing 'first-mile' networks, they would utilize local organizations, which are better positioned to respond to local needs: they understand local contexts; help keep money and jobs inside communities; and speak local languages. Connectivity services are managed by agents who work on a semi-volunteer basis (they receive free Internet access and are paid on an hourly basis for time-intensive work), and networks are standardized in terms of pricing and technology (15, interview).

The Kativik Regional Government in Northern Quebec is presently developing a regional connectivity plan that links to the provincial government's *Northern Plan*. This plan is not yet publicly available, but will include a list of short, medium, and long-term connectivity needs (15, interview).

The Cree communities of Eeyou Istchee and municipalities of the James Bay region of Quebec will soon access broadband services through the Eeyou Communications Network (ECN). Once construction of the community-owned terrestrial broadband infrastructure is complete, ECN's proposed network will employ long-haul fibre to offer connectivity services to nine Cree communities and five James Bay communities. The network is designed to meet the needs of local communities and the specifics of the region.

In the Labrador region, Innu communities have copper T1 connections to schools, but no broadband infrastructure to share with health centres yet, and so are relatively underserved (10, interview).

4.1.2 Yukon

There are fourteen First Nation communities in the Yukon, with eight language groups. Eleven of these communities have final and Self Government agreements in effect and are self-governing. The Council of Yukon First Nations (CYFN) is made up of representatives from these First Nations. The entire territory is served by a single regional teleco, NorthwesTel, which has installed local broadband infrastructure in each of the 14 communities. One isolated, fly-in community faces ongoing connectivity problems with Internet, satellite and videoconferencing services due to very low bandwidth (20, interview). At the local level, First Nations in the Yukon are limited in their ability to dynamically manage and share bandwidth with one another, given that broadband connectivity is administered by the regional teleco. One of our key informants suggested that the general opinion among First Nations and other people in the Yukon is that more competition in the telecommunication sector might result in more efficient, effective services and competitive pricing for the region.

In 2008, CYFN partnered with the Health and Social Services branch of the Yukon government, and with First Nations communities, in a pilot project to install videoconferencing equipment in four First Nations communities. In January 2010, this project expanded to include all 14 First Nations communities in the Yukon. This videoconferencing equipment is used for a wide variety of broadband-enabled public and community service applications, including health presentations, education sessions, and business meetings.

> *Originally for 'Telehealth', the videoconferencing projects started out as a means to connect communities to remotely delivered health care services. However, it has since expanded into a tool that First Nations governments can use in all their departments, such as lands and resources, heritage,*

> *human resources, chief and council, and so on. First Nations governments have used the equipment to hold meetings with Whitehorse and other communities, Elder's Council meetings, patient and family visitations with Hospitals down south, employment interviews, committee and board meetings, AA meetings, Diabetes Workshops, and so on. The First Nation Governments are finding videoconferencing to be a valuable time and cost saving measure.*
> - 20, interview

The Council of Yukon First Nations coordinated training for local community members in the videoconferencing technology, which is typically housed in a government building. While there have been some challenges in building local capacity to use the units, particularly in communities that face staff shortages, generally the project has been well-received, and the equipment is now used for a variety of purposes across a range of First Nations governments (20, interview). Uptake of the videoconferencing equipment has been supported by word of mouth and community champions, including the project Coordinator who is a First Nation member of one of the communities. The First Nations communities own the videoconferencing units, including a three-year maintenance contract (which, along with the contract for the videoconferencing coordinator, ends in April 2012). A lack of bandwidth in certain communities occasional results in packet loss, pixilation and occasional dropped connections when using videoconferencing equipment (20, interview).

4.1.3 Nunavut

Communities in Nunavut (and the Northwest Territories) face challenges of extreme geographic conditions, large landmasses, a low-density population base, and a significant lack of basic transportation infrastructure such as roads and deep sea ports. The region is solely reliant on satellite-based backbone broadband infrastructure, and this has made connectivity costs a major barrier to access.

> *[In Nunavut] there are no roads, and no roads means no fibre, so we're dependent on satellites. Some places south of Nunavut or west of Nunavut can get away with using much cheaper terrestrial microwave to connect, but for Nunavut, satellites are the only option.*
> - 03, interview

These circumstances led to an inability of the region's commercial teleco provider (NorthwesTel) to meet consumer demand for broadband/high speed connectivity (Fiser, 2010). In 2003, a not-for-profit organization, the Nunavut Broadband Development Corporation, (NBDC) issue a Request for Proposals (RFP) asking vendors to bid on the creation of a broadband infrastructure network to serve Nunavut. NBDC needed accurate costs in order to apply to the Industry Canada Broadband for Rural and Northern Development (BRAND) program, to combine

public investment with private sector investment to make it possible to connect Nunavut. SSI Micro won the competitive RFP issued by NBDC to build two networks: Qiniq (in Nunavut) and Airware (in NWT) (Fiser, 2010). As a result of this project, satellite-based commercial wireless broadband infrastructure now serves all 25 Inuit communities in Nunavut. The development of this network is discussed in Chapter 3.

> *We don't have community-owned networks [in Nunavut] -- though I've heard that some communities are moving in that direction. But we're not quite there yet. We need to [gain] support [for] that through government. Now, we use more a community-managed, but not owned, network.*
> - Interview, 22

The NBDC writes that after the Qiniq network launched in 2005, Nunavut received wide-scale deployment of non-line of sight broadband infrastructure. However, connectivity remains a challenge: "capacity on those satellites is now entirely allocated for the remaining lifespan of the satellites. This leaves absolutely no additional satellite capacity for future growth" (Nunavut Broadband Development Corporation, 2010, p. 1). As a result of this situation, NBDC argues additional satellite-based broadband infrastructure needs to be deployed to meet the region's growing needs. The group suggests considering the feasibility of fibre optic broadband infrastructure, to complement or be an alternative to existing satellite-based infrastructure.

'First-mile' services in the Northwest Territories and Nunavut are delivered through licensed and unlicensed wireless technologies. Qiniq uses 2.5 GHz portable wireless modems that can operate up to 20km from the base station point of presence.

Residential-oriented Ka-band satellite internet (through Netkaster, XplorNet, etc) is also available in some communities, and NorthwesTel offers DSL service in Iqualuit (Nunavut Broadband Development Corporation, 2010).

4.1.4 Northwest Territories

In 2003, five Aboriginal organizations formed the Broadband Business Alliance (BBA) to submit a single business plan to Industry Canada supporting the total connectivity requirements of the NWT's un-served communities. This approach was agreed on the basis of ensuring long-term sustainability, maximization of benefits and consistency of services across the Territory. The six organizations involved at that time were the Denendeh Development Corporation; Dogrib Treaty 11; Deline Land Corp; Tetlit Gwich'in Council; and Deninu K'ue Development Corporation.

In 2006, the BBA was formally structured as a Limited Partnership to administer the NSI initiative with Infrastructure Canada. As its General Partner, Falcon

Communications G.P. Ltd. manages the business on behalf of the Limited Partnership.

In 2007, SSI Micro installed a satellite-based backbone broadband infrastructure to serve NWT communities, called AirWare. The Government of Canada contributed more than $5 million for the network through the Broadband for Rural and Northern Development Pilot Program (BRAND), and SSI Micro invested more than $5 million toward the design and implementation of the broadband infrastructure (Falcon Communications, 2007). The AirWare satellite-based network now services 30 communities, as well as a residential broadband service available in Yellowknife. In terms of connectivity services, the network supports full mesh connectivity and dynamic bandwidth allocation to reduce latency and manage applications. According to SSI Micro's website: "with the goal of giving all northern resident[s] equal access to quality services we have deployed infrastructure in even the smallest of communities, some of which have as few as 55 residents" (SSI Micro, n.d., para 5).

Connectivity services delivered through AirWare are expensive and relatively slow, when compared to access levels in southern Canada. Current advertised rates include: $60 per month for 256 kbps; $120 per month for 384 kbps; and $400 per month for 768 kbps (AirWare, n.d.). As one key informant told us:

> *[Using] the term 'broadband' to describe AirWare may be a stretch. Residents in Hay River and Katlodeeche described the service as slow and unreliable, and connections made by my staff and I from our hotel through AirWare were exactly that.*
> - 17, interview

NorthwesTel, which is owned by Bell Canada, also delivers broadband infrastructure and connectivity services to residents and businesses located in the NWT (and the Yukon, Nunavut, and northern B.C. and Alberta). Its connectivity packages vary between communities in terms of availability and cost (NorthwesTel, n.d.). In many cases, if connectivity is available, prices are much higher than in southern Canada. For example, the company's High Speed Iqaluit Lite service (download speed of 512 kbps; upload speed of 128kbps) costs $72.95 per month, while the High Speed Iqaluit Ultra service (1.5 mbps; 384 kbps) costs $119.95 per month (NorthwesTel, n.d.).

In 2007, NorthwesTel and the Inuvialuit Development Corporation formed a joint venture company to provide telecommunications in the Inuvialuit Settlement Region, and a year later, the company was named Tundra Communications (NorthwesTel, 2010).

Community story: Sunchild E-Learning Centre

By Jason Woodman Simmonds

On August 19, 2010 The Sunchild E-Learning Centre celebrated its tenth year of delivering quality distance education to Aboriginal learners throughout Alberta and the NWT. The Sunchild E-learning Centre started when, "[i]n 1999, members of the Sunchild First Nation considered the lack of education in their community and decided alternative methods were needed to reach Aboriginal students" (http://www.sccyber.net/history.php). Members of Sunchild First Nation determined that Aboriginal learners in remote and rural communities, while committed to pursuing formal education, need flexible school schedules because these learners, many of whom are adults, also juggle a number of family and community obligations. Sunchild E-Learning developed a flexible virtual classroom environment as a response to these identified needs. While technology facilitates the delivery of the Sunchild E-Learning program, the program's success lies squarely in the student-centered community-based Sunchild model of education. Technologies may come and go, but the need for community-based, student-centered approaches remain consistent.

The Sunchild E-Learning Centre provides distance education in over 25 reserve communities and urban settings in Alberta and NWT. While the delivery of course content is flexible, class times are set and students log in to the virtual classroom where they can communicate with the teacher via text messaging or microphone. The virtual classrooms are accessed through computers located in community centres or schoolhouses where there are "Key Teachers" or mentors available to assist them. "In most cases, students work from a classroom environment where a Key Teacher addresses technical concerns and ensures student participation" (http://www.sccyber.net/history.php). The benefit is that students can remain in their communities while achieving their educational goals. The result of this flexible approach to learning is that Sunchild boasts an overall course completion rate of greater than 70%. Over the last two years the Sunchild E-learning program has been responsible for more than 50% of all on-reserve First Nations students who
graduated in the province of Alberta.

On top of celebrating ten years of successful course delivery, Sunchild E-Learning Centre and DeVry Institute of Technology recently agreed that Sunchild E-Learning students will have (limited) tuition free access to DeVry's courses through the Passport2College program. As the CEO of Sunchild, Martin Sacher notes: "The program is the perfect fit for our students because it gives them a tuition-free opportunity to get a head start on higher education before they even graduate high school" (DeVry Institute of Technology, 2010, para 2).

4.2 Connectivity in the Provinces

4.2.1 British Columbia

Most of B.C.'s 203 First Nations communities are located in rural or remote areas, and approximately 75% of them consist of fewer than 250 people. The size of these communities, together with the geography of the province has meant that

the business case to provide broadband infrastructure and connectivity to many of these communities has been non-existent (Fiser, 2010, p. 30; Smith, 2008).

In 2005, the *Transformative Change Accord* was signed to try to bridge the gap between First Nations and the rest of British Columbians (Transformative Change Accord, 2005). The Province of BC and a private sector teleco, Telus, negotiated the *Connecting Communities Agreement*, also in 2005, which brought better broadband infrastructure and connectivity to a number of First Nations (Smith, 2008). In that year also, the Province of BC set aside some funding for connecting the remaining First Nations and for building ICT Capacity. In the years since, other broadband infrastructure and connectivity funding has been provided by the Province of BC and by Health Canada. In addition, the provincial government has provided three rounds of *Connecting Citizens Grants* which have supported some First Nations in securing funding for distribution throughout their communities. B.C. also has a number of First Nations that will be connected using Telus Deferral Account funding.

In 2008 the provincial government of BC transferred funds to All Nations Trust Company (ANTCO) who, together with the First Nations Technology Council, the First Nations Health Council and key government advisors make up the *Pathways to Technology* project. At time of writing, the *Pathways to Technology* project has been awarded $40.8 million (Pathways to Technology, 2010). ANTCO was mandated to administer these funds, with support from the First Nations Technology Council (Ministry of Labour and Citizens' Services, 2009). ANTCO also received a commitment to additional $8 million from Indian and Northern Affairs Canada's First Nations Infrastructure Fund, to provided in fiscal years 2011-12 and 2012-13 (4, interview).

The *Pathways to Technology* project recently assessed broadband infrastructure and connectivity levels in all 203 B.C. First Nations communities, categorizing them as either 'unserved', 'underserved', and 'served'. The report concluded there are approximately 48 'unserved' communities in B.C. not yet connected to the core provincial backbone broadband infrastructure (09, interview). Some of the most remote communities are being installed with satellite-based broadband infrastructure. All but four of the satellite communities have been installed, either by BC in the National Satellite Initiative Round 1 or by a partnership between the First Nations Emergency Services Society and the First Nations Technology Council in Round 2.

In late December 2009, ANTCO signed a contract with the private sector teleco NorthwesTel to provide Internet broadband infrastructure and connectivity services to three northern B.C. communities (Iskut, Dease Lake and Telegraph Creek). In May 2010, the organization signed an agreement with the regional teleco Telus, in which ANTCO will invest $23 million to bring high speed broadband to an estimated 55 First Nation communities over the next four years. This agreement will see Telus connect these communities, many of which are in

geographically challenging areas, using fibre optic and remote radio transmission broadband infrastructure. In terms of connectivity, high bandwidth services will be run directly into community health centres and to local Internet Service Providers. The health centres will then be enabled to provide a variety of telehealth applications, while the ISPs will provide retail Internet services to the residents of First Nation communities within their service areas (All Nations Trust Company, 2010). However, at time of report publication, this funding had not yet been allocated to specific broadband infrastructure and connectivity development projects (4, interview).

INAC's criteria for the FNIF funding program included a call for applications for local broadband infrastructure and connectivity projects. In B.C., many communities submitted proposals for the fund but INAC decided to award the total funding to ANTCO (4, interview). Many of these communities hired consultants to develop their proposals. Based on the experience of the Ktunaxa First Nation, each of these proposals likely cost applicants approximately $20,000 and $30,000 to put together.

> *Many communities spent a lot of time, money and human resources to develop these proposals. This kind of proposal-driven funding process, which does not provide any support to help communities develop applications and results in communities competing with one another, is problematic.*
> - 23, interview

ANTCO also signed an agreement with the FNTC in May 2010 to use the $5 million that was allocated by BC in 2005 to provide First Nations communities with digital literacy training and support over the next five years. The FNTC has a Memorandum of Understanding with the First Nation Education Steering Committee (FNESC) who delivers the FNS Regional Management Organization services to B.C. First Nations schools. FNTC has developed a template for community technology plans to help individual communities plan their technology and human resources needs around connectivity services. The BC Chiefs have passed a Resolution that recognizes broadband and related technologies as basic community infrastructure -- equal to roads, water and sewers. Community resources developed by the FTNC include a guide based on network development in the Namgis First Nation in Alert Bay that includes a step-by-step implementation guide (Gordon, 2006). The Ktunaxa Nation's broadband network was initially conceived to disseminate the rapidly disappearing Ktunaxa language (Migone & Henley, 2009), and Maki (2008) offers an overview of the network's development.

Community story: Community Hubs and First Nations in B.C.

By Mark Matthew

When the Transformative Change Accord (TCA), the First Nations Health Plan (FNHP), and the Tripartite First Nations Help Plan (TFNHP) were signed, First Nations Health Directors and Managers in B.C. made it clear that implementing the TFNHP was not something that could occur "off the side of their desks." While the First Nation Heath Council was not resourced to fund every community and every Health Center to engage in implementation of the TFNHP, there were sufficient resources available to invest in a more coordinated approach to supporting communities. Consequently the Council responded to this issue by providing financial support for First Nations communities to take a coordinated and collaborative approach to being an integral partner in the implementation of the TFNHP. These resources have been channeled through the creation and funding of Community Engagement Hubs.

Community Engagement Hubs (CEH) provide a vehicle through which First Nations communities can partner with the FNHC, Health Authorities and the Federal Government to participate in the TFNHP. CEHs are collaborations between First Nations communities working through one agreed-upon organization that the members choose. The purpose of CEHs is to develop planning, collaboration, and communication opportunities for member communities. The focus should be on the relationships and communication processes -- NOT the 'structure'.

The formation of CEH's encourages natural collaborations based on tribal and geographical factors, and provides resources to engage extra capacity to facilitate the coordination work between communities.

Benefits of Community Engagement Hubs include:

Providing a mechanism for communities to work together - Hubs enable a group of communities (usually through their mandated health organizations) to come together to discuss various common issues and to find common solutions. For instance, once members share their respective health plan aspirations with other communities, they may find needs that each has which could be solved through a joint solution. If some of the members are all having difficulties recruiting and paying for nurses for instance, then together they can recruit nursing capacity and share the resource and the cost.

Improving the linkage with the Health Authorities - Health Authorities have a responsibility to provide their services to First Nations on and off reserve but often they find it difficult to engage with First Nations and to develop solutions for service delivery that will work for communities. The hubs provide a forum for health authority personnel to meet with a group of linked communities, to look at ways of better serving those communities. This might include arranging outpatient clinics; providing mobile screening services; working to address public health and environmental health concerns. The hub members are also in touch with community members who use health authority services and often receive a high level of feedback from patients. Hub members can provide feedback to the

health authority on issues that their communities are facing when entering hospitals and being treated there. These are problems which health authorities should remedy with the support and guidance of the hub.

Sharing Knowledge and Expertise - within the hub membership, there will be a wide range of skills and experience among the member's workforces, from management through to health service expertise. Some member communities may be advanced in their Community Health and Wellness Planning while others may be finding it difficult -- so there is opportunity to learn from one another and to help each other. Some communities may have made an arrangement with a service provider to bring them services (such as physicians or specialists) that other members can learn from and possibly adapt for their own situation. Some hubs have started their own newsletters and websites to make information sharing more accessible for the wider community.

Sharing Innovations - Many hub members have developed new ways of doing things that they have trialed and tested in their various communities. Some communities have implemented best practices and formed relationships with other stakeholders to successfully implement their service innovations -- such as the BC Cancer Agency or the BC Diabetes Association. Some communities have developed new resources and informational material for the families, schools and Band Councils in their communities. Hubs provide a mechanism for communities to share these innovations.

Providing Peer Support - Many communities are isolated and as a result the health center workforce is often isolated. Health professionals, Managers and health workers often do not have opportunity to speak with their peers from other health centers to share issues, challenges and innovations -- and to give and receive support to each other.

Improving Access to Services - Collaboration and joint planning create efficiencies, and will provide better health services for BC First Nations people. For example, where it may not be feasible to have a mental health expert in every community, the hub concept would allow for planning to have one expert available to serve the member communities of the hub. In this way, collaboration and resource sharing between the nations in a hub can fill health gaps that otherwise would not be addressed.

Improving Communications - Hubs also act as a communications vehicle, allowing the First Nations Health Council to effectively communicate in an accurate and timely manner with all 203 BC First Nations.

4.2.2 Alberta

In the Canadian prairies, the geography is not as challenging for backbone infrastructure development as it is in B.C. As a result, First Nations communities

are generally quite well served at the backbone broadband infrastructure level -- at least theoretically. The Alberta SuperNet, which was funded by the Government of Alberta in partnership with Bell Canada and Axia SuperNet Ltd, has a broadband infrastructure of fibre cables and towers that extend to connections that link 429 communities (including 402 rural communities) (Government of Alberta, n.d.). In terms of connectivity, as of 2007, SuperNet covered 95 per cent of communities across Alberta for a fixed rate, irrespective of location (Mitchell, 2007).

The AFN notes that SuperNet has been "very beneficial to Alberta's First Nations communities" (AFN Chiefs Committee on Economic Development, 2010, p. 18). However, despite its existence, not all First Nations communities can connect to the existing broadband infrastructure. The reasons why illustrate the challenges of framing First Nations broadband infrastructure and connectivity at the 'last-mile', as opposed to the 'first-mile'. Migone and Henley found the high costs of activating a point of presence (broadband infrastructure), and of maintenance and administration of local-level 'first-mile' networks (connectivity), prevented some communities from joining SuperNet (Migone & Henley, 2009). Access to equal pricing means that once a point of presence is built, the primary challenges faced by First Nations communities are a lack of community capacity to manage and administer local networks.

> *Infrastructure-wise, it's a level playing field [in Alberta], but some communities have more structured human resource capacity than others.*
> - 08, interview

The Alberta First Nations IT Regional Network, the First Nations Technical Services Advisory Group (TSAG), develops broadband infrastructure and connectivity initiatives mandated by the Chiefs of Alberta, including a three-year agreement with Health Canada to support infrastructure development for First Nations health centres in Alberta (AFN Chiefs Committee on Economic Development, 2010, p. 11). As of 2010, all First Nations community health centres in Alberta are on the fibre optic network, and have been connected to it since spring 2009. TSAG is now working to bring fibre optic cables to the local First Nations government offices, and to extend connectivity services to water treatment plants.

> *[In cases where] communities have a point of presence, or are close to it, generates new ideas for development. The Kapawe'no First Nation was able to build its own tower with the use of their First Nations Development Fund (Gaming Revenue) to construct a tower in one of their reserve communities which not only provides internet services but a professional resource to monitor its water treatment plant in that particular community which is located over 100 kilometres away.*
> - 07, interview

The Blood Tribe (a Treaty 7 community) is a unique community, since they assume self-government responsibility in areas like health and education. This government arrangement has implications for community-based approaches to broadband infrastructure and connectivity development: rather than accessing SuperNet through broadband infrastructure owned and administered by an external organization, the Blood Tribe own their fibre broadband infrastructure. One reason they can do this is because they are a highly-populated reserve -- one of the largest in Canada -- and so had enough of a market base to sustain the network's costs (08, interview).

4.2.3 Saskatchewan

The 93 First Nations in Saskatchewan have potential access to existing backbone broadband infrastructure, but are not well-serviced at present. The existing infrastructure includes satellite, DSL copper and optical fibre, depending on service availability. CommunityNet is a closed province-wide backbone with three Virtual Private Networks (VPNs) funded by the provincial government. This is in contrast to the SuperNet model in Alberta, which is an open access connectivity model. The VPNs employed in CommunityNet's approach to connectivity are designed to support public applications in education, health and government services (one for each VPN). Approximately 65 of the province's First Nations schools receive connectivity services through the CommunityNet VPN. The broadband infrastructure used by the network is working toward providing a minimum standard of 3 Mbps (full duplex), scalable to 10 Mbps (with equipment upgrades) by contracting the regional teleco, SaskTel, to run fibre infrastructure to the schools. Local equipment upgrades are needed to increase connectivity services beyond 10Mbps. The province is now working to deploy broadband infrastructure to the remaining (approximately 25 per cent) communities not yet connected. The most recent report shows the process slowed down somewhat. Approximately 33% of provincial schools are connected; all are scheduled to be completed by end of 2011 (16, interview). Communities pay a fixed rate for connectivity, with costs falling into several pricing categories based on location.

CommunityNet is a purchased connectivity service that runs on a physical broadband infrastructure built by the regional teleco, SaskTel. The service is purchased by the provincial government, (which also owns SaskTel), and uses it as an anchor tenant when putting together the business case for broadband infrastructure expansions (17, interview). In the last 10 years, Sasktel has been expanding broadband infrastructure into rural communities, and recently announced projects will support further development. On March 20, 2010, SaskTel announced it will invest $239 million in its Saskatchewan network in 2010: funding that includes $6 million in high speed Internet expansion for First Nations (dependent on federal funding) (SaskTel News Release, March 10, 2010). However, as of mid-2010, the federal government had not yet confirmed this First Nations portion of funding (KCDC FNS Operations Activity Report, p. 7).

First Nations communities connect to the CommunityNet backbone through a PoP located in a local SaskTel office. Many schools in these First Nations communities now have a connection speed of 1.5 Mbps (interview, 16). The First Nations IT Regional Network, Keewatin Career Development Corporation (KCDC) provides connectivity services by managing this system through funding from First Nations SchoolNet. As on-reserve schools, First Nations schools do not receive provincial funding to support connectivity to CommunityNet (a provincially-funded network). Despite CommunityNet's and the provincial government's mandate to connect "all schools", on-reserve First Nations schools are not included, because they are considered a federal responsibility. On-reserve schools receive some federal funding for connectivity, through programs like FNS, but it is supplied on an ad-hoc basis that makes long-term network planning difficult (interview, 16).

As of March, 2010 INAC released $400,000 for last mile optical connection upgrades to FN schools. SaskTel received this funding to implement the upgrades, and at time of writing, initial steps have been, with four schools targeted for fibre installs (interview, 14). The remaining schools are awaiting the formation of a province-wide First Nations group under the auspices of Federal of Saskatchewan Indian Nations (FSIN) and the Education Directors of tribal councils to finalize the spending of the allocated funds and organize the funding for an additional estimated $10M to complete the infrastructure expansion (interview, 14).

> *The challenge in Saskatchewan is that…SaskTel will not provide any connectivity for First Nations unless federal funding is behind it. This has resulted in First Nations being underserved compared to non-First Nations, despite [the fact] all are residents of Saskatchewan. So when SaskTel announced $239 million in upgrades, this did not include First Nations communities…These First Nations are still residents of Saskatchewan, and so they should benefit from the crown corporation.*
> - Interview, 17

Given these challenges, levels of 'first-mile' broadband infrastructure and connectivity varies between First Nations. Often, SaskTel provides high-speed DSL connections into schools, but after those initial connections are made, government funding for community broadband infrastructure upgrades is not provided and so there is not a strong financial incentive to further develop local networks, except in larger communities (16, interview).

> *SaskTel will say they have above 95 per cent coverage rate, but the last 5 per cent is mostly First Nation and a few farmers…First Nations comprise approx 1/6 of Saskatchewan's population but are still unconnected.*
> - Interview, 19

The provincial First Nations political organization, the Federation of Saskatchewan Indian Nations (FSIN), recently began working with communities on a project that

will identify the minimum, community-based standards required for broadband connectivity for public and community service applications in areas like education and health (interview, 17). Once these benchmarks are established, FSIN will partner with communities to develop locally-developed connectivity plans (interview, 17). The estimated cost is between $5,000 -- 10,000 for each community plan, with total costs approximately $750,000, with funding from Indian and Northern Affairs Canada and/or Health Canada (interview, 17).

In Northern Saskatchewan, satellite-based broadband infrastructure and connectivity services connect five remote and rural First Nations schools. However, this does not necessarily mean the rest of the community is serviced by the satellite infrastructure, and sometimes only dial-up connections are available (interview, 17).

Some communities in the Treaty 6 area have installed local wireless networks and use alternate ISPs as a replacement (interview, 16).

Community story: Keewatin Academy of Information Technology

By Nick Daigneault and Jason Woodman Simmonds

The Keewatin Academy of Information Technology (KAIT) was formed in 2003 and was formally known as the First Nations SchoolNet Academy. A division of the Keewatin Career Development Corporation (KCDC) and partner with First Nations SchoolNet (FNS), and CISCO Network Academy, as of January 2009, KAIT offers the Cisco Certified Network Associate (CCNA) Discovery curriculum, as well as the CISCO Information Technology Essentials (ITE) curriculum. In addition to delivering CISCO certified online training, KAIT also offers custom informal software skills training in applications such as Microsoft Office.

KAIT's training is done primarily through distance education using videoconferencing units and "e-learning platforms such as Adobe Connect and Elluminate" but face-to-face training options are also available. While KAIT is able to offer CISCO certification, it currently does not offer the industry-certification testing required after that training. Becoming a Pearson Vue certified testing centre is something that KAIT is considering in the long-term. Presently First Nations learners in remote and rural communities in Saskatchewan are able to utilize the video conferencing units in community centres, health centres, schools, or band-offices to begin their training in the Information Technology field thereby gaining valuable skills to support their community's IT needs. First Nations without video conferencing units are able to access the training through the aforementioned e-learning platforms.

4.2.4 Manitoba

The province of Manitoba (in partnership with Industry Canada) provided targeted investments to build a backbone broadband infrastructure to deliver connectivity

to its unserved communities. However, Fiser (2010) found that the province's major commercial teleco (MTS Allstream) has not been active in its northern high cost serving areas, which presently rely on satellite-based broadband infrastructure. He found only 16.9 percent of residents in the province's 59 CSDs received broadband/high speed services (Fiser, 2010). As is the case in other prairie provinces, southern urban communities have high speed Internet and cellular service, as do larger communities in the north and those located near industrial or utility projects.

Broadband Communications North (BCN), the First Nations IT Regional Network, works to develop community-based broadband infrastructure and connectivity in the province. In 2008, BCN expanded its provincial terrestrial infrastructure with the addition of 5 First Nation communities, and today it serves 41 rural, northern and remote communities, including 35 First Nation communities (BCN Connectivity Profile, p. 5).

> *BCN works to empower communities to operate and manage their own networks. We work with individual bands to establish local ISPs, which then sell their services to households…Numerous communities run their own community ISP, while others are too small and so don't have the capacity or population to support it. In those cases, BCN sells services to users directly.*
> - 06, interview

BCN's *Economic Development Model* promotes development models that support community-based ISPs to build local capacity in connectivity services. This "gives First Nations control over critical infrastructure and help to keep revenues within each community" (BCN Connectivity Profile, p. 10). In 2006, BCN received funding to establish 'first-mile' broadband infrastructure in 25 northern communities through Industry Canada's BRAND program and Manitoba's Rural Infrastructure Fund. Along with local broadband infrastructure, some of these communities began working together to manage connectivity across several communities by re-selling excess satellite bandwidth (01, interview). As of 2010, 14 communities in the BCN network have their own ISPs (and that number is expected to increase to 90 per cent in the next five years) (ibid, p. 11). These local ISPs sell Internet services to community homes and businesses, and offer specialized services to clients like nursing stations, schools and adult education centres. According to BCN's website:

> BCN recognizes that many communities are concerned with the leakage of money from the community and that is why a business model has been designed to offer a high quality of service while making sure the communities' money is primarily kept within the community. BCN provides the infrastructure and assistance to local ISP's while the local ISP's are responsible for individual installations, operation and maintenance of the local network (Broadband Communications North, n.d.).

The regional First Nation political organization, the Assembly of Manitoba Chiefs, recently conducted a regional connectivity-focused ICT Inventory of bandwidth data (upload/download speeds) from all 64 First Nations communities. The Inventory is not yet available for public distribution, as it must pass OCAP (Ownership, Control, Access, Possession) review and gain community permissions before being shared (01, interview). The Assembly is also building human resources capacity through training and education, and recently put in an application to Human Resources Development Canada (HRDC) for funding to train 60 people in a one-year course that will certify them in a range of ICT-related skills. The funding was announced in July 2010, and will be used to support distance education courses from the University of Winnipeg and other partners (including BCN) until 2012.

Community story: Manitoba First Nations Information and Communications Technologies Diploma

By Joan Harris-Warren and Jason Woodman Simmonds

The Assembly of Manitoba Chiefs has partnered with the University of Winnipeg, Atoskiwin Training and Employment Centre of Excellence, Broadband Communications North, Information and Communication Technologies Association of Manitoba, Clear Concepts and the Federal Department of Human Resources and Skills Development Canada to coordinate and implement the First Nations Information and Communications Technology Diploma.

According to a brochure hosted on the University of Winnipeg website, there are three program goals: (1) "to graduate 60 students by 2012." (These students will be trained in both the business and technical aspects of the ICT industry). (2) "To make sure these students have employment in First Nations communities when they graduate." (3) "To build ICT capacities in Aboriginal communities" (http://www.manitobachiefs.com/policy/education/pdf).

With corporate models for connectivity proving inadequate to the needs of remote and rural First Nations communities, having members from the communities trained in the ICT field is an important means of ensuring control of connectivity remains with local First Nations IT Regional Networks and the First Nations communities whose interests they work to represent.

4.2.5 Ontario

In 2003, the provincial government of Ontario launched *Connect Ontario: Broadband Regional Access*, a three-year, $55 million program focused on broadband infrastructure and connectivity development in rural and northern Ontario. According to the AFN, only one first Nation benefitted from this initial investment (AFN Chiefs Committee on Economic Development, 2010, p. 19). In contrast, a federal initiative launched in 1987 (Federal Economic Development

Initiatives for Northern Ontario, or FedNor) became a major investor in First Nations broadband infrastructure and connectivity in the region, including for human resources and training. FedNor was able to use the provincially funded regional broadband infrastructure projects to lever their funds to include the First Nations who were within reach of some of these construction projects. Several First Nations in Treaty 3 region were included in the Bell Aliant fibre construction projects in that region as a result of this funding strategy.

Many rural and remote First Nations in northern Ontario receive broadband connectivity services through KO-KNet, which is run by the Keewaytinook Okimakanak tribal council's KNet (KO-KNet) program. KO-KNet supports broadband connectivity for a number of applications including INAC's Ontario First Nations IT Regional Network. KO-KNet, in partnership with Nishnawbe Aski Nation (NAN), is presently negotiating with Industry Canada, the Government of Ontario's Rural Broadband and Northern Ontario Heritage Fund Corporation, Indian and Northern Affairs Canada, Health Canada, and Bell Aliant to upgrade its broadband infrastructure points of presence in 25 remote First Nations. This project will increase connectivity speeds to more than 10 Mbps with the construction of a fibre broadband infrastructure that will replace end-of-life microwave- and satellite-based infrastructure. Of the 14 communities presently served by satellite-based networks, 12 are scheduled to be served by this proposed fibre connection over the next 4 or 5 years. The official funding announcement for this project was made on November 6, 2010 (Industry Canada, 2010). In 2007, KO-KNet applied for pilot funding to set up cell phone services in remote First Nations communities, and it recently applied for funding to build 10 more cell phone service sites (05, interview).

In terms of connectivity, many of the community networks served by KO-KNet are designed in a way that enables it to pool bandwidth resources, particularly during peak operations (Fiser, 2010, pp. 30-1). KO-KNet has been described as a "model for First Nations Broadband Community Networks" and is internationally recognized for its innovative network design and approach to connectivity (Fiser et al, 2005; see also Garrick, 2004; Ramirez, 2001). For example, in 2000, KO-KNet established the largest First Nations telehealth network in Canada (AFN Chiefs Committee on Economic Development, 2010, p. 11).

Another example of a shared community-owned and operated First Nations network in Ontario is the Western James Bay Telecommunications Network (WJBTN) (Kornacki, 2010). The fibre-optic and wireless broadband infrastructure provides connectivity services to the First Nation communities of Attawapiskat, Fort Albany and Kashechewan, and enables broadband-supported educational, employment, medical and telehealth services in a cost effective manner. The $8 million project was created through a partnership between the Mushkegowuk Council, several First Nations communities, Five Nations Energy Inc., NOHFC, FedNor, Health Canada and Xittel. It was funded through a combination of public

and private funding. According to Grand Chief Stan Louttit of the Mushkegowuk Council Mushkegowuk:

> Mushkegowuk Council's vision for the First Nations to own and operate an advanced fibre optic telecommunication network is now a reality thanks to the commitment, perseverance and dedication of the many First Nations, Five Nations Energy Inc., and community leaders who started this project in 2001 and despite the challenges of securing the funding over the years, remained committed to the idea that our residents need advanced telecom services to live, learn, work and contribute in today's society (quoted in Kornacki, 2010).

Community story: On the Path of The Elders

By Stanley L. Louttit, Cle-alls (John Kelly), Elaine Keillor, and Jason Woodman Simmonds

The Mushkegowuk Cree of Northern Ontario, through a partnership with Carleton University, BlackCherry Digital Media Inc. and Pinegrove Productions, launched the On the Path of The Elders website at Carleton University's Art Gallery on March 24, 2010 (www.pathoftheelders.com/news). On the Path of the Elders offers an interactive Aboriginal history of the Mushkegowuk and the Anishnaabe peoples under Treaty No. Nine, also known as The James Bay Treaty.

The full contents of the website are available to the public. The "About Us" page welcomes visitors with the words: "Our hope is that this site enriches your life and you come to appreciate, more deeply, the history and culture of our people" (http://www.pathoftheelders.com/aboutus). The homepage of the website features links to a photo gallery with pictures from around 1905, the time of the signing of Treaty Nine. An important part of the website is the essay, "An Anishinaabe and Mushkegowuk view and understanding of the treaty." For Teachers, the site provides guides covering grades 4-10.

On the website are fifty-nine oral stories in four different dialects of Cree, (Swampy Cree, Swampy Cree with n dialect, Moose Cree, and Kashechewan Cree) collected by the linguist, C. Doug Ellis. He recorded these stories and anecdotes from western James Bay Cree Elders during the decade, 1955 to 1965. Each story has a title in Cree, English, and French along with an identification of the speaker, the Cree dialect used, an age appropriate level, a short description in English and French, as well as search tags. Thus visitors have the opportunity to hear Mushkegowuk and learn about life-styles of the past and present. Perhaps the most important part of the website is the Elder component. As part of the documenting and preserving Elder history, cultural traditions, and language, the creators of the website have provided Elder interviews and teaching about hunting, trapping and fishing. Vistors to the Elder gallery have a rare oppotunity to view the Elder videos and hear the Mushkegowuk language as spoken by the Elders of James Bay.The information and knowledge in these links is available

through the website's interactive teaching game in which players go on a quest to discover their place in a virtual, videogame community.

The design of these games aims to impart, in an innovative way, the background for the negotiations of Treaty No. Nine signed by these Peoples with the Canadian government. Each game aims to present one facet of the elements necessary to have a healthy First Peoples' community today, blending together a knowledge of aspects that can be pulled from Aboriginal traditions along with good aspects of the larger society.

The six elements are as follows and the corresponding Role-Playing Game is given in brackets:

1) Education [Canoeing Game]
2) Economy [Resource Game]
3) Security [Hunting Game]
4) Health [Healing Game]
5) Culture [Trapping Game]
6) Self-government [Negotiating Game]

The game designers and collaborators have based each level solidly on research about First People's suicide rates among youth's ages 15 to 24. In recent years, suicides in some communities have been as high 600 times above the Canadian norm, which ranks these rates among the highest on the planet. The research has indicated that self-esteem and healthy communities can reduce that suicide rate to zero (http://web.uvic.ca/~lalonde/manuscripts/1998TransCultural.pdf).

Players must successfully play in any order and complete the first five games listed, in order to proceed to the sixth one, the Negotiating Game. All six Path of the Elders game levels teach youths to esteem themselves and deeply understand First Peoples' cultures and beliefs. The first level's quest begins in a Mushkegowuck camp and the players must interact with different community members in order to decide which of the tasks they will complete first. Each task imparts traditional knowledge such as the plants used for medicine in this region. At the same time in the Healing Game the player learns that some of the larger society's health practices can be helpful. For the economy the player learns how one must care for resources in order to benefit the community rather than to produce negative results. Each task is important to the well-being of both the individual and the community.

Through completing all six paths with the embedded information the player has a greater awareness of Mushkegowuk and Anishinaabe values. The game's quest introduces youth to positive outcomes for their lives as First Peoples' community members and Canadian citizens. This is an all-win proposition.

The Eastern Ontario Regional Network (EORN) is a regional broadband infrastructure project that aims to build over 160 new Points of Presence through Eastern Ontario to provide connectivity services of 10 Mbps of speed and capacity at rates for ISPs and consumers comparable to urban areas throughout Ontario (Eastern Ontario Regional Network, n.d.). In July 2009, the project received $110 million in provincial and federal funding contributions. EORN met with KO-KNET several times to support their efforts to include five or six First Nations located in eastern Ontario.

Giiwednong Health Link is a health and information management connectivity project between Manitoulin and North Shore First Nation health organizations (http://www.giiwednonghealth.ca/). The project is focused on developing an integrated knowledge base to improve decision making, garner efficiencies and integrate into larger systems. The focus is on a means to electronically collect, manage and store health data, as well as statistics to support programming and reporting. KO-KNET provides each of Giiwednong Health Link's health centres with a secure network connection as part of its contract with e-Health Ontario (05, interview).

The Chiefs of Ontario, a coordinating body for the 133 First Nation communities located within the boundaries of the province of Ontario, has created a First Nations eHealth and Connectivity working group. This group has been mandated by the Chiefs in Assembly to develop an integrated strategy of eHealth and broadband connectivity for all First Nations in Ontario (12, interview). The group is comprised of First Nations health and connectivity experts as well as government partners. The group had its first meeting on October 6-7, 2010 and will be meeting monthly thereafter.

4.2.6 Quebec

Broadband infrastructure and connectivity development in Quebec began in 2000 with the launch of two initiatives made available at both the federal and provincial levels. The government of Quebec had a province-wide backbone broadband infrastructure deployment strategy called Villages Branchées. Open only to provincial institutions, First Nations were not eligible to apply directly or as lead into the program, but instead, were obliged to work with provincial institutions and or agencies. Given the significant demand for broadband infrastructure and connectivity services during this period, projects were significant in scope, and delays in the application process carried over until 2003-2004. It is unclear exactly how many First Nations from the Quebec region managed to apply directly to the Federal (BRAND) program, but the ability to develop these proposals and compete with projects of much greater scope made this a significant challenge from the outset.

Upon receiving its mandate as the Regional Management Organization to deliver the Schoolnet Program in 2003, the First Nations Education Council (FNEC) was

informed of only one broadband infrastructure development project that involved seven Algonquin First Nations in the Abitibi-Timiskaming area, spanning the western Quebec region. This was unfortunately the only project that FNEC was involved in. However, the project was completed in 2005, and now public and community service providers within these seven communities receive connectivity services through fiber-optic broadband infrastructure.

As the First Nations IT Regional Network, FNEC helps First Nations communities secure connectivity services to the provincial backbone broadband infrastructure. Formed in 1985, FNEC explores broadband-enabled public and community services (AFN Chiefs Committee on Economic Development, 2010, p. 7). It now provides connectivity services to 18 communities in Quebec, and is presently working on an *Internet Connectivity Initiative* to make Internet services more accessible (www.cepn-fnec.com). FNEC supports local network broadband infrastructure development, and has developed its own connectivity strategy to deploy fiber optic broadband infrastructure to First Nation public and community service providers, including the last mile improvements where feasible to do so. FNEC has completed 8 of 13 community broadband infrastructure projects, and is working to connect the remaining 5 member communities, of which 13 of 22 have been identified for improvements. In terms of residential connectivity, FNEC has seen little opportunity to acquire support for such projects, but continues to advocate to government for funding. However, its work in developing connectivity agreements with companies like Telus, enables communities to re-sell Internet services delivered through locally-owned and operated broadband infrastructure to local users. For example, a recent project funded by Health Canada enabled FNEC to work with eight communities to connect a series of buildings into a local network, which can eventually be developed into a local ISP (14, interview).

Community story: FNEC's New Meeting Software

By Jason Woodman Simmonds

In 2006 the First Nations Education Council (FNEC) announced the successful implementation of video-conferencing units in its 22 member communities. Since this time, the videoconferencing has been used for everything from Elders meetings, to education, to telehealth (http://firstnationschools.ca/node/277). While this videoconferencing equipment was designed for videoconferencing between larger groups and in this regard was perfectly suited to the delivery of course materials, or telehealth conferences, its size means that it was often located in larger facilities such as the band office, schools and health centres in the communities. Because of this location access was limited.

With an eye towards long-term sustainability, FNEC has built on the videoconferencing capabilities of the newer fibre optic network in many of the communities by introducing a new platform, Converged Management Application or CMA. According to the FNEC website, "the CMA software application allows users to simply point and click to call and collaborate with colleagues over video

from any desktop computer or laptop at any time" (http://www.cepn-fnec.com/interfaces_e/actualites_e.aspx). The CMA also connects people using a variety of communication technologies, from telephones, to webcams, to larger Polycom cams. In terms of its applications for distance education and telehealth, this means that members in the community will be able to remain in their homes, rather than vying for access to the videoconferencing equipment in community buildings. From their homes they will be able to interact with family members and friends or healthcare professionals or teachers and participate in larger conferencing on FNEC's dedicated network. As FNEC's website states it, "[u]nlike MSN and other mainstream desktop video services, the CMA service is strictly reserved for member use and can only be accessed by secure login managed at the FNEC" (http://www.cepn-fnec.com/interfaces_e/actualites_e.aspx).

4.2.7 Atlantic Provinces

Canada's Atlantic region is presently served by a terrestrial T1 (copper) backbone broadband infrastructure operated by Atlantic Canada's First Nation Help Desk (ACFNHD). Under two separate mandates provided by the Atlantic Policy Congress of First Nations Chiefs and administered by Mi'kmaw Kina'matnewey, the Help Desk provides connectivity services through IT Regional Network capacity to First Nation and Innu communities in Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland, and Labrador.

Starting in 2003, ACFNHD began building broadband infrastructure to provide connectivity to First Nations schools, and later expanded it to serve health facilities. Now it consists of approximately 50 sites with videoconferencing capabilities (roughly half in education, and half in health). ACFNHD is presently working to upgrade most connections in the broadband infrastructure from T1 to fibre, which will result in significantly higher performance, cost savings, and increased capacity. Like other First Nation regional IT networks, the Help Desk leveraged their network that was began for education to work with Health Canada to develop videoconferencing and telehealth resources for First Nations in the region (AFN Chiefs Committee on Economic Development, 2010, p. 11).

Between 2010-2012, ACFNHD is partnering with a commercial telecommunications company, Bell Aliant, to connect local broadband infrastructure networks to a PoP (Point of Presence), and support local connections between on-reserve buildings like health centres, schools and band offices. The federal government (through Health Canada or First Nations SchoolNet) is expected to cover ongoing community connection costs, $895 per month for 10 Mbps connections. However, long-term funding support for the regional network is uncertain. National First Nations SchoolNet funding has been eliminated and replaced with stop-gap funding previously used to support educational initiatives through the INAC New Paths program. RMOs, including in the Atlantic, are in an awkward positions with uncertain year-to-year funding not targeted to their specific needs.

It is expected that the 2011-2012 fiscal year will continue at a reduced level under New Paths funding until an alternative connectivity strategy is put in place. ACFNHD has negotiated 3-year service contracts for each of its member communities will Bell Aliant, which will waive termination fees for the final year if government funding ceases following the second year (First Nations Help Desk, n.d.).

5 First Nations and Inuit Communities and Federal Initiatives for Broadband Infrastructure and Connectivity

To date, there has been no strategic federal policy to develop broadband infrastructure and connectivity in First Nations and Inuit communities. This section provides a historical analysis of those federal initiatives aimed primarily at broadband infrastructure and connectivity development in remote and rural communities. However, an analysis of these government initiatives demonstrates that they are generally short-lived, under-funded, and have failed to consider the specific needs and contexts of First Nations and Inuit communities. As a result, we have an uneven and erratic path of broadband infrastructure and connectivity development support for First Nations and Inuit communities.

More generally, Canada has slipped from its early position as an international leader in broadband infrastructure and connectivity. This situation is immediately apparent in the lack of equitable access to broadband-enabled public and community services in rural and remote First Nations and Inuit communities vis-à-vis urban Canadians. This reinforces the argument why strategic federal policy in this area must reflect a community-driven 'first mile' approach.

> First Nations were rarely considered in early [broadband infrastructure and] connectivity programs. But Canada is comprised of many rural and remote communities; policy makers have always seen ICT as an answer to the country's vast size and distances, and First Nations have been quick to ensure that their needs are identified and addressed as Canada expands the level and quality of connectivity networks (AFN Chiefs Committee on Economic Development, 2010, p. 5).

This report demonstrates that First Nations and Inuit communities are early adopters of broadband infrastructure and connectivity, in spite of the lack of "first-mile" development support programs. Too often, these low population density regions are "out of sight, out of mind" for urban-located policy makers. As well, telecommunication corporations are busy competing for their urban and backbone infrastructure markets, and there is a very poor traditional business case for them to become involved providing broadband infrastructure and connectivity services to remote and rural communities. Past government programs are too often focused on backbone broadband infrastructure development, with little support for community-owned and operated broadband infrastructure. One exception to this trend was the regional economic development program, FedNor, which provided remote and rural First Nations with the funds for local 'First-Mile'-driven infrastructure development that was levered to build broadband infrastructure and support connectivity services.

5.1 Broadband Infrastructure for Community Residents and Services to Serve Remote and Rural First Nations and Inuit Communities

Remote and rural First Nations and Inuit communities are more than groupings of individual households with residents who access high-speed Internet connections. These communities include organizations, agencies, buildings and facilities that rely on high speed broadband infrastructure and connectivity to provide essential services to their residents, as discussed in Chapter 2. These communities use broadband infrastructure and connectivity to link with resources in other communities or in urban areas. For example, the First Nations Health Council enables patients in remote villages in B.C. to meet with physicians through securely managed videoconferencing connections. Middleton summarizes the public and community service benefits broadband infrastructure and connectivity makes possible:

> Broadband networks are often described as the utility of the 21st century, as important as water and electricity. Broadband connectivity can -- and I emphasize the word can -- foster social and economic development, in three main areas. First, broadband connectivity enables individual citizens to access an enormous range of services and content. Second, it allows service delivery to communities. And third, it supports and enables other infrastructures that are essential to our economy, for instance transportation systems or energy management (Middleton, 2010, p. 2).

Remote and rural First Nations and Inuit communities arguably require more bandwidth per capita than urban communities. Consider Nunavut. The Nunavut territory encompasses almost two million square kilometres, covering 20 per cent of Canada's land mass. The territory has the highest birth rate in Canada; 35 per cent of the population is under 18. In 2009, the territory boasted a real GDP growth of 8 per cent. However, the 27,000 people living there (85 per cent of whom are Inuit) live in just 25 remote communities -- with no roads linking them together. As a result, almost all travel between communities is via expensive flights. Access to secure, high quality, fast broadband infrastructure and connectivity services would offset the cost of these necessary, but expensive travel requirements.

5.2 Why Government Support is Required for Broadband Infrastructure

Federal and provincial/territorial governments have supported the development of telecommunications infrastructure and services in rural and remote regions across Canada for decades. The country's vast geographic size and challenging terrain, and its low population density, makes government support of communications infrastructure development necessary. But despite these conditions, Canadian telecommunications policies have moved towards a greater reliance on private capital to fund the construction and maintenance of broadband infrastructure. This shift comes despite evidence that highlights pricing mechanisms and infrastructure costs as a primary source of the growing 'digital divide', since private companies do not otherwise have an economic incentive to develop and deliver their services to rural and remote areas. Critics argue that rural and

remote areas, and areas of low socioeconomic status, are unattractive locations for profit-oriented commercial Internet service providers to build and maintain infrastructure, and offer connectivity services, given the low return on investment over the short term (CRTC, 2009; Migone & Henley, 2009).

> It is up to policy makers to ensure that our digital society is accessible by all, and that no one is excluded. There is still a digital divide in Canada, that is a gap between those who are already engaging in our digital society in some way, and those who are not (Middleton, 2010, p. 3).

Historically, soon after telephone companies began to offer their services, the Canadian government introduced a regulatory requirement for them to provide universal service. This meant they were required to make telephone service available to every customer living in their geographical areas; in exchange for this requirement, government offered the companies a monopoly operating position. A similar requirement was not introduced for the many competing Internet Service Providers (ISPs), and so no regulatory mechanism presently exists to force ISPs to provide universal connectivity service (O'Donnell et al, 2010). However, as of late 2010, the CRTC has held hearings on this issue, with parties like Liberal MP Marc Garneau arguing that high-speed Internet should be added to the CRTC's 'basic service objective', given is role as "the critical infrastructure that links our society in the 21st century" (quoted in Marlow, 2010).

> *If we frame [broadband development] as a private sector business case, it's not viable in small, remote and rural First Nations. The private sector gets involved when there's public funding -- they argue they can build the infrastructure, but they are not vested in the communities, and so when the funding ends, they leave…If there was a strong business case, these corporations would have been out here building infrastructure a long time ago.*
> - 5, interview

Broadband infrastructure and connectivity development in Canada is largely dependent on the viability of a business case for private sector companies. Commercial ISPs need to demonstrate a proven return on investment for their projects. However, many First Nations and Inuit communities are located in areas far from existing 'backbone' broadband infrastructure, and in some regions, such as Nunavut, there is no terrestrial 'backbone' broadband infrastructure at all. The small population of many First Nations and Inuit communities makes 'economies of scale' for connectivity services even more difficult to achieve. As Fiser writes:

> Clearly, the extent of Canada's First Nations, Inuit, and Northern households presents a small market for commercial operators…[and the regions they are located in constitute] a formidable geographic terrain…that would probably deter even the bravest team of telecommunications engineers (Fiser, 2010, p. 18).

As a result of these conditions, access to broadband infrastructure and connectivity services from private-sector providers in these communities is expensive when compared to prices in urban centres. Fiser found that an average household subscriber in the 537 First Nations census subdivisions he examined pay for more and receive less access to broadband compared to those in the CRTC's 2009 national connectivity profile (Fiser, 2010, p. 35). In 2007, Fraser similarly found that costs to access broadband in Nunavik and Nunavut can be three to five times higher than in southern urban centres -- with download capacity only a fraction of what is available in the South (Fraser, 2007). In short, according to the CRTC:

> It is clear that market forces have not been sufficient to drive affordable broadband access into rural and remote parts of Canada nor to ensure affordable broadband access for lower-income Canadians; thus, regulatory approaches could be considered. These approaches could include expanding the basic service objective to include broadband access and introducing an obligation to provide broadband access to all Canadians (CRTC, 2010a, Appendix 6).

Without the level of government involvement highlighted by the CRTC, a traditional business case for broadband infrastructure and connectivity development is unlikely in most of Canada's unserved and under-served Inuit and First Nations communities.

5.3 Historical Overview of Federal Initiatives for Remote and Rural Connectivity

Communications infrastructure development shares a long history with the political and economic sovereignty of the Canadian state. The transcontinental railroad and telephone infrastructure helped unite the country in its early years (Babe, 1990). Satellites and broadcasting links enabled Inuit and First Nations communities to develop a national (and now, international) broadcasting system that continues to meet the specific needs of local populations (Roth, 2005). These are just two examples of how communications policy-making played an important role in empowering local communities while benefitting the nation as a whole. In some ways, broadband infrastructure and connectivity development offers even more significant potential, given the public and community services it enables:

> Television brought a 'one way' view of the outside world to remote communities but did little to promote understanding or interaction among those communities and the rest of the world, or even between other remote communities. In many ways internet connectivity is much more significant, bringing with it a chance to connect in a true dialogue with the world and make 'sideways' connections with other communities (Smith, 2008, p. 5).

In such an environment, Smith (2008) argues that "the role of policy makers becomes one of supporting initiatives that have a chance of succeeding and focusing attention on the areas most in need" (Smith, 2008, p. 5). As demonstrated in Chapter 3, First Nations and Inuit communities demonstrate a history of successes in broadband infrastructure and connectivity development projects. These communities have utilized a variety of funding initiatives, strategies, and projects, usually with limited time frames and specific objectives (AFN Chiefs Committee on Economic Development, 2010, pp. 5-6; Perley & O'Donnell, 2006). This section focuses on mapping these federal department initiatives.

Community story: The Gwich'in Social and Cultural Institute

By the Gwich'in Social and Cultural Institute

As the Gwich'in Social and Cultural Institute (GSCI) website notes, "GSCI works with the four communities of Aklavik, Fort McPherson, Inuvik, and Tsiigehtchic which all fall within the Gwich'in Settlement Area (GSA)" (http://gwichin.ca). The Gwich'in Settlement Area is entirely in the Northwest Territories but is also part of a larger Gwich'in Settlement Region which includes Primary and Secondary Land Use Areas in the Yukon (http://gwichinplanning.nt.ca). This Settlement Region was negotiated in 1992 as part of the Gwich'in Comprehensive Land Claim Agreement. During this time, in response to some of the issues raised during discussions for the Land Claim Agreement, the Gwich'in Tribal Council, the organization responsible for implementing the land claim established, among other organizations, the GSCI. According to the website:

> The objective of the Institute is to conduct research in the areas of culture, language and traditional knowledge so that this body of knowledge will be recorded and available for future generations and the development of programs appropriate for Gwich'in needs.

With four offices in three communities, they rely heavily on the internet for communication, research, and file sharing to carry out its mandate, "To document, preserve, and promote Gwich'in language, culture, traditional knowledge, and values."

The GSCI currently uses digital media (as well as other media such as print) to record traditional knowledge. Their website offers a talking map with links to recordings of Gwich'in place names, content encouraging revitalization of the Dinjii Zhu' Ginjik or Gwich'in language. GSCI recently launched an extensive plant database with traditional knowledge and use of plants for food, medicine, and shelter. Plans are presently underway to develop a cybercartographic atlas of approximately a thousand named places with associated digital content. An online exhibit showcasing nine Gwich'in material culture items is also being developed in partnership with the Canadian Museum of Civilization.

Table 1: Summary of Federal Government Initiatives for Remote and Rural Connectivity

Year	Program / Organization	Description
1989	Supreme Court of Canada ruling on telecommunications	Affirmed federal jurisdiction over telecommunications
1994	Information Highway Advisory Council	Set out to build the "highest quality, lowest cost information network in the world". Establishes Industry Canada's Information Highway Applications Branch (IHAB)
1995	IHAB's SchoolNet and Community Access Programs (CAP)	Bringing the Internet to every school and library in Canada. Established the First Nations SchoolNet program in 1996
1996	*Building the Information Society: Moving Canada into the 21st Century*	Supported universal, affordable and equitable access to ICTs
1997	*Preparing Canada for a Digital World*	CAP was effective in accelerating access to the Internet, but questions remained about its long-term financial sustainability
1998 - 2008	Federal Economic Development in Northern Ontario Region (FedNor)	Industry Canada's FedNor program, as a regional economic development agency, began "filling the gaps" in connectivity
1999	Smart Communities	Provided funding for community-driven broadband infrastructure and connectivity development projects; Keewaytinook Okimakanak (KNet) was the only successful First Nations applicant
2001	National Broadband Task Force	Aimed to secure access to broadband infrastructure and connectivity services for all Canadians
2001-2004	Broadband for Rural and Northern Development Pilot Program (BRAND)	A $105 million, 3-year initiative to address the gap between served and unserved communities; based on a recommendation from the National Broadband Task Force
2001	Aboriginal Canada Portal	Combined the Gathering Strength and the Connecting Canadians programs
2002	National Satellite Initiative (Stage 1)	Distributed 2 Public Benefit Transponders. Enabled First Nations and Inuit communities to access

		satellite-based infrastructure and connectivity services
2002-2004	*Connecting Aboriginal Canadians*	United four programs: • Broadband initiative (infrastructure) • Smart Communities initiative (promotes innovative community networks) • Community Access Program (partnerships to provide public access) • First Nations SchoolNet (computer literacy and e-culture in First Nations communities) Held forums on broadband infrastructure and connectivity issues; produced reports highlighting challenges and recommendations
2003	Regional Management Organizations	First Nation SchoolNet under Industry Canada supports the development of regionally based networks to support education in First Nation communities
2004	*Aboriginal Voice Project*	A study and effort to promote recommendations on Aboriginal e-government
2005	National Satellite Initiative (Stage 2)	Improved satellite-based broadband infrastructure and connectivity for Inuit and First Nations communities
2009	*Broadband Canada: Connecting Rural Canadians*	2009 federal budget allocated $225 million over three years for broadband infrastructure development
2009	*National Digital Strategy*	Industry Canada announced consultations towards development of Canada's *National Digital Strategy*
August 2010	Telecom Decision CRTC 2010-637	Telecos must spend money in their deferral accounts to invest $421.9 million to expand broadband infrastructure and connectivity service to 287 rural and remote communities, many of which are First Nations

The Government of Canada has a long history of initiatives linked to broadband infrastructure and connectivity development. However, most of these initiatives have been short-term, ad hoc projects that First Nations and Inuit communities have successfully managed to leverage to build up their community-based

networks. Legally, the mandate is clear. In 1989, the Supreme Court of Canada affirmed federal jurisdiction over Canadian telecommunications -- around the same time the Internet became more widely available in Canada. Moreover, the *idea* of universal broadband access in Canada has been discussed since the earliest days of the Internet. In 1994, the federal government's Information Highway Advisory Council set out recommendations to "build the highest quality, lowest cost information network in the world" (quoted in Tumin, n.d., p. 7). Among the 300 recommendations made by the Council was the need for universal, affordable and equitable access, which might be delivered in satellite-served communities through programs like Aboriginal Business Canada or SchoolNet and the Community Access Program (AFN Chiefs Committee on Economic Development, 2010, p. 8). In 1996, the Government of Canada announced an action plan called *Building the Information Society: Moving Canada into the 21st Century*, which "support[ed] universal, affordable and equitable access to information and communication technology and infrastructure" (ibid, p. 8).

In the 1990s the federal government piloted two initiatives that would be integral to the ongoing development of broadband infrastructure and connectivity services for rural and remote First Nations and Inuit communities: the SchoolNet program, which provided funds to connect schools, and the Community Access Program (CAP), which provided up to $30,000 in funding for ICT equipment and community-operated Internet access sites (O'Donnell et al, 2009).

Canadians quickly embraced new digital network technologies: in 1997, Canada was the only OECD country whose citizens exhibited a measureable uptake of broadband connectivity (Middleton, 2010). Furthermore, First Nations and Inuit communities had already begun to establish their own broadband infrastructure and connectivity projects. For example, KNet in Northern Ontario was established in 1994, and between 1995 and 1998, nearly 80 per cent of First Nations schools were connected to the Internet (AFN Chiefs Committee on Economic Development, 2010, p. 9). In the North, Inuit communities began using ICTs and developing websites in the early 1980s (Alia, 2010). The 1997 Speech from the Throne included a commitment to make Canada the world's most connected nation, and until 2000 that promise seemed likely to be fulfilled. However, even then, program sustainability came into question. For example, a report released in 1997 called *Preparing Canada for a Digital World* noted that "CAP had been effective in accelerating access to the Internet, but expressed concerns about whether public access sites would be financially sustainable over the long-term" (AFN Chiefs Committee on Economic Development, 2010, p. 9).

Starting in 1998, the federal regional economic development agency in northern Ontario (FedNor) began investing in both ICTs and community-owned broadband infrastructure development. With the support of an Aboriginal Working Group, they published a *Needs and Gap Analysis Telecom Report*. Between 1998 and 2008, FedNor's programs helped facilitate community infrastructure development

and strategically leverage program funding from other federal and provincial initiatives.

In the late 1990s, the federal government's *Connecting Canadians* strategy united connectivity initiatives like SchoolNet and CAP, as well as announced new initiatives. Smart Communities, launched in 1999 by Industry Canada, was designed to support innovative, locally-driven community pilot projects for broadband connectivity (AFN Chiefs Committee on Economic Development, 2010, p. 12). While 19 First Nations groups and communities submitted proposals to these initiatives, representing 16% of the 115 proposals from across Canada submitted to this program in 1999, Keewaytinook Okimakanak (KNet) in northern Ontario was the only successful First Nations project, and "this was a one-time investment project and no further First Nations were given the opportunity to participate" (ibid, p. 13).

In 2001 Industry Canada's *National Broadband Task Force* argued that broadband connectivity could enable all Canadians to access public and community services like education, health, cultural activities and economic opportunities (Industry Canada, 2001). The *Report of the National Broadband Task Force* noted the potential impact that high-speed broadband connectivity can have for rural and remote communities in areas like economic development, health care and education. This report put forward two models for national-level broadband development policy: the *Infrastructure Support Model*, which provides government funding to network builders to increase the supply of broadband infrastructure and connectivity services for targeted communities; and the *Community Aggregator Model*, which proposes that governments invest in user-based 'demand aggregators' at the community-level to stimulate the delivery of broadband capability (Task Force Report, 2001, p. 73). The overriding vision of these initiatives, as demonstrated in subsequent federal programs like *Grassroots Canada* and *Canadian Content Online*, was to connect all Canadians.

As a result of *Task Force* report, the government developed the *Broadband for Rural and Northern Development Pilot Program* (BRAND), a $105 million, 3-year initiative to address the broadband infrastructure gap between served and unserved communities (AFN Chiefs Committee on Economic Development, 2010, p. 14). Through the program, 142 First Nations partnered with other organizations to receive an investment in capital broadband infrastructure -- a situation that still left hundreds of First Nations unserved. Furthermore, the initiative only provided a one-time investment, constraining the ability of communities to provide ongoing connectivity services. In short, despite the ambitions articulated in the *Task Force* report, many of the resulting programs were critiqued at the level of implementation as under-resourced and reliant on short-term, ad hoc funding (Alexander et al, 2009, p. 224). Put differently, they were biased in terms of broadband infrastructure development, at the expensive of sustainable connectivity. These critiques are early examples of challenges still faced today, particularly by First Nations and Inuit communities.

The Government of Canada recently endorsed the United Nations *Declaration on the Rights of Indigenous Peoples*, a stated commitment to uphold the rights of indigenous peoples. Canada has long been recognized as a leader in supporting indigenous broadcast media (Roth, 2005). Despite declining government funding of such initiatives, Alia argues Canadian programs and policies have "set international precedents and inspire Indigenous projects in many regions and countries" (Alia, 2010, pp. 83-4). However, Canada's history of successes in Aboriginal broadcasting is not paralleled in federal government support for broadband infrastructure and connectivity development. Instead, initiatives aiming to develop First Nations and Inuit broadband infrastructure and connectivity seem to reflect government interest and involvement in early planning stages, for example the National Aboriginal Connectivity Forums, but a lack of sustainable support in program implementation.

In 1999, six national Aboriginal organizations, along with federal departments, met to discuss forming an online Aboriginal-content portal and established the *Aboriginal Canada Portal* working group (AFN Chiefs Committee on Economic Development, 2010, p. 13). As a result of these discussions, in 2001, the federal government, in partnership with Aboriginal organizations, launched the *Aboriginal Canada Portal* website, and the *Connecting Aboriginal Canadians* initiative, which aimed to support ICT-enabled development objectives (Alexander, 2001). This initiative combined two existing programs: *Gathering Strength* and *Connecting Canadians*. Its vision was to include Aboriginal peoples in the knowledge-based economy and society while highlighting the unique contexts of these communities. As a result of this process "it became evident that cultural consideration is as important as improved technological infrastructure, and that governments need to tailor their support for the different approaches taken by Aboriginal people to preserve their diverse cultures" (O'Donnell et al, 2009, p. 4; see also Alexander et al, 2009). The *Aboriginal Canada Portal* website brought together links and information from more than 25 federal departments and agencies, and added to the collection and management of First Nation, Inuit and Métis-specific content on the Internet (AFN Chiefs Committee on Economic Development, 2010, p. 8). However, substantive implementation of these objectives in program delivery has been critiqued (see Alexander, 2005). For example, the AFN noted: "the Aboriginal Canada Portal website was not the source, however, to address 'broadband access' issues for the many communities with inadequate connectivity" (AFN Chiefs Committee on Economic Development, 2010, p. 13).

Between 2002-2004, the Aboriginal Canada Portal Working Group organized three national 'Connecting Aboriginal Canadians' forums to research the digital divide challenges involved in providing broadband infrastructure and connectivity to Aboriginal communities (Aboriginal Connectivity Portal, 2006), and later released a report generated by a working group of various government departments, national Aboriginal organizations and the World Summit on the Information

Society (WSIS). This report aimed to identify the main obstacles to overcoming the 'digital divide' for Aboriginal communities, and identified challenges in four areas: community awareness and ICT planning capacity; telecom (broadband) infrastructure and public access; network (connectivity) sustainability; and ICT skills and e-skills development. The group argued that community involvement, champions and input are necessary at every stage of ICT development, implementation and sustainability. As well, governments must support better coordination across departments and act as an enabler for a community-based sustainability model. A subsequent report released in 2006 by the group noted continued impediments to broadband infrastructure and connectivity. It recommended a group be formed to build, operate, and maintain a national broadband infrastructure and provide ongoing connectivity services. Some of the challenges highlighted included sustainability, jurisdictional challenges, and the ability for First Nations to drive policy development. According to the AFN:

> The connectivity conferences also represented a turning point, from a conference approach to promoting connectivity to an approach respecting Aboriginal Peoples' distinctions and clearer alignment in policy development processes constructed by technicians and leadership (AFN Chiefs Committee on Economic Development, 2010, p. 14).

In 2004, the *Aboriginal Voice* project was both a study and an effort to promote recommendations for future Aboriginal e-government initiatives (Crossing Boundaries, 2004). The project involved a round table of national and regional Aboriginal organizations, federal and provincial government officials, and Aboriginal representatives. Participants identified three pillars of e-government: to improve service delivery in a citizen-focused way; to provide information as a public resource; and to engage citizens in government. They also noted that the potential opportunities made available by ICTs might be more important to Aboriginal people than to other Canadians, given their ability to help overcome isolation (geography, size, distance) and address social, cultural and economic needs (Crossing Boundaries, 2004). In examining challenges, opportunities and empirical evidence, the roundtable tried to focus development efforts on broadband infrastructure and capacity-building in connectivity issues, in part through encouraging collaboration and partnerships.

In 2002, responsibility for overseeing program delivery of First Nations SchoolNet (FNS) was assigned by Industry Canada to a group of Regional Management Organizations (RMOs), most of which included partnerships between Tribal Councils, First Nations agencies and other organizations (AFN Chiefs Committee on Economic Development, 2010). The regionally based networks would support education in First Nation communities. Original funding levels of over $25 million that included broadband infrastructure and content development, ICT hardware and software purchased, connectivity charges and helpdesk services are now reduced to $5 million covering only connectivity services based on 2005 connections and limited helpdesk services. Beginning in 2006, funding for FNS

became increasingly uncertain, despite recognition that the RMOs (many of which now refer to themselves as First Nations IT Regional Networks to acknowledge these changes) had reduced costs and maximized program opportunities.

In 2003 and 2005, two rounds of funding linked to the National Satellite Initiative (NSI) enabled First Nations and Inuit communities to set up satellite-based broadband infrastructure in remote northern communities. The $155 million project enabled 27 First Nations communities (more than half of which located in B.C.) to access satellite-based broadband infrastructure. This program also helped the Northern Indigenous Community Satellite Network (NICSN) provide connectivity services to 43 communities in northern Ontario, Manitoba and Quebec. In 2005, the AFN resolved to work with NICSN to advocate Industry Canada for funding to purchase two public service transponders that would provide sustainable broadband infrastructure and delivery of connectivity services (AFN Chiefs Committee on Economic Development, 2010, pp. 15-6). The NSI program also funded Inuit-led initiatives in NWT and Nunavut that resulted in the development of broadband infrastructure provided by the Qiniq and AirWare networks. These projects are discussed in more detail in Chapter 3.

In 2006, the Pacific Community Networks Association published a report called *New Opportunities for Canada in the Digital Age: Recommendations on the Future of the Community Access Program* (Pacific Community Networks Association, 2006). The report pointed to existing broadband infrastructure and connectivity services funded through the CAP program, which "placed community technology resources in the hands of over 3,000 rural and urban communities" (Pacific Community Networks Association, 2006, p. 3). However, it noted the program suffers continued reductions in funding. The report proposed that the Canadian government develop a cross-departmental strategy to make full use of Canada's community-based connectivity assets: "a Digital Opportunities Strategy that is national in scope is the most cost-effective and efficient means to sharpen Canada's competitive edge while increasing the well-being of communities" (Pacific Community Networks Association, 2006, p. 4).

This historic analysis demonstrates that despite recognition and early support of universal broadband infrastructure and connectivity, federal initiatives have failed to adequately support sustainable community-based development in First Nations and Inuit communities -- and for Canadians more generally. Those remote and rural communities with the capacity to move forward began constructing solutions but the majority of First Nation and Inuit communities remained unserved, in part because government initiatives were consistently under-resourced and short term in nature.

> Canada was once a leader in broadband provision, but the shortsighted design of the 1990s policies meant that many providers pulled out of less financially viable regions once government subsidies were no longer

> available. In addition, funding for projects which supported education and digital inclusion projects were cut (Tapia et al, 2009, p. 357).

A large number of researchers support this interpretation of the failure of Canadian federal broadband infrastructure and connectivity initiatives. Geist writes that "industry watchers point to the late 1990s as the last time Canadian digital policy was driven by a cohesive plan" (Geist, 2009, para 3). As of December 2009, Canadians ranked 9th among OECD countries for broadband uptake (Middleton, 2010). Alexander et al write: "Canada's Connecting Canadians initiative no longer headlines the federal policy agenda, after a decade on the chopping block under both Liberal and Conservative federal administrations" (Alexander et al, 2009, p. 224). Furthermore, there is evidence of ongoing reductions in funding support for these initiatives, despite widespread recognition of their successes. In 2008, the federal government announced further cuts to digitalization programs (for example $11.7 million in cuts to Canadian Memory Fund). The government has twice cut, and then re-instated, funding to CAP. Other funding programs, like the National Satellite Initiative's support to NICSN and First Nations SchoolNet, continued to receive short-term funding that is only renewed on a year-over-year, project-focused basis, despite long-term evidence of program successes from government and academic sources(INAC, 2009). In sum, it appears that a long history of federal government initiatives for First Nations and Inuit broadband infrastructure and connectivity planning is undermined by a lack of sustained policy implementation.

Community story: Grunt Gallery, Beatnation and Online Aboriginal Hip Hop Youth Culture

By Jason Woodman Simmonds

Beat Nation and Grunt Gallery: Hip Hop as Indigenous Culture, based in Vancouver B.C., is a virtual community featuring young Aboriginal artists from across Canada, the United States, and South America with one First Nations artist, Ron Harris (Ostwelve), connecting his work with Indigenous movements in South Africa. The website is produced by Grunt gallery, a Vancouver based artist run centre that has a twenty year relationship with First Nations communities as programmed artists, staff and board members. Curated by Tania Willard and Skeena Reece, as Program Director Glenn Alteen notes, Grunt Gallery "encourages an interface between Aboriginal artists working in Contemporary Art and the wider Canadian Contemporary Arts communities" (email correspondence). Thus the gallery and website feature several different artistic mediums, from rap and music through to painting (such as graffiti art) and sculpture, as part of an Aboriginal Hip Hop youth movement and includes Aboriginal artists from BC, Saskatchewan, Manitoba, and Newfoundland First Nations.

The website (created by Cree artist Archer Pechawis from Mistawasis First Nation, Saskatchewan) is itself a living piece of hip hop art maintained curators Tania

Willard and Skeena Reece. Indeed Pechawis runs his own web design studio which is an industry leader, All Nations Media, out of Vancouver BC. The featured artists on Beat Nation are too numerous to mention, but there are a great many examples of these young artists embracing their traditional cultures through hip hop. One such example is filmmaker and programmer Kevin Lee Burton (Swampy Cree), from God's Lake Narrows, MB. Among his numerous productions, Burton has produced a video and a series of still photos called Nikamowin (or song), a production on the importance of maintaining nehiyawayawin (or Cree language). Beatnation is one of several sites Beatnation.org is one of nine productions developed by Grunt Gallery and designed by Archer Pechawis in the last five years. As with Beatnation, these Grunt Gallery productions provide an important venue where Aboriginal youth can express the visions of their lives and communities. As more youth in remote and rural communities gain internet access they will be able to participate in such youth movements while remaining in their communities.

5.4 Current Federal and Territorial Government Initiatives that Support First Nations and Inuit Broadband Infrastructure Development

The previous section focused on an historical analysis of past federal initiatives that support broadband infrastructure and connectivity development in First Nations and Inuit communities. This section summarizes current initiatives that these communities are accessing funding from when developing their community-based projects.

Table 2: Summary of Current Federal Initiatives for Rural and Remote Connectivity

Department	Program
Indian and Northern Affairs Canada	Aboriginal connectivity strategy (in development, not yet released)
Industry Canada, Canadian Heritage and Human Resources and Skills Development Canada	National Digital Plan (in development, not yet released)
CanNor	Northern Digital Opportunities Strategy (in development, not yet released)
Industry Canada	Broadband Canada: Connecting Rural Canadians
Industry Canada (recently moved to Indian and Northern Affairs Canada)	First Nation Infrastructure Fund (FNIF)
Industry Canada and Infrastructure Canada	National Satellite Initiative – Part 1 and Part 2
Health Canada	First Nations, Inuit and Aboriginal Health: e-Health Solutions Unit
Heritage Canada	Gateway Fund

CRTC	Telecom Decision CRTC 2010-637
Industry Canada	Community Access Program

5.4.1 Aboriginal Connectivity Strategy (INAC)

Indian and Northern Affairs Canada (INAC) has been tasked with developing an Aboriginal connectivity strategy. Although INAC began supporting the First Nations SchoolNet program in 2006, the department has only had authority over broadband infrastructure and connectivity development as of 2009, when it became part of the broader First Nations Infrastructure Fund (FNIF) portfolio (4, interview). However, this new program responsibility has not yet been accompanied with any new funding.

The Aboriginal connectivity strategy is still just a concept, as nothing has yet been publicly released. It is not clear if and how it will be connected to Industry Canada's *National Digital Strategy* (discussed below). It is also unclear if the strategy will address broadband infrastructure, connectivity services, or both. Furthermore, there have to date been no opportunities for First Nations and Inuit groups to participate in the development of the strategy through targeted, formal consultations.

5.4.2 National Digital Plan (Industry Canada, Canadian Heritage and Human Resources and Skills Development Canada)

In June 2009, Industry Canada announced plans to develop a *National Digital Strategy*. Other federal departments linked to the development of the *Strategy* include Canadian Heritage and Human Resources and Skills Development Canada (Government of Canada, 2010). The creation of the plan is supported by the recommendations in a recent report by the Senate Standing Committee on Transport and Communications called *Plan for a Digital Canada*. The report recommended a strategy for an inclusive digital society, along with a new Minister of Digital Policy, and the deployment of a national broadband network that could deliver essential digital services to all citizens.

Shortly after announcing its plans to develop a *National Digital Strategy*, Industry Canada opened public consultations for "feedback from all interested parties on priorities and targets" (Industry Canada, 2010a, para 8). One of the consultation's five discussion themes was: Building a World-Class Digital Infrastructure, which included mention of rural and remote communities (Industry Canada, 2010b, p. 2). However, nowhere does this initial consultation paper refer to the unique needs of First Nations and Inuit communities, in terms of broadband infrastructure and connectivity services (Industry Canada, 2010c). This oversight fails to consider the conclusions of evaluations of programs like the *Aboriginal Canada Portal* (Anderson, 2005). Furthermore, it represses the long history of successful First Nations and Inuit community-based communications infrastructure and services development, which stretches at least as far as the

Wawatay Native Communications Society's 1974 efforts to establish a community radio system (O'Donnell et al, 2010; see also Alia, 2010; Roth, 2005).

5.4.3 Northern Digital Opportunities Strategy (CanNor)

In 2008, the Speech from the Throne announced the creation of a new stand-alone agency focused on northern economic development, a key deliverable under the government's *Northern Strategy*. In 2009, the Canadian Northern Economic Development Agency (CanNor) was provided with $50 million over five years to "to help provide the foundation for a prosperous economic future for those who live, work and support their families in the North" (Canadian Northern Economic Development Agency, n.d.).

As of June 2010, CanNor's ICT Working Group began working towards defining and establishing a northern-focused 'Digital Opportunities Strategy' to assist in developing an Agency ICT policy and strategy. This strategy aims to: strengthen northern ICT tools; address the communications needs of the North within the federal context; facilitate the planning and delivery of communications technology and digital literacy among citizens in the north; allow market forces to function where and when possible; and acknowledge government's role in ensuring northern residents possess the skills, knowledge and tools required for full participation in the global economy. Part of the strategy involves identifying the communications infrastructure and capacity requirements needed for effective community and economic development. The lead-up to the strategy builds on several recent meetings, including the Northern Communications and Information Systems Working Group (NCIS WG). Members of this group include Government of Canada departments like Justice, Fisheries, Environment, Indian and Northern Affairs Canada, Canadian Space Agency, Public Safety and Human Resources and Skills Development, as well as representatives from Territorial governments. The premiers of the Yukon, Northwest and Nunavut Territories are also linked to these developments. The premiers published a communiqué on May 14, 2010 that stated they "agreed that reliable connectivity to satellite transmission across the North is essential for the continued economic and social development of northern communities and they urged the federal government to continue to support that policy" (24, interview). The communiqué also noted the opportunities for significant partnerships between the territorial premiers and CanNor:

> One area of focus is telecommunications. The premiers discussed the opportunity of identifying ways to enhance telecommunications to support services such as healthcare, justice and education and directed their governments to formalize a pan-territorial policy working group on telecommunications (Northern Premiers' Forum, 2010, p. 2).

Substantive program funding to support this work has not yet been released. Infrastructure Canada has a $225 digital program, which has announced local-level projects. The Territories have connectivity on their agenda, but have not taken substantive action. CanNor is funding a survey of northern government

departments and communities that will identify existing communications capacities and infrastructure across the north and identify future needs.

5.4.4 Broadband Canada: Connecting Rural Canadians (Industry Canada)

The federal government's 2009 budget allocated $225 million over three years to Industry Canada *Broadband Canada: Connecting Rural Canadians* program (Industry Canada, 2009). The first round of 52 funded projects will bring broadband access to an estimated 169,000 households (Industry Canada, 2010c). According to the AFN:

> Several First Nations and networks have applied for funding from this new program. Neither the AFN not individual First Nations were invited to provide input into the selection criteria and procedures for this particular fund. As of the writing of this report [March 31, 2010], it is unknown how many First Nation-specific projects will be funded (AFN Chiefs Committee on Economic Development, 2010, p. 18).

5.4.5 First Nations Infrastructure Fund (formerly Infrastructure Canada; recently shifted to INAC)

Infrastructure Canada was established in 2002 as a federal department to support and facilitate infrastructure development initiatives, and in 2007 was mandated to oversee the *Building Canada* initiative, a seven-year (2007-2014) plan linked to public works projects in communities. The First Nations component of this initiative, a five-year, $131 million First Nations Infrastructure Fund, did not initially specifically address broadband infrastructure (AFN Chiefs Committee on Economic Development, 2010, p. 17). While broadband infrastructure and connectivity is included within the program's areas of responsibility, this inclusion was not initially accompanied with any new funding. Responsibility for the First Nations component of this program recently (2009) shifted from Infrastructure Canada to Indian and Northern Affairs Canada.

5.4.6 National Satellite Initiative – Part 1 (Industry Canada) and Part 2 (Infrastructure Canada)

First Nations and Inuit satellite-based broadband infrastructure projects were created in large part through two rounds of funding under the National Satellite Initiative (NSI). Forty-three remote Inuit and First Nations communities, and two non-First Nations or Inuit communities in the northern regions of Quebec, Ontario and Manitoba receive Internet services through the Northern Indigenous Community Satellite Network, (NICSN). In 2002, communities in Nunavut, NWT and northern Ontario began sharing satellite bandwidth provided through a Public Benefit Transponder. In 2003, NSI allocated a second Public Benefit Transponder to NICSN to provide connectivity services to public institutions in 43 communities. NSI also funded one project in Nunavut ($7.83 million to provide broadband service via satellite to all 25 communities), and one project in NWT ($7.0 million for 31 communities in NWT). These territorial projects are guided by boards of

directors that include First Nations and Inuit representatives, but are owned and administered by a commercial organization, SSI Micro.

In 2007, Infrastructure Canada announced funding for NSI Part 2. This second round of NSI funding would improve connectivity services by adding more transponders and bandwidth to the existing satellite-based broadband infrastructure.

Despite evidence of the success of these projects in achieving economies of scale, network efficiencies, and strong, long-term partnerships across geographic and jurisdictional boundaries, the satellite-based broadband infrastructure and connectivity services are in danger of losing core funding. In one key informant's words: "The trend appears clear: lower funding for less stable lengths of time" (interview 15).

5.4.7 First Nations, Inuit and Aboriginal Health: e-Health Solutions Unit (Health Canada)

Health Canada's First Nations and Inuit Health (FNIH) is responsible for providing health care for First Nations and Inuit peoples. Its e-Health Solutions unit develops programs in "support of e-Health infrastructure to ensure that First Nations and Inuit communities are connected and informed" (Health Canada, n.d.).

5.4.8 Gateway Fund (Heritage Canada)

The Department of Canadian Heritage, through Canadian Culture Online, recently launched a targeted call for proposals under the *Gateway Fund* to increase access to diverse online Canadian cultural content, including projects presented by and with content about Aboriginal Peoples (Canadian Heritage, n.d.). According to the *Fund's* website: "the applicant's main role must be to serve one or more Aboriginal communities and it must be active in promoting the culture of that (those) community(ies)" (ibid).

5.4.9 Telecom Decision CRTC 2010-637 (CRTC)

In August 2010, the CRTC approved Telecom Decision CRTC 2010-637, which states that telephone companies must spend the money in their deferral accounts to invest $421.9 million to expand broadband Internet service (broadband infrastructure and connectivity) to 287 rural and remote communities, many of which are First Nations. Any remainder funds are to be rebated to existing customers who live in non-high-cost serving areas (which excludes many rural and remote First Nations customers from receiving these rebates, given they are living in communities designated as 'high-cost' serving areas) (CRTC, 2010b). The CRTC-approved plans provided by the major telcos do not include any First Nations located in designated high cost serving areas in northern Ontario.

5.4.10 Community Access Program (Industry Canada)

In the mid-1990s, Canada's CAP program was used as a model for many of member states in the European Union (Pacific Community Networks Association, 2006). Our key informants told us that CAP sites play an important role for many First Nations communities in B.C. that do not yet have widespread local-level broadband infrastructure and connectivity services, and the program is widely utilized among Inuit communities in the North.

However, while some European nations built upon the CAP model and incorporated it in robust, nationally-oriented broadband strategies, "funding for CAP in Canada was reduced, government utilization of the infrastructure was limited, and the program lagged in adjusting its mission and evaluative criteria to the changing realities of ICT in Canadian society" (Pacific Community Networks Association, 2006, p. 10; see also Smith, 2008). In March 2010, funding cuts to CAP resulted in public outcry and (temporary) restoration of funding (Middleton, 2010, p.4).

A forthcoming history of the CAP program that is presently in draft form (Moll, forthcoming, 2011) notes how after 2007-2008, it no longer appeared in annual departmental performance reports filed by Industry Canada with Treasury Board. Another shift occurred during fiscal year 2009-2010, when funds allocated for CAP from a $225M infrastructure fund designed to extend broadband coverage to rural and remote areas, rather than from the Regional Operations branch budget. Rather than a fund to support ongoing connectivity services, the $225M infrastructure fund was shifted to the federal government's Economic Action Plan, which focused on physical infrastructure construction projects. This shift was also apparent in March 2010, when CAP administrators across Canada began receiving letters advising them their funding would be terminated at the end of that month, unless their sites were located more than 25 km from a public library (Moll, forthcoming, 2011). The CAP community responded by contacting MPs and the media, and the issue was raised during Question Period by members of all three opposition parties in the House of Commons. According to Moll (forthcoming, 2011):

> In a quick turn about, Industry Minister Tony Clement announced that there had been a bureaucratic misunderstanding and that the funding had never really been withdrawn. The program was good for another year but again funded through the temporary "Connecting Rural Canadians" infrastructure program (forthcoming, 2011).

Funding for the broadband infrastructure-focused *Connecting Rural Canadians* program is presently scheduled to end on March 31, 2011.

6 Why Current Federal Initiatives are Not Working for First Nations and Inuit Communities

This chapter highlights the key challenges First Nations and Inuit communities face with existing government initiatives for broadband infrastructure and connectivity development. As discussed in the previous chapter, over the years a number of different initiatives were put in place in an attempt to improve broadband infrastructure and connectivity in remote and rural parts of the country. Building on past research, this chapter draws from reports put forward by government, First Nations and Inuit organizations, and from interviews with 23 key informants from across Canada. The findings in this section may be useful for policy makers working towards programs like the Aboriginal connectivity strategy (INAC) and *National Digital Plan* (Industry Canada).

Challenges are organized in three categories: government approaches; relationships between government and First Nations and the Inuit; and funding frameworks.

Table 1: Summary of Challenges with Existing Government Initiatives

Ineffective Government Approaches	Lack of Support for Community-based Broadband Infrastructure and Connectivity Projects
	'Siloed' – Not Holistic
	Federal Government's Definition of 'high-speed' Internet
	Increased Responsibilities for Connectivity without Increased Funding
	Canadian Government Defaulting to Private-sector Telecos
	Lack of Community Input in Broadband Infrastructure Design and Connectivity Services
	Ignoring Program Evaluations that Demonstrate Efficiencies and Effectiveness of Community-Based Broadband Infrastructure and Connectivity Projects
Inappropriate Funding Frameworks	Short-Term Funding Models
	Project-Based Funding Models
	Unrealistic Requirements by Funding Bodies
	Communities Competing for Funding
	Funding Evaluation Frameworks
	Canadian Government Defaulting to Lowest-Cost Technical Solution
	Human Resources Capacity
	Need for Separate Funding to Support Both Broadband Infrastructure and Connectivity Services
Unequal Government	Political Uncertainties

to Government Relationships	Jurisdictional Issues
	Lack of Community Participation in Policy Development

6.1 Ineffective Government Approaches

The literature and interviews identified seven critiques of current government approaches to connectivity initiatives for First Nations and Inuit communities.

6.1.1 Lack of Support for Community-based Broadband Infrastructure and Connectivity Projects

Research and key informants critiqued existing government approaches as failing to recognize and support the many innovative development projects already going on in First Nations and Inuit communities. Key informants told us that existing government initiatives are overly centralized, and do not provide adequate resources or a long term strategy that might effectively support remote and rural broadband infrastructure and connectivity development.

This argument is based in a 'Community Informatics' approach to policy-making (Gurstein, 2007). Community Informatics holds that decentralized, local, participatory government structures for broadband infrastructure development and connectivity services are best equipped to meet the needs of communities. For example, in their summary of the Keewaytinook Okimakanak Remote Water and Wastewater Monitoring Initiative, Gurstein, Beaton and Sherlock (2009) write that:

> Rather than attempting to identify or create the desired service providers, the authors of the program undertook to redefine the nature of the service to be provided -- so that it could be redesigned in such a way as to be appropriately provided by those already resident in the community and thus likely to be retained in the community (Gurstein, Beaton & Sherlock, 2009, para 38).

Existing approaches force communities to adapt to the pre-determined requirements of already-existing technological policies and practices. In contrast, an approach based in Community Informatics asks how technological policies and practices can be designed to meet the needs of communities.

> *We need a high-level goal…a mandate [that] would then enable individual communities in each region to develop solutions to their own unique challenges.*
> - 15, interview

6.1.2 'Siloed' – Not Holistic

> *The government does not have a strategic, unified vision for ICT development…Sometimes we end up applying for different programs that could be better harmonized. For example, funding for Health-related infrastructure has to link to health centres and Health Canada -- but that same infrastructure could also be used for education.*
> - *14, interview*

Existing federal approaches to broadband infrastructure and connectivity services are critiqued as being 'siloed' between government departments. Rather than approaching these issues holistically, federal departments like Indian and Northern Affairs Canada, Health Canada, and Heritage Canada treat them as mutually-exclusive departmental responsibilities. Rather than collaborating to share limited resources, some departments remain attached to (and protective of) program funding and related jurisdictional authorities (02, interview). As a result, broadband infrastructure and connectivity initiatives can become duplicated and fragmented across government departments (Migone & Henley, 2009, p. 140). The AFN writes that "the 'silo' effect and vertical structure of most initiatives mean communities are responsible for writing numerous proposals, developing partnerships, finding bridge funding for projects…[and so on]" (AFN Chiefs Committee on Economic Development, 2010, p. 22).

> *In terms of government funding, if we get $4 million from Industry Canada, we can't get more than $2 million from other federal agencies, like Health Canada. (Federal stacking rules prevent projects from being more than 75 per cent funded by federal funds.)*
> - 03, interview

Even within federal departments, connectivity issues are de-contextualized from the socio-cultural, political and economic realities of communities. This was one finding in Alexander's (2005) examination of the *Connecting Aboriginal Canadians* initiative. She critiqued existing approaches to e-government development in Canada, arguing that "e-government has not been developed in ways that advance social equality and social justice" (Alexander, 2005, para 1). The government's abandonment of initiatives like the *Aboriginal Digital Opportunities Initiative* and the under-resourcing of others, like the *Community Access Program*, have augmented the democratic deficit and exacerbated the digital divide (ibid). Critics argue that current approaches focus on measures of 'efficiency' and 'flexibility', but they ignore basic access problems.

As discussed in Chapter 3, there are many examples of partnerships between multiple federal departments, provincial governments and the private sector that have contributed to common broadband infrastructure and connectivity initiatives. For example, the regional economic development program for northern Ontario (FedNor) was successful in bringing different departments together to contribute

to a local and regional broadband infrastructure projects. Such projects tend to accommodate community needs and priorities and bring together different partners.

Researchers and key informants argue that broadband infrastructure and connectivity services are best framed as a holistic tool used for a variety of applications, rather than a specific tool linked to individual federal departments and their associated responsibilities. Similar to other elements of core public infrastructure like roads or water utilities, broadband is a 'neutral' infrastructure that delivers core public and community services like education, health and economic development.

> *We argue that broadband infrastructure should be funded specifically by Industry Canada, as a ubiquitous element of basic infrastructure, like roads or water management. But that's not happening -- it's being imposed on communities through a variety of ad-hoc applications.*
> - 06, interview

6.1.3 Federal Government's Definition of 'high-speed' Internet

The Government of Canada's existing technical definition of 'high speed' Internet is outdated and inadequate. Its current recognition of 1.544 Mbps as 'high speed' is significantly lower than other OECD countries such as Australia, Finland, Spain, and England (Fiser, 2010, pp. 39-40). In fact, some so-called 'developing' countries, such as Guatemala and Egypt, have faster benchmarks for 'high speed' Internet than Canada (4, interview). This minimum service definition is also obsolete within Canada, where urban-based Internet service providers already offer speeds up to 20 Mbps; almost 15 times faster than the existing definition. In the Northwest Territories, the government definition of 'broadband' Internet is even slower. According to the Canada -- Falcon Communications GP Ltd. CSIF Agreement for Northwest Territories Broadband (2005-06 - 2014), dated November 22, 2005, 'broadband' is defined as "data transfer speeds greater than 512kbps", while minimum standards of 'high-speed' Internet service to be made available to End Users are 9.8 mbps of data transfer capacity available through the broadband connection, for the exclusive use of end users; access to the global Internet); a non-routable IP address; and access to ISP services like e-mail. In short, despite the reality of ever-faster Internet access and applications that require increasing amounts of bandwidth to function, the government's formal definition of 'high speed' Internet still follows a benchmark set almost a decade ago.

> The Government of Canada presently refers to 1.5 Mbps inbound as a target baseline for broadband policy. This baseline does not represent a universal service obligation, and it presents a fairly moderate policy perspective when compared to the pledges and benchmarks of other OECD nations (Fiser, 2010, p. 8).

The 2001 *Report of the National Broadband Task Force* recognized the danger of defining broadband in terms of specific information transmission rates. The reasoning was that doing so would be counter-productive, given the rapid development of technology: "what is considered fast today may be considered slow in six months' or one year's time" (Report of the National Broadband Task Force, 2001, p. 1). However, the current office definition of 'high speed' broadband in Canada vis-à-vis other countries indicates that this flexible definition has failed to support the development of broadband infrastructure and connectivity services that have kept pace with increasing technological standards. For example, in the 2006 report of the *National Aboriginal Connectivity and E-Services Forum*, participants "stated that a basic level of connectivity was not effective to run the operations that were needed at the community level and this should not be the base criteria to determine if a community was connected or not" (National Aboriginal Connectivity and E-Services Forum, 2006, p. 22). As one key informant noted: "government agencies/departments are saying that 1.5 Mbps is fine -- but that definition won't support videoconferencing and other applications" (2, interview).

Another problem with this 1.5 Mbps measure is that it is designed for residential broadband-enabled services. Since it focuses on individual households and not broadband-enabled public and community services, it does not address the more bandwidth-intensive requirements necessary to support the services most First Nations and Inuit communities hope to gain more access to. Internet-only residential satellite and wireless broadband infrastructure and connectivity services are often not capable of delivering the dedicated secure circuits required for managed applications such as eHealth and videoconferencing.

Critics argue the government's existing definition of 'high speed' Internet must be further refined to recognize asymmetrical differences between upload and download capacities. In fact, Middleton writes that since the government's definition was introduced in 2001, "the recommendation for symmetrical speed -- that is equal capacity to upload information as well as download it -- is no longer in place" (Middleton, 2010, pp.6-7). This issue is a key technical challenge in managing satellite-based bandwidth, which typically has much faster downlink than uplink speeds. Having control over the satellite transponder gives a lot more flexibility and the ability to configure it to be more suited to management bandwidth upload -- as partners in projects such as the Northern Indigenous Community Satellite Network have found.

> *I estimated that [in Northern Quebec] we get services 100 times slower on download and 10 times slower on upload than urban centres in Canada. For me to deliver the same services that are common in Montreal, it would cost $4,000 - $6,000 a month per user. No-one will pay that. And as Internet services get more bandwidth intensive, this [cost] will increase.*
> - 15, interview

For these reasons, the Government of Canada should reconsider its definition of 'high speed' Internet.

6.1.4 Increased Responsibilities for Connectivity without Increased Funding

First Nations and Inuit communities are taking on increased responsibilities in the development, maintenance, administration and in some cases, ownership of broadband infrastructure. However, these increased connectivity responsibilities are rarely met with accompanying funding increases. For example, many First Nations IT Regional Networks started as Regional Management Organizations to deliver education-based services through First Nations SchoolNet, are now also managing connectivity in areas as diverse as justice and health. However, their monthly connectivity costs are still located in and restricted to the education budgets of First Nations communities.

This challenge is apparent across federal government departments too. For example, Indian and Northern Affairs Canada (INAC) recently began coordinating broadband infrastructure development in First Nations communities through the First Nations Infrastructure Fund (FNIF). However, this new departmental responsibility was not accompanied with any new dedicated funding for connectivity: the category of 'connectivity' joined the existing infrastructure fund, which also includes areas such as water and roads (02, interview). The problem is that there is not enough funding available to provide adequate connectivity services for communities, which should include dedicated infrastructure funding for housing, water, broadband and so on.

6.1.5 Canadian Government Defaulting to Private-sector Telecos

When developing broadband infrastructure and connectivity projects, the Canadian government will almost always default to commercial telecos to build and manage networks. However, there is an inherent tension in this approach based on the business logic employed by for-profit organizations. As discussed earlier, rural and remote communities with low populations do not yield short-term profits, sometimes to the detriment of sustainable community-based development projects (06, interview). For example, Broadband Communications North recently purchased unused broadband infrastructure from a commercial organization in two northern Manitoba towns that lay dormant after the organization had finished construction.

6.1.6 Lack of Community Input in Broadband Infrastructure Design and Connectivity Services

Approaches to broadband infrastructure design and connectivity services reflect differences between 'last-mile' and 'first-mile' development. If an external organization is recruited to design and implement broadband infrastructure and

connectivity services, they often present a pre-designed plan to the community. The community then offers its input on an already-existing design -- an approach that puts community input 'last'.

> *Currently, we submit a proposal to match a bid put out by Industry Canada, and (if approved) the government then finds vendors to work with them (who are typically chosen at lowest cost). But we can't design the networks ourselves. Once the vendors are involved, they tell us their design requirements. This shouldn't happen -- we shouldn't be involving the private sector in this stage of the process. Instead, we should be able to propose a design, and then after that design is approved, send out the RFP.*
> - 06, interview

In contrast, broadband infrastructure and connectivity planning can be approached by first asking the community to articulate local-level needs, and then building a plan from those needs (the community is consulted 'first'). The example of SaskTel, the local incumbent and crown corporation in Saskatchewan, illustrates the 'last-mile' paradigm of community-based broadband infrastructure and connectivity services. SaskTel partners with First Nations communities to access government funding to connect to the provincial backbone broadband infrastructure through a point of presence, most often a school (interview, 16). This entry point is then used to construct a 'last-mile' local network for residential users. Much of the broadband infrastructure development is planned and implemented by SaskTel. While they do involve First Nations by asking feedback on network designs, SaskTel, not First Nations communities, make most decisions (interview, 16). As one key informant put it:

> *Sasktel partners with First Nations to approach the federal government to acquire funds to develop Sasktel's infrastructure -- but there is no community ownership of the resulting infrastructure.*
> 19, interview

A 'first-mile' approach would enable a broader basis of participation and in some cases, local ownership of the local broadband infrastructure. It would also support community-involvement in the design of connectivity services.

6.1.7 Ignoring program evaluations that demonstrate efficiencies and effectiveness of broadband infrastructure and connectivity projects

As discussed in previous sections of this report, repeated program evaluations of the First Nations SchoolNet by both Industry Canada and Indian and Northern Affairs Canada, demonstrated how the RMOs and the program have successfully introduced, constructed and supported broadband infrastructure and connectivity services in First Nations across the country. The efficiencies and effectiveness of the RMOs in partnering with the First Nation schools and the communities was

clearly documented in comprehensive mid-term and final program evaluation reports. And yet, the government has limited and frozen the funding for these broadband infrastructure developments at 2005 connectivity levels for First Nation schools across the country. In the majority of the First Nations, this means the schools are supposed to be delivering bandwidth-intensive programs and services using connectivity services based on two-way satellite connections available in 2005.

6.2 Inappropriate Funding Frameworks

Inuit and First Nations communities also face challenges with existing funding frameworks. This section outlines specific challenges with federal and provincial project funding that targets these communities.

6.2.1 Short-Term Funding Models

Researchers and key informants argue that the government needs to reframe funding frameworks to support more sustainable community-based initiatives. Migone and Henley write that "subsidies are mostly project and short-term related, creating a somewhat unstable funding environment" (Migone & Henley, 2009, p. 139). This critique is echoed in Alexander's (2005) discussion of cuts to programs like CAP that impact sustainable community development in remote and/or marginalized communities. Key informants similarly told us government funding is often provided on a one-time, 'lump-sum' basis. This challenge is also noted by the AFN, which points to many broadband infrastructure and connectivity initiatives that "were developed as pilot projects or one-year investments. This is not sustainable for First Nations and creates instability" (AFN Chiefs Committee on Economic Development, 2010, p. 22).

These short-term funding programs tend to address the one-time broadband infrastructure development costs that accommodate large telecom providers to build and own the backbone infrastructure. But such programs fail to support cases where a community might want to construct and manage a local-level network; that is, fund local broadband infrastructure and connectivity services. In some regions, telecom providers agree to construct broadband infrastructure, and then once the public funding for capital builds is depleted, they leave the communities without providing ongoing connectivity services. If communities want to continue using this infrastructure, they must pay expensive connectivity costs (5, interview).

In fact, this kind of funding approach goes against the Conservative government's own public statements. For example, through its $33 billion *Building Canada* plan, the federal government stated it aimed to meet infrastructure needs across Canada through "long-term, stable and predictable funding" (Infrastructure Canada, Aug 24, 2007 press release, para 9).

> *The organization of funding programs is a big challenge. There are not many support mechanisms to enable communities to design and plan their own networks -- or for the ongoing implementation of such networks. Even larger communities [in Saskatchewan] … that have local networks find it difficult to secure the capacity and funding to support themselves.*
> - Interview, 16

6.2.2 Project-based Funding Models

Linked to the previous challenge, rather than long-term funding programs, most First Nations and Inuit broadband infrastructure development projects are designated as short-time funding projects (Migone & Henley, 2009, p. 140). However, broadband technologies require ongoing financial support to operate, maintain, and repair networks; that is, to provide connectivity services. Sustainable program-based funding resources must recognize these ongoing costs.

> *Government does not see the issues we deal with as 'A' level funding -- as programs. Instead, they are treated as pilot projects that receive annual funding based on successfully approved proposals. This is an ongoing challenge, but they are starting to recognize our situation as time passes.*
> - 01, interview

For example, First Nations SchoolNet (FNS), despite a record of positive evaluations from its federal funding agency, Indian and Northern Affairs Canada, has suffered a continued decrease in annual funding levels, which dropped from $45 million in 1996, to $25 million in 2004, to $6.68 million in 2008/09 (INAC, 2009). FNS is funded on a year-over-year project basis, meaning that funding is only approved on an annual basis. This lack of certainty restricts the ability of communities to develop broadband infrastructure and connectivity services created through the program. The administrators of one FNS-funded organization, KNet, argue that decreasing, uncertain project-based funding approaches restricted them from further expanding their membership, which had already grown to serve 60 remote First Nations communities between 2000-2008 (Strachan, 2009, p. 15).

In another example from Inuit communities, the Nunavut Broadband Development Corporation (NBDC) signed a 5-year Contribution Agreement with Infrastructure Canada (as part of the National Satellite Initiative) on January 5, 2009. Combined with matching funds from customers, this Agreement constitutes an investment of over $43 million to develop a satellite bandwidth management tool, procure additional satellite capacity, and upgrade the existing terrestrial satellite network; that is, for ongoing connectivity services (as well as broadband infrastructure upgrades). However, funds will cease to flow after June 30, 2012, and to date, there is no replacement program. According to the NBDC: "without federal investment, the continued operation of the QINIQ network will be at risk

and that would put internet access in the majority of Nunavut's communities at risk" (Nunavut Broadband Development Corporation, 2010, p. 2).

Many project-based funding models require spending to be linked to specific broadband infrastructure projects. For example, if a project is funded for 'health' purposes (connectivity for specific community services), the community cannot spend a portion of its budget of this project on building broadband infrastructure -- despite the cost-savings and health service-delivery benefits that such infrastructure can provide. An alternative, program-based funding approach might support the positive impacts of broadband infrastructure and connectivity services across different public and community service applications.

> *One of the biggest hurdles in linking broadband to health, education and other community applications is that money must be linked directly to those purposes. There is also, often, a lack of ability to plan and enable long-term strategies as overall community funding is tied to time-limited program funding.*
> - 02, interview

6.2.3 Unrealistic Requirements by Funding Bodies

Communities also face challenges in preparing funding proposals, including fast turnaround times and a lack of human resources. As one key informant stated: "when government put out programs, sometimes turnaround times are so fast, the communities don't even know the opportunities are out there" (1, interview). For example, the Broadband for Rural and Northern Development Pilot Program (BRAND) program requires applicants to put together a business plan, work on partnerships, develop a community-driven solution, and report results -- all without providing any additional funding to support these time- and resource-intensive activities. Providing support to communities in these areas can help build local capacity while at the same time ensure community-based projects meet local needs.

> *INAC has really pushed for a comprehensive regional strategy – with full details on levels of connectivity, technology use, and so on in communities. [But] they provided insufficient funding to develop a comprehensive strategy. Community consultation, partnership development and environmental scans are costly and time intensive…For a lot of communities, there often isn't enough local capacity to put together a proposal.*
> - 02, interview

Aside from a few examples (such as FNTC's work in B.C.) there is an absence of (or absence of knowledge of) publicly available procedural manuals that communities can use when developing plans to develop broadband infrastructure

and connectivity services. Instead, these tools are created on a time-consuming case-by-case basis.

> *The process for many government funding programs is flawed. Funders expect Aboriginal non-profit entities to do their work without funding for necessary administrative resources…Where is an Aboriginal non-profit organization supposed to get resources to pay rent, do administrative activities and so on? The funders expect the organization to do all that with no support.*
> - 11, interview

6.2.4 Communities Competing for Funding

Funding applications are sometimes set up in ways that force communities to compete with one another. Rather than encouraging partnerships that would encourage them to share limited resources and benefit from economies of scale, communities compete to access a limited pool of funding (O'Donnell et al, 2010).

> *The criteria for the First Nations Infrastructure Fund does not lend itself well to encouraging partnerships as it is targeted more specifically to capital-type infrastructure [located] specifically on a reserve, not necessarily to address a broader geographic area that may encompass several reserves.*
> - 02, interview

Furthermore, government sometimes funds competing broadband infrastructure development projects within the same province or region, rather than encouraging shared projects. For example, in Manitoba, Industry Canada funded a competing broadband infrastructure development project in some communities already serviced through broadband infrastructure owned and managed by Broadband Communication North (6, interview). Federal funding was used to support competition between the two networks, but might have been better employed to build on and improve the already-existing broadband infrastructure. A similar situation occurred in Nunavut. In 2008, the Nunuvut Broadband Development Corporation noted that communities were served by both an Ardicom network system and the Qiniq network, and "when someone from the Ardicom network sends a file to someone on the Qiniq network in the same community, the file goes all the way to the Internet backbone for sorting, and returns to the community -- an unnecessary waste of bandwidth" (Nunavut Broadband Development Corporation, 2008, pp. 6-7). A more efficient approach would combine both networks.

> *FNS receives partial funding for broadband, given that it is a required part of educational program delivery. But other programs are also competing to build the same infrastructure – through Health or Justice, for example…In the past, government programs and projects have been siloed, with the result of a lot of duplicate infrastructure.*

- 06, interview

6.2.5 Funding Evaluation Frameworks

The criteria used to evaluate connectivity projects are sometimes based on measurements that do not work for assessing success in rural and remote First Nations and Inuit communities. This is due to a misunderstanding of local contexts. Ramirez (2007) argues that conventional project evaluation approaches that emphasize the instrumental side of technology and seek to demonstrate a direct link between investments and results are problematic when applied to rural and remote First Nations and Inuit communities. An alternative approach might measure successes in terms of socio-technical systems, stakeholder engagement, and an acknowledgement of the multiple dimensions at play (Ramizez, 2007).

> *They look at the number of households connected, the jobs created, and so on. But in a rural/remote FN community, these measures don't work. For example, the number of jobs directly created [through broadband infrastructure development] is negligible. But if you frame evaluations differently, we can demonstrate results. For example, eHealth has cut down on transportation costs, increased preventative care, [and] enabled more access to health care.*
> - 06, interview

6.2.6 Canadian Government Defaulting to Lowest-Cost Technical Solution

Often, the lowest cost technical solution for broadband infrastructure development is the default choice for government funders. These short-term cost savings often come at the determinant to long-term sustainable community development in terms of providing ongoing connectivity services. One of our key informants noted that funding criteria often supports the lowest cost broadband infrastructure, but the resulting network is quickly oversubscribed by users; thus suffering at the level of connectivity (5, interview). Such 'quick fixes' sometimes result in a need to continuously upgrade broadband infrastructure in a piece-meal fashion, rather than take advantage of the easily scalable aspects of a well-designed network. For example, over the years, First Nations IT Regional Networks have had to replace 'low-cost', two-way satellite dishes with next generation models every 2 or 3 years, at a huge cost. An initial investment in better, but more expensive, broadband infrastructure would reduce the need to make these ongoing purchases, and support more efficient, effective connectivity services.

6.2.7 Human Resources Capacity

Existing project-based, short-term funding models reduce the ability of communities to develop the human resources capacities required to administer

sustainable, long-term connectivity services (Muttitt et al, 2004; Migone & Henley, 2009). Often, corporate-provided connectivity services require users to pay for network usage and operation, and as a result, financial and human resources leave the community, impacting its ability to develop local capacity. For example, a study in B.C. from 2008 found this was a key challenge for First Nations communities:

> Our research concluded that many of the networks are inadequately prepared for the challenges that face them when they start to build and later maintain the network. In particular, business planning is often overly optimistic or inadequate, funding is directed towards 'startup' and cannot support ongoing maintenance and upgrades, [and] skills and training are not present in the community (Smith, 2008, p. 1).

A study of community-based organizations in Canada found that the federal government's "project funding regime" had considerable negative consequences for the organizations. In particular, the requirement for continuous applications for project funding undermines efforts to build human resources capacity within organizations and limits their ability to provide core services for the communities they serve (Gibson, O'Donnell and Rideout, 2007).

Rather than encouraging self-sustaining community development, existing short-term funding models encourage dependency relationships with external connectivity service providers (Alexander, 2005). Alexander writes "access to technology without the capacity to utilize it strategically is of little value" (Alexander, 2005, p. 4). As noted by the Nunavut Broadband Development Corporation's submission to Industry Canada's consultations, without appropriate training "the lion's share of employment benefits and business opportunities [in Nunavut] will go to southerners" (Nunavut Broadband Development Corporation, 2010, p. 3).

> *[One] First Nation [in Saskatchewan] implemented a local network, but now have problems maintaining and managing it, and securing funding to do so. It's a specific case, but I think it reflects a wider problem…We need to build local capacity to plan and manage the networks -- not just focus on capital costs.*
> - Interview, 16

Capacity issues extend beyond technical training. In Alberta, the 2004 Aboriginal Information Communication Technology Forum highlighted that Aboriginal government and agencies must increase their capacities to improve program and service delivery through ICTs (Government of Alberta, 2004). Peddle's (2007) research similarly found that while the Labrador region is one of the most connected locales in the country, there has been limited uptake of new ICTs for eHealth applications, because of a lack of local capacity to use the technology (Peddle, 2007). Given the rural and remote locations of many First Nations and

Inuit communities, these challenges are compounded by high staff turnover and heavy workloads. Thus, capacity issues must extend to include broadband-enabled public and community services.

A community-based, culturally-informed needs assessment analysis might help address these kinds of challenges (Alexander, 2005, p. 7-8). Such projects are already underway in many First Nations and Inuit communities. For example, the Assembly of Manitoba Chiefs is establishing a Manitoba First Nation Technology Council and training 60 community Information Communication Technology specialists (Assembly of Manitoba Chiefs (n.d.). A similar advisory council focused on ICT issues is underway among Saskatchewan First Nations (16, interview). In Nunavut, NBDC has been involved in building local capacity in Inuit communities through its network of Community Service Providers.

6.2.8 Need for Separate Funding to Support Both Broadband Infrastructure and Connectivity Services

Many current funding programs confuse one-time funding for broadband infrastructure with the required ongoing connectivity charges for broadband services and applications. Rather than provide program funding for capital builds, and separate program funding for ongoing operations and maintenance (O&M), management and application of the infrastructure, current approaches conflate both. This undermines the ability of communities to sustainably manage their local broadband infrastructure. Too often, urban-based service providers and institutions are funded to produce bandwidth-intensive, broadband-enabled applications, but their 'customers' -- the homes, businesses and organizations located in communities -- do not receive the funding required to build and then maintain the infrastructure required to access this content. First Nation content and application developers were once supported by the First Nations SchoolNet program in 2002-2004 but this support was cut as the program funding was reduced.

For example, one key informant told us that responsibility for First Nations School connectivity may be shifted to Indian and Northern Affairs Canada's Infrastructure program (interview, 5). This would undermine connectivity in communities because it decreases the amount of funding schools can access to pay for the bandwidth they need to support broadband-enabled applications.

> *Connectivity services are not the same as infrastructure…All funding must have two components. One for developing the appropriate infrastructure that can be First Nation owned and operated, especially if public funding is being utilized. And two, appropriate ongoing operational funding for the service delivery of adequate bandwidth to provide equitable and affordable online experiences for all the different applications required in First Nations.*
> - 5, interview

Community story: Natoaganeg (Eel Ground First Nation) Uses Geographic Imagining System (GIS) and Global Positioning System to Protect Traditional Territory, New Brunswick

By Jason Woodman Simmonds

Located in Northern New Brunswick along the South West Miramichi River, Natoaganeg or Eel Ground First Nation is home to over 800 people. The traditional lands of the Natoaganeg cover approximately 7,000 acres of Acadian Forest. While the Mi'kmaqs of Natoaganeg have been stewards of their traditional lands since contact, the entire Acadian Forest (which covers most of the maritimes and stretches into Maine) has seen its share of resource exploitation in the form of, among other things, excessive logging. As a result the Acadian Forest is endangered. According to a GeoConnections media release, "The traditional territory of Eel Ground is surrounded by a very active forestry industry. Over 50 pulp and paper, veneer and saw mills can be found in and around Eel Ground" (www.geoconnections.org).

In order to protect and restore the health of their traditional lands, the people of Natoaganeg have partnered with GeoConnections under the Sustainable Communities Initiative (SCI). Recently Natoaganeg acquired a Global Positioning System and they have been using this system to refine the accuracy of extensive mapping projects most of which have used Geographic Imagining System computer software. As the head of Eel Ground's Straight Arrow Specialized Lumber Products, Stephen Ginnish, notes, "The GPS lets us test our paper notes and the digitized information to make sure what we're producing in our maps is 99.9% accurate" (geoconnections.com). On top of this the GIS and GPS can help project how different forestry practices will play out in the long term.

Natoaganeg is able to combine the use of GIS and GPS technologies with traditional knowledge of plant and animal life in their territory. As a result they are developing standard setting forestry practices that recognize the forests as more than simply an exploitable commodity. At the same time, they are using their experience and knowledge with this technology to help other First Nations protect their lands.

6.3 Unequal Government to Government Relationships

The lack of clearly-defined relationships between the federal government and Inuit and First Nations organizations is another challenge. Researchers and key informants argue this leads to uncertainty with regards to political and jurisdictional roles and responsibilities, and so inhibits substantive, community-level participation in policy development.

> *[There are] regional differences [and] a lack of government support across regions…Governance, law and jurisdiction has never even been considered in this arena by most First Nations, let alone the [federal] government.*

- 19, interview

6.3.1 Political Uncertainties

Political uncertainties can restrict the sustainable development of broadband infrastructure and connectivity projects. Much like other public works projects, such as building water or transportation infrastructure, the development of broadband infrastructure is a long-term, large-budget activity. However, short-term, year-over-year, project-based funding frameworks can become linked to political concerns that can shift with changes of government and department personnel.

> *Political factors, for example the shift from the Liberal to Conservative government [have an impact]. Changing political philosophies can wreak havoc on a project, as can changes in personnel within government.*
> - 05, interview

6.3.2 Jurisdictional Issues

The roles and responsibilities between First Nations and Inuit communities and the federal government are unclear and difficult to navigate. In contrast, for example, Aboriginal broadcasting policy is guided by a document that clearly outlines the roles and responsibilities of the federal government with regards to Aboriginal populations (in the 1991 *Broadcasting Act*, as discussed by Roth, 2005). But at present there are no specific formal legislative provisions to guide First Nations and Inuit involvement in telecommunications and connectivity policy. This makes it difficult to see where government responsibilities are located (for example between federal, provincial and First Nations and Inuit governments) (Muttitt et al, 2004). In the United States, the Federal Communication Commission generated a *Statement of Policy on Establishing a Government-to-Government Relationship with Indian Tribes to guide policy formation* (FCC, 2000). That document may be a useful guide in the event a similar policy statement is created in Canada.

Another source of inspiration for the development of an appropriate First Nations and Inuit broadband policy may be the 'Policy Principles' that are used by Heritage Canada to guide their Northern Aboriginal Broadcasting and Distribution Projects (Northern Aboriginal Broadcasting and Distribution Projects, n.d.). These principles can be 'adapted' or 'updated' to also accommodate First Nations and Inuit broadband infrastructure and broadband connectivity services. The policy principles are:

- Northern residents should be offered access to a range of programming choices through the exploitation of technological opportunities;

- Northern Native people should have the opportunity to participate actively in the determination by the CRTC of the character, quantity and priority of programming broadcast in predominantly Native communities;
- Northern Native people should have fair access to Northern broadcasting distribution systems to maintain and develop their cultures and languages;
- Programming relevant to Native concerns, including content originated by Native people, should be produced for distribution wherever Native people form a significant proportion of the population in the service area; and
- Northern Native representatives should be consulted regularly by government agencies engaged in establishing broadcasting policies that would affect their cultures.

The existence of a variety of roles and responsibilities for governments involved in program delivery for First Nations and Inuit communities is also a challenge. In Canada, responsibility for many on-reserve services such as education lies with the federal government, and First Nations access funding programs provided by the federal government. Broadband development for Inuit communities has emerged differently than for First Nations in the territories in part because most of the population is Inuit or Aboriginal, and so the territorial government provides these services. For example, the Kativik Regional Government in northern Quebec, which governs Inuit villages, recently applied for broadband infrastructure funding from the First Nations Infrastructure Fund (FNIF). However, they were directly told that "there is not the smallest window for you to get access to funds" (interview, 15). Since Inuit villages in Quebec cannot access funding through FNIF, they turned to funding programs administered by the provincial government and Industry Canada.

Another example of a challenge resulting from jurisdictional issues is the restricted ability of First Nations to benefit from Alberta's SuperNet backbone infrastructure. One participant in the 2006 *National Aboriginal Connectivity and E-Services Forum* stated that while SuperNet is designed to connect all First Nations communities in Alberta, it only provided fibre up to the border of the reserves, after which it became "a jurisdictional issue between different departments on who would pay for [the last-/first-mile connection]" (National Aboriginal Connectivity and E-Services Forum, 2006, p. 25). Participants from Inuit communities at the same *Forum* noted similar jurisdictional challenges and legislative barriers (ibid, pp. 32-3). As the AFN notes:

> Industry Canada is responsible for 'Connecting Canadians' but Indian and Northern Affairs Canada is responsible for policies and programs affecting First Nations, particularly as it relates to the *Indian Act*. HRSDC administers human resource and some skills training initiatives involving first Nations…but education and training is a provincial responsibility (unless it involves First Nations schools, which are then under the purview of INAC.) It is not difficult to understand how all of these overlapping jurisdictions and

mandates create a heavy burden on First Nations communities (AFN Chiefs Committee on Economic Development, 2010, pp. 21-2).

6.3.3 Lack of Community Participation in Policy Development

Researchers and key informants noted a lack of substantive community-level participation in policy development and in partnerships. In whatever form it takes, a community-driven broadband infrastructure and connectivity development policy requires the substantive participation of First Nations and Inuit communities. Unfortunately, research points to evidence that an 'equal playing field' is not yet in place. Migone and Henley write: "ultimately, community control is what can guarantee that the power relations linked to ICT [development] will not derail it to the detriment of community members and organizations" (Migone & Henley, 2009, p. 140). Furthermore, key informants told us that First Nations and Inuit communities have not been consulted in early discussions to the Aboriginal connectivity strategy being formulated by Indian and Northern Affairs Canada.

> *We need to move away from the assumption that Aboriginal communities are not capable. If they want something, they can do it themselves, and this should be supported…There needs to be substantive, sustainable community involvement.*
> - 03, interview

Private and public sector organizations employ individuals to work as 'community liaisons', and many of these liaisons visit the communities and know the local contexts. However, to be effective their recommendations need to be supported by the institutions they work for.

> *In Manitoba, much of the funding comes from Western Economic Diversification Canada -- through Community Futures. But their offices are located in urban areas, and they don't understand rural realities. They tend to fund projects in urban areas.*
> - 06, interview

The need for equal partnerships can be illustrated in agreements between First Nations and Inuit organizations and commercial entities. As noted earlier, these communities often do not have the resources to negotiate on equal terms with large institutions. For example, if no-one in the community is an expert on the technical aspects of broadband, communities are sometimes sold obsolete equipment (Migone & Henley, 2009). One company installed an outdoor network in the Oweekano community in B.C. using cables meant for indoor application -- and the network soon broke down due to the demanding climate (09, interview).

7 Ways Forward: Building 'First-mile' Oriented Broadband Infrastructure and Connectivity Services with First Nations and Inuit Communities

This final chapter provides an overview of themes that emerged in our discussions about elements to include in a federal First Nations and Inuit broadband strategy. They are drawn from our interviews and research on community-based broadband infrastructure and connectivity projects. The primary framework uniting these themes is our opinion that such a strategy must support a 'first-mile' development approach that draws on and supports the work already being done in and by First Nations and Inuit communities across Canada. As Matear (2002) argues, to best facilitate local community development, broadband infrastructure and connectivity policy would incorporate community-based solutions and local participation. This report has described many different projects that reflect a 'first-mile' development approach. These projects are unique to local communities, and reflect different approaches to 'community-based' development. However, they also share a common cause: the recognition that policies can better involve the local organizations engaged in designing, maintaining, administering, and in some cases, owning broadband networks.

> *[Too many broadband development projects] are conceived from outside and then brought into the community, instead of coming from within the community.*
> - 05, interview

Some of our key informants believe that if broadband infrastructure and approaches towards connectivity services had followed a 'First-mile'-driven development process, every remote and rural community across Canada would have been connected to their region's broadband backbone long ago. What is being experienced today in many regions across Canada is that national-level broadband infrastructure is being built over already-existing infrastructure -- with communities remaining unserved or underserved. Too often, centralized builds resulted in available resources being used to develop an externally-owned backbone broadband infrastructure, with no resources made available to provide connectivity services to communities located in rural or remote areas, including CRTC-defined High Cost Serving Areas. This 'last-mile' approach to development leaves First Nations and Inuit communities without the resources and capacities to own and operate their own broadband infrastructure and connectivity services.

Canada has a public responsibility to develop a broadband infrastructure and connectivity agenda that incorporates Inuit and First Nations communities. It is fundamental that this policy does not simply mirror the development approaches used for urban centres, but instead recognizes the unique contexts and challenges in rural and remote communities. It is our opinion that the involvement, experience and knowledge of the people already working to build

broadband infrastructure and provide connectivity services in these communities can enrich policy development.

> *We need dialogue, conferences, and workshops to get people talking…not from a policy perspective, but from a practical perspective. This process needs to include communities.*
> - 6, interview

As described in earlier chapters, this report references a long history of research and advocacy in this area. For example, a 2006 report by the Pacific Community Networks Association proposed several key elements for a national-level *Digital Opportunities Strategy for Canada*, including the full utilization of existing community technology assets (Pacific Community Networks Association, 2006, p. 9). Similar points are raised in recommendations in the *National Broadband Task Force Report* (2001), *Aboriginal Round Table* (2006), and in submissions to Industry Canada's recent consultations on the *Digital Economy Strategy* put forward by the Nunavut Broadband Development Corporation (2010) and the Assembly of First Nations (2010).

Our review found that at present, there is no cohesive federal government policy to support broadband infrastructure and connectivity services in remote and rural First Nations communities. According to our key informants, and discussed in Chapter 6, many of the initiatives that do exist are inadequate, underdeveloped and uncoordinated among many different departments and program areas. Rather than 're-invent the wheel', we suggest that a reformed government policy for First Nations and Inuit broadband infrastructure and connectivity services might benefit from drawing on the existing expertise and partnerships that exist at the 'first-mile' level.

Specific themes that emerged in our discussions with key informants in this area are broadly organized into three categories: framing a First Nations and Inuit community connectivity policy; supporting First Nations and Inuit community leadership; and facilitating community-based development.

Table 1: Summary of Themes to Support First-mile Oriented Broadband Infrastructure in First Nations and Inuit Communities

Framing a First Nations and Inuit Community Broadband Infrastructure and Connectivity Policy	Establish Broadband as Core Infrastructure that Enables the Delivery of Public and Community Services
	Employ a Holistic Approach
Support First Nations and Inuit Community Leadership in Policy Development	Create Institutionalized Support for First Nations and Inuit Broadband
	Support Local Engagement
	Recognize Remote and Rural Community Realities

Facilitating Community-Based 'First Mile' Development	Ensure Development is Driven by Community, not Technological, Needs
	Support Partnerships with Commercial and Government Organizations
	Support Resource-Sharing Between Communities
	Establish Sustainable Funding Frameworks

7.1 Framing a First Nations and Inuit Community Broadband Infrastructure and Connectivity Policy

This report highlights First Nations and Inuit broadband infrastructure and connectivity services that are driven by 'First-mile' rather than 'last-mile' development approaches. Such approaches might be supported by broadband policy that flows from, not extends to, local communities. If broadband infrastructure is framed as part of core infrastructure, like roads and water utilities, it might become seen as a holistic tool that community-based connectivity services can adapt to their unique local contexts and employ in multiple public and community service applications.

Informants from First Nations and Inuit communities expressed a distrust of government with regards to past approaches to broadband development policy. This is due to a history of government inaction in this area, as described in Chapter 6. Establishing a clearly defined, formal relationship guiding broadband policy-making roles and responsibilities between federal, provincial/territorial, and First Nations and Inuit governments that is grounded in the substantive participation of local communities might help repair these relationships.

> *We need to ensure there is in fact a policy about broadband connectivity. First Nations are not convinced about this…There needs to be a consistent policy across government, so different departments don't contradict each other.*
> - 09, interview

7.1.1 Establish Broadband as Core Infrastructure that Enables the Delivery of Public and Community Services

The Canadian government has a responsibility to provide First Nations and Inuit communities with support for broadband-enabled public and community services. This point is supported by widespread evidence of the impacts that broadband infrastructure and connectivity services have on delivering core public and community services to rural and remote Inuit and First Nations. In 2001, the *Report of the National Broadband Task Force* recommended that all Canadians have equal access to broadband infrastructure and connectivity services, and to

the social, cultural, and economic benefits delivered through broadband applications (Report of the National Broadband Task Force, 2001, p. 4). Migone and Henley argue that access to ICT infrastructure should be considered a right, like postal and health services (Migone & Henley, 2009; see also Alexander, 2005; Middleton, 2010). A 2009 OECD report estimated that investment in broadband connectivity can pay for itself in ten years; according to Middleton: "this conclusion was based on achieving savings in the electricity, health, transportation and education sectors, as a result of using the broadband network for service provision" (Middleton, 2010, p.7). As stated in 2001 *Report of the National Broadband Task Force:*

> It is no exaggeration to say that over time, the impact of broadband communications on Canadian life will be at least as great as the impact of railways, highways, airlines, traditional telecommunications and broadcasting (Report of the National Broadband Task Force, 2001, p. 3).

The theme of broadband as core infrastructure was expressed by most key informants interviewed, as well as by First Nations and Inuit leadership. For example, the First Nations Technology Council has a Resolution from the Chiefs in B.C. stating that: "[the FNTC] had passed a resolution through their Chiefs stating that broadband for the First Nations communities should be considered basic infrastructure" (National Aboriginal Connectivity and E-Services Forum, 2006, p. 24). In 2006, the AFN also began advocating that telecommunications and ICT infrastructure be defined as a basic infrastructure requirement, and an acceptable component of the Indian and Northern Affairs Canada Capital Funding Program (AFN Chiefs Committee on Economic Development, 2010, p. 16).

> *Once you have the [broadband] foundation built and properly managed, it enables so many public and community services. It's basic infrastructure, like an airport or a road. The government needs to determine what its definition will be for ubiquitous broadband service, and then support it. Broadband delivers a higher quality of life for these people…There needs to be an equal playing field, and broadband is an enabling factor.*
> - 06, interview

In fact, in the U.S., the Chair of the Federal Communications Commission compared broadband Internet to road infrastructure in a speech to the National Congress of American Indians (McMahon, forthcoming).

If defined as core infrastructure, broadband connectivity services can be provided to communities at equitable services and fair pricing (BCN Connectivity Profile, pp. 14-5). This can help offset the challenges faced by communities located in areas where a viable business case for private sector organizations to build broadband infrastructure and provide connectivity services does not exist. This issue was highlighted in the 2001 *Report of the National Broadband Task Force*, which stated that broadband access "should be available at a reasonably

comparable price to that charged in more densely populated areas" (Report of the National Broadband Task Force, 2001, p. 5). The NBDC also highlighted this point in its submission to Industry Canada's recent *Digital Economy* consultations:

> From its inception and throughout the deployment and operation of the QINIQ network, NBDC has always advocated for similar level and cost of service for all of Nunavut's communities. Without this commitment, only the larger communities would have internet access and the majority of Nunavut's communities and residents would not (Nunavut Broadband Development Corporation, 2010, p. 2).

> *"We want [INAC] to understand that we need basic infrastructure, before we can focus on delivering services…The [Assembly of Manitoba] Chiefs' Task Force on Health has highlighted the need to establish a strong broadband infrastructure. Health Canada focuses on health-related issues (which are services). INAC is more focused on infrastructure. The two don't connect -- they are 'siloed' in that sense. That's a challenge.*
> - 01, interview

Middleton (2010) suggests Alberta's SuperNet as one model of a backbone broadband infrastructure design that can offer connectivity access at a uniform price, regardless of location (Middleton, 2010, p. 7). However, as discussed earlier, to be most effective for First Nations and Inuit communities, such an approach might include support that enables communities to link to such a backbone infrastructure through a point of presence. Otherwise, no matter how robust the backbone infrastructure, some First Nations and Inuit communities may not be able to access it.

To be effective in delivering public and community services, broadband infrastructure can also be accompanied with support for ongoing development and maintenance -- that is, for connectivity services. There is a danger that broadband infrastructure will be lumped together with other elements of core public works infrastructure like water, sewage and housing without being accompanied with new funding. If this happens, communities will likely be forced to prioritize between water, housing, and connectivity needs. The nature of broadband infrastructure as an enabling force for a range of applications results in positive externalities in other aspects of community development. For example, one project in northwestern Ontario will employ broadband networks to manage community water plants, decentralizing responsibility for operations while maintaining centralized support (8, interview). Similar projects can utilize broadband networks in ways that promote local capacity while achieving the efficiencies made possible through centralized management of some functions -- but only if communities facing challenges in other priority areas like health, housing and education receive support specific to broadband connectivity.

As core infrastructure, broadband would be affordable, accessible and available. Affordability requirements are essential for the effective use of broadband-enabled public and community services. Canada already has a history of making telephone services universally available at affordable rates. Accessibility involves ensuring that community-based broadband infrastructure is accompanied with levels of connectivity that deliver all the services that the community requires. Having managed or unmanaged circuits, having adequate bandwidth to support the services, and having the choice to purchase the level of service required are essential components of accessible broadband infrastructure. Availability ensures that network connectivity is operated and managed to the benefit of the community. Service and network management, technical support requirements means new employment and economic opportunities for communities operating their own network. Having the resources and programs to create these opportunities and the necessary skills to deliver these services can ensures that the communities, and all Canadians, benefit.

Community story: Keewaytinook Centre for Excellence

By Barry Strachan

The provision of safe drinking water for their people continues to be a top priority for First Nation leadership across Canada.

In Ontario, the organization of Chiefs of Ontario (COO), have documented this by passing a resolution in council that adopts in principal the *Provincial Safe Drinking Water Act*. This act legislates the requirements for potable water quality, operator training, operator certification and transparency of reporting for all facilities treating drinking water in the province. Lessons learned following the e-coli outbreak in the drinking water system in Walkerton, Ontario have been incorporated into this *Act* making its requirements the most stringent in Canada.

Given the complex and logistical challenge presented by implementing the requirements of the *Safe Drinking Water* Act in its member communities, Keewaytinook Okimakanak (a non-political First Nation Council in Northwestern Ontario) created the Keewaytinook Centre of Excellence in Dryden, Ontario. The Keewaytinook Centre is a state of the art training facility, specifically designed to provide hands-on instruction to meet the educational requirements of Water and Wastewater Operators in Ontario.

The founding principles of the Keewaytinook Centre are:

- Relevancy – the training programs provided are current and utilize technologies common to Water Treatment Facilities throughout the province.
- Affordability – delivery costs are to be maintained in a range that recognizes the limited financial resources available to most small municipal and First Nation clients.

- Accessibility – given the large geographic area in Northwestern Ontario to be served, the training programs need to be designed in such a way that they are easily accessible to the client base.

The first principle has been achieved by employing professional curriculum developers and trainers and by having all training materials reviewed and approved by representatives of the Ministry of the Environment in Ontario. The second principle is easily achieved by virtue of the fact that Keewaytinook Okimakanak is an incorporated "Not-for-Profit" organization. The third principle is being achieved as follows. To be fully accessible to its clients, the Keewaytinook Centre employs a variety of strategies:

1. All training programs are designed to be comprehensive but of short duration. This takes into account the long distances our clients must travel to access the service and limits the amount of time that they are away from home.

2. The Keewaytinook Centre employs professional training staff, who travel directly to some communities to deliver our training programs.

3. Internet based training programs, designed by the Keewaytinook Centre of Excellence staff, allow Operational Personnel to participate in Ministry of the Environment approved training programs from their workplace or home computers. Current training programs available on line include:

- Water Sources and Characteristics
- Safety in the Workplace
- Workplace Hazardous Material Information System
- Transportation of Dangerous Goods
- Lock Out/Tag Out

4. Connectivity is being employed to allow Operators located in remote locations access to the full calendar of training opportunities at the Keewaytinook Centre of Excellence. Utilizing the broadband system installed and operated by its sister organization KNET, operators have the option to participate, in real time, via video conference. The full capability of this technology is yet to be harnessed and the Keewaytinook Centre of Excellence plans further pilots to refine the methodology for delivering training programs in this manner.

Connectivity can also being employed to provide operational support for water and wastewater facilities in remote areas. Using a combination of web based and video conferencing technology supported by qualified Water Operations Personnel, it is now possible to monitor remote Water Treatment Facilities in real time from a central location. Problems in facilities can be diagnosed and in some cases mitigated without the need for a costly trip to the site to assess the

situation. Operators in remote locations can often be talked through problems in a timely manner before the situation becomes critical. Lower costs, more confident operational personnel and a sustainable, safe potable water supply are the net result of using broadband-enabled public and community services to their full potential.

First Nation leadership has many challenges to overcome with regard to the long term sustainability of the public infrastructure in their communities. Fortunately they also hold the key to the solutions. Keewaytinook Okimakanak with the support and vision of the Chiefs of its member communities is an example of how employing technology as a tool, not a crutch, can affect profound change in people's lives.

The Keewaytinook Centre of Excellence and KNET continue to experiment with the almost unlimited potential of IT technology. We believe that First Nations deserve the opportunity to become self reliant and to limit their dependency on external service providers.

7.1.2 Employ a Holistic Approach

Given the existing 'siloed' approach to project funding, another theme that emerged in our interviews was that a *First Nations and Inuit Community Connectivity Strategy* must employ a holistic approach. Ideally, this would help reduce the duplication and fragmentation of government departments involved in broadband infrastructure and connectivity services (Migone & Henley, 2009; see also BCN Connectivity Profile, pp. 14-5).

> *Who will deliver the strategy – INAC or Health Canada? Many departments are involved in broadband infrastructure development. This is one reason I think infrastructure should be separate from application and service delivery -- to maintain consistency across government departments.*
> - 09, interview

As described in Chapter 3, the AFN's *e-Community ICT model* locates broadband infrastructure and connectivity services as part of a broader plan for economic, social and cultural change (J. Whiteduck, 2010). The First Nations IT Regional Networks, which are First Nations-driven organizations that would administer the AFN's plan, are rooted in a holistic approach that broadband can support not only educational applications but also telehealth, justice and economic development (T. Whiteduck, 2010). At the regional level, the Assembly of Manitoba Chiefs' eHealth group similarly implements a holistic view of community health that includes a consideration of economic impacts, geography issues, media development among youth, and other aspects of community development, including broadband infrastructure. As the AFN notes in a recent history of First Nations ICT initiatives:

> ICT is a tool that enables communities to advance their own needs and aspirations in the areas of health, education, justice, economic development and culture by embracing and fully utilizing the modern technological ICT tools available in a more holistic manner (AFN Chiefs Committee on Economic Development, 2010, p. 17).

> *The government's approach needs to be holistic -- they need to look at how different elements of development are connected and supported by broadband infrastructure. The Public Health Agency of Canada offers several 'key determinants of health' that reflects this holistic approach – how health is linked to economic development, education, employment, etc. This might be a baseline that demonstrates how things are connected.*
> - 02, interview

Key informants told us a holistic approach should be employed to reform existing funding frameworks. As described in Chapter 6, many funding applications presently require demonstrated links to specific project outcomes. However, given the nature of broadband development, in many cases it would be more efficient and effective to frame funding on a program basis that conceives it as enabling multiple public and community service delivery applications.

> *While federal agencies have some flexibility in terms of allowing us to share resources, there isn't a lot of support. You have to provide reports of exactly how you are spending funds and their direct links to specific services. So everything earmarked for health stays in health, and the same for education.*
> - 08, interview

The Mary Moses Story

by Kevin Burton

There's no clearer picture of how empowering videoconferencing can be in addressing First Nation issues than sharing "The Mary Moses Story".
Francis Perry volunteered with an organization whose mission is to prevent Fetal Alcohol Spectrum Disorders (FASD). Francis speaks powerfully in the first person about what it is like to grow up with the disorder.

Francis appeared with a pediatrician in a videoconference about the subject and met with twelve Atlantic First Nation schools, eleven of them via videoconference. Inspired by the story, and compelled to do something to protect children, the students of the Eel Ground Drama Group selected their topic and worked with the drama teacher to frame and present the issues. The play was a great success, winning six awards at the New Brunswick Drama Festival.

A DVD, "The Mary Moses Story" was also produced, and a national videoconference was held for its releases. Subsequently, another version with higher production value was shot and another national videoconference was held. The production earned the prestigious Kaiser Award for Excellence in Aboriginal Programming.

Students have been empowered and have responded beautifully. Thousands of people have viewed the DVD. Certainly, those that helped produce and share the message have had their lives positively impacted. Francis Perry may have said it best when, with a tear in his eye, he stated: "Two years ago we couldn't get four people together in a room to talk about this important topic. Now look at it!"

7.2 Support First Nations and Inuit Community Leadership in Policy Development

Another set of themes that emerged in our interviews was that policy makers must draw on First Nations and Inuit communities when designing any strategy. This was one of the four principles the AFN and its partners put forward in their 2010 submission to the *Digital Economy Consultations* (J. Whiteduck et al, 2010). The group argued the government must "work with First Nations leaders and organizations representing First Nations communities to develop the federal strategies" (ibid, 2010, p. 2).

Specific points about how policy might support First Nations/Inuit involvement are organized into three broad categories: create institutionalized support for First Nations and Inuit broadband development; support local engagement; and recognize remote and rural realities.

7.2.1 Create Institutionalized Support for First Nations and Inuit Broadband Development

Institutional reforms can support community-based broadband infrastructure and connectivity services development. For example, a First Nations and Inuit broadband development office housed in a federal department like Indian and Northern Affairs Canada or Industry Canada might support and facilitate community-based broadband infrastructure and connectivity services. Rather than a top-down, centralized model, such an office might instead support 'First-Mile' work already being done in communities. For example, it might offer funding application support for regional support organizations or facilitate partnerships between communities, or between communities and public or private sector organizations.

This proposal mirrors recent reforms in the United States. There, the federal government recognized and supported Native American formal involvement in the development of the draft *National Broadband Plan* released in March 2010 (FCC, 2010; McMahon, forthcoming). In the months leading up to the *Plan*, Native

American communities presented empirical evidence of deficiencies in existing broadband networks and federal policy frameworks. This evidence was marshaled in arguments for more substantive involvement in federal broadband policy-making, presented alongside evidence of the existing successes of community-based Native American broadband networks. Upon the draft *Plan*'s release, the federal government solicited feedback from Native American leadership, through formal consultations with the National Congress of American Indians. These consultations resulted in recommendations to reform the structure of the Federal Communications Commission (FCC), and to provide targeted funding and policy support for community-based indigenous broadband infrastructure, government, and administration. As a result of these reforms, the FCC recently created an Office of Tribal Affairs.

> An Aboriginal ICT strategic model should be developed under the leadership of national and local Aboriginal organizations, in partnership with Canadian governments and academics. The development of the model would draw from the early successful, and failed, examples of ICT-adoption in Aboriginal communities across the country (Alexander, 2005, p. 5).

The Assembly of First Nations and the First Nations IT Regional Networks have argued for a similar approach for First Nations in Canada. They have proposed an annual gathering of First Nations, government representatives, and ICT representatives to identify best practices, assess progress, and identify knowledge gaps (T. Whiteduck, 2009, p. 5). The AFN has called on the federal government to incorporate First Nations governments in policy-making, support strong linkages with the AFN Chiefs Committee, ensure federal coordination to utilize existing community networks and services, and build partnerships with other national and international indigenous peoples. "First Nations must be part of the program and policy development process and decision making processes. The clear objective is to ensure sustainable systems are built, where First Nations [have] control" (J. Whiteduck, 2009, p. 11). The AFN argues that there "is the need for an organization to foster relationships and manage multiple partners, funding sources and work across policy areas" (AFN Chiefs Committee on Economic Development, 2010, p. 23).

7.2.2 Support Local Engagement

> *Many government strategies are focused at the national level -- it's easier for them to start developing these strategies nationally. But we argue we need to start locally, and build up to the national level. INAC's policy is centralized, but it's very far removed from the communities.*
> - 04, interview

Another theme that emerged in discussions with key informants was that policy-makers might employ a community-based strategic planning approach to broadband infrastructure and connectivity development. The *Report of the*

National Broadband Task Force noted that "communities should be engaged in planning broadband networks in light of local needs, and in building local capacity to use broadband services and content" (Report of the National Broadband Task Force, 2001, p. 4). Migone and Henley write: "ultimately, community control is what can guarantee that the power relations linked to ICT [development] will not derail it to the detriment of community members and organizations" (Migone & Henley, 2009, p. 140). Such an approach enables more substantive inclusion in digital networks while avoiding the problems associated with 'overcentralization' (ibid, para 22; see also Falconer, 2009, p. 17; Middleton & Crow, 2009; and Tapia, Powell, & Ortiz, 2009). Grossman writes that: "due to widely varied needs and priorities, broadband development should generally be addressed at the local community level instead of at the regional and national level" (Grossman, 2008, p. 4).

> *The challenge is the government funding arrangements formed in centralized offices in Ottawa. It's difficult to remain strong partners because of funding restrictions. They are consulting with us, but there are misunderstandings.*
> - 01, interview

Genuine engagement with First Nations and Inuit peoples is supported by community-based administration, and sometimes, ownership, of broadband infrastructure and connectivity services. This report describes several examples of First Nations and Inuit community-based projects in Chapter 3. Government can play a role in supporting these initiatives by providing avenues for engagement with, and between, individuals working at the community level. For example, the Assembly of Manitoba Chiefs organized four ICT-related forums involving 150-200 people, representing all 64 First Nations in the province. The Nunavut Broadband Development Corporation similarly organized networking sessions for local Community Service Providers, and consultations with members of all 25 communities in Nunavut during the development of the Qiniq network. In its 2010 submission to Industry Canada's Digital Economy consultations, the AFN and its submission partners argued for government support of a cohesive national network of people involved in local and regional IT development:

> As First Nations identify partnering opportunities with the private sector and other partners to develop local and regional networks and e-Community opportunities, there is the need to support local innovation, priorities and needs (J. Whiteduck et al, 2010, p. 4).

> *Over the past few years INAC has supported an end of year meeting on broadband connectivity issues -- and has been told consistently by the AFN IT Working Group that the Connectivity Working Group needs to come together more regularly. There are so many good things being done across the country that could be shared and leveraged if we met more often. Face-to-face meetings with time to really network are crucial.*
> - 04, interview

7.2.3 Recognize Remote and Rural Community Realities

Government policy can also work to recognize the unique rural and remote realities present in First Nations and Inuit communities. The unique challenges faced by these communities have been described in detail in this report. One effective way to address them is to build on the successes of already-existing local 'first-mile' innovations.

> *It's important that policy-makers and funders understand the unique local contexts of rural First Nations communities. It's very different than developing last-mile infrastructure in urban regions -- urban DSL is a lot different than rural wi-fi. But at the same time, there's no less demand or need for broadband in rural areas. There's a need to design networks in a way that best fits the rural communities they are located in.*
> - 06, interview

This point follows previous recommendations from the 2001 *Report of the National Broadband Task Force:*

> Given the great diversity of the needs and capabilities of Canada's rural, remote, northern, First Nation and Inuit communities, the Task Force quickly concluded that it would be pointless to try and design a 'one size fits all' approach (Report of the National Broadband Task Force, 2001, p.5).

To implement a flexible approach, the *Task Force* recommended two models: an Infrastructure Support Model, which focuses on incentives to stimulate the supply of broadband infrastructure and services; and a Community Aggregator Model, which focuses on stimulating demand for broadband capabilities (ibid, p. 6). This report supports the *Task Force* recommendation for a Community Aggregator Model that might enable 'first-mile' focused development processes.

> *There is a difference in dealing with someone who grew up in the Yukon as opposed to someone who grew up down South in a huge city and doesn't understand the complexities of our culture.*
> - 20, interview

7.3 Facilitating Community-Based 'First Mile' Development

Finally, our research pointed to discussion themes concerning how the federal government can facilitate community-based 'first-mile' broadband development. The four topics briefly discussed are: ensure development is driven by community needs; support partnerships with commercial and government entities; support resource-sharing between communities; and establish sustainable funding frameworks.

7.3.1 Ensure Development is Driven by Community Needs

There is a need to re-frame the Government of Canada's existing technical definition of 'high speed' broadband, which was set almost 10 years ago (in 2001) at 1.5 Mbps. This re-definition can also include the recognition of levels of broadband infrastructure and connectivity services required for community -- not just residential -- applications. As the AFN and its partners noted in their submission to Industry Canada's *Digital Economy* consultation:

> Our experience suggests that these services [such as telehealth and digital education] will require a minimum of 10 Mbps fibre connection to the communities (J. Whiteduck et al, 2010, p. 3).

To avoid becoming obsolete and keep pace with ongoing developments, these technical definitions can move beyond the 'what' of technical issues like broadband infrastructure development, to also recognize 'how' connectivity is employed in First Nations and Inuit communities (Migone & Henley, 2009, p. 141). Such a model might involve researchers who might work with communities to define goals and objectives that ICTs are implemented to serve. One example of a national-level research group created to conduct this kind of research was Research on ICT with Aboriginal Communities (RICTA), a Canadian research cluster designed to build a national network of connectivity, knowledge and relationships committed to using social science and humanities perspectives for ICT development (Walmark et al, 2005). Founded in March 2005, RICTA began from the perspective that Aboriginal communities can contribute to local, context-specific development processes by using ICT for education, health and wellness, government, language and culture, and economic development. In another example, Alexander (2005) developed a seven-point checklist that highlights pre-requisites for culturally-relevant, appropriate and successful ICT adoption in Aboriginal communities, including awareness of ICTs in society and capacity to meet development priorities (see Alexander, 2005, p.4). This kind of work is also already being done by First Nations and Inuit community-based organizations, such as KNet, Broadband Communications North and the Nunavut Broadband Development Corporation.

> *Communities change. They grow in size, their needs expand, etc. So there may be a need to rebuild or redeploy network infrastructure. Acceptable limits to bandwidth are changing all the time. We need to design networks that are flexible enough to match these changing demands.*
> - 06, interview

7.3.2 Support Partnerships with Commercial and Government Organizations

Partnerships with commercial, government, and First Nations and Inuit organizations are a core component of broadband infrastructure and connectivity development (J. Whiteduck, 2010). In their critical examination of the *Connecting*

Canadians (CC) program, Fiser and Seibel concluded that it undervalued the human side of building public-private partnerships for community-based networks (Fiser & Seibel, 2009). To work most effectively, these partnerships can give high priority to projects led by community-based First Nations and Inuit organizations (Downing, 2002). As the AFN and its partners submitted to Industry Canada's *Digital Economy* consultations:

> Where a business partnership may be proposed, a program initiative to help support First Nations equity needs must be identified locally, regionally, and nationally. Such an effort will support First Nations organizations to develop and assess opportunities to negotiate new arrangements that promote economies of scale at a national level (J. Whiteduck et al, 2010, p. 4).
>
> *Once you start formalizing or imposing this kind of relationship on communities (for example, making mentorship a necessary component of being funded) it all falls apart. Such relationships need to be informal, open and transparent. They need to come from the communities. The government can facilitate them, but the relationships and the drive need to come from communities.*
> - 05, interview

Tapia et al's model of "hybrid public broadband" proposes a role for government to support partnerships between local governments, industry and community groups that balance ownership, management, maintenance and use (Tapia et al, 2009). One example of a project that harmonizes such goals is described in the 2008 report *Managing Bandwidth -- Nunavut's Road Ahead,* which noted that "[after] combining the needs of the public, the needs of various sectors, and non-core government needs in relation to each other, it is clear that many solutions ideal for one group are also ideal solutions for another" (Nunavut Broadband Development Corporation, 2008, p. 5).

Private and public sector organizations can work with First Nations and Inuit communities to recognize the complex policy and funding environments that First Nations and Inuit must negotiate when forming partnerships. Many First Nations and Inuit communities enter multi-year contracts in order to secure better connectivity rates. But it often takes long negotiations before they can convince service providers about the challenges of ad-hoc government funding structures, which put them at risk of 'cancellation fees' that accompany many long-term contracts. Many companies have changed their contract agreements and offered below-market rates to recognize this situation (08, interview). For example, KNet in Ontario conducted negotiations with Bell Canada to substantially reduce the cost of regional access to broadband services (www.knet.ca/services/).As one key informant stated: "if we knew our funding was stable, we could negotiate more effectively (14, interview).

7.3.3 Support Resource-Sharing Between Communities

Government policy can be designed in a way that enables communities to share resources, rather than compete with one another. This approach not only encourages partnerships between communities, but is also necessary in areas that cannot support a business case for private-sector broadband infrastructure and connectivity development. By sharing resources and negotiating together, First Nations and Inuit communities benefit from the resulting economies of scale.

> *[We can] group communities together as a unit, instead of negotiating separately. So if a company partners with a group of communities, there's more of a business case than working to connect just one.*
> - 9, interview

There are many already-existing examples of communities pooling together resources across local and provincial jurisdictions. For example, the National Indigenous Satellite Community Network (NICSN) described in Chapter 3 shares network resources and satellite bandwidth with communities across northern Ontario, Quebec and Manitoba. But rather than build on these successes, a recent funding program, Broadband Canada, requires that each partner organization would need to apply separately for additional resources.

7.3.4 Establish Sustainable Funding Frameworks

A core challenge to developing robust First Nations and Inuit broadband infrastructure is the absence of sustainable funding. Several reports have argued that any nationally-focused *First Nations and Inuit Community Connectivity Strategy* requires long-term government support (Downing, 2002; see also Migone & Henley, 2009 and Smith, 2008). As the AFN writes:

> Looking at some of the other early federal programs, such as SchoolNet, and the Community Access Program, it is apparent that funding levels continued to decrease or remain level, while the once-touted Internet access to First Nations communities is no longer adequate for the growing number of applications and bandwidth requirements (AFN Chiefs Committee on Economic Development, 2010, p. 24).

> *We need to get decision-makers to understand that broadband infrastructure and the human resources capacities to manage it, are long-term investments, even if they are expensive in the short-term.*
> - 08, interview

Appendix: Methods

The study methodology included: a literature review; 23 interviews -- in-person, by telephone or by videoconference -- with people working in the field of First Nations or Inuit community broadband infrastructure and connectivity development; developing stories of community connectivity and use of ICT; meeting and discussing the project with First Nations organizations and other key informants, and revising drafts together.

The community stories were written to outline innovative, industry-leading uses of ICTs and broadband by First Nations communities and organizations in areas including art, education, and health. These areas are intimately related and so, for example, language immersion programs in First Nations' schools cannot be separated from health and well-being. In some cases the stories were authored or co-authored by members from the concerned organizations and communities. In all cases the stories that appear in this report have been verified by organization and/or community members.

We also conducted a literature review of First Nations and Inuit ICT and broadband infrastructure development and connectivity services. This review also included research about broadband-enabled public and community services. The review surveyed both peer-reviewed publications and grey literature from First Nations and Inuit organizations, and government reports. The search for peer-reviewed publications included the following databases: Sociological Abstracts; ACM; IEEE; Bibliography of Native North Americans; Google Scholar; Scopus; Web of Science; and INSPEC. We searched the databases using a combination of subject terms and keywords related to First Nations and Inuit peoples, and computer-based technologies and networks (*keywords: broadband; Internet; digital media; new media; information technolog**). The search was not restricted to Canadian sources. The grey literature search included working with key informants to identify works known to them, as well as and Internet searches of First Nations and Inuit organizations, government agencies, and other organizations. This search yielded the 181 items listed in the bibliography.

We also conducted interviews with 23 key informants working on First Nations and Inuit connectivity at community level. All but one of these interviews was conducted in-person, on the telephone, or through videoconferencing. The remaining interview was conducted through an online survey. On average, these interviews lasted 1.5 hours. The semi-structured interviews followed a standardized set of questions related to broadband infrastructure, connectivity, and broadband-enabled public and community services. All interview data was transcribed and sent to key informants for verification before being included in the report. Key informants were also invited to verify regional information used in the overview of existing broadband infrastructure and connectivity in Chapter 4.

Appendix: Meetings

The following is a list of meetings with First Nations and Inuit groups and government and research organizations that the research team conducted during the development of this report:

- Regular (monthly) videoconference meetings with project partners
- Videoconference meeting and presentation on September 24, 2010 to discuss the project with the Assembly of First Nations' IT Think Tank
- In-person presentation to Social Sciences and Humanities Research Council in Ottawa on October 26, 2010 to summarize progress to date
- Videoconference meeting and presentation on November 3, 2010 to introduce the TACS project to representatives from Indian and Northern Affairs Canada, Health Canada, the Canadian Space Agency, CanNor, Infrastructure Canada, and Human Resources and Skills Development Canada working on an Aboriginal connectivity strategy
- Online national meeting hosted by Fort Severn First Nation to discuss the draft TACS report on November 17, 2010.
- In-person presentation to and discussion with the Assembly of First Nations IT Think Tank in Ottawa on November 23, 2010.
- In-person discussions during an 'open house' with members of the research team held on November 25, 2010, between 9am-3pm, in Ottawa at the Delta Hotel.

Bibliography

Aboriginal Canada Portal Working Group (2004) Final Report: Third Annual National Connecting Indigenous Peoples in Canada Forum. Ottawa, March 24-26.

Aboriginal Connectivity Portal (2006) Sustainable "Draft" Overview of National Aboriginal Connectivity and E-Services Partnership Framework Forum Discussion Paper. Presented at the National Aboriginal Connectivity and E-Services Forum.

AFN Chiefs Committee on Economic Development (2010). *Overcoming the Digital Divide: An Historical Overview of First Nations Connectivity*. *DRAFT*. March 31, 2010. Assembly of First Nations, Chiefs Committee on Economic Development paper.

AirWare (n.d.). *Services/Rates*. URL: http://www.airware.ca/services-rates

Alexander, C. J. (2001) Wiring the Nation! Including First Nations? Aboriginal Canadians and the Federal e-Government Initiatives. Journal of Canadian Studies, 35 (4), 277-296.

Alexander, C. J. (2005). Northern Exposure: Assessing Citizenship, Democracy and the Great Canadian e-Government Expedition. *Technikfolgenabschatzung: Theorie und Praxis*. 2(14), January – June. Pp. 80-87.

Alexander, C. 2005. "Deconstructing Digital Delusions and Dependencies: The Politics of Identity and Federal Citizenship in Canada's Digital Frontier." www.policy.ca

Alexander, C.J. (with Adamson, A., Daborn, G., Houston, J., and Tootoo, V.) (2009). Inuit Cyberspace: The Struggle for Access for Inuit Qaujimajatuqangit. *Journal of Canadian Studies*, 43(2), 220-249.

Alia, V. (2009). Outlaws and citizens: indigenous people and the 'New Media Nation'. *International Journal of Media and Cultural Politics*, 5(1&2): 39-54.

Alia, V. (2010). *The New Media Nation: Indigenous Peoples and Global Communication.* New York and Oxford: Berghahn Books.

All Nations Trust Company (2010). Pathways to Technology: Project Update, July 2010. *All Nations Trust Company Newsletter,* Summer 2010. Issue 19. URL: http://www.antco.bc.ca/downloads/summer.pdf

Allec, R. (2005) First Nations Health and Wellness in Manitoba: Overview of Gaps in Service and Issues Associated with Jurisdictions: Inter-Governmental Committee on First Nations Health.

Assembly of Manitoba Chiefs (n.d.). AMC Policy Area: Health – eHealth. *Assembly of Manitoba Chiefs*. URL: http://www.manitobachiefs.com/policy/health/ehealth.html

Bahrychuk, J. (2009) Transitions: Building Support for Isolated Aboriginals with Vision Loss Through the Use of Technology. Canadian Society of Telehealth, Vancouver, October 3-6.

Beaton, B., Fiddler, J., & Rowlandson, J. (2004) Living Smart in Two Worlds: Maintaining and Protecting First Nation Culture for Future Generations. In M. Moll & L.R. Shade (eds.), Seeking Convergence in Policy and Practice: Communications in the Public Interest (Volume 2) Ottawa: Canadian Centre for Policy Alternatives: 283-297.

Beck, R. et al. (2005). Nutarniq: Uniting the Arctic Community with a Wireless Arctic Network for Circumpolar Communications. *Polar Geography*, 29(1), 43-78.

Bell, M., Rossiter, J., Axtell, T. (2009) Skills Online: Public Health Professional Development for the North. Public Health Agency of Canada (PHAC). Presentation at the National Aboriginal Health Organization (NAHO) National Conference, Ottawa, November.

Bonny, E., Berkes, F. (2008) Communicating traditional environmental knowledge: addressing the diversity of knowledge, audiences and media types. Polar Record, 44 (230): 243-253.

Brasfield, C., Clement, C. (2007) Beyond the Pilot Studies: Cognitive Behavioral Therapy in a Remote Aboriginal Community. Canadian Society of Telehealth. St. John's NL, November 4-6.

Breu, R.D. (2009) First Nations' Electronic Resources: Tools for Cultural Protection, Revitalization and Self-Determination. Canadian Library Association 6: 14-17.

Broadband Communications North (n.d.). *About BCN.* URL: http://www.gobcn.ca/about_bcn

Budka, P., Bell, B., Fiser, A.. (2009) MyKnet.org: How Northern Ontario's First Nation Communities Made Themselves At Home On The World Wide Web. Journal of Community Informatics 5(2).

Burgess, N. (n.d.). *Together at a Distance: Pan-Arctic E-Learning Project*.

Business Wire (2004a). Broadband Wireless Internet a Boost for Iqualuit. *Business Wire*, Pg. 1. (Feb 26, 2004).

Business Wire (2004b). Inukshuk Internet Inc. and the Kativik Regional Government to Deploy High-Speed Internet Connectivity North of the 55th Parallel. *Business Wire*. Pg. 1. (Jul 20, 2004).

Caidi, N. & Walmark, B. (2006). Developing an On-Demand Book Service for First Nations Communities in Northern Ontario. Background Paper prepared for the CRACIN Workshop, 2006. Faculty of Information Studies, University of Toronto.

Canadian Heritage (n.d.). *Gateway Fund.* URL: http://www.pch.gc.ca/pcce-ccop/pgm/gtwy-eng.cfm

Canadian Northern Economic Development Agency (n.d.). *The Agency's Focus*. URL: http://www.cannor.gc.ca/fcs-eng.asp

Carpenter, P. (2010) The Kuhkenah Network (K-Net). In White, J.P., Peters, J., Beavon, D., Dinsdale, P. (eds). Aboriginal Policy Research VI: Learning, Technology and Traditions. Toronto: Thompson Educational Publishing: 119-127.

Carpenter, P., Kakepetum-Schultz, T. (2010) Above and Beyond: Embedding Community Values and Beliefs into an Evolving First Nations IT Health System. E-Health COACH Conference, Vancouver, May 29-31.

Carpenter, P. and Rowlandson, J. (2009) Accelerating Access to an Integrated and Scalable Health Infostructure for remote Ontario First Nations: Optimizing Community, Provincial & Federal Resources in Ontario's James Bay Coast. COACH e-Health Conference, Quebec City, June 3.

Castells, M. (2009). *Communication Power*. Oxford and New York: Oxford University Press.

Chouinard, J. (1983) Satellite contributions to telemedicine: Canadian CME experiences. Can Med Assoc J, Vol 128 April.

Community Learning Project (2009) RAIN Project: Resource Access and Information Network. Presentation at the First Nations ICT Summit, Vancouver, February.

Coulson, H., Vermette, M. (2008) How Telemedicine is Bringing Home Care

Services to First Nations in Remote Communities. Canadian Society of Telehealth (CST), Ottawa, October 5-7.

Crossing Boundaries. (2004) Aboriginal Digital Voice: National Roundtable Summary of Proceedings. Ottawa, March 23.

Donelle, L., & Hoffman-Goetz, L. (2008) An exploratory study of Canadian Aboriginal online healthcare forums. Health Communication, 23(3): 270-281.

Downing, R. (2002). Bridging Aboriginal Digital and Learning Divides: Report on Office of Learning Technologies Support to Aboriginal Communities. *Office of Learning Technologies.*

DeVry Institute of Technology (2010). Sunchild E-Learning and DeVry Calgary Bring Tuition-free Higher Education Courses to Aboriginal Students. *Press Release,* August 26, 2010. URL: http://www.newswire.ca/en/releases/archive/August2010/26/c5196.html

Eastern Ontario Regional Network (n.d.). *About Us*. URL: http://216.168.98.134/about-us/

Ebare, S. (2006) First Nations Remote Communities Connectivity and Health: Identifying Opportunities and Challenges for British Columbia. School of Communication, Simon Fraser University: Vancouver, British Columbia.

Falcon Communications (2007). Launch of new service brings greater access to broadband across the Northwest Territories. *Press Release*, February 6, 2007. URL: http://www.denendeh.ca/news/documents/Broadband_service_Feb6_2007.pdf

Fiddler, J. (2008) UN Declaration on the Rights of Indigenous Peoples: The Role of ICTs. Presentation at the First Nations ICT Summit, Vancouver, February.

First Nations Education Council (2009) 2008-2009 Annual Report. Conseil en Education des Premieres Nations – First Nations Education Council. Wendake, Quebec.

First Nations Help Desk (n.d.). Atlantic First Nation Fibre Optic Project. *Fact Sheet*. URL: http://schools.firstnationhelp.com/fibre/

First Nations, Inuit and Aboriginal Health (n.d.). eHealth. *Health Canada.* URL: http://www.hc-sc.gc.ca/fniah-spnia/services/ehealth-esante/index-eng.php

First Nations Technology Council (2005) Information and Communication

Technologies in B.C. First Nations Communities. Report on an Environmental Scan Conducted by the FNTC. March.

Fiser, A. (2010, forthcoming) A map of broadband deployment in Canada's Indigenous and Northern communities: access, management models, and digital divides (circa 2009). Communication, Politics & Culture 43(1) RMIT Publishing.

Fiser, A., & Seibel, F. (2009) From National Technology Experiment to Regional Socio-economic Development: Policy Measurement, Social Enterprise, and the Demands of Aboriginal Community Networking Beyond the Connecting Canadians Agenda. Aboriginal Policy Research Conference. Ottawa, March 9-12.

Fiser, A., & Clement, A. (2009) K-Net and Canadian Aboriginal communities. IEEE Technology and Society Magazine, 28 (2): 23-33.

Fiser, A., Clement, A., & Walmark, B. (2005). The K-Net Development Process: A model for First Nations Broadband Community Networks. Presented at the Telecommunications Conference (TPRC) September 23-25, 2005, held at George Mason University School of Law in Arlington, VA.

Fraser, W. (Summer 2007). Can the Internet be the Arctic's Economic Future? *Inuktitut*, 103: 44-49.

Friedman, M. (1996), Wiring Canada's Inuit communities. *Computing Canada*. Willowdale: Aug 1, 1996, 22(16): 1-2.

Gagnon, M.P., Duplantie, J., Fortin, J.P., Landry, R. (2006) Implementing telehealth to support medical practice in rural/remote regions: what are the conditions for success? Implementation Science 1 (18): 1-8.

Garrick, R. (2004) Changes Internet technology has brought to northern Ontario. Indian Life, 24: 7.

Garrick, R. (2005) Broadband Linking Northern Communities by 2007. *Wataway News*, January 27, 2005, 32(2). URL: http://www.wawataynews.ca/node/10851

Gibson, K., Kakepetum-Schultz, T., Coulson, H., O'Donnell, S. (2009) Telemental Health with Remote and Rural First Nations: Advantages, Disadvantages, and Ways Forward. National Aboriginal Health Organisation (NAHO) Conference. Ottawa, November 24-27.

Gibson, K., Simms, D., O'Donnell, S., & Molyneaux, H. (2009). Clinicians'

Attitudes toward the Use of Information and Communication Technologies for Mental Health Services in Remote and Rural Areas. Canadian Society for Telehealth Conference, Vancouver, BC, October 3-6.

Gibson, K. O'Donnell, S., Rideout, V. (2007) The project-funding regime: Complications for community organizations and their staff. Canadian Public Administration, 50(3): 411-435.

Gideon, V. (2006) Canadian Aboriginal peoples tackle e-health: seeking ownership verses integration. Landzelius, K., ed. Native on the Net: Indigenous and Diasporic Peoples in the Virtual Age. London: Routledge: 60-79.

Gideon, V., Nicholas, E., Rowlandson, J., Woolner, F. (2009) Enabling and Accelerating First Nations Telehealth Development in Canada. Journal of Community Informatics 5(2).

Ginsburg, F. (2009). Beyond Broadcast: Launching NITV on Isuma TV. *In Media Res: A Media Commons Project*. May 4, 2009. URL: http://mediacommons.futureofthebook.org/imr/2009/05/03/beyond-broadcast-launching-nitv-isuma-tv

Gordon, J. (2009) Namgis First Nation: Building a Successful ICT Network in a First Nations Community. Presentation at the First Nations ICT Summit, Vancouver, February.

Gordon, J.P. (2006) Building an ICT Network: A Guide for Small and Remote First Nations Communities. Vancouver: First Nations Technology Council.

Government of Alberta (2004) Final Report. Aboriginal Information Communication Technology Forum, Edmonton, Alberta.

Government of Alberta (n.d.). *Alberta Supernet*. URL: http://www.servicealberta.gov.ab.ca/AlbertaSuperNet.cfm

Government of Canada (2010). Government of Canada Launches National Consultations on a Digital Economy Strategy. *Press Release*, May 10, 2010. URL: http://news.gc.ca/web/article-eng.do?m=/index&nid=530969

Grossman, R. (2008). Literature Review: Impact of Technology Change on Issue Areas Relevant to Connectivity in Remote and Indigenous Communities. *Centre for Community Informatics Research Development and Training* and *Northern Indigenous Community Satellite Network*.

Gurstein, M., Beaton, B., Sherlock, K. (2009) A Community Informatics Model for

e-Services in First Nations Communities: The K-Net Approach to Water Treatment in Northern Ontario. Journal of Community Informatics, 5(2).

Hancock, B.R., and O'Donnell, S. (2009) New Media and Self-Determination: Publicly Made and Accessible Video and Remote and Rural First Nation Communities. Canadian Communication Association, Ottawa, May.

Hanley, S. (2009) FNTC: Working on Behalf of all First Nations in BC, ICT Summit. Presentation at the First Nations ICT Summit, Vancouver, February.

Hanley, S. (2006) First Nations Tcchnology Council: Working on Behalf of all First Nations in BC. Presentation at the First Nations ICT Summit, Vancouver, February.

Harper, D. G. (2007) BC-Yukon First Nations' Health Network. World Conference on Educational Multimedia, Hypermedia and Telecommunications (EDMEDIA).

Health Canada (n.d.). *Funded Health Programs and Services*. URL: http://www.hc-sc.gc.ca/fniah-spnia/finance/agree-accord/prog/index-eng.php#gov_infa

Health Canada (2001) Community Services in the 21st Century: First Nations & Inuit Telehealth Services. National First Nations Telehealth Research Project HTF-NA402 1998-2001. Health Canada: Ottawa.

Health Canada. (2002) How Canadian eHealth Initiatives are Changing the Face of Healthcare: Success Stories. Office of Health and the Information Highway, Health Canada: Ottawa.

Health Canada. (2003) Framework for Remote and Rural Readiness in Telehealth: Final Report. Health Canada: Ottawa.

Health Canada (2004a) Backgrounder on Telehealth Activities in First Nations and Inuit Communities: Aboriginal Crossing Boundaries-On-line Discussion Document. eHealth Solutions Unit: First Nations & Inuit Health Branch Canada.

Health Canada (2004b) Telemental Health in Canada: A Status Report. Health and the Information Highway Division Information, Analysis and Connectivity Branch Health Canada: Ottawa.

Health Canada (2009) Determinants of Health, 1999 to 2003: A Statistical Profile on the Health of First Nations in Canada. Ottawa, Ontario.

Helmer, N. (2010) Mushkegowuk First Nations: Telemedicine, Digital Imaging and EMR Planning and Implementation. Chiefs of Ontario Health Forum, February 24.

Henley, H. (2010) Land and Language: Exploring the Uses of The Ktunaxa Nation Network in British Columbia, Canada. (Master's Thesis) Retrieved from www.umanitoba.ca/institutes/natural_resources/pdf/theses/Masters Thesis Henley 2010.pdf

Ho, K., Jarvis-Selinger, S. (2006) A Pan Canadian Environmental Scan of Clinical Telehealth Activity Evidence Companion. Vancouver: University of British Columbia.

Hoffman-Goetz, L., & Donelle, L. (2007) Chat room computer-mediated support on health issues for Aboriginal women. Healthcare for Women International, 28(4): 397-418.

Hogenbirk, J., Ramirez, R., Ibanez, A. (2006) Final Evaluation Report : KO Telehealth / North Network Expansion Project. Sudbury and Guelph, ON. Centre for Rural and Northern Health Research, Laurentian University; the School of Environmental Design and Rural Development, University of Guelph.

Hogenbirk, J.C. (2008) Economic Evaluation of Keewaytinook Okimakanak Telemedicine: Federal and Provincial Cost Avoidances. Centre for Rural and Northern Health Research, Laurentian University.

Hogenbirk, J.C. (2009) Impact of Telehealth on Health Services Utilzation by Members of First Nations Communities in Northwestern Ontario: Preliminary Investigations. Canadian Society of Telehealth, Vancouver, October 3-6.

Howard, P. N., Busch, L., Sheets, P. (2010) Comparing Digital Divides: Internet Access and Social Inequality in Canada and the United States. Canadian Journal of Communication, 35(1): 109-128.

Hunter-Courchene Consulting Group Inc. (2006). *2006 National Aboriginal Connectiviy and E-Services Forum: "Sustainable Connectivity as an engine for Social and Economic Growth".* Conference proceedings. Government Conference Centre, Ottawa: March 13-16, 2006. URL: http://www.aboriginalcanada.gc.ca/cac/2006forum/site.nsf/vGraphics/Report/$file/National_Forum_Draft_Report_Version_2.pdf

INAC (2009) Evaluation of the First Nations SchoolNet Program. Final Report. Indian and Northern Affairs Canada, Evaluation, Performance Measurement and Review Branch. Ottawa, February 16.

Indian and Northern Affairs Canada (n.d.). *First Nations Infrastructure Fund (FNIF): Program Guide*. Ottawa: Indian and Northern Affairs Canada. URL: http://www.ainc-inac.gc.ca/ih/ci/pubs/prg/prg-eng.pdf

Industry Canada (2001) The New National Dream: Networking the Nation for Broadband Access. Report of the National Broadband Task Force. Ottawa: Industry Canada.

Industry Canada (2010). Government of Canada announces third round of Broadband Canada funding -- Approximately 30,000 more households to benefit from broadband internet access. *Press Release,* November 6, 2010. URL: http://media.knet.ca/node/10815

Infrastructure Canada (2003a). Government of Canada launches national satellite initiative to provide broadband across to Northern and remote communities. *Infrastructure Canada Press Release (October 5, 2003).* URL: http://www.ic.gc.ca/eic/site/ic1.nsf/eng/02469.html

Infrastructure Canada (2003b). Broadband access project to connect 90% of New Brunswick residents. *Infrastructure Canada Press Release (November 18, 2003).* URL: http://www.infc.gc.ca/media/news-nouvelles/csif-fcis/2003/20031118moncton-eng.html

Infrastructure Canada (2005a). Governments of Canada and Quebec sign the agreement for the installation of fibre-optic cables to Magdalen Islands. *Infrastructure Canada Press Release (May 12, 2005).* URL: http://www.infc.gc.ca/media/news-nouvelles/csif-fcis/2005/20050512magdalenislands-eng.html

Infrastructure Canada (2005b). Agreement brings broadband access to rural and remote schools and communities in Newfoundland and Labrador. *Infrastructure Canada Press Release (September 15, 2005).* URL: http://www.releases.gov.nl.ca/releases/2005/edu/0915n07.htm

Infrastructure Canada (2007a). Canada's New Government Provides $20.65M for Wider Broadband Access to 43 Northern Communities. *Infrastructure Canada Press Release (August 24, 2007).* URL: http://www.infc.gc.ca/media/news-nouvelles/csif-fcis/2007/20070824kuujjuaq-eng.html

Infrastructure Canada (2007b). Infrastructure Agreement Providing Greater Broadband Access to Northern Quebec Communities. *Infrastructure Canada Press Release (October 12, 2007).* URL: http://www.infc.gc.ca/media/news-nouvelles/csif-fcis/2007/20071012kawawachikamach-eng.html

IsumaTV (n.d.). Local Servers: High-speed video, low-speed communities. *IsumaTV.* URL: http://www.isuma.tv/local-servers

Ives, N. G., & Aitken, O. (2008) Technology and Access: Responding to the Social Work Education Needs of First Nations and Inuit Communities, Social Work Education, 27: 683-692.

Jarvis-Selinger, S. (2008). Tl'azt'en Learning Circle: Information Technology, Health and Cultural Preservation. *The Journal of Community Informatics*, 4(3).

Jennett, P.A., Scott, R.E., Affleck Hall, L., Hailey, D., Ohinmaa, A., Anderson, C., Thomas, R., Young, B. and Lorenzetti, D. (2004). Policy Implications Associated with the Socioeconomic and Health System Impact of Telehealth: A Case Study from Canada*, Telemedicine Journal and e-Health*, 10(1): 77-83.

Jennett, P., Jackson, A., Ho, K., Healy, T., Kazanjian, A., Woollard, R., et al. (2005). The essence of telehealth readiness in rural communities: an organizational perspective. Telemedicine Journal and e-Health, 11(2): 137-145.

Johnston, T. (2008) A Telehealth Initiative: Health Education By Video Conference. Presentation at the First Nations ICT Summit, Vancouver, February.

Jong, M. (2004) Managing Suicides Via Videoconferencing in a Remote Northern Community in Canada. International Journal of Circumpolar Health 63(4): 422-426.

Keewaytinook Okimakanak Research Institute (2005) C-Band Public Benefit – Keewaytinook Okimakanak's Kuhkenah Satellite Network work 2001-2005: Summative Overview - Assisting Remote Communities Across Canada to Access & Use C-Band Public Benefit. March 28.

Keewaytinook Okimakanak (2005) Position Paper: Turning the Corner with First Nations Telehealth. Prepared by John Rowlandson & Associates. May.

Kornacki, C. (2010). Fibre optic cable launched in James Bay area First Nations. *Wawatay News Online*, February 22, 2010. URL: http://www.wawataynews.ca/archive/all/2010/2/22/Fibre-optic-cable-launched-in-James-Bay-area-First-Nations_19272

Lavoie, J., Williams, D. (2009) Managing changes in First Nations' healthcare needs: is telehealth the answer? Journal of Community Informatics 5(2).

Leclair, C., Warren, S. (2007) Portals and Potlach, In Information Technology and Indigenous People, eds. L.E. Dyson, M. Hendriks, S. Grant. Information Science Publishing: Hershey PA: 1-13.

Lewis, J.L. Sheppard, S.R.J. (2006) Culture and communication: Can landscape visualization improve forest management consultation with Indigenous communities? Landscape and Urban Planning, 77 (3): 291-313.

Lulua, M., Flannery, M. (2009) An Introduction to the Tsilhqot'in Stewardship Planning Portal. Presentation at the First Nations ICT Summit, Vancouver, February.

Maar, M., Seymour, A.M. (2008) Development of the Aboriginal Telehealth Knowledge Circle Research Agenda. Canadian Society of Telehealth, Ottawa, October 5-7.

Maar, M.A. et al. (2009). Reaching agreement for an Aboriginal e-health research agenda: the Aboriginal telehealth knowledge circle consensus method. *Rural and Remote Health,* 10, 1-13.

Maki, Don (2008) What NOT to do in Building a Network: Lessons Learned. Presentation at the First Nations ICT Summit, Vancouver, February.

Many Guns, A., Brown, T. (2009) Alberta First Nations Telehealth Change Management Project. Canadian Society of Telehealth, Vancouver, October 3-6.

Marlin, A., & Bruce, D. (2005) Broadband Adoption, Use, and Impacts in Eel Ground First Nation, New Brunswick: A Case Study.

Marlow, I. (2010) Make high-speed Internet 'basic service,' CRTC urged. *The Globe and Mail* (Nov. 2, 20100. URL: http://www.theglobeandmail.com/news/technology/make-high-speed-internet-basic-service-crtc-urged/article1782354/

Masum, H., Brooks, M., Spence, J. (2005) MusicGrid: A case study in broadband video collaboration. First Monday [Online], 10(2).

McKelvey, F., O'Donnell, S. (2009) Out from the Edges: Multi-site Videoconferencing as a Public Sphere in First Nations. Journal of Community Informatics 5(2).

Middleton, C. (2010). From Canada 2.0 to a Digital Nation. *Canadian Federation for the Humanities and Social Sciences, Big Thinking Lecture*. Ottawa, October 7, 2010. URL:

http://www.fedcan.ca/content/en/618/From_Canada_2.0_to_a_Digital_Nation.html

Migone, J. and Henley, H. (2009). Impact of Information and Communication Technology on Social Capital in Aboriginal Communities in Canada. *Journal of Information, Information Technology, and Organizations*, 4, 127-145.

Milliken, M., O'Donnell, S., Gorman, E. (2009) How K-Net and Atlantic Canada's First Nation Help Desk are using videoconferencing for community development. Journal of Community Informatics 5(2).

Ministry of Labour and Citizens' Services (2009) $8.3 M to Help First Nations Bridge the Digital Divide. *Press Release,* February 20, 2009. URL: http://www2.news.gov.bc.ca/news_releases_2005-2009/2009LCS0004-000216.htm

Mitchell, D. (2007) Broadband at the Margins: Challenges to Supernet Deployment in Rural and Remote Albertan Communities. In D. Taras, M. Bakardjieva & F. Pannekoek, (eds.) How Canadians Communicate II: Media, Globalization, and Identity. Calgary: University of Calgary Press: 261-287.

Moll, M. (2011). "A Brief History of the Community Access Program: From Community Economic Development to Social Cohesion to Digital Divide". Appendix B in A. Clement, M. Gurstein, G. Longford, M. Moll, and L. Shade (eds). *Connecting Canadians: Investigations in Community Informatics*. University of Athabasca Press: Forthcoming, May.

Molyneaux, H., O'Donnell, S. (2009a) ICT and Health and Wellness in Remote and Rural First Nations Communities: A Social Determinants of Health Perspective. Canadian Society of Telehealth, Vancouver, BC, October 3-6.

Molyneaux, H., O'Donnell, S., Oakley, P., Kondratova, I., Lumsden, J., McIver, W., Gibson, K., Simms, D., Milliken, M., Pinelle, D., and Hagerman, V. (2009b) Patient Portal Technologies. Fredericton: National Research Council. 110 pages. NRC 50795. ERB-1164.

Muttitt, S., Vigneault, R., Loewen, L. (2004) Integrating telehealth into Aboriginal healthcare: the Canadian experience. International Journal of Circumpolar Health 63(4): 401-414.

Naditz, A. (2008) Canada's IT Leader funds Native Telehealth. Telemedicine Journal and e-Health, 14(1): 8-9.

Nagesh, Gautham. (August 12, 2010). New FCC Office Targets Native Americans.

Hillicon Valley: The Hill's Technology Blog. Retrieved from: http://thehill.com/blogs/hillicon-valley/technology/114059-new-fcc-office-targets-native-americans

NAHO (2009) Honouring Life Network: New Media in Suicide Prevention. Presentation at the National Aboriginal Health Organization (NAHO) National Conference, Ottawa, November.

National Broadband Task Force (2001) *The New National Dream: Networking the Nation for Broadband Access. Report of the National Broadband Task Force.* Industry Canada: Ottawa. URL: http://dsp-psd.pwgsc.gc.ca/Collection/C2-574-2001E.pdf

National C-Band Benefit User Group (2004). *History of NICSN: The Development of a Community Satellite Network*. January, 2004. URL: http://smart.knet.ca/satellite/history.html

National C-Band Benefit User Group (2005). Indigenous Community Leaders from the North in Three Provinces to Attend Opening of Satellite Broadband Network in Sioux Lookout, Ontario. *Press Release*. URL: http://smart.knet.ca/satellite/press_release.html

Network BC (n.d.). About Us. *Network BC.* URL: http://www.network.gov.bc.ca/about.htm

Northern Aboriginal Broadcasting and Distribution Projects (n.d.). Northern Aboriginal Broadcasting and Distribution Projects. *Heritage Canada*. URL: http://www2.pch.gc.ca/pgm/pa-app/frm/nab-eng.cfm

NorthwesTel (n.d.). High Speed Iqaluit Lite. *NorthwesTel*. URL: http://www.nwtel.ca/personal/internet/dsl/high-speed-iqaluit-lite/

NorthwesTel (2010). History: First in the North. *NorthwesTel*. URL: http://www.nwtel.ca/about-northwestel/history-first-in-the-north/

Nunavut Broadband Development Corporation (n.d.) *Our Mission.* URL: http://www.nunavut-broadband.ca/

Nunavut Broadband Development Corporation (2008). *Infrastructure Phase II: Managing Bandwidth -- Nunavut's Road Ahead.* March 31, 2008. Iqaluit: Nunavut Broadband Development Corporation. URL: http://www.nunavut-broadband.ca/PDF/Nunavut%20Broadband%20Business%20Plan%20to%20INFC-080331v1.12-Exec%20Sum%20Only.pdf

Nunavut Broadband Development Corporation (2010). *Submission to the Digital*

Economy Consultations on behalf of the Nunavut Broadband Development Corporation. July 9, 2010. Iqaluit: Nunavut Broadband Development Corporation URL: http://de-en.gc.ca/wp-content/themes/clf3/upload/1891/Digital%20Economy%20submission%20-%20NBDC.pdf

O'Connor, J., O'Connor, C., Anderson, K., Boyes, M., Mah, S. (2008) From Nova Scotia to Alberta, A General Medicine Telehealth Clinic for a First Nations Community. Canadian Society of Telehealth, Ottawa, October 5-7.

O'Donnell, S. and Delgado, G. (1995) Using the Internet to Strengthen the Indigenous Nations of the Americas. Media Development 3: 36-38.

O'Donnell, S., Walmark, B. and Hancock, B-R. (2010) Videoconferencing and Remote and Rural First Nations. In White, J.P., Peters, J., Beavon, D., Dinsdale, P. (eds). Aboriginal Policy Research VI: Learning, Technology and Traditions. Toronto: Thompson Educational Publishing: 128-139.

O'Donnell, S., Molyneaux, H., Gorman, E., Milliken, M., Chong, C., Gibson, K., Oakley, P., Maitland, J. (2010) Information and Communication Technologies to Support Health and Wellness in Remote and Rural First Nations Communities: Literature Review. Fredericton: National Research Council, May, 136 pages.

O'Donnell, S., Milliken, M., Chong, C., Walmark, B. (2010) Information and Communication Technologies (ICT) and Remote and Rural First Nations Communities: An Overview. Presented at the Canadian Communication Association Annual Conference (CCA 2010) Montreal, June 1-3.

O'Donnell, S., Perley, S., Walmark, B., Burton, K., Beaton, B., & Sark, A. (2009) Community-based Broadband Organizations and Video Communications for Remote and Rural First Nations in Canada in Stillman, L., Johanson, G., and French, R., editors, Communities in Action. Newcastle upon Tyne, UK: Cambridge Scholars Publishing: 107-119.

O'Donnell, S., Perley, S., Simms, D., & Hancock, B-R. (2009) Video communication roadblocks facing remote Indigenous communities. IEEE Technology and Society Magazine, 28 (2): 16-22.

O'Donnell, S., Beaton, B., and McKelvey, F. (2008) Videoconferencing and sustainable Development for Remote and Rural First Nations in Canada. Community Informatics Research Network (CIRN 08), Prato, Italy.

Pacific Community Networks Association. (2006) *New Opportunities for Canada in the Digital Age: Recommendations on the Future of the Community Access Program* (May 10, 2006).

Pannekoek, F. (2001) Cyber Imperialism and the Marginalization of Canada's Indigenous Peoples. Presented at The Handing Down of Culture, Smaller Societies and Gobalization, Université Laval, May 25-26.

Pathways to Technology (n.d.). *About the Project.* URL: http://www.pathwaystotechnology.ca/about-the-project

Pathways to Technology (2010). *Community Update -- April 2010*. URL: http://ptt.posterous.com/community-update-april-2010

Peddle, K. (2007) Telehealth in Context: Socio-technical Barriers to Telehealth use in Labrador, Canada. Computer Supported Cooperative Work (CSCW 2007). Springer 16: 595-614.

Perley, S. (2009) Representation and Participation of First Nations Women in Online Videos. Journal of Community Informatics 5(2).

Phillips, M. (2009) Podcasting for the Benefit of Aboriginal Languages: How to Establish a Podcast Website via iWeb. Presentation at the First Nations ICT Summit, Vancouver, February.

Picot, J., Power, C. (2007) Premières' Nations du Québec: Plan Stratégique de Télésanté 2007-2010. CSSPNQL. Quebec.

Potter, D. (2010) Keewaytinook Internet High School Review (2003-2008). In White, J.P., Peters, J., Beavon, D., Dinsdale, P. (eds). Aboriginal Policy Research VI: Learning, Technology and Traditions. Toronto: Thompson Educational Publishing: 147-155.

Ramirez, R. (2007) Appreciating the Contribution of Broadband ICT with Rural and Remote Communities: Stepping Stones Towards an Alternative Paradigm. The Information Society 23(2): 85-94.

Ramirez, R. (2001) A model for rural and remote information and communication technologies: a Canadian exploration. Telecommunications Policy 25 (5) 315-330.

River Valley Health (2006). Telemental health and Teleaddictions partnership project – Mawi Wolakomiksultine Evaluation Report: Fredericton, NB: River Valley Health.

Rowley, S., Sparrow, L., Schaepe, D. (2009) Musqueam and the Reciprocal Research Network. Presentation at the First Nations ICT Summit, Vancouver, February.

Sanderson, B., McKenzie, C., Clarke, L., Ramchandar, S., Asgarali, A. (2009) Building Partnerships for Sustainable Telehealth in First Nations Communities. Canadian Society of Telehealth, Vancouver, October 3-6.

Saqui, O., Chang, A., McGonigle, S., Purdy, B., Fairholm, L., Baun, M., et al. (2007) Telehealth videoconferencing: improving home parenteral nutrition patient care to rural areas of Ontario, Canada. Journal of Parenteral & Enteral Nutrition, 31(3): 234-239.

Savard, J-F. (1998). A Theoretical Debate on the Social and Political Implications of Internet Implementation for the Inuit of Nunavut. *Wicazo Sa Review*, 13(2), 83-97.

Schnarch, B. (2004) Ownership, Control, Access, and Possession (OCAP) or Self-Determination Applied to Research: A Critical Analysis of Contemporary First Nations Research and Some Options for First Nations Communities. Journal of Aboriginal Health, 1(1): 80-95.

Simms, D., O'Donnell, S., & Perley, S. (2008) Attitudes Toward and Use of Video Communications by Educators in First Nation Schools in Atlantic Canada. Fredericton: National Research Council. January.

Smith, R. (2008). *First Nations Communication Research: Final Report.* Vancouver: School of Communication and Centre for Policy Research on Science and Technology. URL: http://arago.cprost.sfu.ca/smith/research/fncr/FNCR.pdf

Soukup, K. (2006). Report: Travelling through layers: Inuit artists appropriate new technologies. *Canadian Journal of Communication* 31, 239-246.

SSI Micro (n.d.). SSI History. *SSI Micro*. URL: http://www.ssimicro.com/SSI-History

Telesat. (2005). Telesat brings broadband communications to 30 Aboriginal communities. *Press Release.* URL: http://prod05.bce.ca/en/news/releases/ts/2005/01/19/71965.html?displayMode=print&

Thiessen, V. and Looker, E.D. (2008). Cultural Centrality and Information and Communication Technology among Canadian Youth. *Canadian Journal of Sociology*, 33(2), 311-336.

Tomkinson, K. (2009) In Search of Community Champions: Researching the Outcomes of K-Net's Youth Information and Communications Technology Training Initiative. Journal of Community Informatics 5(2).

Transformative Change Accord (2005). *Transformative Change Accord*, November 25, 2005. URL: http://www.gov.bc.ca/arr/social/down/transformative_change_accord.pdf

Treaty 7. Information and Communications Technology for First Nations (ICTFN) (2004) Treaty 7 Aboriginal ICT Forum Session Summary. Calgary, March 30 & 31.

Vermette, M. (2008) How the Telehomecare Project Supports Homecare Staff in Remote Communities. Canadian Homecare Summit, St. Andrews-by-the-Sea, NB, October.

Walmark, B., O'Donnell, S., Beaton, B. (2005) Research on ICT with Aboriginal Communities: Report from RICTA 2005. Community Informatics Research Network (CIRN 2005) Cape Town, South Africa, August 24-26.

Walmark, B. (2010) Digital Education in Remote Aboriginal Communities. In White, J.P., Peters, J., Beavon, D., Dinsdale, P. (eds). Aboriginal Policy Research VI: Learning, Technology and Traditions. Toronto: Thompson Educational Publishing: 140-146.

Williams, D. (2009) Expansion Requirements for First Nations Telemedicine. Canadian Society of Telehealth, Vancouver, October 3-6.

Williams, D. (2010) Telehealth/Telemedicine Services in Remote First Nations in Northern Ontario. In White, J.P., Peters, J., Beavon, D., Dinsdale, P. (eds). Aboriginal Policy Research VI: Learning, Technology and Traditions. Toronto: Thompson Educational Publishing: 159-168.

Whiteduck, J. (2010) Building the First Nation e-Community. In White, J.P., Peters, J., Beavon, D., Dinsdale, P. (eds). Aboriginal Policy Research VI: Learning, Technology and Traditions. Toronto: Thompson Educational Publishing: 95-103.

Whiteduck, J., Burton, K., Whiteduck, T., & Beaton, B. (2010). *A First Nations Perspective on a Digital Economy Strategy and an Aboriginal Connectivity Strategy*. Consultation Paper, submitted to Industry Canada's Digital Economy Strategy consultation and to Indian and Northern Affairs Canada. URL: http://de-en.gc.ca/wp-content/themes/clf3/upload/1938/Aboriginal-Connectivity-AFN-First-Nation-Submission.pdf

Whiteduck, T. (2010) First Nations SchoolNet and the Migration of Broadband and Community-Based ICT Applications. (2010) in White, J.P., Peters, J., Beavon, D., Dinsdale, P. (eds). Aboriginal Policy Research VI: Learning, Technology and Traditions. Toronto: Thompson Educational Publishing: 105-117.

Back Cover

This report is dedicated to First Nation and Inuit children, their children, and their children's children living in remote and rural communities. These people have always lived in these special parts of Canada, and will continue to do so. They have the same rights as all Canadians, no matter where they live.