The Kuh-Ke-Nah broadband governance model:

How social enterprise shaped internet services to accommodate indigenous community ownership in Northwestern Ontario, Canada (circa 1997 to 2007)

by

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Note to the Reader: KO-K-Net Services Edition (October 15, 2009)

I successfully defended this thesis on October 5th, and have made subsequent corrections and modifications since the previous pre-defense release. Thanks to everyone who helped me along the way. Special thanks to Keewaytinook Okimakanak and K-Net Services.

The 2009 INAC data set presented in Chapter 1 of this post-defense version presents a subsequent iteration and validation process with INAC First Nations SchoolNet and regional offices. A number of errors were corrected and the comprehensive data set was reduced to 978 occupied census subdivisions. This data is current as of (October 15, 2009).

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Abstract

This thesis articulates how the Kuh-Ke-Nah network (K-Net) shaped broadband development in remote indigenous communities. K-Net operates under the not-for-profit stewardship of Keewaytinook Okimanak (KO) Tribal Council. Located in Northwestern Ontario, KO brought K-Net to life amongst its six member First Nations in the mid 1990s. As K-Net evolved and expanded its membership, KO established a governance model that devolves network ownership and control to community networks in partner First Nations. This governance model reflects KO's use of social enterprise to organize K-Net's community-based broadband deployment amidst necessary partnerships with government programs and industry players.

K-Net's social enterprise has rapidly grown since 1997, when its core constituents fought for basic telephone service and internet access in Northern Ontario. In the space of less than a decade, K-Net communities have gone from a situation in which it was common for there to be but a single public payphone in a settlement, to a point where over thirty now have broadband

internet services to households. Technologies now under K-Net control include a C-Band satellite transponder, IP videoconferencing and telephony, web and email server space, and a variety of terrestrial and wireless links that effectively connect small, scattered First Nations communities to each other and the wider world.

K-Net's governance model encourages member communities to own and control community local loops and internet services under the authority of a local enterprise. Community ownership and control over local loops allows First Nations to collaborate with KO to adapt broadband applications, such as telemedicine and an internet high school, to local challenges and priorities. K-Net's aggregation of demand from disparate users, within and across member communities, creates economies of scale for the network's social enterprise, and allows a dynamic reallocation of bandwidth to meet social priorities.

Based on four years of research with K-Net stakeholders under the Canadian Research Alliance for Community Innovation and Networking (CRACIN), my thesis documents the evolution of K-Net's governance model as a reflection of its social enterprise. Drawing from Community Informatics and the Ecology of Games, I trace K-Net's history and organization to assess how KO, its partners, and K-Net's constituents, cooperated to make social enterprise viable for member First Nations.

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Chapter 1

1 Setting the Stage: What is broadband governance?

Broadband governance is not a well established subject of policy or research. By itself broadband may be little more than a vaguely technical[1] term for the simultaneous transmission of voice, video, and data packets over a single network medium[2].

Engineers now provide “broadband” over a variety of media, including twisted copper telephone wire, coaxial cable, optical fibre, fixed wireless, cellular mobile, low earth orbit satellite systems, and so forth. Each network medium introduces particular technical and economic constraints on the quality and quantity of information packets that travel through it.

Yet, if the technical configuration enables one to watch a movie, phone a friend, monitor the Toronto Stock Exchange, and send an email, all through a networked computing device, and in relative synchrony, it probably deserves to be called “broadband”. In that regard broadband is a relatively uncontroversial, almost banal, network concept. If it is a subject of governance it must confer other attributes than this.

On an industrial and national scale the discovery that, through digitization, disparate analogue media can serve the same purpose(s), such as telephony, television, or data transfer, has radically altered the once separate and heavily regulated fields of telecommunications and broadcasting.

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[1] My technical definition of broadband telecom infrastructure follows the criteria established by Industry Canada’s National Broadband Taskforce and Communications Research Centre, which called for carriers capable of supporting two-way video transmission at a minimum bit rate at or near 1.544 mbps. Admittedly “broad” bandwidth is a moving target as new applications and services develop to tax existing infrastructure, so I use this definition as a benchmark for comparative historical purposes.

[2] Newton’s Telecom Dictionary (22nd Edition; Newton 2006) states, somewhat facetiously:

> Today’s common definition of broadband is any circuit significantly faster than a dial-up phone line. That tends to be a cable modem circuit from your friendly local cable TV provider, a DSl circuit, a T-1 or an E-1 circuit from your friendly local phone company. In short, the term “broadband” can mean anything you want it to be so long as it’s “fast.” In short, broadband is now more a marketing than a technical term.

The technical discovery is at least as old as Shannon's mathematical theory of communication (circa 1948; Cf. Shannon & Weaver 1964); but the sociopolitical structures that shape how industries, nations, and media internetwork remain in a state of relative infancy. For communications policy and research, the sociopolitical and economic implications of broadband have opened new dimensions that are forcing experts to reexamine the familiar network concepts in an unfamiliar light (Mansell & When 1998; Dutton et al. 1999; Keeble & Loader 2001).

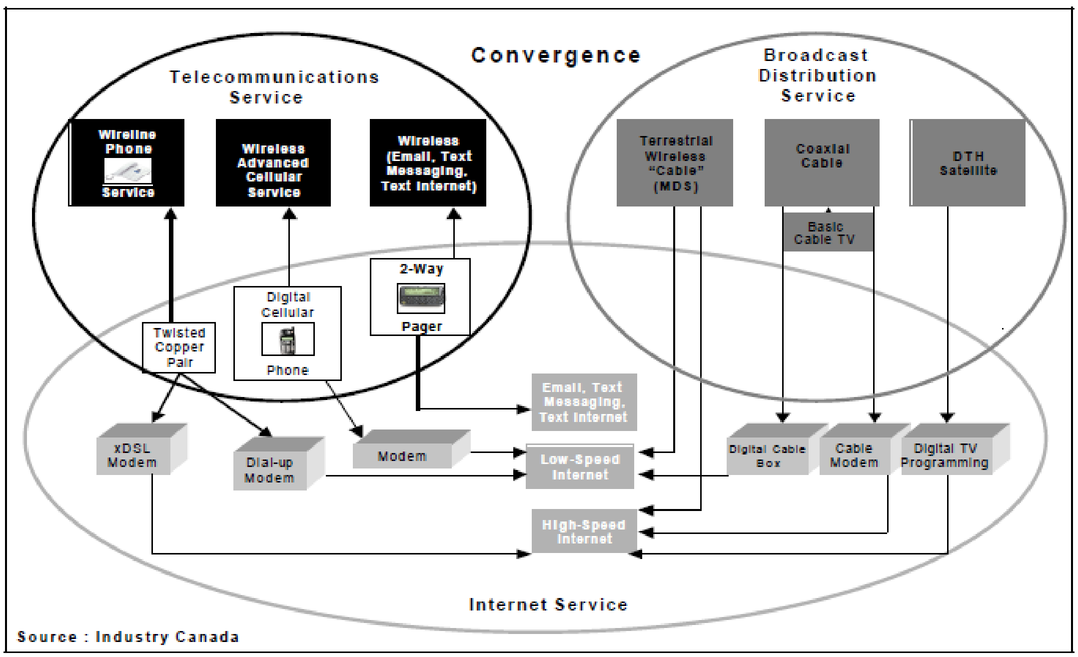

Figure 1: A depiction of broadband media convergence of telecom + broadcast + internet (Source Industry Canada 1999)

In this light broadband is a slippery signifier for what used to be called media convergence or the Information Highway in the 1980s and 1990s (see Figure 1 for a graphical depiction). So it is unfamiliar and yet familiar, as it accentuates 20 or so years of new media developments and information policy. It combines public and private communications systems. It introduces competition and cooperation between telephone, cable, and wireless network service providers. It both facilitates and disrupts social and community development. It closes knowledge and information gaps, just as it widens the developmental divide between affluent communities and society's marginalized. The closer one looks at the subject of broadband, beyond strictly technical parameters, the less certain communications policy and research become. Faced with uncertainty, broadband's various proponents and detractors struggle to introduce order, and by doing so, they make governance a necessary ingredient of the concept's slippery definition.

Communications policy and research continue to struggle over what broadband networking represents, particularly in terms of societal development. There are no firm agreements over what constitutes a model broadband infrastructure, or what the objectives of broadband deployment should be, or how broadband deployment should proceed, if indeed it should. These disagreements, I believe, are nevertheless ample justification to keep broadband in the vocabulary of communications policy and research. The slippery and contentious semantics they seek to stabilize reflect a global uncertainty about the developmental pathways that information communications technologies (ICTs) should take. They thus reinforce the importance of governance as an explicit subject of communications/informatics research. As communities try to negotiate the possible ramifications that broadband may or may not introduce in the lives of their members, as well as society more generally, they are relearning how to govern their technologies, and themselves.

In this light, communities, and not simply industrial sectors, nations, or international authorities, ought to be the privileged locus of broadband governance. For as one disaggregates this network concept into associated media and ICTs, from the legacy and rival carrier systems, to the logical layers of network management, to the multimedia applications, electronic services, and so forth, the entire subject of broadband and its governance becomes a nest of local development choices and controversies for communities. Rarely are these choices and controversies purely technical or narrowly economic, despite the wishes of particular communities of interest within the industrial sectors, nations, and international authorities that frame what's going on. They manifest a societal context of sociopolitical and institutional relations that shapes the complex aggregate and its particular layers at every twist and turn of broadband development. What therefore accumulates for communications/informatics policy and research is more than a bundle of technologies to route packets of data, voice, and video, but ways to re-configure societal relationships through the development and use of these technologies and the socio-technical infrastructure that localized community activity creates.

Currently the diversity of contending approaches to this unfamiliar and yet familiar network concept terminate in two opposing historical models of networking that appear to have folded in on each other as part of a new global uncertainty: These are perhaps best represented by the centralized Post Telegraph and Telephone (PTT) complex versus the decentralized internet cloud.

For proponents of the 500+-year old PTT model of a public/communications utility, (that traces back to the 16th C. Hapsburg Empire!), ICT infrastructure is primarily a system of carriage. PTT integrates ICTs within a centralized and hierarchical network that is commensurate with the monolithic nation-state, its bureaucracy, and counterpart natural monopolies (Noam 1987). The PTT is a model of order, of fixed lines and regulated media, of expensive switching equipment, vertically integrated organizations, and measured ponderous growth. Its attributes are analogous to those of other nationally regulated, and (at critical moments) publicly subsidized transport systems such as canals, electrical transmission lines, gas pipelines, sewage systems, railways, and roads.

For proponents of the Internet and the end-to-end principle embedded in its architecture (e.g., TCP-IP), ICT infrastructure consists of a multitude of personal computing devices, software tools, and contents/services in addition to the media they occupy (e.g., spectrum, fibre-optics, coaxial cable, twisted-pair, etc.). The Internet model is a metaphor of creative chaos (the cloud). It does not quite resemble any kind of durable infrastructure seen before, as it diverts and reconstitutes itself in the midst of disorder. Conceived to support battlefield communications, the Internet ideally consists of stupid minimal networks and a heterogeneous array of computerized devices and intelligent/empowered users. It thus favors decentralized ownership and cooperation, with innovation and control at the edges. Unlike the PTT's promise of stability, security, and reliability, it may become rapidly transformed and redeployed as a result of user interference.

How do such distinct and potentially antagonistic models of ICT infrastructure co-exist? What does their shared reality resemble today? As Noam (1987: 40) conceived of this "broadband future" in 1987, the reality of broadband ICT infrastructure is a complex mesh of post-

PTT/Internet based systems. Amidst the haze of global uncertainty, its governance comes through a blending of institutions, old and new:

> The future network concept is one of great institutional, technical, and legal complexity. The network environment will consist of an untidy patchwork of hundreds of subnetworks, serving different geographical regions, customer classes, and service types, with no neat classification or compartmentalization possible. It includes a hodgepodge of participants, governmental and private, national and regional, general and specialized, narrow and wideband, terrestrial and satellite, tiny and vast, domestic and multinational (Noam 1987, 40).

What then is broadband governance, if not the perpetual and negotiated reconfiguration of network concepts? Dutton, in his "ecology of games" approach to modeling telecommunications, and more recently, to broadband governance, (Dutton 1992, Dutton et al. 2004) represents Noam's "untidy patchwork", the network concept we have today with broadband, as an outcome of decisions that multiple stakeholders make as members of various interrelated communities. The sociopolitical structure of communities, in terms of their governance capabilities, connotes a kind of arena or "serious game" in Dutton's vocabulary. The stakeholders and their communities are diverse, as are their ways of representing and self-regulating the infrastructure in their midst. Their arenas or games represent both the institutions and the relationships where governance takes place. They are not sector specific, but may include international authorities, vendor supply chains, legislative assemblies, citizen action groups, municipalities, health clinics, schools, residences, neighbourhoods, and so forth. Their interactions preoccupy various stakeholders, such as legislators, engineers, financiers, bureaucrats, community associations, public officials, researchers, and private citizens. Each of these stakeholder types are positioned and interrelated with many others in one or more community, and each is preoccupied by particular (and limited) aspects, or representations, of ICT infrastructure. Together, they act to shape possible outcomes in each and every other's community, without ever completely understanding how everything and everyone fits together in the ecology of games that shapes the practice of governance.

Thus, in a broadband ecology of games, there is therefore no single mastermind or motive force shaping infrastructure development and use. Yet, there are clearly interests at stake and visions in conflict, for which local community institutions, and issues of governance become manifest (Dutton 1992). Governance, no matter how uncertain at a global scale, is paramount for the local negotiation of broadband deployment in communities. Its character is social and political, technical and economic.

What broadband governance reveals is not simply the sum of various ICTs and how to manage them. It reveals an emergent and evolving communications-information infrastructure that mirrors the complexity of societies and parallels their historically contingent pathways (Cf. Dutton 1992, Dutton et al. 2004; Clement & Shade 2000). Whether one takes broadband to be simple and banal, or otherwise polymorphous and ungraspable in the abstract, in whatever form it takes as community infrastructure, it acquires a specific historical trajectory. Only out of broadband's many local histories, local arenas and serious games can common framing narratives emerge, be they industrial, national, international, or global.

This means that just as dominant communities prefer to relate their particular broadband visions and models, their preferred network concepts, so other communities with other interests and perspectives insist on creating and defending their own.

1.1 Confronting global uncertainty: Indigenous peoples' hopes and fears in a broadband-enabled society

In 2001, two years prior to the first United Nations' *World Summit of the Information Society*, then *Assembly of First Nations*[3] National Chief Matthew Coon Come spoke before the *Indigenous Peoples Summit of the Americas* (IPSA), a pre-conference to the inter-hemispheric *Third Summit of the Americas: Connecting to the New Economy*. As a sociopolitical microcosm of the pan-American and UN summits, *IPSA* assembled delegates from a tiny cross-section of North, South, and Caribbean America's 45 million indigenous peoples.

[3] The AFN is a Nnational political organization that seeks to represent Canada's First Nations (i.e., registered Indian bands) before the federal government. It is comprised of elected representatives from provincial and regional level political First Nations organizations.

Amidst the trappings of international diplomacy, the assembly came to examine the place of indigenous peoples in an unpredictable and volatile global economy. What they faced appeared to be a path of competing decisions and relationships that were reconfiguring and concentrating the structure of wealth, land, and labour through networks and technologies dependent on broadband telecommunications infrastructure[4].

At issue was the problem of equitable access and control over this infrastructure and what appeared to be dwindling prospects for self-governance along the global economic path. In his inaugural speech Coon Come worried about the role that rapidly converging global communications technologies would play in indigenous peoples' lives, particularly given that few indigenous communities had means to influence – let alone access – the dominant networks of wealth and power that had coiled around them under the historic and economic circumstances of colonialism and mass urbanization. Yet, despite the feeling of overwhelming odds, Coon Come was hopeful that remote and rural indigenous communities could adopt the same technologies and adapt broadband telecommunications to strengthen their autonomy in a global economy (2001):

> We can use technology. With access to new internet infrastructure that can be applied with the best networking capacities that are there, we can connect our communities, our hospitals, and our schools…. we missed the Industrial Revolution; we will not miss the information technology revolution.

What he feared however, was the persistent threat of complex social traumas that many indigenous communities face in the ebb tide of previous global economic restructurings of the 19th and 20th centuries. This was a tide that grew with colonial appropriations of ancestral lands and imperial co-optations of traditional sociopolitical structures. It swelled with missions and campaigns to assimilate native families, cultures, and economic practices to Euro-American institutions. At once facing forward to global uncertainty, and facing backward to the brutal legacy of past global restructurings, Coon Come (2001) concluded:

> On its own, bringing high-speed digital hook-ups into indigenous communities where there is inadequate sanitation infrastructure, 90 percent unemployment, gross overcrowding in housing, ill health, gas sniffing, and epidemic suicide, can make little or no difference, whether they are in North America, Central America or South America.

Thus through his cautious ambivalence Coon Come captured the contradictory interplay of real and ideal forces that shape the prospects of indigenous broadband telecommunications models. For all the stakeholders involved these contradictions simultaneously arouse and confuse the anticipation of how broadband ICTs and networks may or may not tip the balance between competing visions of economic prosperity, autonomous community development and societal transformation in the 21st century. Perhaps most important of all, in this gestatorial phase of indigenous broadband's history, indigenous communities struggle to participate in broadband governance and assert models of their own.

What was uncomfortably certain from Coon Come's vision was that remote and rural Aboriginal communities faced numerous challenges they could not solve on their own. Most of their traditional communities occupy sparsely populated geographic areas, lands whose natural richness and sweeping vastness can hardly disguise severe physical and economic obstacles for broadband telecommunications deployment. Their situation called for partnerships and cooperation. Any viable indigenous broadband governance model would have to include government(s), industry, and NGO activity if Coon Come's broadband vision was to be more than a speculative fantasy.

1.2 A Canadian vision emerges: "Connecting Canadians" and a "New National Dream"

In large part Coon Come and the Assembly of First Nations were reacting to policy developments already taking place in Canada's federal government. Only a few months prior to Coon Come's speech at *IPSA*, the federal government of Canada had announced its own broadband vision in the Governor General's 2001 Speech from the Throne, accepting:

> […] the critical goal of making broadband access widely available to citizens, businesses, public institutions and to all communities in Canada by 2004.

The throne speech referred to Aboriginal communities and unserved populations directly. Based on the recommendations of its National Broadband Taskforce (circa 2000 to 2001), the federal government had charged the Minister of Industry with setting a tone for investment in broadband infrastructure, based on a "New National Dream". This was not a comprehensive plan, but a vision, some recommended strategies, and a set of government investment programs to catalyze partnerships with telecommunications service providers and communities.

Two years later, federal delegates presented a synopsis of this vision and their activities to the first *World Summit of the Information Society* (WSIS) in Geneva, Switzerland (2003). Also among the Canadian delegates were a number of indigenous leaders. These were some of the same delegates who had heard Coon Come speak at *IPSA*. A number were representatives of remote and northern communities whose location in telecommunications high cost serving areas made them most dependent on non-market solutions for broadband deployment. The aboriginal delegates had joined their federal counterparts to acknowledge and demonstrate the possibilities of government investment in broadband infrastructure. The combined force included multiple federal departments, provincial governments, not-for-profits, non-governmental-organizations, and community representatives.

From the traces of speeches and documents at hand, this *WSIS* event marked a relatively hopeful time for broadband deployment in Canada's remote indigenous communities (if not exactly a "revolution" as Coon Come had envisioned): Under the aegis of Industry Canada's Information Highway Applications Branch (IHAB), the federal public service was spending close to CAD $600M in national grants and transfer payments (allocated between 1998 and 2006), mainly for the purpose of internet related programming, through partnerships with industry and not-for-profit organizations, and with a particular emphasis on access for remote indigenous communities, unserved/underserved regions, and low-income communities. This investment strategy had evolved under a quick succession of policies that began with IHAB's Information Highway and shifted towards broadband through a set of programs that IHAB had branded as part of a federal *Connecting Canadians* agenda. They included the Smart Communities broadband demonstration project, Government Online, and internet connectivity programs such as Community Learning Networks, the Community Access Program (CAP), and First Nations SchoolNet that now carried mandates to enhance community broadband ICT capacity. Apart from focusing government investment around ICTs and/or internet connectivity, these programs were mainly project-based and not part of any core government service structure. It was up to the local recipient organizations of these program funds, primarily not-for-profits, to make sense of how one or more of the various programs fit together in the communities they served.

Canada's presence at *WSIS* 2003 also marked the second year of Industry's latest connectivity programs, which the federal government had specifically earmarked for broadband in high cost serving areas. These were the National Satellite Initiative (NSI) and Broadband for Rural and Northern Development (BRAND). What the new broadband and older IHAB programs imparted was a loosely knit collection of investment strategies to support (now) broadband and related ICT deployment on the basis of a public good for (potentially) all Canadian communities to enjoy. Like Coon Come, the stakeholders involved in this loosely coupled system of projects, programs, and policies had accepted a hopeful vision of broadband. They talked about an emerging public service infrastructure and ICT toolset for community development that would implicate healthcare, education, and economic development, as well as possibly new forms of community participation in governance and public service delivery.

The immediate challenge for government and indigenous stakeholders was finding the right roles and combinations of incentives and rules to attract and direct support from all the relevant players and vested interests. The arena of joint deliberators and decision-makers in this sociopolitical ecology would have to include industry (telecom service providers, internet service providers, systems vendors, trainers, etc.), government departments and agencies (federal, provincial, municipal, aboriginal), as well as not-for-profit non-governmental organizations close to the physical communities, consumers, and minority interest groups. More than anything, the abstract visions and policies on the table required champions and local level projects to take a risk, test their assumptions, and demonstrate possibilities for where to go next.

1.2.1 The research context: Driving questions

For indigenous peoples, the resource opportunities and challenges that broadband telecommunications infrastructure presents are intertwined with persistent sociopolitical and economic struggles to assert indigenous community ownership and control over community affairs. These struggles manifest in terms of the indigenous communities' encounters with dominant institutions and conflicting policies. In most nations of the world, indigenous peoples constitute a minority segment of society. Their local institutions and regional policies thus intersect with the policies of surrounding governments, participating industries, and neighbouring communities. Broadband governance thus adds another twist to an already complex sociopolitical and economic reality.

Coon Come's vision of community-based networks that indigenous peoples may own and control thus faces serious sociopolitical and economic challenges. In this thesis, I look into the recent past of Canada's broadband telecommunications environment to examine a significant case of broadband governance by indigenous communities, under the *Connecting Canadians* agenda (circa 1997 to 2007). I contend that to understand how a revolution such as Coon Come's vision of indigenous community-based networks can be realized, perhaps only in part, one has to study actual practices that appear to work for particular communities. From actual practices we may infer and articulate core principles that provide insight into the vision, offering lessons about their strengths and vulnerabilities, and at the same time, providing a governance model for other initiatives in similar circumstances.

Candidate practices to be observed must encompass a period of time commensurate with a full policy cycle, such as Canada's past *Connecting Canadians* agenda (circa 1997 to 2007). This allows research to inform us about the historical context of practices, as well as the ecology in which policies and practices co-evolved. History reveals how successfully the observed practices of community networking became embedded in socio-technical infrastructure, as evolving community networks (e.g., from possibly one community, to thirty or more, and so forth). The ecology of this evolution reveals the organizations through which the sociopolitical and economic dimensions of observed practices and community development played out.

In terms of specificity and comprehensiveness, case(s) must also reflect local indigenous policies as well as intersecting industry strategies and relevant government policies. Although it may be valuable for some researchers to dissect multiple cases into generic community networks or ahistorical approaches to broadband governance, we must also take opportunities to search through the depth and richness of particular case histories (and policy cycles). Case histories allow us to discover the actual sociopolitical, technological, and economic decisions that established pathways for particular forms of broadband governance and influenced the particular growth of particular forms of community networks and practices. The resulting research must be firmly situated in a geographic perspective to situate broadband policy in regional development.

To model actual practices of indigenous broadband governance, without losing sight of the ecology, and its historical context, we therefore have to ask specific questions on a case study basis. We have to go in deep, for a longitudinal record, rather than to cut across large samples for a cross-sectional surface reading of general characteristics. In this thesis I channel four guiding questions (and corollary research approaches) for a case history of indigenous broadband governance. They are:

1. What constitutes the historical case of indigenous broadband governance?
    - Case history must include and relate geographic, social, technical, economic, and political dimensions
2. Who were the players and relevant actors in the case's historical development and contemporary ecology?
    - Case history must include the views of relevant First Nations, governments, industry, and community-based actors. It must also contend with the role of technological actors that constitute the basis, potential for, and limitations of community networking (such as the internet, carriage facilities, computing devices, and so forth).
3. How did the case develop over time and in which geospatial communities?
    - Case history must contextualize participating communities and their ecology in terms of relevant technologies, institutions, and organizations at regional and super-regional levels
4. How does the case embody governance?
    - Case history must reveal a relatively coherent set of principles of ownership and control that guide broadband deployment and access to internet services. It should provide a flavor of governance that can be adopted for future comparative research or tested in practice.

Each of the four questions is in a generic form because we have barely touched the surface of the case. The case history will have to rephrase each question in terms of the focal model/ecology's specific history and organizational conditions. With that in mind, I now introduce the significant case in question, Canada's K-Net; at first, as a partial reconstruction or story of how it appeared to stakeholders at the *WSIS* event in 2003. This reconstruction complements my reading of Canada's first broadband policy cycle/environment (circa 1997 to 2007), which has come to be known by the label *Connecting Canadians*, as I discussed in my introduction to Section 1.2 above (see Clement et al. 2004). Following this first story about K-Net, I situate the case within Canada's Aboriginal connectivity landscape, to demonstrate why K-Net is an exemplar of the challenges and ideals discussed thus far, and why it is relatively unique in the principles of ownership and control that its practitioners espouse. I then reflect on my relationship to K-Net, as a researcher and collaborator, to contextualize and explain the research program I undertook to study K-Net as part of a larger four-year research project that made my thesis work on this case possible.

1.2.2 Taking up the challenge of Coon Come's vision: Canada presents K-Net to the World Summit of the Information Society (WSIS) 2003

> *Jesse Fiddler, of Sandy Lake First Nation, Ontario, Canada, stood amongst a mixed crowd of delegates gathered in the Canadian Pavilion at the first World Summit on the Information Society (WSIS) in Geneva, Switzerland. He turned to the Pavilion's videoconference screen and found a welcome surprise. At home, nearly 7000 kilometers away, stood his wife with their newborn child, smiling back through the videoconferencing unit, connected…*

Jesse Fiddler worked for one of the hundreds of not-for-profit organizations that were extending *Connecting Canadians* programs into remote, rural, and urban communities since 1997. According to the official federal count, by 2003, community-based organizations had established 8800 public Internet access sites under Industry Canada's *Community Access Program* (CAP), and constituted an estimated workforce of 17,000 volunteers across the country (Macleod 2003). 499 of these sites were in First Nations including a number of connectivity pioneers from the late eighties and early nineties. Jesse's employer, the K-Net Services branch of Keewaytinook Okimakanak (KO) Tribal Council, was particularly known for its achievements in connecting remote First Nations communities and schools in partnership with IHAB's CAP and First Nations Schoolnet programs (circa 1994 and counting).

By leveraging these and other programs, KO-K-Net Services had since developed a regional model for indigenous broadband governance that encompassed a network of over 25 Points-of-Presence[5] (POPs) in local First Nations community networks and related public service branches (circa 2003). KO named the project K-Net in 1995. It stood for the Kuh-Ke-Nah Network, an Oji-Cree word meaning "everybody". K-Net was thus one of Canada's oldest and largest surviving community-based networks of indigenous communities (Fiser et al. 2006), located in Northern Ontario, Manitoba, and Quebec. Since 2001 it had been exploring broadband services.

In its ninth year of operation, having started as a narrowband Bulletin Board System in 1994, and now its second year of broadband deployment (in 2003), K-Net was an IHAB *Connecting Canadians* success story that had achieved and sustained multiple iterations of terrestrial and satellite based internet access in some of the nation's most underdeveloped telecom high cost serving areas. The contrast of what it had achieved with what its First Nations constituents had only recently left behind was remarkable. As late as the year 2000, three of its First Nations members, each with populations greater than 300 had not had residential telephony.

The activities and achievements K-Net represented spoke directly to the vision of hope that Coon Come had presented before *IPSA*. Its core communities in the Nishnawbe Aski Nation of Northern Ontario also shared Coon Come's concerns about the historical conditions and social traumas that First Nations peoples face, particularly linked to suicide, substance abuse, and type II diabetes. They saw their struggle to improve ICTs as part of a broader regional policy to ameliorate socio-economic conditions in their territory (see Figure 2 below for a map of Nishnawbe Aski).

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5 Newton's Telecom Dictionary (22nd Edition, 2006: 712): "POP. A physical place where a carrier has a presence for network access, a POP generally is in the form of a switch or router". Though a POP is not a community, a community may have multiple POPs.

Figure 2: Map of Nishnawbe Aski Nation, associated First Nations, and Tribal Councils in Northern Ontario (Source KO-K-Net Services)

K-Net is also remarkable for the story it tells about its deeper ecology. As an actual case of indigenous broadband governance, its story is as old as Canada's earliest Information Highway policies, and its layered infrastructure resembles an archeological assay of IHAB and related program funds: Since 1996 KO had nurtured First Nations community networks with support from IHAB's Community Access Program, First Nations SchoolNet, Computers for Schools, and many other federal, provincial and regional partners. In 2003, KO was in the midst of its most ambitious enterprise to date, taking its core group of six member First Nations through three simultaneous broadband development projects, in partnership with IHAB's Smart Communities program, Industry Canada FedNor, Indian and Northern Affairs Canada, Human Resources Development Canada, Health Canada, the provincial Northern Ontario Heritage Fund Corporation, the Bell and Telesat telecommunications companies, and smaller government, Aboriginal, and industry partners.

These K-Net projects promised to transform, not only telecommunications for member high cost serving areas, but also the delivery of public services for health, education, and governance in remote Aboriginal communities. They presented specifications for how to build supporting infrastructure for prospective e-services, with the hope that the potential of broadband information communications technologies would also unlock the communities' potential for socio-economic development. Added to these lofty goals, which had yet to be realized by any community-based broadband development project in Canada, was the promise that the principles that KO-K-Net Services learned at this time, could be applied to accelerate the growth of at least 19 other Aboriginal broadband community networks and services, with more to come (up to 30 community networks by 2006, including over 100 POPs).

Jesse was at *WSIS* 2003 to show some of the K-Net projects supported by Industry Canada, projects to close Canada's technology gaps, and particular solutions to bridge the disparities in telecommunications access between its metropolitan areas along the US border and the sparsely populated remote and rural regions that dotted the rest of Canada's sprawling geography. His home community of Sandy Lake, although the second largest First Nation in Northwestern Ontario (pop. 2057), had only acquired digital carrier services in 2001. Sandy Lake was like 24 other First Nations in Northwestern Ontario that linked to K-Net (and each other) through locally owned community-based networks. Due to their remoteness from Ontario's southern urban sprawl, it was still less than five years since they had been part of Canada's marginal 1%, communities left unserved or underserved by the Incumbent Local Exchange Carriers (ILECs)[6] in their officially designated telecom high cost serving area. Understanding how K-Net brought them out of their state and instituted governing relationships to nurture and protect their community networks is the driving aim of this thesis.

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[6] ILEC is a term to describe traditionally dominant telecom carriers that, in Canada, are federally regulated by the Canadian Radio Television-Telecommunications Commission under the Telecommunications Act (1993). In 2003 there were nine relatively major ILECs across Canada (Bell, Aliant, Telus, etc.), and 42 smaller independents (primarily in Ontario and Quebec). ILECs compete with CLECs, competitive local exchange carriers, a category that includes cellular/PCS providers, ISPs, IXCs, CATV providers, LMDS operators, and power utilities (Newton's Telecom Dictionary 22nd Edition 2006: 230).

1.3 Situating the thesis subject

There are officially 615 Canadian First Nations (or Indian Bands). According to the 2006 Canadian census, these First Nations occupy roughly 866 census subdivisions[7] (or parcels of reserve land). Each of the 866 occupied census subdivisions[8] physically delineates a First Nations community, and presents a potential site for broadband deployment (e.g., to support fixed settlements or to assist mobile communications within a territory). In 2009, I worked on a Geographic Information Systems (GIS) project with the First Nations SchoolNet (FNS) program under Indian and Northern Affairs Canada (Education). Our goal was to map broadband deployment across the 866 occupied First Nations census subdivisions, as well as 52 Inuit communities (in Inuvialuit, Nunavut, Nunavik, and Nunatsiavut), and 60 Northern municipalities (in Yukon, and the Northwest Territories).

Based on our environmental scan, and the expertise of INAC regional offices and six FNS Regional Management Organizations, RMOs (see Chapter 5), we developed a credible cross-sectional snapshot of First Nations, Inuit, and Northern internet infrastructure in Canada (circa 2009). The RMOs were critical in helping us to acquire a deeper appreciation of the kinds of organizations that own and operate internet services in First Nations communities. Each RMO is an Aboriginal led organization with strong ties to the constituencies of internet users in the First Nations they serve. The boards of the RMOs are mainly comprised of representatives from the communities they serve. Many of their employees also live in the communities, or maintain

[7] The Statistics Canada 2006 Census Dictionary defines a census subdivision (CSD) as: […] "the general term for municipalities (as determined by provincial/territorial legislation) or areas treated as municipal equivalents for statistical purposes (e.g., Indian reserves, Indian settlements and unorganized territories)". http://www12.statcan.ca/english/census06/reference/dictionary/geo012.cfm

[8] Of particular importance in this mapping exercise is the state of permanent residences in target census subdivisions. In this mapping exercise, a permanent residence is defined according to the Statistics Canada 2006 Census Dictionary, which refers to: "a private dwelling in which a person or a group of persons is permanently residing. Also included are private dwellings whose usual residents are temporarily absent on Census Day. [This definition precludes…] unoccupied private dwellings or dwellings occupied solely by foreign and/or temporary residents". http://www12.statcan.ca/english/census06/reference/dictionary/dwe006.cfm

direct ties, which thus offers them an on the ground view of the developments happening in their respective regions, e.g., viz. internet services and broadband deployment. In the Inuit and Northern communities we were assisted by several INAC regional offices, whose officers maintain similarly strong ties to the communities they serve.

My participation in this data collection and validation process made me realize just how special the K-Net case is within Canada. From a data set of 978 occupied First Nations, Inuit, and Northern census subdivisions, 576 (59%) maintained access to some form of internet infrastructure capable of supporting inbound rates of 256 kbps[9] or higher (as per the OECD definition of broadband, circa OECD 2006). 65.1% of these 576 census subdivisions acquired residential internet access at inbound data transfer rates ≥ 1.544 mbps; 28.1% acquired residential internet access at inbound data transfer rates ≥ 256 kbps but < 1.544 mbps; and the remaining 6.8% acquired limited broadband internet services (≥ 1.544 mbps) to community facilities, such as schools, health clinics, or public administrative offices (with no service options for residents or small businesses). Figure 3 below, provides a national level map visualizing the 2009 INAC data set.

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[9] This was a controversial subject for us (particularly in the Northern satellite served communities). Industry Canada maintains an official baseline of 1.5 mbps for broadband. ILECs and CLECs are known to call inbound rates < 256 kbps, "broadband lite". I will use the term broadband when discussing the INAC data set, as consumer grade internet access ≥256 kbps that has the capability to evolve to accept greater inbound rates (≥1.544 mbps) without forcing service providers to tear their carriage systems out and rebuild from the ground up.

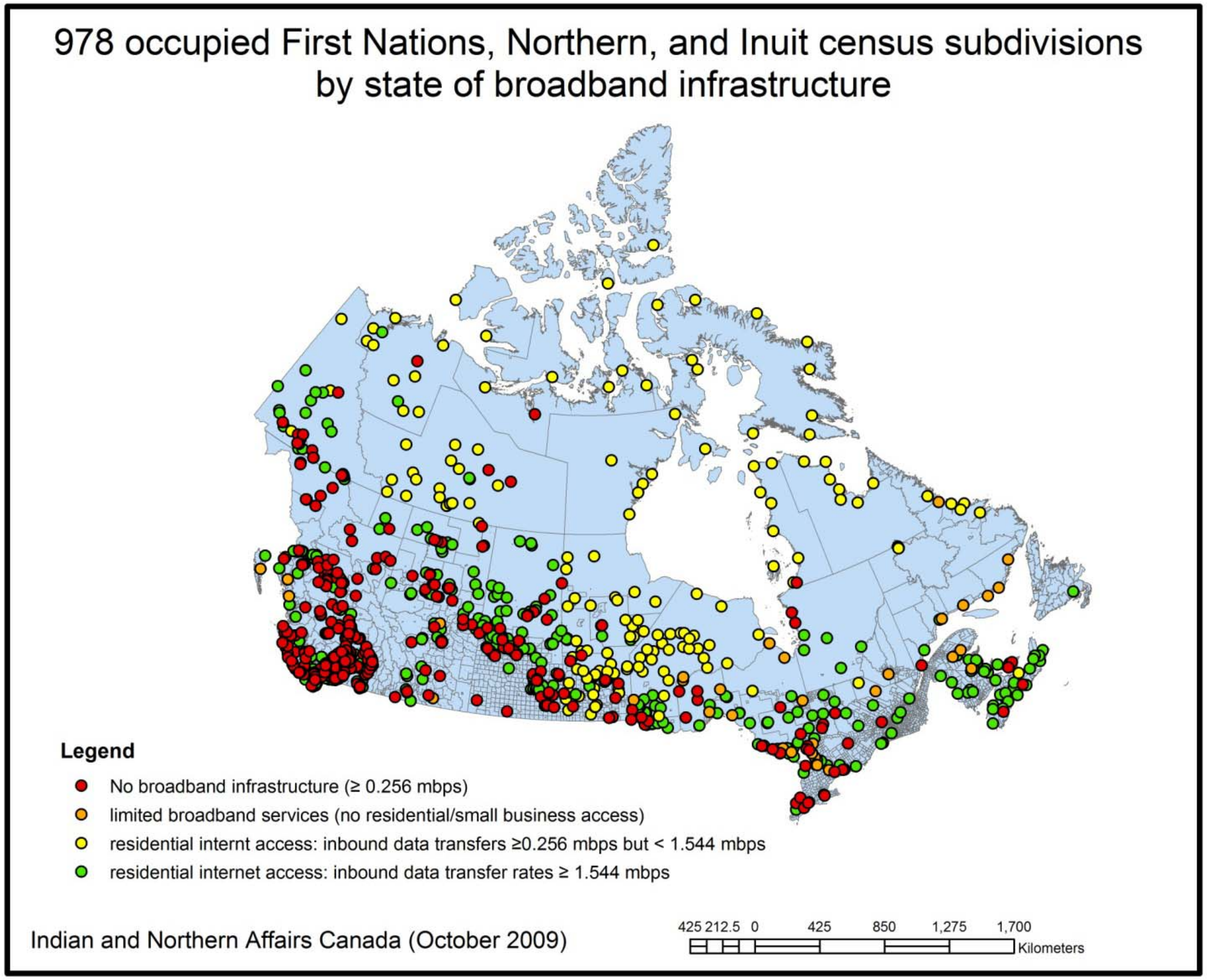

Figure 3: Overview of the 2009 INAC data set (only occupied CSDs shown)

In terms of network management options, of the 576 census subdivisions, 404 (70%) acquired internet services from a third party ILEC or CLEC, while 172 (30%) acquired internet services through a community-based Aboriginal organization (such as K-Net's KO-K-Net Services). By community-based organization I mean one where the owner is directly accountable to the local constituency it serves, and attributes some form of non-monetary value to its relationship with that constituency. The constituency in turn, has some directing influence over the organization, whether through a board, or as part of a long-term contractual relationship (such as a joint-venture partnership). In that regard, the 172 known community-based options in the 2009 INAC data set establish possibilities for local Aboriginal ownership and control over broadband infrastructure and internet services.

But what exactly constitutes ownership and control in this context? The scenario in Coon Come's vision, of local area networks supporting community health and education is part of that context; as is the possibility of a local community enterprise selling internet services, or a local technician managing access devices and a community's Point of Presence (POP) on the wider area network they connect to. If there is one mitigating factor that determines the potential for each of these possible scenarios, what would it be? My claim is that there is a particular technological actor that plays an important, yet under theorized role in shaping broadband ownership. It is both an object of governance and an ally to those who know how to wield it. I am speaking of the community local loop.

1.3.1 Broadband governance by local loops

In this thesis the distinguishing feature of ownership depends on the state of what, in telecommunications parlance, are called the "local loops". Newton's Telecom Dictionary (22nd Edition, 2006: 550) defines a local loop as,

> The physical connection from the subscriber's premise to the carrier's POP (Point of Presence). The local loop can be provided over any suitable transmission medium, including twisted pair, fiber optic, coax, or microwave. Traditionally and most commonly, the local loop comprises twisted pair or pairs between the telephone set, PBX, or key telephone system, and the LEC (local exchange carrier) CO[10] (central office). As a result of the deregulation of inside wire and cable, the local loop typically goes from the demarc (demarcation point) in the phone room closet, in the basement or garage, or on the outside of the house, to the CO. The subscriber or building owner is responsible for extending the connection from the demarc to the phone, PBX, key system[11], router, or other CPE[12] device.

In K-Net's case, a fully fledged community owned local loop looks like Figure 4 below.

[10] Central Office: The telecom service provider's building where subscribers' lines are joined to switching equipment for connecting other subscribers to each other, locally and long distance. Can also be a wire centre in which there might be several switching exchanges (Newton's Telecom Dictionary 22nd Edition 2006: 215)

[11] Private Branch Exchange and Key system: A privately owned branch (a small Central Office) for internal switching. A Key system is similar to a PBX, in which telephones have multiple buttons permitting the user to directly select central office phone lines and intercom lines. Both are often found in large offices. (Newton's Telecom Dictionary 22nd Edition 2006: 525, 687)

[12] Customer Premises Equipment: Simply, telecom equipment (switches/routers, wiring/cabling, etc.) that the customer is responsible for (on her side of the demarc). (Newton's Telecom Dictionary 22nd Edition 2006: 264)

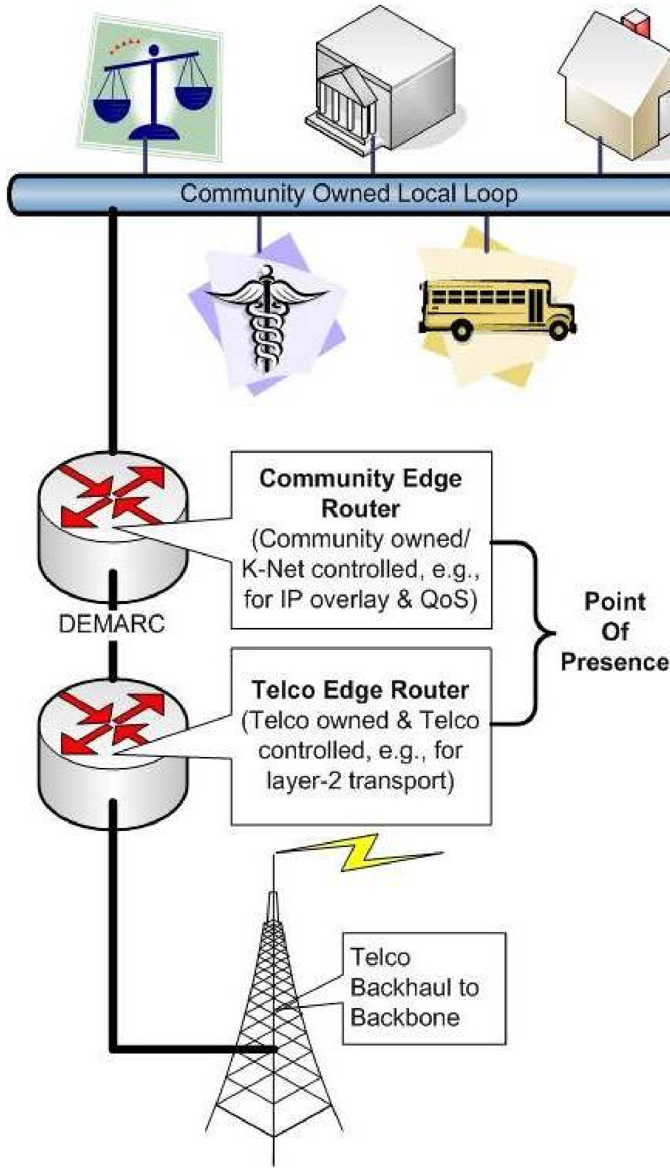

Figure 4: Community network as technological actor. Who owns the loop, controls the services?

In the stylized diagram in Figure 4 above, note that the distinguishing feature of ownership is the demarcation point (the demarc), that separates what the community owns, controls, and is responsible for, from what the telecom service provider owns, controls, and is responsible for. Picture a shed filled with electronic equipment that routes and switches network traffic to and from various parts of the community (Local Area Network), and between the community and a Wide Area Network (WAN) to the outside world. The demarc is a point in this shed, where the equipment the community owns meets the equipment the WAN provider owns. (Loops and WAN's can be a lot more complicated than this, particularly when a third party management organization gets in the way, but for illustrative purposes, we'll start simply). Note that behind the demarc, on the community side, is a network of services and local enterprise applications. Here, the stylized diagram depicts that a K-Net-community network manages health, education, and administrative applications, as well as forms of residential and business applications, just as Coon Come had envisioned. K-Net-community networks, under the auspices of a local First Nations authority, or an appointed local enterprise ISP, can do this by reason of the technical configuration that their constituency and KO-Net Services have arranged at their local loop (and K-Net's regional WAN).

If this description is a little too technical, Clement and Shade (2000) provide what they call an Access Rainbow model that can help less telecom-oriented readers. Table 1 below summarizes their model and its layers. Picture this model fitting over the local loop ownership situation and the various kinds of computing/communications devices and internet services, as well as social services and issues that could stack on top of the carriage level systems that community owned loops interface.

Access Rainbow	Description	Linkages:
Governance	How decisions are made concerning the development and operation of the infrastructure	All Layers
Literacy/Social Facilitation	The skills people need to take full advantage of information/communications facilities,	Literacy and social facilitation are closely connected with service providers (those providing the support at various institutional/organizational levels); with

	together with the training and facilitation to acquire these skills.	software tools; and with content and services
Service/Access Provision	The organizations that provide network access to users	Service providers work closely in supplying literacy and social facilitation to the technology. They must also work closely with the communities they represent to ascertain the content and services that are required. They also have a link to the Governance level, in ensuring that their voices and needs are met in ongoing policy implementation
Content/Services	The actual information and communications services offered	Ideally content and services should not be tightly related to the particular suppliers of carriage media, hardware devices or software tools
Software Tools	The program that runs the devices and makes connections to services	Interoperability with the device layer; ability to foster literacy and social facilitation
Devices	These are the actual physical devices that people operate	The device layer must be compatible with the carrier layer
Carriage	These are the facilities that store, serve or carry information. The technology that comprises a community's local loop exists at this level.	How do the carriage facilities interoperate with the device layer? How do technical developments and refinements interact with the other layers?

Table 1: Clement and Shade's Access Rainbow model, (Source Clement and Shade 2000)

Note that in Clement and Shade's Access Rainbow model, governance pervades all the other layers by default. Thus, there may be many kinds of information communications governance, inclusive of those cases we may associate with broadband or internet services. The specificity of kinds depends on the layers and layerings that one wishes to focus on and articulate. Reflecting this plurality within their general Access Rainbow, Clement and Shade go on to frame governance in terms of three key questions of overall infrastructure design (i.e., of the focal infrastructure one wishes to model): These are, "access to what", "access for whom", and "access for what purposes".

In my thesis, the responses are access to local loops, by First Nations communities, to develop broadband internet services (under their control). By focusing on the local loop as a technological artifact of broadband governance we come to a finite set of operational models and avoid the hazard of an infinitely differentiable Access Rainbow spectrum. Moreover, I have found that, based on the 2009 INAC data set, and the economic and technological parameters of available carriage systems and internet based technologies (circa 2009), broadband governance at the local loops can pass through four models of relatively coherent principles of ownership and control.

Based on the 2009 INAC data set, these four models of principles distinguish the relative boundaries between different candidate cases of broadband governance in the First Nations, Inuit and Northern communities of Canada (i.e., the 576 broadband-enabled census subdivisions (≥256 kbps) in the INAC data set): They are ownership by commercial enterprise, ownership by a First Nations authority, ownership by a First Nations commercial enterprise, and co-ownership under social enterprise. Understanding these models will help establish where K-Net is situated ecologically, and why its case history is particularly significant in Canada. Table 2 below provides case summaries, and a chi-square test indicating that the observed frequencies of the governance models are not uniformly distributed (sig. <.004). Within the 2009 INAC data set, models such as commercial and social enterprise have a much higher probability of occurrence than the rest.

Broadband governance models: Observed versus expected frequencies

	Observed N	Expected N	Residual
ILEC/CLEC	404	144.0	260.0
FN SME	16	144.0	-128.0
Social Enterprise	100	144.0	-44.0
FN Authority	56	144.0	-88.0
Total	576		

Test Statistics

	Governance
Chi-Square[a]	650.444
df	3
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 144.0.

Table 2: Chi-Square Test differentiating governance models in the INAC data set of 576 census subdivisions identified with broadband infrastructure (2009)

1.3.2 Ownership by commercial enterprise

Under commercial enterprise, an incumbent local exchange carrier (ILEC) or competitive local exchange carrier (CLEC) owns and manages the local loop. Here the principles of ownership relate to the enterprises' profit-orientation. In the case of Canadian ILECs, ownership also includes a regulated obligation to serve basic telecom services (see Chapter 4); however, at this time those obligations do not include a service objective for broadband deployment (see Chapter 4). ILECs are nationally regulated and serve regions of telecom consumers. CLECs are less-encumbered by regulation and range from small independent Internet Service Providers, to medium and large cable companies and telecom service resellers. ILECs typically have the capacity to offer a range of public, residential and business services. The capacities of CLECs depend on their size and market orientation. As Figure 5 indicates, in 1999 there were nine relatively major ILECs, plus 42 independents in Ontario and Quebec. Bell and Aliant have subsequently merged (into Bell Aliant, in 2006), leaving eight relatively major industry players.

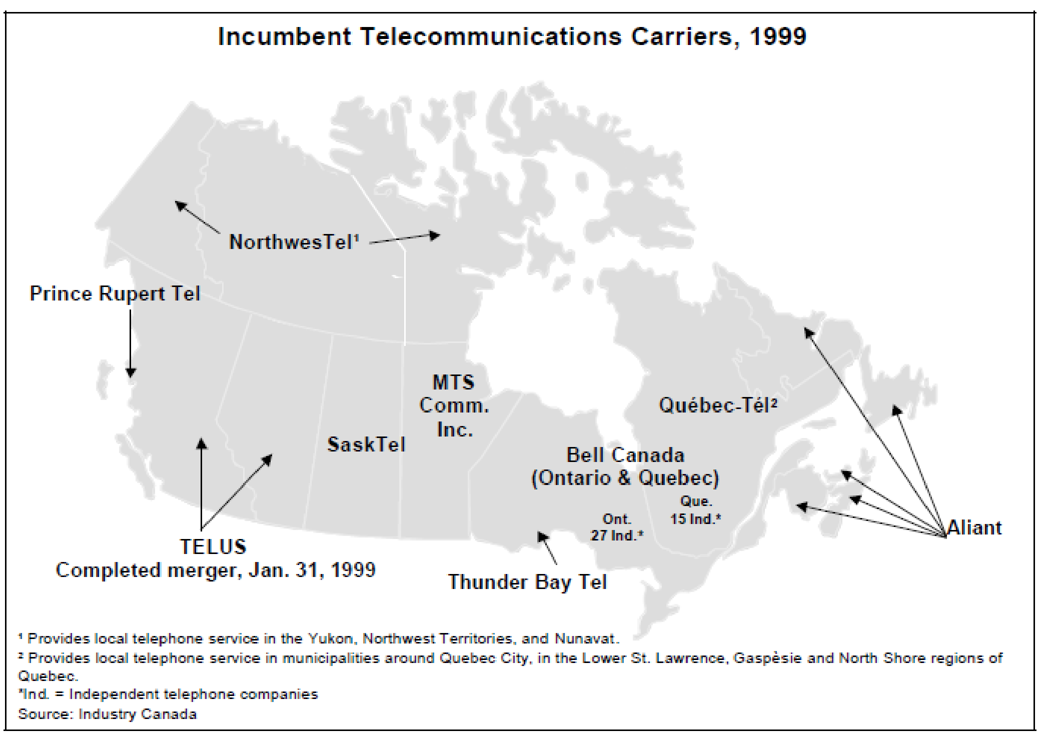

Figure 5: Map of ILEC territories (circa 1999), (Source Industry Canada 1999)

Number of ILEC Exchanges Targeted by CLECs*				
ILECS / CLECs	Manitoba Telephone System (Manitoba)	Aliant Communications (Atlantic Canada)	Telus (British Columbia and Alberta)	Bell Canada (Quebec and Ontario)
AT&T		1	4	11
Axxent			3	20
Call-Net			7	23
GT Group Telecom	1		4	7
Others		3	12	49

*Since many exchanges are targeted by more than one company, the numbers reflect double counting and therefore it is estimated that there are 70 exchanges identified as possible markets by the registered CLECS.
Source: Industry Canada estimates based on CRTC Website.

Figure 6: ILEC exchanges targeted by CLECs in 1999, (Source Industry Canada 1999)

Figure 6 above, indicates the situation of CLECs in 1999. Ontario was by far the largest point of entry for them. As I will discuss in Chapters 3 and 4, ILECs and CLECs are typically profit-oriented towards high density urban markets. First Nations and Northern communities do not typically benefit from this orientation, as they primarily occupy remote and rural regions that the telecom industry and regulators refer to as high cost serving areas. See Figure 7 below for a snapshot of internet market share between ILECs and CLECs in 2003. Since the mid-2000s, cable companies (combined) have led the market in numbers of internet subscribers, to the dismay of ILECs.

Returning to the 2009 INAC data set, the combined households of the 576 census subdivisions identified with broadband infrastructure, (at 111,129[13] according to the 2006 census), would comprise approximately 1.4% of the 2003 ILEC/CLECs' internet subscriber market share (i.e., roughly 8M subscribers as shown in Figure 7). If we include the combined households of the total 2009 INAC sample of 978 occupied census subdivisions (at 132,306[14] according to the 2006 census), that percentage increases to a mere 1.7% of the 2003 subscriber data. Clearly, the

[13] Total population for the 576 communities (by 2006 census) is 372,144.

[14] Total population for the 978 communities (by 2006 census) is 438,010.

extent of First Nations, Inuit, and Northern residential markets for broadband internet services is not an important incentive for ILECs and CLECs, particularly when one includes the total surface area of the INAC data set's 978 occupied census subdivisions. At roughly 2,095,595 square kilometers (or 21% of Canada's total surface area[15]), it indicates a formidable geographic terrain, marked by dense forest, frozen tundra, complex lake systems, hills, and other natural formations that would cow even the bravest team of telecommunications engineers.

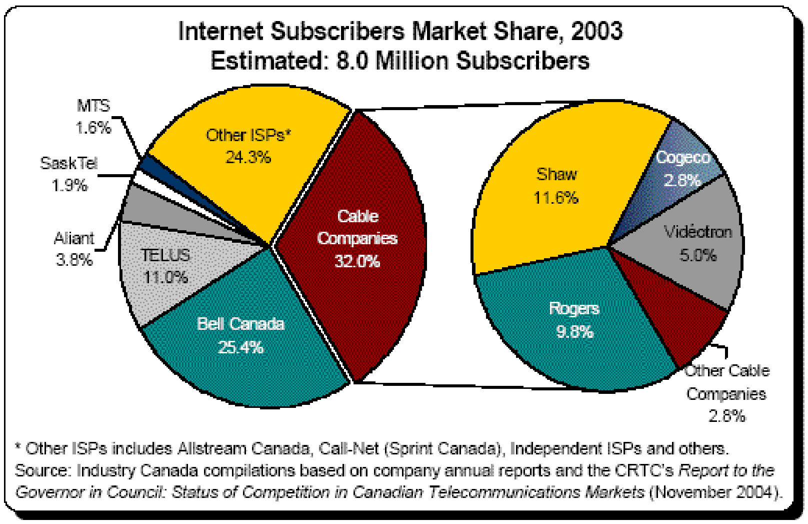

Figure 7: 2003 Market share of Canadian internet subscribers (ILECs and CLECs), (Source Industry Canada 2004)

Nevertheless, evolving technologies, particularly wireless devices, have introduced new internet service business models, to the urban environment and to rural and more remote communities (see Appendices 3 and 4). Moreover, ILECs typically maintain the critical backbone networks that interconnect Canada's various regional and local area networks. Through Canada's open access provisions, ILECs must permit competitors to access their networks and collocate carriage level switching/routing devices at fair prices (Intven et al. 2000; Sinclair et al. 2006). Thus, ILECs are often an integral part of any network and its governance, by providing bandwidth and interconnections, even though they may not directly participate in services or network

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[15] Canada's total surface area is roughly 9,984,670 square kilometers.

management operations (beyond maintaining a standard quality of service for wide area network traffic).

The 2009 INAC data set indicates that ILECs and CLECs managed 70% of the 576 communities' local loops (see Table 3, page 50, below). Digital Subscriber Line (DSL) over telephone lines was their top choice for local loop (50.5% or 204 CSDs), followed by wireless (34.4% or 139 CSDs). Beyond the commercial ownership principles of ILECs and CLECs, one finds three other models.

1.3.3 Ownership by First Nations authority

In cases of ownership by First Nations authority, a municipal-like entity (or regional body) operating in the physical community owns the local loop and manages services. Here the principles of ownership primarily relate to public service. The authority is typically focused on delivering support to public services such as administrative offices, schools and health clinics (see Table 4, page 51, below, for an overview of the services offered), from which residential and business related internet services may be secondary pursuits. In this model, the authority exploits its jurisdiction and influence, (possibly regionally), to aggregate demand (and fiscal powers) across public services. It normally purchases bandwidth (through a Point of Presence) from an ILEC or CLEC, but may own its own backhauls (typically wireless in such cases). The First Nations authority is similar to municipal counterparts; however its remoteness has made the municipal condominium fibre option less likely as an economic option (Cf. Lehr et al. 2005). The First Nations authority also does not possess an independent right to tax its constituents, and draws infrastructure development funds through core programs at the federal departments of Indian and Northern Affairs Canada, Health Canada, as well as other federal and provincial programs. Given its budgetary cooptation by federal departments, the First Nations authority's decision to pursue broadband deployment is heavily predicated on the program policies of federal and provincial bureaucrats. The 2009 INAC data set found that a First Nations authority, operating on its own, owned and managed the local loops in 9.7% of the 576 communities (see Table 3, page 50, below). In 37.5% of those 56 cases, the choice for local loop was wireless, followed by a Ka-band satellite POP to a school, with no loop (10 cases), followed by a fibre network option connecting schools, health clinics, and administrative offices with no residential access (9 cases). In the five remaining cases of governance by First Nations Authority, a limited

PoP (T1, or other satellite) provided an exclusive connection to a school, public office, or health clinic. In The 2009 INAC data set, the First Nations Authority model appears to delimit possibilities for residential access (including small business subscribers). As we will see in cases of the social enterprise co-ownership model below, a number of First Nations authorities pursue partnership agreements with not-for-profit organizations, or local First Nations enterprise, to deliver and manage internet services over co-owned loops that include residential and small business subscribers. Most others however, opt for an ILEC or CLEC to manage their services and respective loops. As indicated in the INAC connectivity sample, 70% of the 576 focal communities purchase services from ILECs or CLECs via the commercial ownership model, (see also Table 3, page 50, below).

1.3.4 Ownership by First Nations commercial enterprise

In cases of First Nations commercial enterprise, the principles are a cultural variant of ownership by commercial enterprise. The cultural variant is simply that a First Nations or other Aboriginal entity owns the local loops and manages a community network for profit. Typically (given the size of most Aboriginal communities), ownership of local loops is transferred to a small medium enterprise operating at the behest of a First Nations authority and/or ILEC (cf. Alberta's province-wide SuperNet arrangement with Axia, or British Columbia's province-wide Network BC arrangement with Telus). The small-medium First Nations commercial enterprise is typically focused on basic internet access for residents and businesses. There appear to be three varieties of First Nations commercial enterprise in the 2009 INAC data set. The first variant is a wireless internet service provider (WISP), taking advantage of new wireless technologies such as WiMax, and one or more provincial/territorial campaigns to connect underserved communities via partnerships with ILEC backbones (e.g., as with British Columbia's Network BC, or Alberta's SuperNet). In these cases the WISP leases a POP from the ILEC and sells internet services to community members via wireless. The second variant is a DSL reseller that purchases wholesale from its local ILEC. (There are no independent telephone companies operating under First Nations control, to my knowledge and in the 2009 INAC data set). The third variant is a species of community cable television provider, who has converted existing community cable loops to support internet services via DOCSIS[16]. The WISP has to build a market from nothing, while the community cable company and DSL reseller have the potential advantage of a legacy customer base through television and the Plain Old Telephone Service (POTS). The 2009 INAC data set indicates only 16 cases, or 2.8% of the 576 communities, where a First Nations commercial enterprise, operating on its own, owned and managed the local loops (see Table 3, below). The commercial operators' choice of loop was foremost wireless (at 68.8% or 11 cases), followed by DSL resellers (at 3 cases), and cablecos (at 2 cases). Last in my tour of the INAC connectivity sample, but not the least of the local loop ownership principles, is social enterprise.

1.3.5 Co-ownership by Social enterprise

Under this set of principles, a not-for-profit organization is vested in a partnership with the local municipal-like First Nations authority, area businesses (including smaller WISPs and cablecos), public services, ILECs, CLECs, and other potential partners. Through partnerships it builds a sociopolitical and economic network around these various loosely coupled entities, to grow a market for broadband internet services. Given its particular view of First Nations, markets, governments, and technologies, it may also provide a protective institutional structure that maintains local property rights over community local loops while it exercises control over particular internet services and related economic transactions for the benefit, or under the direction of, core constituents (i.e., its board of directors and community partners). This latter model is most interesting to me, for it combines elements of the previous three governance models. The not-for-profit orientation of the social enterprise gives it a facility for operating in partnerships with ILECs, CLECs, small municipal-like First Nations governments, small-medium businesses, big governments, and social networks of civil society.

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[16] Data Over Cable Service Specification, a North American cable modem initiative

Each partner may in turn, own, or contribute to, a piece of the resulting network, and it is up to the social enterprise organization to regulate who owns and controls which pieces, and how their contributions fit together (i.e., to blend harmoniously). Social enterprise provides an organizational structure, its enterprise side, that lets these various entities, who would normally not have a means to communicate, let alone collaborate altogether, to join forces, perhaps indirectly, and enable forms of development that neither would (or possibly could) undertake on its own. The 2009 INAC data set indicates that 17.4% of the 576 census subdivisions (or 100 cases), were CSDs where a First Nations social enterprise co-owned and managed the local loops (see Table 3, below). The sample indicates that loops under social enterprise are predominantly wireless (74%) and cable (26%). I did not identify DSL, fibre, or other loop options under social enterprise. This may be surprising, particularly to insiders at social enterprise organizations such as KO-K-Net, who are known to use DSL. The distinguishing factor here is whether that DSL line in use connects multiple community services and extends a local internet service provider, or whether it connects a single office, or a couple of offices, to the community POP. In the latter case, where connectivity is limited, I opted to identify the arrangement as being under a First Nations authority, for in such cases, the authority and not its partners at the social enterprise, owns the connection (for example, under the federal First Nations SchoolNet program).

Social enterprise as a model of broadband governance, hinging on the defining question of local loop ownership is the technological focal point of this thesis. As we shall see shortly, it is unique to a particular cluster of First Nations community networks connected through K-Net. Yet, as this is not a general delineation of a broadband governance model, but an entry point to a deeper case history, there remains the question of what to include and what to leave out. See Figure 8 below, for a national level map visualizing the social enterprise family's distribution with respect to the previously discussed governance models.

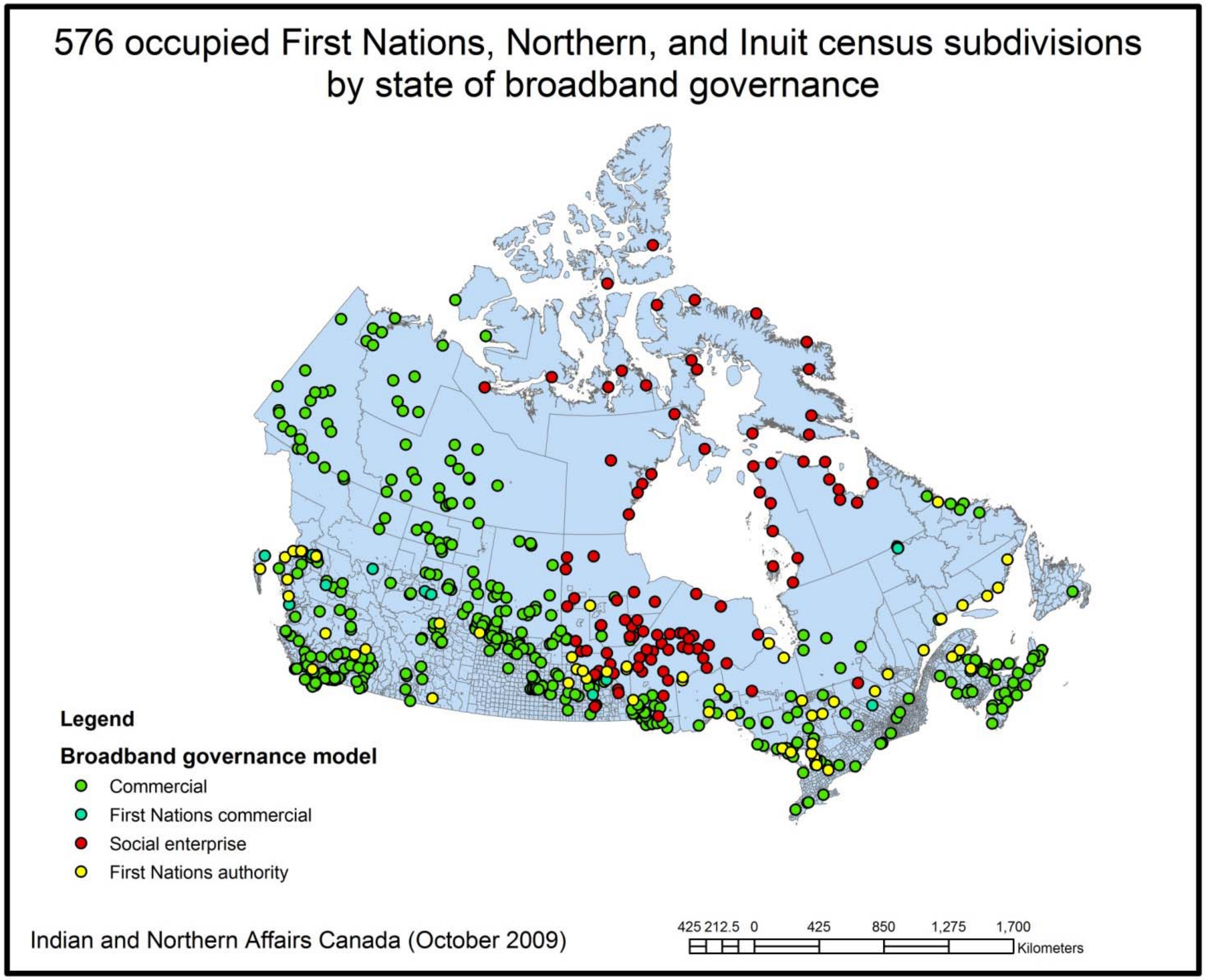

Figure 8: Overview of Broadband Governance Models from the 2009 INAC data set

576 First Nations, Inuit, and Northern census subdivisions by broadband governance model and local loop option(s)

			localloop							
			Cable	DSL	Fibre	Ka-band	Multiple Options	POP (no local loop)	Wireless	Total
Governance	Commercial (ILEC/CLEC)	Count	36	204	0	4	21	0	139	404
		% within Governance	8.9%	50.5%	.0%	1.0%	5.2%	.0%	34.4%	100.0%
		% within localloop	51.4%	96.7%	.0%	28.6%	95.5%	.0%	56.7%	70.1%
	FN Commercial (Small-Medium Enterprise)	Count	2	3	0	0	0	0	11	16
		% within Governance	12.5%	18.8%	.0%	.0%	.0%	.0%	68.8%	100.0%
		% within localloop	2.9%	1.4%	.0%	.0%	.0%	.0%	4.5%	2.8%
	Social Enterprise	Count	26	0	0	0	0	0	74	100
		% within Governance	26.0%	.0%	.0%	.0%	.0%	.0%	74.0%	100.0%
		% within localloop	37.1%	.0%	.0%	.0%	.0%	.0%	30.2%	17.4%
	FN Authority	Count	6	4	9	10	1	5	21	56
		% within Governance	10.7%	7.1%	16.1%	17.9%	1.8%	8.9%	37.5%	100.0%
		% within localloop	8.6%	1.9%	100.0%	71.4%	4.5%	100.0%	8.6%	9.7%
Total		Count	70	211	9	14	22	5	245	576
		% within Governance	12.2%	36.6%	1.6%	2.4%	3.8%	.9%	42.5%	100.0%
		% within localloop	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 3: Local loop Technologies by Broadband Governance Model (Data courtesy of INAC First Nations SchoolNet 2009)

Table 4: Types of Internet Service(s) by Broadband Governance Model, (Data courtesy of INAC First Nations SchoolNet 2009)

Crosstabulation of 576 First Nations, Inuit, and Northern census subdivisions by broadband governance and internet service option(s)

			internet service(s)			
			Broadband access (>1.544 mbps) for education only	Multiple community services but no residential/ small business service	Multiple community services, residential and small business access	Total
Governance	Commercial (ILEC/CLEC)	Count	0	1	403	404
		% within Governance	.0%	.2%	99.8%	100.0%
		% within service	.0%	4.0%	76.9%	70.1%
	FN Commercial (Small-Medium Enterprise)	Count	0	0	16	16
		% within Governance	.0%	.0%	100.0%	100.0%
		% within service	.0%	.0%	3.1%	2.8%
	Social Enterprise	Count	0	0	100	100
		% within Governance	.0%	.0%	100.0%	100.0%
		% within service	.0%	.0%	19.1%	17.4%
	FN Authority	Count	27	24	5	56
		% within Governance	48.2%	42.9%	8.9%	100.0%
		% within service	100.0%	96.0%	1.0%	9.7%
Total		Count	27	25	524	576
		% within Governance	4.7%	4.3%	91.0%	100.0%
		% within service	100.0%	100.0%	100.0%	100.0%

1.3.6 Delimiting scope: Social enterprise as a specific broadband governance model

There are numerous other kinds of organizations that are not included in the four models, largely due to issues of scope in preparation for my deeper case history. Some of these organizations include the particular RMOs that helped collect and validate the 2009 INAC data set. These network overlay and community intermediary organizations (Ramirez et al. 2004, O'Donnell et al. 2007a) utilize networks services through one or more of the broadband governance models listed above. Ramirez et al. 2004, for example, shows how various not-for-profit community intermediaries harnessed K-Net, to deliver telemedicine, distance education, and other community development applications. They could do so, without having to reference the situation of K-Net's various local loop arrangements (which KO-K-Net Services oversaw as the social enterprise organization). In terms of Clement and Shade's (2000) Access Rainbow, community intermediaries manage operations at the layer of devices and higher, but leave network management to a social enterprise like KO-K-Net Services, or an ILEC, CLEC, WISP, cableco, or other variant of commercial enterprise (Cf. O'Donnell et al. 2007b)[17]. This also distinguishes community intermediaries from a First Nations authority, which governs from its municipal-like base, unlike the not-for-profits.

In other cases, a community intermediary mediates as a not-for-profit business entity between its constituent communities (who want broadband), prospective ILECs or CLECs (who are willing to provide services, at the right price), and a government program (that will provide capital development and/or start up operational funds, provided that the not-for-profit organizes the communities and establishes a business case with the ILEC or CLEC). In Canada, this model was part of the federal Broadband for Rural and Northern Development (BRAND) and National Satellite Initiative (NSI) programs (based on recommendations of the federal National Broadband Taskforce of 2000 – 2001). These programs operated between 2002 and 2007. BRAND no longer exists, while NSI is in its second round. The INAC data set of 576 census subdivisions indicates that 39% of loops under commercial enterprise ownership received BRAND funding (i.e., 158 out of 404 cases), compared to 50% of First Nations commercial (8 out of 16 cases), 24% of social enterprise (24 out of 100 cases), and finally 11% of First Nations authorities (6 out of 56 cases). This is not an attempt to quantify how much funding went to each model, but to show that community intermediaries may provide important organizational functions across the different ownership models[18], particularly in terms of securing government

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[17] O'Donnell et al.'s Videocom project, with K-Net and other RMOs, though thus far, mainly about video practices by First Nations, also presents an account of how videoconference use by community intermediaries depends on linkages between the services and carriage layers (particularly around whether a community-based organization has control over the video bridging operations that facilitate multipoint videoconferencing). The intiative, begun in 2006, continues to evolve. See http://media.knet.ca/videocom_final

[18] The INAC sample indicates that only 7.5% of ILEC or CLEC owned loops received funding from NSI. The majority of NSI funds went to satellite projects operated under social enterprise (at 61% of 100 cases).

program funds. This function however, is not enough to make a community intermediary a social enterprise, as it does not require intermediaries to pay particular attention to the ownership and control of local loops.

In terms of broadband research, the point is not to dominate the field, by, e.g., subsuming community intermediaries within social enterprise, or vice versa, but to focus attention on the particular layers of infrastructure in a way that allows different (research) foci to integrate and reveal a greater ecological whole (i.e., the ecological interactions between carriage, devices, services, and so forth, as theorized in the Access Rainbow, Clement and Shade 2000).

Sometimes the distinction between these community intermediaries and a social enterprise, for example, is rather fuzzy. As we shall see, a social enterprise can host a variety of community intermediaries within its organizational infrastructure (sometimes directed by the same board of directors). K-Net's KO Tribal Council, for example, separates its network management services (K-Net Services) from the telemedicine and distance education applications that Ramirez et al. 2004 studied. Organizationally, the entities are separate, with separate line managers, staff, and offices roughly 400 kilometers apart. Yet they share a board of directors, a constituency of communities, and encompass layers of K-Net's shared infrastructure that have to interoperate.

In this thesis, the critical question to ask when distinguishing the species is thus: Does this entity (whether community intermediary or social enterprise) worry about local loop ownership and its management? If it does, for the purposes of a broadband governance model, categorize it as a social enterprise. If it does not, then leave it in the community intermediary, or other pile, and worry about it when the time comes to examine how the two entities interoperate within their shared ecology.

Another possible issue of scope is that social enterprise exists as a conceptual model in other research and policy contexts (Dees 1998, Quarter el al. 2003). I make no claims to have invented the term social enterprise. I use it singularly in the context of broadband governance. However, my use of the term is relevant to the greater body of literature. The Social Economy Centre at the University of Toronto, directed by Jack Quarter, devised a list of four guiding principles for nonprofits, cooperatives, and forms of social enterprise. They are (following Quarter et al. 2003 and Ryan 2007):

1) Producing goods and services with a clear social purpose and nonprofit orientation
2) Providing these goods and services to the public or to their membership
3) Managing independent of government
4) Depending in varying degrees upon volunteer/social participation and often labeled voluntary
5) Encouraging democratic decision-making with individual and collective participation and empowerment emphasized.

I accept these principles as endogenous to social enterprise as well as to most not-for-profit community intermediaries. However, missing from the list is an enterprise orientation and concomitant questions of ownership (i.e., who has a right to produce goods and services through the organization of social enterprise). A number of authors have sought to capture the social dimension of enterprise through concepts such as social capital. Mignone summarizes this relational resource view, which I consider to be another important focal point for my inquiry, namely how the social enterprise organizes its business relationships. He writes (2009: 1):

> A common understanding amongst most authors is that social capital is a resource composed of a variety of elements, most notably social networks, social norms and values, trust, and shared resources (Bourdieu & Wacquant, 1992; Bourdieu, 1983; Loury, 1992; Putnam, Leonardi, & Nanetti, 1993; Putnam, 2000; Woolcock, 1998a; Woolcock, 1998b; Woolcock & Narayan, 2000; Narayan, 1999; Schuller, Baron, & Field, 2000; Lin, 2001). Its function appears to be related to the enabling of some societal good within the boundary of that specific societal level (Coleman, 1988; Coleman, 1990). It is mostly considered an aggregate feature that can aid in the characterization of a social system. For Bourdieu (1983), social capital relates to actual or potential resources within a social structure that collectively supports each of its members, and is linked to the possession of a durable network of relationships of mutual acquaintance and recognition.

It is important to include the social enterprise within its social system and demonstrate how it derives values and resources through interactions with that system. However, what is missing from the social capital concept is how social resources relate to financial and physical capital, not to forget technical actors (such as local loops), and the critical question of ownership and control. I accept the underlying notions of relationships, norms, values, and trust, as shared social resources that a social enterprise requires, but I frame these resources in terms of the social enterprise organization, its mission, and set of principles (see Chapter 6).

In this thesis, the focal point of analysis is not a social network or social system, but an organization of financial, physical, and sociopolitical resources, within a historical social system, that focuses its resources on the question of local loop ownership. Broadband governance must include technological and economic actors as well as the social systems that Mignone (2009) describes. These actors and systems co-evolve ecologically. Though social enterprise engages the qualities of a mission, inclusiveness, membership, and democracy, as (Quarter et al. 2003) and the Social Economy Centre described; as an application of broadband governance, it is also intensely political and heavily dependent on industrial and bureaucratic relationships embedded in forms of telecommunications legislation and regulation (Dutton et al. 1999, Dutton 2009). This is why I prefer to use the term sociopolitical relationship, rather than social capital. Therefore, given its sociopolitical context, a social enterprise operating a daycare or grocery store, may face very different challenges than a social enterprise mobilizing broadband deployment or one entering the fields of healthcare or education.

Thus, I infer a model of social enterprise principles, based on my fieldwork and research, and apply it to establish a social enterprise family of local loop ownership and network management options from the 2009 INAC data set. Students of independent grocery markets, social services, and so forth, will have found their own specific underlying technologies, despite the similarities in approach to technology ownership and the local enterprise management of services (Cf. Dees 1998). Though I am sympathetic to proponents of social enterprise in general, this thesis is not an attempt to justify a general model of social enterprise beyond cases of broadband governance in Canadian First Nations. I leave that to future and/or complementary studies. Nor is this a study of a virtual social enterprise. The Social Economy Centre's Sherida Ryan (2007) describes online social economy organizations as online communities. She notes the controversies amongst researchers and online community members in distinguishing their online activities from place-based communities. I take no particular position on this debate. I acknowledge the presence of online communities, but prefer to keep them embedded in the layers of carriage, devices, services, and so forth, that Clement and Shade (2000) show as part of a unified information-communications infrastructure. That said, online communities may present interesting questions for broadband governance based on social enterprise. One of K-Net's distinguishing features in the 2009 INAC data set, is the range of services it offers, including free email addresses, homepages, and webspace on content management systems such as Moodle and

Drupal. Users of these free services are not necessarily based in the communities where K-Net co-manages particular loops. Yet, they are potential constituents. Such fuzzy questions remain to be explored (Bell et al. forthcoming).

In this thesis, I define the social enterprise principles of broadband ownership to be, in terms of a guide to action and case historical research:

1. A carriage-level network of community networks, that focuses on the provision of telecom and/or other ICT services to a multi-sector user ecology that includes a core constituency of unincorporated communities, municipal-like authorities, small-medium enterprise, public sector programs, and larger private sector for-profit members (including ILECs and CLECs), as well as free riders and online communities (via free services);

2. A system of governance through partnerships under a not-for-profit business manager and network operations centre. The business manager manages accounts and transactions. The network operations centre manages network traffic, as well as co-ownership and co-management arrangements of local loops with public and private sector parties. The system of governance goes beyond a community intermediary role to facilitate the economic creation of local enterprise through the use of local loops. Local enterprise (whether for- or not-for-profit) must include internet service and may include the provision of broadband services such as voice/video/data over IP or other protocols compatible with the network.

3. A social economy organization that derives value from a primarily non-monetary position rooted in a democratic process (Cf. Quarter et al. 2003) that strives to articulate the demands and capabilities of the various constituent communities it serves. In this case, value is derived from acquiring a standard of communications for one's constituents, and protecting, sustaining, and elevating that standard through ownership and control over broadband resources at the local loop level.

The social enterprise that I have in mind, and from which I inferred these model principles, namely K-Net, is a carriage level network of community networks, a system of governance, and a social economy organization. Combined, these attributes of practices and their underlying principles constitute K-Net's broadband governance model. A deeper case history of K-Net will explain how these principles formed and evolved alongside K-Net's constituent community networks and their local loop ownership arrangements. (Please refer to Section 1.2.1 above for the guiding research questions and case history structure).

With a more refined understanding of the principles and practices that encompass the social enterprise within a broadband governance context, we can now return to explore the 2009 INAC data set to examine why K-Net is particularly special. There are, after all, four other social enterprise network organizations that have a family resemblance (and actual connection) to K-

Net, as identified in the INAC data set. I have organized the data in terms of their distinguishing features to show the family resemblances and how K-Net stands out. To reiterate, (see Figure 8, on page 49, above) our map of the field (circa 2009) features ownership by commercial enterprise (ILECs/CLECs), ownership by First Nations authority (municipal-like or regional), ownership by First Nations commercial enterprise, and ownership by social enterprise. It is worth examining how the different governance models cluster geographically in the INAC data set. Social enterprise, in particular, appears to agglomerate in a pattern around Northwestern Ontario, encompassing Nunavik/Northern Quebec to the East, Nunavut to the North, and Manitoba to the West. (Please refer to Figure 8, on page 49). Table 5 (page 59, below) and its graphical representations in Figures 9 and 10 (below), summarize the relevant network organizations (such as K-Net Services or generically labeled ILECs/CLECs).

Disregarding the aggregate categories of ILEC and CLEC, as well as the aggregate category of community networks operated under First Nations authority and First Nations commercial enterprise, we face five specific network management organizations, each one with a family resemblance to the principles of social enterprise defined above. Out of this sample of five, KO-K-Net is the largest, followed by Qiniq (a joint venture between a community-intermediary and a CLEC in Nunavut), and Broadband Communications North (BCN) in Manitoba. (See Figures 9 and 10 below). The remaining two network organizations are actually part of a joint satellite venture with KO-K-Net called the Northern Indigenous Community Satellite Network (NICSN). I have included Qiniq under social enterprise, although its centralized organization of a not-for-profit organization/CLEC (the Nunavut Broadband Taskforce/SSI Micro) owns the network assets that comprise the community loops the CLEC uses. According to my definition of social enterprise principles however, Qiniq also employs community members as part of its sales force (acting as Community Service Providers). The case is borderline, a distant relation in the family, due to its lack of community owned loops, and particularly because there are no community technicians operating under the model and no opportunities for a local enterprise to spinoff application services (at least at this time). The CLEC, SSiMicro for example, handles all service calls.

Broadband Communications North (BCN) in Manitoba is a wireless network of community networks. Apart from its joint venture satellite side (with KO-K-Net Services and KRG), it follows an ownership model similar to K-Net that employs local community technicians, and enables communities to own their local loops and develop local enterprise initiatives such as community ISPs. As a partner in the NICSN satellite initiative, BCN (and its partner Keewatin Tribal Council) provides the same business model to its satellite communities. It presents a likely candidate for inclusion in research to further our knowledge of the social enterprise model I have defined.

The final social enterprise network organization is KRG in Nunavik/Northern Quebec. The Kativik Regional Government is a regional Inuit authority that also operates a for-profit network management organization and internet service provider called Tamaani. In the communities it serves, Tamaani looks very much like the Qiniq business model. It retains ownership of all loops (through its central organization), but employs community sales staff and local technicians. Yet, as a member of NICSN it has had to interoperate with K-Net's not-for-profit organization. KRG thus presents another suitable candidate for inclusion in comparative case historical research on the social enterprise principles I have defined. (See Table 5, page 59, Figure 9, page 60, and Figure 10, page 61 below for summaries and visualizations of the cases).

576 occupied First Nations, Inuit, and Northern census subdivisions by state of broadband governance and network management organization

			Network management organization								
			ILEC	CLEC	Community Network	K-Net-Community	SSI-Micro-NBTF	BCN-Community	NICSN-BCN (K-Net Network Management)	NICSN-KRG (K-Net Network Management)	Total
Governance	ILEC/CLEC	Count	237	167	0	0	0	0	0	0	404
		% within Governance	58.7%	41.3%	.0%	.0%	.0%	.0%	.0%	.0%	100.0%
		% within NetworkMgmt	98.8%	93.3%	.0%	.0%	.0%	.0%	.0%	.0%	70.1%
	FN SME	Count	0	3	13	0	0	0	0	0	16
		% within Governance	.0%	18.8%	81.3%	.0%	.0%	.0%	.0%	.0%	100.0%
		% within NetworkMgmt	.0%	1.7%	30.2%	.0%	.0%	.0%	.0%	.0%	2.8%
	Social Enterprise	Count	0	0	0	29	25	18	13	15	100
		% within Governance	.0%	.0%	.0%	29.0%	25.0%	18.0%	13.0%	15.0%	100.0%
		% within NetworkMgmt	.0%	.0%	.0%	67.4%	100.0%	100.0%	100.0%	100.0%	17.4%
	FN Authority	Count	3	9	30	14	0	0	0	0	56
		% within Governance	5.4%	16.1%	53.6%	25.0%	.0%	.0%	.0%	.0%	100.0%
		% within NetworkMgmt	1.3%	5.0%	69.8%	32.6%	.0%	.0%	.0%	.0%	9.7%
Total		Count	240	179	43	43	25	18	13	15	576
		% within Governance	41.7%	31.1%	7.5%	7.5%	4.3%	3.1%	2.3%	2.6%	100.0%
		% within NetworkMgmt	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 5: Broadband governance models by network management organizations, (Data courtesy of INAC First Nations SchoolNet 2009)

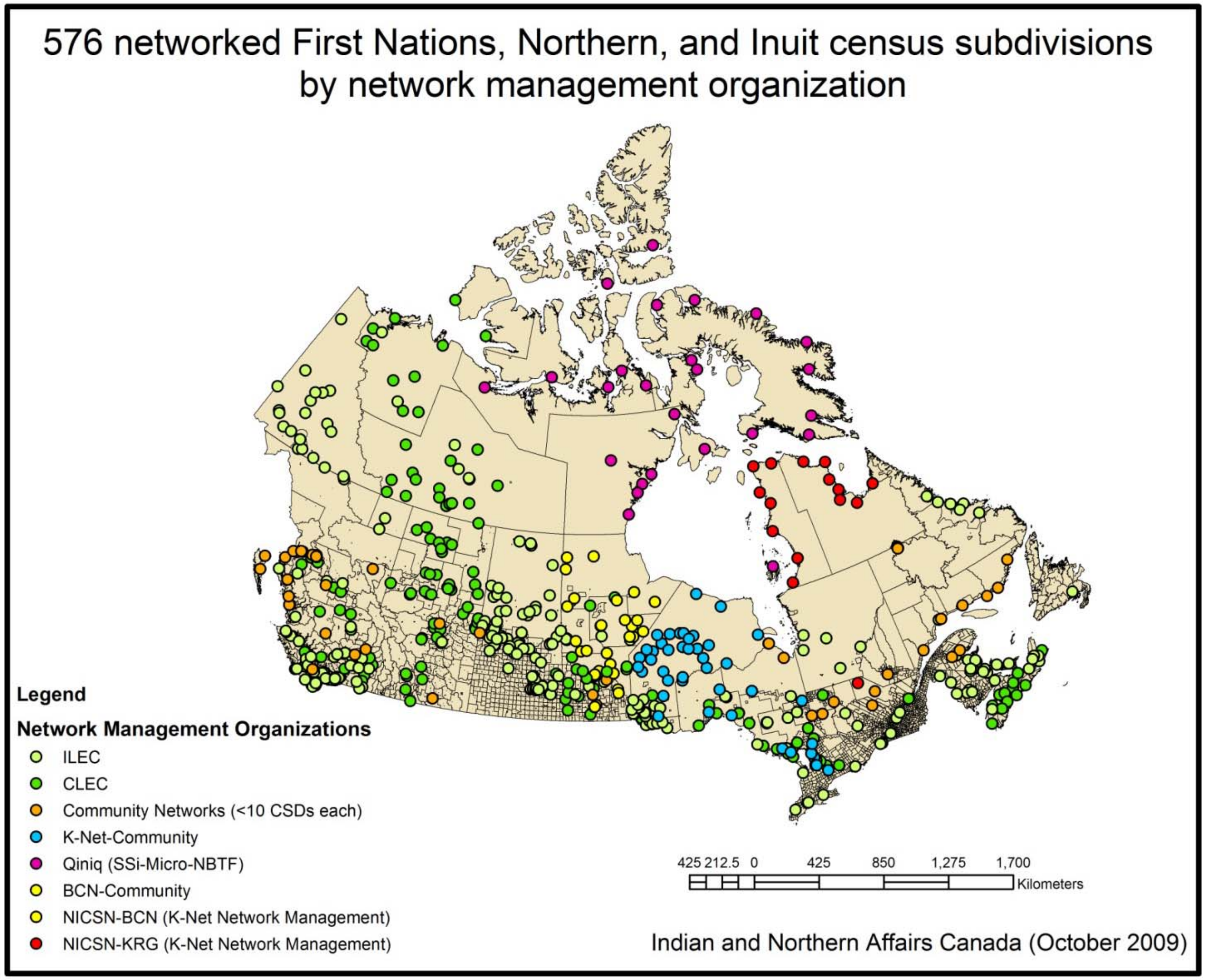

Figure 9: Map of Network Management Organizations found in the 2009 INAC data set

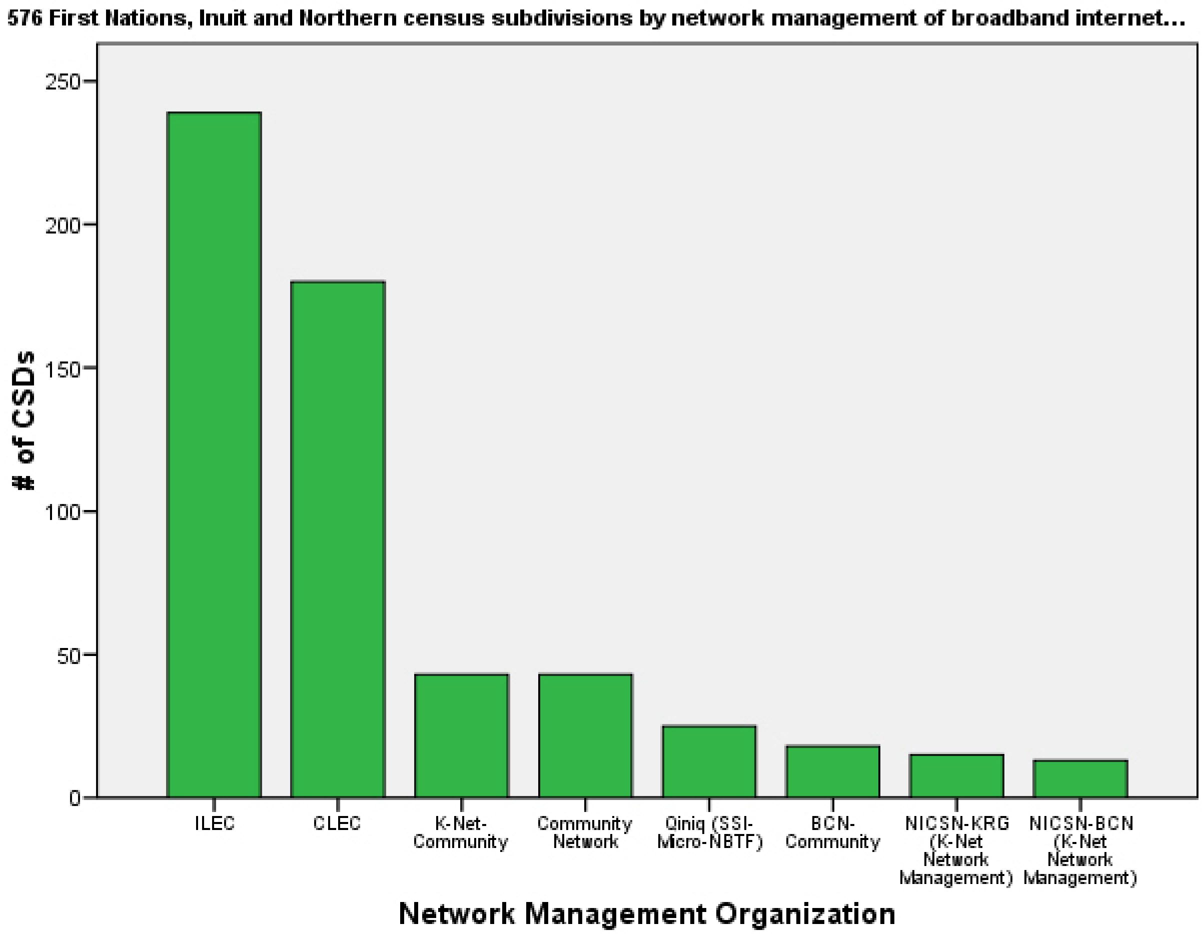

Figure 10: Bar Chart representing Table 5 and Figure 9

In its comparative profile, KO-K-Net therefore operates like BCN on the business end, and co-manages its satellite resource with BCN and KRG. While Qiniq and KRG/Tamaani are relatively centralized social enterprise organizations, KO-K-Net (like BCN), is relatively decentralized. Are there other distinguishing features (see Table 6, page 64, below)? In terms of age, KO-K-Net began in 1994 with its first pre-broadband, dialup modem-based initiatives. None of the other social enterprise organizations were in the field before 2002. Thus KO-K-Net predates them by 8 years, particularly in terms of the organizational lessons and tactics it had time to refine over those years with successive generations of pre-broadband technologies (See Table 6, page 64, below, Chapter 4, and Chapter 5, Sections 5.2 and 5.4).

KO-K-Net Services is unique in its position within the Canadian internet/broadband policy cycle. Its organization and technological development program emerged at the same time as Federal connectivity initiatives such as First Nations SchoolNet and the Community Access Program (see Chapter 5). It was a demonstration project for the Connecting Canadians Smart Communities Demonstration project (Ramirez 2000). The other four candidate social enterprise networks in the "family" are children of BRAND and NSI, programs that evolved out of *Connecting Canadians*, when policy lessons had already been learned and pathways to local infrastructure ownership and control had already been underway. K-Net's membership only includes one BRAND program, though through NICSN it has benefited greatly from NSI (as discussed in Chapters 3, 6 and Appendix 3). K-Net's maturity relative to its four counterparts points to a more robust set of organizational capabilities that have evolved out of its social enterprise. These principles have had a longer time to be tested and refined under KO-K-Net Services' tutelage.

From locally owned loops K-Net has become far more than a provider of basic carriage and internet services. (Refer back to the Access Rainbow on pages 39 – 40 above). Rather than be a seller of products, it is a facilitator for First Nations organizations and communities. In this capacity it brokers relationships among various agencies to provide a wide range of public and civic services in remote communities (e.g. telemedicine applications, Industry Canada's First Nations SchoolNet, the Keewaytinook Internet High School (KiHS), personal homepages and email addresses, video conferencing and webcasting/archiving of public events). It thus constitutes a (nearly) full-spectrum, vertically integrated service provider oriented to meeting the social and economic development needs of its primary constituents. Networks such as Qiniq and Tamaani aspire to this level of service, but have yet to develop a roster of services beyond basic high speed internet (largely due to bandwidth constraints over their respective satellite resources). KO-K-Net has learned to work around its technological constraints to enable a greater range of programs and services. BCN follows a similar path as K-Net, and has benefited from the advice of key KO-K-Net Services managers. But it is currently not mature enough to demonstrate the same capabilities as K-Net-community networks.

Through K-Net, First Nations community ownership and control over local loops means that each community can adapt broadband services to address local challenges and priorities. For some communities, the priority is creating residential IP-telephony or cable plant for entertainment purposes, for others it is promoting education opportunities and public health online, and for others it is economic development. This aggregation of demand from disparate users creates economies of scale and allows the dynamic reallocation of bandwidth to meet social priorities (high school classes, remote eye examinations, residential connectivity). While a reflection of the technical savvy and political acumen of its initiators, K-Net's success also derives from its adoption of core principles rooted deeply in First Nations community values. This is seen in its decentralized structure, which encourages resource pooling, knowledge sharing, and respect for local autonomy. Together these values support community-driven needs and objectives to shape the network and its applications. For these reasons I have chosen to focus on an in depth case study of the K-Net broadband governance model, from its historical emergence in 1994 to its battles to influence regulation and broadband deployment policies between 1997 to 1998, to its first ventures into broadband deployment between 2000 and 2007. There will be room for comparisons, particularly between KO-K-Net Services, its sisters BCN and KRG in NICSN (see Chapter 6), and with a variety of important community intermediaries and policy programs in K-Net's ecology (circa 1997 to 2007).

Network Organization	Governance of Local Loops	Start date	Local Enterprise(s)
KO-K-Net	Community Owned (examined in this thesis)	1994 (Bulletin Board System) 1996 to 2002: Direc PC 2000 (broadband)	Community ISP, Community Technicians, applications specialists (e.g., VOIP)
Broadband Communications North	Community Owned	2002	Community ISP, Community Technicians, applications
NICSN-BCN (Keewatin Tribal Council)	Community Owned (compared in Chapter 6 and Appendix 3)	2002 (started under Kewatin Tribal Council, BNC's tribal council partner)	Community ISP, Community Technicians, applications
NICSN-Kativik Regional Government	Centralized Ownership (Tamaani), (compared in Chapter 6 and Appendix 3)	2002	Community sales force
Qiniq	Centralized Ownership (Nunavut Broadband Development Corporation/SSiMicro (for future research; partially compared in Appendix 3)	**2003**	**Community sales force**

Table 6: Table of Comparisons for the five Network Management Organizations identified

1.4 Reflexive interlude: My participation with K-Net under the Canadian Research Alliance for Community Innovation and Networking (CRACIN)

This thesis is the culmination of a four year long participatory action research project with K-Net members and stakeholders. In 2003 I became a graduate student researcher with the Canadian Research Alliance for Community Innovation and Networking (CRACIN). It was through CRACIN that I came to learn about K-Net and its governance model (see Appendix 1 for an overview of our research partnership).

CRACIN funded and structured research around partnerships with communities and governments. According to its mission statement:

> The Canadian Research Alliance for Community Innovation and Networking (CRACIN) is a collaborative partnership between an interdisciplinary mix of academic researchers from universities across all regions of Canada, along with international researchers in Community Informatics and ICT policy for economic and social development; the three principal federal government departments promoting the Connecting Canadians agenda; and community networking practitioners and advocates from seven of the major Canadian CN initiatives.

CRACIN partnered graduate student researchers with community organizations to conduct case studies under the auspices of a participatory action research approach. It also organized six workshops between 2003 and 2007 to assist and integrate the case studies by linking community and government partners with Canadian and international collaborators around the major policy themes related to the interdisciplinary field of Community Informatics.

I first met members of K-Net during a pre-planning videoconference in December 2003. These were K-Net Coordinator, Brian Beaton, and former K-Net Network Manager, Dan Pellerin (who left the organization in 2006). A follow up email from Dan (see Figure 11 below), captured the dominant themes that would structure my ensuing inquiry into K-Net for the next four years.

Re: meeting today
From: "Dan Pellerin" <danpellerin@knet.ca>
To: "Brian Beaton" <brian.beaton@knet.ca>
Cc: <Cracin@fis.utoronto.ca>; "Adam" <Fiser@fis.utoronto.ca>; clement@fis.utoronto.ca>; brianwalmark@knet.ca

Sent: Sunday, December 28, 2003 9:42 AM

Hi..

My comments are basically an echo of the video conference call. We have an opportunity to pick up and snapshot K-Net over a period of time. We have the past circa 1994 to present. Some materials for this exist. People are still alive and familiar with the history. We have the ability to document the next three years and to coordinate a series of research projects that will be a part and contribute to the whole picture. CRACIN is in a unique position to take the high road on this and to have students and charges work on various parts in collaboration with community members. It would be a great project if the CRACIN group were to be able to obtain additional funding along with K-Net in order to pay for a student to work with a local *researcher* to develop the various sub-projects and to pass on and share information and skillsets in a bi-directional manner.

Can this be captured in the project goals?

cheers

dan

Figure 11: Dan Pellerin, K-Net Services Network Manager, reacts to CRACIN planning session (circa 2003), (reprinted by permission of the author)

My case study began with a 28 hour drive to Sioux Lookout, Ontario, where the headquarters of KO Tribal Council's K-Net Services is located. There I met with Brian Beaton, Dan Pellerin, other members of the six person staff, and their families. Brian and his family took me to a Powwow in Lac Seul First Nation. We ate moose with wild rice by a circle of RV campers. We watched the fancy dancers twirl in circles around a canopy where sturdy looking men kept time with their drums. In between the action Brian introduced me to different community members, mostly from the Lac Seul area. I heard how life was changing, sometimes for the better, other times for the worse, and the conversations validated my desire to dig into K-Net's past and understand how the network had developed and evolved into the relationships and technologies I was beginning to learn about.

I remember most vividly what one well-respected elder from Lac Seul had told me about technology. She had long raven hair with a touch of grey, and appeared to be anywhere between 50 and 60. I have since lost her name, but she pulled me aside from the long winding line to the outdoor buffet, (as I went up for seconds), to talk about what brought us together. First she asked me why I was there. I told her I had just met Brian Beaton and was trying to learn about K-Net. She said her son was in Thunder Bay studying graphic design. He used computers a lot. Everyone in her family had a K-Net email address and a homepage on MyKnet.org. They kept in touch through email and homepages. She liked that she could reach him when she wanted. Sometimes they used IM instead of the phone.

I had expected to hear stories like this after meeting the core group at K-Net. They were very enthusiastic about their network, and appeared to make use of ICTs whenever they could. Their basement office in Sioux Lookout was practically a warehouse of new and old laptops, videoconferencing units, digital cameras, routers, wireless devices, CDs of software, and a small library filled with manuals (CISCO systems, Linux, Apache, etc.). But when I looked up, the woman's face had darkened a bit. She asked me what I thought was happening to the communities now that they had computers, Internet access, satellite TV, and so forth. I said it was probably a good thing, since families like hers had more options to communicate. She agreed, but then asked me, "Who really controls the technology?" I let her continue, mainly because I didn't have an answer.

"Things are moving so fast now," she said. "I'm not sure we're in control of all this technology. I'm not sure I know where things are heading". I asked her if she was worried about change. She said she worried about what was happening to her children and her neighbour's children, and to all of the First Nations youth from the region. More and more, she said, Nishnawbe youth are growing up without a strong sense of place. She said they have trouble recognizing themselves in the land, in the language of their grandparents, in the traditional foods, and in the local cultures. They're acting more and more like youth from the south, seeing more of themselves in

MTV than in Wawatay (the regional First Nations broadcaster), and it could be that this technology is helping them forget about where they're from.

I was taken aback by her story. I hadn't really thought critically about local control and ownership of the media. Part of me assumed that K-Net had survived this long because it had solved the dilemma of ownership and control. During our first meetings at CRACIN we talked about the role of communities in shaping technology. Our research espoused a Community Informatics perspective which placed physical communities like Lac Seul at the centre of technology development. But the actual situation appeared to be a lot more problematic. How did K-Net address ownership and control?

Leaving Sioux Lookout I had a number of half-baked research questions dancing in my head. The most important one, to me, tried to articulate what the Lac Seul elder had told me at the Powwow: Who or what owns and controls K-Net? It wasn't an elegant or fully articulated question, but it stuck in the back of my mind. The other questions, which Brian and Dan had impressed up me, related to youth and their role in K-Net's development. The demographic features of K-Net's core First Nations constituency reflect a young population base. Over 50% of the 30,000 or fewer souls in the Sioux Lookout District are under the age of 25 years. How were they using K-Net to communicate? How were they living with the technology? K-Net Services has had to focus on youth for demographic reasons, but it also began as an initiative to support their education in 1994. One of K-Net's most stable and consistent funding partners was Industry Canada's First Nations SchoolNet program that KO extended into Ontario First Nations schools (to support school connectivity). I had lots to learn and Dan Pellerin's earlier comments about the value of documenting K-Net's history seemed to keep the disparate threads of my emerging inquiry together.

1.4.1 CRACIN partnerships: Research by/for /against/with K-Net

CRACIN espoused a form of participatory action research. My ensuing research experience, however, did not follow a traditional participatory action research (PAR) program. As O'Brien (2001) summarizes it, the concept of action research (of which PAR is a variant):

> […] is known by many other names, including participatory research, collaborative inquiry, emancipatory research, action learning, and contextural action research, but all are variations on a

> theme. Put simply, action research is “learning by doing” - a group of people identify a problem, do something to resolve it, see how successful their efforts were, and if not satisfied, try again. While this is the essence of the approach, there are other key attributes of action research that differentiate it from common problem-solving activities that we all engage in every day.

These attributes O’Brien notes, include a systematic approach to the problems at hand that combines problem-based interventions with theoretical considerations and methodological refinements. It is project-based with theory and method providing the guiding threads that keep the iterative cycles of inquiry from veering off track.

Under CRACIN, I was a graduate student. My official Academic Case Study Lead, Andrew Clement, is a professor at the University of Toronto’s Faculty of Information. He is also my thesis supervisor. My official Community Case-Study Lead, Brian Beaton, is the K-Net Services Coordinator, in Sioux Lookout. As our inquiry evolved I took on a number of different projects that either reflected the requirements of CRACIN’s academic and government partners (such as our national workshops), or the requirements of KO-K-Net Services (such as community outreach, research support, hosting videoconferences from our Toronto node, and so forth).

Andrew’s dual role as supervisor and PI remained fairly consistent. Finding ways to balance the demands of CRACIN research and my thesis work became recurring themes in our conversations. Brian’s roles changed a lot, relative to the various roles I had to accept as the case study progressed. He was a mentor and a gatekeeper who initiated me into (some of) the inner workings of KO-K-Net Services, and introduced me to the First Nations constituents and partners that K-Net represented. He became my employer on a number of project-based contracts that gave me the resources I needed to conduct fieldwork in remote communities. He also became a collaborator on a number of cross-over projects with third parties such as Princess Margaret Hospital (PePTalk), First Nations SchoolNet (FNS), and the Chiefs of Ontario (COO).

Without KO-K-Net Services’ financial and organizational support, CRACIN would not have been able to support much in the way of field research in remote K-net communities. CRACIN also used K-Net’s various technologies, such as its videoconferencing bridge and streaming platforms to host national conferences and support research beyond the K-Net case study.

By dovetailing my research with KO-K-Net Services projects, all within a loosely-formalized action research approach under CRACIN, we developed a negotiated series of project-based research encounters. As in traditional PAR studies, my co-principals, at CRACIN and KO-K-Net Services, met with me periodically to chart my progress towards mutual goals and various project-based deliverables. In terms of my academic responsibilities, my primary tasks were to conduct the CRACIN field research, draft related reports, present case study findings, and balance the demands represented by Andrew and Brian. The result was more like an informal contract than a common theory or methodological program. I was the agent. Andrew and Brian were my co-principals. What I would do, and where I would go, reflected the opportunities that evolved from our interrelationship, driven by the needs of academics and practitioners.

Although we could be fairly clear about what our objectives and project deliverables were, we were less clear about the common elements of the case we were studying. Throughout CRACIN, and beyond our K-Net case study, there could be distinctly conflicting views of the conceptual terrain, particularly between the academics and practitioners. Brian in particular established himself as a provocative speaker during our CRACIN meetings, and on the broader project listserv. He questioned why more CRACIN case studies were focused on urban settings than on rural and remote settings[19]. He opined that too many academics had a tendency to be self-serving experts who did not bother to understand what communities where learning by doing. If anything, this provocative stand made my fellow graduate students and I think about whom we were as researchers, and what we were doing with our research. It also made me wonder about the principles behind KO-K-Net Services' leadership. K-Net had already garnered recognition at federal government levels (up to the Prime Minister's Office) and had recently celebrated its achievements with Industry Canada, on an international stage at *WSIS* 2003. Yet Brian, and his colleagues at KO-K-Net Services confronted their partners openly, and berated them for not making enough of a contribution to improving technologies and services in rural and remote

[19] Brian was not actually correct in this. Rural and remote cases studies included Alberta Supernet, northern Saskatchewan, Knet, Labrador and WVDA. Urban case studies included VCN, SCH, WN, ISF, and Ottawa SmartSItes (briefly). Communautique in Quebec covered both urban and rural settings.

communities. Brian and his colleagues presented the image of an anti-establishment group, questioning everything and everyone. They were also not afraid to turn the questions on themselves and each other). As a relatively small organization, the presented a tightly-knit, charismatic, and almost evangelical social network.

I concluded that as a model for social enterprise principles in its field, KO-K-Net Services lead by accepting imperfections and vulnerabilities as lessons for practice. As they drive ahead into the unknown (where the new opportunities are), they lead by continually seeking, whether to expose vulnerabilities or find hidden strengths, all in a struggle to mature their projects and organization(s) in accord with the mission and principles that drive them. On K-Net's path, successes and failures have to meet the same simple criterion: evolution towards better ICT infrastructure that First Nations can own and control. At least that was my impression. It struck me as a very organic/ecological approach, but also raw, argumentative, unpredictable, subjective, and easily misunderstood. It also made me realize that, as my personal relationship to K-Net's membership deepened and became the subject of their inquiries (e.g., into how urban academics perceive remote First Nations), my research on K-Net would be inescapably social and political. I risked a simultaneous combination of capture and alienation, and wasn't sure whether this situation was a blessing or a curse. If anything, it kept me on my toes.

Thus, navigating the theoretical context of our research was not simply a matter of adjusting concepts within a scientific framework. Logistically, our negotiations encompassed multiple field sites and projects, multiple conferences, and multiple contexts. Our methods and theories had to evolve as our opportunities to conduct research evolved. An early 2004 attempt at creating "success stories" about the uptake of ICTs in K-Net/First Nations SchoolNet supported schools, gave way to a series of focused studies on Youth ICT workers in 2005. A chance partnership with a parallel e-health project by a colleague at Princess Margaret Hospital (under the University of Toronto Health Network) spun off into a series of focus groups with K-Net community network managers. That spin-off then led to an opportunity to work with the Chiefs of Ontario in hosting a Telemedicine conference at the University of Toronto in 2006. The encounters at that conference then spun off into further discussions about program policy and government support of K-Net applications (Fiser & Luke 2008). See Appendix 1 for a complete list of our CRACIN and related spinoff projects.

I wore many different hats throughout my CRACIN experience. I was a student researcher, a consultant, a project manager, A/V technician and a conference coordinator. Somewhere in between these various project roles I had to thread the outlines of a thesis argument. I tried to capture as much of the lively and rich experience of this case history as I could. I made contacts. I took notes. I followed up, and kept my eyes on the ever expanding ball of threads that encompassed K-net's evolving history. For the first three years I could hardly articulate what K-Net meant to me, without sputtering off along parallel lines of inquiry: "Well it's this, but it's also that, and it's sometimes something else…" Gradually the ecology revealed its inner workings.

One of my earlier milestone CRACIN encounters was in Fall 2004, when I had an opportunity to present a first take on my research approach at the Community Informatics Research Network (CIRN) in Prato Italy. My supervisors at CRACIN and K-Net Services supported me and agreed that it would be wise to pair me up with a community partner who could present a deeper understanding of K-net to the audience. So it was that I came to meet Jesse Fiddler (who had been K-Net's *WSIS* delegate in 2003). What impressed me the most about Jesse was how natural he made K-Net appear. Here was a young man, in his mid-twenties, who had lived almost half of his life as part of K-Net Services. Jesse didn't present K-Net as something alien or ultramodern. He talked about the networks and systems he helped build as tools that anyone could pick up and apply, given an appropriate combination of opportunities, supports, and time. This was a refreshing outlook to someone like me, who was coming from an urban university. Here was an Oji-Cree man with a network: A descendent of the legendary Sucker Clan, (Fiddler & Stevens 1985), he helped the CIRN conference organizers set up their wireless LAN; and there was nothing exotic, or out of the ordinary about how he configured 802.11a on Windows XP[20] in between stories of hunting goose on the freezing tundra, fishing out on Sandy Lake, or taking his kids out to bush camp.

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[20] A couple of years later, in Sandy Lake, Jesse showed KO-K-Net Services network manager Dan Pellerin how to hack Linux on an Xbox, while I watched Spunge Bob Squarepants with the kids…

After meeting Jesse it didn't feel right for me to try and tell his story, or the stories of his "K-Nerd" peers (like his wife Angie Morris-Fiddler who attended *WSIS* 2005 in Tunis, or Cal Kenny, Kanina Terry, Jamie Ray, Jeremy Sawanas, Terrence Burnard, Angus Miles, Richard Ogima… and many others whom I got to work with, or met in passing, or chanced to read online…). They didn't need academic translators. They were already telling their stories to each other and to the world and making policy connections of their own. If I was going to try to write a history of K-Net, it was going to be about the things that CRACIN let me see from my vantage point in between the communities, the established academics, the government partners, and industry players. It was going to be about how K-Net introduced new technologies to its First Nations communities; and how it followed principles, and negotiated them in a sociopolitical dance, to secure the communities' ownership and control over those technologies, as they drew ever closer to a more connected world. I returned from the conference and began to drive my stakes into the ground.

I had never expected theory-building or modeling to be the most political and emotional aspect of my CRACIN experience, but as our case study drew to a close, and as my thesis work took centre stage, the negotiated reality of K-Net's broadband governance model became my reality. At issue was my working metaphor for the sociopolitical structures I had encountered and wanted to capture. These were the structures that both enabled and constrained KO-Net Services' ability to apply its principles in practice. The metaphor of governance that I had adopted, the "ecology of games" that Dutton (1992) introduced to telecommunications policy research, had helped me find a language to explain how KO-K-Net Services wrestled with the Lac Seul elders' concerns about ownership and control.

My first two takes on the ecology of games were in 2007 with a historical report on K-Net's development that Andrew Clement and I had produced for Ontario's Ministry of Government Services. My second take was a paper I had drafted for the Community Wireless Infrastructure Research Project (CWIRP) that had taken me back to Lac Seul First Nation as part of a study of its wireless community network (for Infrastructure Canada). Brian had read both papers as early drafts. He feared the ecology of games was giving readers the wrong impression about K-Net's social enterprise governance model, and told me to rethink my position and tone. See Figure 12, below, for my initial reaction to Brian's concerns as an email to Andrew (my supervisor and

CRACIN PI). This is followed by Andrew's reaction (in Figure 13), concluded by a parallel email from Brian to me, which summarizes our conflict and draws up a resolution (Figure 14). I believe these three exchanges capture the essence of our CRACIN experience. They provide a backdrop, a contextual springboard for the more systematic account of my data collection methods and fieldwork in Section 1.5 below.

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from adam fiser <adam.fiser@gmail.com>
to Andrew Clement <andrew.clement@utoronto.ca>
date 8 September 2007 13:57
subject Beaton, the Ecology of Games, & other models of Conflict
mailed-by gmail.com

Hi Andrew.. Brian and I have been having a debate over the value of the ecology of games framework as a model of K-Net's development.

I tried to explain the utility of the model as a way to capture the political economic dimensions of K-Net's development: By studying the strategic interactions and value conflicts between the various players, like KO, the First Nations, the various federal departments, the ILEC Bell and other telecom service providers we can reveal the dynamics that shape K-Net and/or possibly threaten its survival.

I gave Brian some relevant articles to read (Dutton 1992). I framed a few K-Net case studies in terms of the framework (e.g., telehealth's various tensions, the telco wars with TBay Tel and Bell, the rise of the SchoolNet RMO...), but it really irked him to see a perspective in which K-Net was potentially at the mercy of various tentatively aligned political/economic interests. He refuses to suspend disbelief in any way and suggested that if I pursue this line of inquiry he will pull his support.

So what should I do? I'm not entirely wedded to the ecology of games as a framework for my thesis. There are other metaphors and modeling techniques that can be used to capture K-Net's evolutionary dynamics and survival tactics (e.g., I've studied new institutional economics, ANT, etc.). But I refuse to write a thesis that's nothing more than a public relations campaign for K-Net when the reality of this community-owned infrastructure is far more subject to vulnerabilities and tensions than its protagonists would have us believe. Surely there must be a middle ground between the undiluted conflict model Beaton fears I'll present and the undiluted success story I'm not inclined to write?!

-Adam.

Figure 12: Adam Fiser email re: Ecology of Games

from Andrew Clement <andrew.clement@utoronto.ca>
to adam fiser <adam.fiser@gmail.com>
date 8 September 2007 14:58
subject Re: Beaton, the Ecology of Games, & other models of Conflict
mailed-by utoronto.ca

Wow,

This is most interesting. I quite agree with your conclusion ("Surely there must be a middle ground between the undiluted conflict model Beaton fears I'll present and the undiluted success story I'm not inclined to write.?), but I doubt whether giving up the ecology of games model would be enough to mollify Brian significantly. I would consider several possible approaches with him:
- explain that 'games' in the academic sense in no way trivializes things, but often is deadly serious - think of 'game theory' origins in nuclear strategic analysis - see http://en.wikipedia.org/wiki/Game_theory
- emphasize that your analysis of KNet's 'game playing' offers testimony to its competence and the possibility of emulation, and is not damaging
- reassure him that our approach is in no way designed to undermine Knet, but rather to help better understand it
- probe for why your analysis appears so risky to him? Who might read it (the 'wrong' way)?
- try to address these specifically
- give him and others in Knet an opportunity to see a draft of the thesis and participate in your thesis defense. You would of course be more than happy to correct any factual errors and clarify any misleading statements.

You should address in your thesis the methodological issues of working in close engagement with KNet, maintaining mutual openness and respect without becoming totally captive to it. There may indeed be some things that you don't put into the thesis, but this should not mean impairing your academic contributions when there is so little risk to your informants.

You could take this interaction as evidence of the careful positioning (gaming, dancing) work that Brian orients to and so provide further evidence for your 'game' thesis (not that you could actually use this in your diss. :-).

Let's talk soon about this.

Andrew.

Figure 13: Andrew Clement email re: ecology of games, (reprinted by permission of the author)

from Brian Beaton brian.beaton@knet.ca
reply-to brian.beaton@knet.ca
to adam fiser <adam.fiser@gmail.com>
date 6 September 2007 13:06
subject RE: What kind of game is this?
mailed-by knet.ca

These discussions seem to really highlight the impact that the urban academic environment and experience has on how one thinks and interacts with others. This discussion has occupied a fair amount of my time and I am still not too sure if I will ever utilize this "games theory" to "model strategic interaction" [smiles] … our work is just too important for everyone involved for me to reduce it to a game.

I am not too sure where to begin on this one … I do appreciate your appreciation for my concerns about this "conflict model". To tell you the truth, it does not make my "skin crawl" to discuss these issues because I was only trying to address my concerns for the work you are doing about us and with us. As I tried to point out, the challenges you presented within this conflict model are well known to all of us and we are forever working through each of them one step at a time, as opportunities present themselves.

I sincerely want to see all the material you produce to be celebrated and appreciated by as many people as possible but I was hesitant to promote these last two publications because of the issues I tried to raise. This wish is even more pronounced for the production of your thesis because I do want to celebrate that one with you. I was just very concerned about the possibility that this line of thinking was taking you down a path that I sure was not too comfortable traveling with you, for the reasons I tried to document.

Whenever anyone presents the winners and losers within the context of the conflict model, I would suggest that there are strong implications concerning blaming and pointing fingers. So maybe there was no direct blaming one or the other but for all the reasons I tried to present, the fingers sure seemed to be pointed at me and the work we are doing and how it possibly prevents others from doing it. When people are involved, there is ALWAYS politics also involved, so just by writing about these examples does present a certain political reality for the reader.

I am looking forward to working with you throughout all your thesis work and am especially looking forward to the final product …

Brian

Figure 14: Brian Beaton email re: ecology of games, (reprinted by permission of the author)

In the end, our conflict eventually deepened my resolve to maintain the ecology of games as part of my perspective on K-Net's social enterprise. I came to conclude that, as Brian's email in Figure 14 discussed, the principles KO-K-Net Services espouses are its "rules of the game", its way of identifying goals (such as achieving ownership), identifying opportunities, and aligning itself in relation to all the other players who make broadband deployment possible in the remote First Nations and their high cost serving areas.

Brian's challenge forced me to recognize the principles that made K-Net a success story within the timeframe of our CRACIN study and the 10-year broadband policy cycle of *Connecting Canadians* (in which K-Net's broadband deployment took place). K-Net did not weather the ups and downs of federal and provincial project-based funding by adopting a winner takes all strategy, as Brian rightly points out. It thrived on cooperation at this time, creating opportunities for local enterprise out of local ownership. In 2009, it maintains its position as a network of indigenous community-based networks because its social enterprise allows governments, industry players, and communities to "play together". I know this may not be exactly how Brian or Andrew, or anyone else, would account for K-Net as a model, but it represents K-Net as I came to understand it through CRACIN. Moreover, its justification rests on this thesis.

1.5 Data generation methods

This thesis presents a case history of K-Net's development as a network of community-based networks and as a social enterprise model for broadband deployment and governance. To this end, interviews and participant observation complemented readings through K-Net Services' extant archives of K-Net's documented developments. I sifted through electronic records to compare the organization's letters of intent, proposals, internal reports, emails, and so forth, for historical themes and points of comparison with federal policy and industry strategy.

As I compared and contrasted the different stakeholder views that emerged from my readings of K-Net's history it became apparent that government policy documents and industry briefs only reveal a partial view of broadband policy in Canada. They must be read alongside the documents of the community-based organizations that built the indigenous broadband experiments and played along with governments and industry (See Chapter 3 and Appendix 6, for examples).

1.5.1 Fieldwork

Although it rests on case historical research, my thesis also examines K-Net in its contemporary ecological setting (circa 2007-2009). My profile of the network and KO-K-Net Services, incorporates readings of policy documents, audits, and briefings, but its core sections in Chapters 5 and 6 reflect interviews and fieldwork that I conducted under CRACIN. In these later chapters I present the social enterprise organization that holds K-Net's broadband governance model together with its decentralized community networks. The insights generated from my fieldwork would not have been possible without the partnership of KO Tribal Council's Keewaytinook Okimakanak Research Institute (KORI) and K-Net Services.

My data collection process with KORI involved a combination of qualitative and quantitative aspects. Between 2004 and 2007, I collaborated with KORI director Brian Walmark, and KORI researcher, Franz Seibel, on a series of projects to support and understand K-Net's social enterprise and its organizational linkages with K-Net community networks. In total, we visited 21 K-Net affiliated First Nations to observe the technical and organizational processes at work in the various local community networks. I personally visited 10 of these First Nations[21]. We compared notes and debated theories about K-Net's guiding principles.

Our sample was purposive and drawn to explore K-Net's diversity. It evolved organically over a series of action research projects and stakeholder workshops (see Appendices 1 and 2, for an overview of the research projects and workshops). In these encounters, we had to balance the requirements of our immediate project deliverables with the longer term demands of our inquiry into K-Net's social enterprise.

Through these encounters, we observed network upgrades, applications deployments, and routine operations. We conducted interviews with community network managers, community technicians, and youth interns to learn about their roles. In total, we interviewed 51 of these network-related professionals (roughly three per community). We also interviewed local residents and staff, at community schools and health clinics, to learn about their relationships

[21] I visited Batchewana, Deer Lake, Eagle Lake, Fort William, Keewaywin, Lac Seul (Frenchman's Head, Kejick Bay, Whitefish Bay), North Spirit Lake, Oshwekan, Pikanjikum, Poplar Hill, Sandy Lake. The other seven visits in which I was not present included Bearskin Lake, Cat Lake, Fort Hope, Fort Severn, Sachigo Lake, Slate Falls, and Weagamow.

with the social enterprise, as K-Net consumers. This occurred in five of the KO communities, which had the longest running relationship with the social enterprise (for a total of 35 additional research participants). Additional interviews by videoconference, telephone, and email increased the community sample to 32 First Nations[22] (for a combined total of 112 community level research participants). We chose participant observation, unstructured interviews, and loosely structured focus groups as our core data collection methods on account of the First Nations' cultural preference for direct engagement and interpersonal reflection (Terry 2004). As my collaborators at KORI have learned from experience, more rigid and impersonal data collection devices, such as surveys, have typically generated low response rates from the communities. Throughout my fieldwork with KORI I found this viewpoint corroborated in interviews with Aboriginal stakeholders and with policy advisors at Industry Canada (circa 2004). In the 2003 - 04 period for example, an Industry Canada sponsored survey of connectivity and ICT integration in First Nations schools across Canada had a return rate of 26% (i.e., 153 out of 588 mailed questionnaires to principals of First Nations schools).

To complement our community inquiries we visited K-Net Services in Sioux Lookout Ontario to observe the technical and organizational processes of the network operations centre (NOC) and management team responsible for K-Net's development (in 2003, 2004, 2005, 2006). Interviews with K-Net Services staff were conducted (with extensive videoconferencing, telephone, and email follow up). Quantitative data relevant to K-Net's overall network operations and business transactions were collected from the NOC and management team (see Chapter 6). These data included financial statements pertaining to K-Net's capital development and its not-for-profit business model (see Chapter 5), as well as network level data related to K-Net user accounts, data transfer rates, and so forth (Fiser et al. 2006). We also met with the Director and Chiefs of Keewaytinook Okimakanak in Balmertown (2005) and Thunder Bay (2005, 2006) to discuss the deeper sociopolitical context of K-Net's tribal council origins and mission (as reflected in Chapter 3).

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[22] Big Trout Lake, Fort Albany, Kingfisher Lake, M'Chigeeng, Moose Factory, Rainy River, Walpole Island, Wapakeka, Webequie, Wikwemikong, Wunnumin Lake.

To round out our inquiry we met with K-Net partners from government (e.g., Industry Canada, Health Canada, and Indian and Northern Affairs), public agencies (Smart Systems for Health Agency) and industry (e.g., Superior Wireless, TBay Tel, Cisco, and Bell). These meetings (between 2005 and 2007) helped us to validate our interpretations of K-Net's social enterprise and informed us of the critical role of social enterprise in governing public-private partnerships to stabilize K-Net's community-based initiative.

1.5.2 Historical case-oriented research

My study of K-Net's social enterprise is a contribution to historical case-oriented research. My methodological approach is therefore interpretive. In his text on comparative social science Ragin writes (1989: 3):

> Historically oriented interpretive work attempts to account for specific historical outcomes or sets of comparable outcomes or processes chosen for study because of their significance for current institutional arrangements or for social life in general.
>
> Typically, such work seeks to make sense out of different cases by piecing evidence together in a manner sensitive to chronology and by offering limited historical generalizations that are both objectively possible and cognizant of enabling conditions and limiting means – of context.

In this thesis I use a mixed methods case historical approach to help situate K-Net and establish my investigation of its social enterprise principles. My principal thesis claim is that K-Net is a social enterprise broadband governance model, based on the principles, defined above in Section 1.3.6. The task for the rest of this document is to explain and justify this claim. The tools I use are historical and descriptive methods appropriate for small-N cases. The former relate case histories of critical episodes in K-Net's development, to my claims that K-Net is a social enterprise model of broadband governance. The latter, through devices such as the maps and cross-tabulations, visited earlier in Chapter 1, provide snapshots of the various players and activities occurring in K-Net's ecology during the critical historical episodes where pivotal developments occurred to shape K-Net's social enterprise.

K-Net is a pioneering exemplar of technology partnerships in a period when Canadian Telecommunications policy had come to reexamine the role of the regulator, governments, markets, and communities in telecommunications development. It is already a model in the field of Community Informatics (see Chapter 2). I contend that it presents important sociopolitical and socio-technical lessons for how to coordinate local community ownership and control through social enterprise.

In terms of my guiding research questions from Section 1.2.1 above, I examine the K-Net model in terms of the following claims. Each question is linked to a Thesis Chapter, where embedded case histories provide in-depth responses. The outline, in brief, is as follows:

1. **What constitutes K-Net, as an exemplary social enterprise broadband governance model?**

   I presented a definition of the social enterprise principles that I attribute to K-Net in Chapter 1. They are our guide for examining the constitutive elements of K-Net's social enterprise. To reiterate they propose that K-Net should be:

i. A carriage-level network of community networks, that focuses on the provision of telecom and/or other ICT services to a multi-sector user ecology that includes a core constituency of unincorporated communities, municipal-like authorities, small-medium enterprise, public sector programs, and larger private sector for-profit members (including ILECs and CLECs), as well as free riders and online communities (via free services);

ii. A system of governance through partnerships under a not-for-profit business manager and network operations centre. The business manager manages accounts and transactions. The network operations centre manages network traffic, as well as co-ownership and co-management arrangements of local loops with public and private sector parties. The system of governance goes beyond a community intermediary role to facilitate the economic creation of local enterprise through the use of local loops. Local enterprise (whether for- or not-for-profit) must include internet service and may include the provision of broadband services such as voice/video/data over IP or other protocols compatible with the network.

iii. A social economy organization that derives value from a primarily non-monetary position rooted in a democratic process (Cf. Quarter et al. 2003) that strives to articulate the demands and capabilities of the various constituent communities it serves. In this case, value is derived from acquiring a standard of communications for one's constituents, and protecting, sustaining, and elevating that standard through ownership and control over broadband resources at the local loop level.

In Chapter 2 I present a literature review on the theory and practice of community networking, where K-Net's social enterprise finds multiple family resemblances as well as important contrasts, in terms of its carriage capabilities, its system of governance, and its social economy. In Chapter 3, I provide a historical account of how K-Net' social enterprise principles gradually evolved from KO-K-Net Services' encounters with important funding opportunities, sociopolitical forces (games), and technological actors. This Chapter articulates how the principles co-evolved through such encounters, and provides our first view of K-Net's carriage capabilities, system of governance, and social economy. It demonstrates how KO-K-Net Services and its allies changed the rules of telecom in their region by enabling social enterprise. In Chapter 4, I provide the regulatory context in which K-Net is embedded (and forged sociopolitical alliances). This regulatory context provides a counterpoint to K-Net's developments, revealing why KO-K-Net Services and its allies had to take initiative to shape the new rules for telecom in their region, as discussed in Chapter 3. It also reveals how opportunities for partnership were developing within governments and industry, just prior to K-Net's broadband deployment (circa 1998). In Chapter 5, I provide the federal and regional contexts in which K-Net is embedded and drew resources for capital development and operations to support its broadband deployment. This is a deeper investigation of the partnerships that constitute K-Net's social economy. In Chapter 6, I draw the historical constitutive elements together, to examine how KO-K-Net Services' contemporary social enterprise organization manages its carriage capabilities, social economy, and system of governance with First Nations, community intermediaries, governments, and industry.

2. Who were the players in the K-Net model's historical development and contemporary organizations?

I answer this question in Chapter 3 with a historical account of who the players were and how they came together at key episodes of K-Net's evolution as a social enterprise. This includes an account of the local loops, and their development out of earlier technology initiatives such as K-Net's BBS and DirecPC technology partnerships (see also Chapter 5, Sections 5.2 and 5.4). I reflect on the formative First Nations' perspectives (particularly KO-K-Net Services' core constituents), in Chapters 3 and 4. I reflect on the formative perspectives of K-Net's industry and community intermediary partners in

Chapters 3 and 4. (Chapter 4 also provides an account of K-Net's regulatory context and the role of the CRTC as national regulator). I reflect on the formative perspectives of K-Net's federal and regional partners, emphasizing their linkages within an extended profile of Industry Canada IHAB in Chapters 4 and 5. (This particularly focuses of First Nations SchoolNet, FedNor, and the Sioux Lookout Aboriginal Area Management Board. See also Appendix 3 for a closer look at Industry Canada FedNor's role). I profile the contemporary relationships amongst all the significant players, and their relationships with/at the community local loops, in Chapter 6. This includes sociopolitical and economic relationships. Chapter 6 explains how KO-Net Services manages the various significant players and handles their different requirements under social enterprise.

3. How did the K-Net model develop over time and in which geospatial communities?

Chapter 1 provided an overview of the geospatial communities associated with K-Net's social enterprise. Chapter 3 provides a historical account of the social enterprise's community network growth as well as background information on the communities. Chapter 4 provides a detailed look at K-Net's earliest planning phases and situates the relevant communities within it, particularly in terms of their collective participation in a Northern Ontario Telecommunications Infrastructure Working Group. Chapter 5 situates K-Net and its community partners within their roles as co-participants in federal and regional programming. Throughout the case histories are graphical elements such as maps and charts to help the reader maintain a birds-eye-view of K-Net and its collaborating community networks. (Map keys and tables of correspondence for all the featured communities are available in Appendix 7).

4. How does the K-Net model operationalize governance based on social enterprise?

I answer this question in Chapter 3 by taking the reader through K-Net's evolution as a social enterprise, from the situation of its telecommunications pre-history in Northwestern Ontario, to its configuration of broadband community networks. I refine the historical account of that evolution with a contemporary profile of the social enterprise organizations operations and socio-economic transactions in Chapter 6. Chapter 6 presents the guiding principles in the context of KO-K-Net Services' actual practices at the level of its social enterprise business unit and network operations centre (circa 2007).

I now turn to the Literature Review in Chapter 2, to situate K-Net within the field of Community Informatics/community networking (Cf. Gurstein 2001), and in the sociopolitical context of an ecology of games framework (Cf. Dutton 1999).

Chapter 2

2 Community-based networking: Contextualizing K-Net's broadband deployment and governance

This chapter provides a review of the history and theory of community networks in Canada and abroad. I situate this literature review within the discipline of Community Informatics (CI). CI, where community networking has found a home in research and practice, best fits the context of K-Net's history and my CRACIN research experience. CI focuses communications/informatics research, policy, and practice around community networking models and the particular roles that not-for profit organizations and activities play in shaping the developmental trajectory of ICT infrastructure, the Internet, and broadband (Cf. Kubicek & Wagner 1998, Abbate 1999, Longford 2005). In this context, CI researchers have identified at least three conceptual models of community networks, at play in different periods of history that run parallel to the emergence and development of internet services and related ICTs (Kubicek & Wagner 1998). These models are Bulletin Board Systems, Free-Nets, and Community development networks. They are particularly focused on service provision, and role of community intermediary organizations, as I have defined them in Chapter 1. Thus, missing from the CI taxonomy is an explicit mention of social enterprise in terms of a not-for-profit organization that mediates and delivers services on top of organizing to secure community ownership and control over carriage level telecommunications infrastructure (as featured in Clement and Shade's Access Rainbow). None of the models in this literature review pays particular attention to the carriage level, apart from having to transact with ILECs and CLECs, and compete with ILEC and CLEC based commercial information services. They are however, part of the lineage of community networks that the social enterprise model is a part of. As I will demonstrate in Chapter 3, K-Net's evolution as a social enterprise, closely parallels these models, as it too developed from a BBS, to a Free-Net like service, to its contemporary form as a network of broadband community networks. However, at each of these critical episodes its membership strove for ownership and control (particularly due to socio-technical and economic constraints they faced in a telecommunications high cost serving area). Moreover, in this review and in Chapter 3, I show that K-Net's social enterprise in its tactical approach to technology development, resonates with earlier forms of community owned media, such as community radio (Hudson 1977, Mohr 2001).

2.1.1 A taxonomy of community networks

For Kubicek and Wagner (1998) these models are institutional. They represent mindsets, norms, technologies, and entrenched policies that delimit and articulate which stakeholders, artifacts, and activities become involved in ICT development. As such, what they represent establishes the rules and heuristics that community networking practitioners employ to conceptualize ICT infrastructure, talk about it, and play out its development and applications in actual situations.

Kubicek and Wagner (1998) apply an ecological and historical interpretation to community networking. Each model (and successive generations of stakeholders) inherits from its predecessors while simultaneously reshaping what constitutes a community network to reflect innovations in the global ecology of ICT infrastructure (i.e., the Internet). Throughout this history of changes, they find a recurring theme of agency and questions of who represents and acts on behalf of community stakeholders. Agents of community networks have been academics, government actors, community activists, not-for-profit organizations, and to a lesser extent commercial interests.

I believe the developmental trajectories of ICT infrastructure and the Internet in Canada's First Nations warrants a place in community networking history. First Nations networks offer a unique ecology of stakeholders at play in their environmental, economic, and sociopolitical context. They also exhibit qualities resonant with the lineage of community networking models that CI researchers have compared internationally (Kubicek and Wagner 1998) and within national boundaries, e.g., in Canada, by CRACIN researchers, Moll and Shade (2004), and Longford (2005). Thus, throughout my review of the academic literature on community networking, I shall incorporate a comparison and contrast of First Nations community networks to mainstream community networks.

Community networking predated the Internet/WWW with modem-based Bulletin Board Systems. Nevertheless the various information communications technologies associated with community networks and internet services, are a direct descendent of a United States government-academic network called ARPANET, which began in the late 1960s and gained international recognition in the early -70s (Abbate 1999). The first experiments with ARPANET were essentially academic advances in communications theory. Core technologies, such as packet switching, were envisioned for military applications – to create resilient communications systems (Baran 1990 in Abbate 1999: 10). Apart from military applications and pure research, the academic experiments inspired commercial ventures (e.g., Ethernet) as well as not-for profit activities. The latter activities linked university equipment and academic know-how with community interests and applications. They inspired school and library networks, Bulletin Board Systems, and public access sites to electronic community repositories (Abbate 1999).

In Canada, a similar legacy of government-funded innovation and academic collaboration inspired the emergence of not-for-profit community networking in the 1980s and early -90s (Longford 2005). In the case of First Nations connectivity, the role of the academic was significantly less involved in the process of technology innovation. More often than not, the Canadian government chose to deal with First Nations communities directly or through not-for-profit community based organizations and/or regional agencies. These community based organizations acted as local catalysts of not-for profit innovation, much like the academic groups that behaved as agents of communities in the early days of community networking (Cf. Kubicek & Wagner 1998). Not-for-profit community-based organizations also shouldered an extra burden to negotiate common ground between the interests of their various stakeholders in First Nations, government, and industry (Ramirez 2001, Fiser 2005).

In their review of community networking's developmental history Kubicek and Wagner (1998) provide an institutional framework of rules to distinguish community networks from other internet-based development arenas. I believe their framework also partially describes the institutional environment that enabled internet infrastructure to penetrate remote First Nations communities in Canada (Cf. Ramirez 2001, Fiser 2004, Fiser et al. 2005). Although Kubicek and Wagner (1998) do not explicitly employ Dutton's (1992, 2009) metaphor of games, I find it to be a useful complement given that the rules they identify establish the basic technological, sociopolitical, and economic features of a community network, notwithstanding its evolution across successive generations.

Some actors in a community network game have more privileges than others. In terms of developmental trajectories community networks privilege stakeholders from the not-for-profit sector and civic participation movements (Cf. Longford 2005). Moreover, based on their historical analysis of internet-based not-for profit activities in North America, and Europe, Kubicek and Wagner (1998) posit that community networks are:

1. run by and for a local physical community,
2. to serve a clearly defined geographic region,
3. to address the needs of day-to-day life,
4. to represent local culture and strengthen the cohesion of the local community,
5. provided at no or little cost to the user.

Following their identification of community networking's basic rules, Kubicek and Wagner (1998) identify three generational models of community networks. Save for the first (which borrows from other traditions, such as the American countercultural movement), each model borrows layers from its predecessors while adding a new set of layers that rearticulates what community networks are and how they can be developed and applied.

In my summary of the three generations I employ Clement and Shade's (2000) seven-layered Access Rainbow model (see Table 7) to organize what I consider to be the goals each generation introduces to infrastructure development. Here my use of the Access Rainbow provides a summary overview of the different models, focusing one's attention on the interconnections between various layers of information-communications infrastructure. For my purposes, I focus particularly on the issue of governance, mainly to demonstrate the dominant games that shape these models. As Clement and Shade (2000) note, issues of governance penetrate all layers and are largely shaped by what is happening at various other layers. The effect this produces is similar to Dutton's ecology of games in creating a holistic impression of an evolving and infrastructure of interdependent layers (or games).

Access Rainbow layers	Description	Linkages:

Governance	How decisions are made concerning the development and operation of the infrastructure	All Layers
Literacy/Social Facilitation	The skills people need to take full advantage of information/communications facilities, together with the training and facilitation to acquire these skills.	Literacy and social facilitation are closely connected with service providers (those providing the support at various institutional/organizational levels); with software tools; and with content and services
Service/Access Provision	The organizations that provide network access to users	Service providers work closely in supplying literacy and social facilitation to the technology. They must also work closely with the communities they represent to ascertain the content and services that are required. They also have a link to the Governance level, in ensuring that their voices and needs are met in ongoing policy implementation
Content/Services	The actual information and communications services offered	Ideally content and services should not be tightly related to the particular suppliers of carriage media, hardware devices or software tools
Software Tools	The program that runs the devices and makes connections to services	Interoperability with the device layer; ability to foster literacy and social facilitation
Devices	These are the actual physical devices that people operate	The device layer must be compatible with the carrier layer
Carriage	These are the facilities that store, serve or carry information.	How do the carriage facilities interoperate with the device layer? How do technical developments and refinements interact with the other layers?

Table 7: Access Rainbow (Source Clement and Shade 2000)

Kubicek and Wagner (1998) attribute the first generation model to public Bulletin Board Systems from the early 1970s. Their exemplary case for this era is Community Memory, a Bulletin Board System that served Berkeley, California. Patrons originally had to visit a storefront in order to access Community Memory (later replaced by coin operated kiosks). Its original version was a teletype machine encased in a cardboard box that spewed out pages of personal ads, classifieds, and list-serv type messages while patrons crowded around. There was no centralized administration of the database (a time-sharing computer in San Francisco), and patrons provided the content themselves. Every message was public and correspondence was asynchronous. Moreover, patrons did not have user accounts or ascribed identities in the system. Community Memory inspired counterpart experiments in Canada that shared similar attributes. The innovative layers of the model are: Teletype, BBS software, user driven content, public messaging services, possible anonymity, and decentralized (relatively anarchic) governance. See Table 8.

Access Rainbow layers	Description	Examples:
Governance	How decisions are made concerning the development and operation of the infrastructure	Decentralized governance, ‘hacker’ ethos, Counterculture (Free Speech Movement, movement for Appropriate Technology, Whole Earth)
Literacy/Social Facilitation	The skills people need to take full advantage of information/communications facilities, together with the training and facilitation to acquire these skills.	No formal training per se, information aids (e.g., posters) by the TTY/console provide instructions about basic functionality (FIND and ADD information)
Service/Access Provision	The organizations that provide network access to users	‘Countercultural’ information providers, University donated equipment, business support,
Content/Services	The actual information and communications services offered	‘Information Utility’, User Driven content, Public messaging system, (No central authority to collect, select or edit data)
Software Tools	The program that runs the devices and makes connections to services	
Devices	These are the actual physical devices that people operate	Telephone terminal equipment, modems, timeshare computer, Teletypewriter
Carriage	These are the facilities that store, serve or carry information.	PSTN, timeshare computer

Table 8: Access Rainbow model of a Bulletin Board System (adapted from Kubicek and Wagner 1998, and Clement and Shade 2000)

The second generation model of community networks in Kubicek and Wagner’s (1998) institutional taxonomy are the Free-Nets from the mid 1980s. Unlike the earlier public BBS, Free-Nets provided users with personal profiles and private communications via free email. They also provided users with internet access options for synchronous interaction via chat. Free-Nets were mostly hosted by universities and supported by volunteers (Longford 2005). According to Kubicek and Wagner they “promoted computing and networking as a means of personal and professional advancement and took care that especially blue collar workers and low income groups had access to their system" (Kubicek & Wagner 1998: 2.2). See Table 9.

Access Rainbow	Description	Examples:
Governance	How decisions are made concerning the development and operation of the infrastructure	Local governance (Free-Net committees), Free-Nets
Literacy/Social Facilitation	The skills people need to take full advantage of information/communications facilities, together with the training and facilitation to acquire these skills.	Basic keyboarding skills, knowledge of diverse word processing packages, World Wide Web navigation and search strategies, database manipulation, spreadsheet implementation
Service/Access Provision	The organizations that provide network access to users	Employers, educational institutions, Internet Service Providers (ISPs), ILECs, community nets, libraries, schools and other public facilities, community organizations, workplaces
Content/Services	The actual information and communications services offered	Telephone enhancements (e.g. 911, call answering, caller ID), radio/television programming, electronic mail, newsgroups, the World Wide Web, databases
Software Tools	The program that runs the devices and makes connections to services	Browsers, e-mailers, search engines, authoring and editing tools, distribution list servers
Devices	These are the actual physical devices that people operate	Telephone terminal equipment, TV and radio receivers, modems, cable modems, set-top boxes, Net PCs, Web TVs, kiosks, workstations, PDAs
Carriage	These are the facilities that store, serve or carry information.	Telephone, cable, radio/television broadcast, Internet, and other networks. WWW server space
Access Rainbow	Description	Examples:
Governance	How decisions are made concerning the development and operation of the infrastructure	Legislation, regulations (e.g. CRTC, FCC), local civic bodies, and markets

Literacy/Social Facilitation	The skills people need to take full advantage of information/communications facilities, together with the training and facilitation to acquire these skills.	Basic keyboarding skills, knowledge of diverse word processing packages, World Wide Web navigation and search strategies, database manipulation, spreadsheet implementation
Service/Access Provision	The organizations that provide network access to users	Employers, educational institutions, Internet Service Providers (ISPs), ILECs, community nets, libraries, schools and other public facilities, community organizations, workplaces
Content/Services	The actual information and communications services offered	Telephone enhancements (e.g. 911, call answering, caller ID), radio/television programming, electronic mail, newsgroups, the World Wide Web, databases
Software Tools	The program that runs the devices and makes connections to services	Browsers, e-mailers, search engines, authoring and editing tools, distribution list servers
Devices	These are the actual physical devices that people operate	Telephone terminal equipment, TV and radio receivers, modems, cable modems, set-top boxes, Net PCs, Web TVs, kiosks, workstations, PDAs
Carriage	These are the facilities that store, serve or carry information.	Telephone, cable, radio/television broadcast, Internet, and other networks. WWW server space

Table 9: Access Rainbow model of a Free-Net, (adapted from Kubicek and Wagner 1998, and Clement and Shade 2000)

The Free-Net movement was prominent in Canada up until the late 90s (Cf. Moll and Shade 2004; Longford 2005). Their influence has significantly waned due to competition from commercial ISPs, which began to offer a greater diversity of applications and information services. The innovative layers of the second model are: text based search, email/chat, user profiles and private communications, computer skills development/employment training, and centralized governance.

The third generation model of community networks in Kubicek and Wagner's taxonomy, emerged in the 1990s as part of a broader community development ethos (Cf. Longford 2005). These are community development networks. The not-for profit community intermediaries that manage these networks target specific geospatial communities, offer public access, aggregate local information, and seek grants and partnerships to further their not-for profit ventures. They often partner or emerge from existing community service agencies (such as community centres, community development corporations, settlement houses, etc.). Kubicek and Wagner's exemplar from this era is the Boulder Community Network (BCN), a US not-for-profit that started in 1994 as one of the first community networks on the World Wide Web. According to Kubicek and Wagner's (1998) research, the developers of the Boulder Colorado Network (BCN) compared the Free-Nets and Community Memory with their contemporary situation and decided that instead of competing with oncoming commercial Internet Service Providers (ISPs) they would create public access terminals as a social welfare net for the less privileged stakeholders of society. To this end, BCN's organizers sought development grants from the US Department of Commerce. BCN is also focused on geospatial localities and tailored ICT development opportunities to regions. Its website acts as an aggregator of information from the physical communities it serves, and provides an outlet for various local information providers, interest groups, community services, and SMEs that locally cater to its communities. The innovative layers of the model are overwhelmingly on the content/services spectrum of Clement and Shade's (2000) Access Rainbow. They include community economic development, social welfare net, geospatiality, local information aggregation, and grant seeking. Governance under this model must be an ongoing balancing act between efficient organizational management, external funders, and decentralized locally-driven services and contents. See Table 10.

Access Rainbow	**Description**	**Examples:**
Governance	How decisions are made concerning the development and operation of the infrastructure	Legislation, regulations (e.g. CRTC, FCC), local civic bodies, and markets
Literacy/Social Facilitation	The skills people need to take full advantage of information/communications facilities, together with the training and facilitation to acquire these skills.	Basic keyboarding skills, knowledge of diverse word processing packages, World Wide Web navigation and search strategies, database manipulation, spreadsheet implementation
Service/Access	The organizations that provide network access to	Employers, educational institutions,

Provision	users	Internet Service Providers (ISPs), ILECs, community nets, libraries, schools and other public facilities, community organizations, workplaces
Content/Services	The actual information and communications services offered	Telephone enhancements (e.g. 911, call answering, caller ID), radio/television programming, electronic mail, newsgroups, the World Wide Web, databases
Software Tools	The program that runs the devices and makes connections to services	Browsers, e-mailers, search engines, authoring and editing tools, distribution list servers
Devices	These are the actual physical devices that people operate	Telephone terminal equipment, TV and radio receivers, modems, cable modems, set-top boxes, Net PCs, Web TVs, kiosks, workstations, PDAs
Carriage	These are the facilities that store, serve or carry information.	Telephone, cable, radio/television broadcast, Internet, and other networks. WWW server space

Table 10: Access Rainbow model of the community development network, (adapted from Kubicek and Wagner 1998, and Clement and Shade 2000)

As for the kinds of development games that community networks play, Kubicek and Wagner (1998) note that as the generational models evolved successive generations became much more susceptible to intrusions from competing external stakeholders, particularly for-profit industry players who offered competitive ICT services. First generation models such as Community Memory had little competition from commercial ventures. Free-Nets and third generation community networks on the other hand had direct competition from commercial ISPs and large software firms such as Microsoft that saw tremendous profit in tailoring internet-based information services to various communities of interest, both physical and virtual. Moreover, third generation community networks, due to their increased dependence on government funding games, also became partially responsible for articulating government policies to their constituents. This includes framing network contents/services in terms relevant to national or provincial/state level government policies and evaluation procedures (Cf. Moll and Shade 2004). Whether such dependence is a direct cooptation of community networks by government is difficult to generalize. I believe that at the very least it leads to a creative tension that the agents operating such community networks have to continually negotiate. This creative tension also appears to be a recurring theme when we examine the agency of First Nations community networks (Cf. Ramirez 2000, Fiser 2004).

It is also evident from Kubicek and Wagner's exemplars that, as the generational models evolved they became more complex organizationally and in terms of their internal sociopolitical relationships with constituents. Free-Nets individuated user profiles which not only afforded patrons a sense of private space that first generation community networks could not offer (e.g., email accounts), but also enabled patrons to identify with each other as virtual stakeholders vested with a sense of ownership of their Free-Net and a measure of control over its developmental trajectory. Community Memory's anarchic information space could only offer a sense of ownership and control to a much narrower list of insiders. Contrarily, the internal stakeholder relationship of Free-Net patrons fostered a sense of stewardship amongst members that could manifest as organized political activism on behalf of particular Free-Nets in times of economic uncertainty (Moll and Shade 2004). However, stewardship could also create factionalism between different user groups that ultimately had to compete over the allocation of scarce network resources to their favoured applications and causes.

Third generation community networks such as Boulder Colorado Network are just as susceptible to the increased game play of their internal stakeholders, both virtual (via stakeholders from online communities of interest) and physical (via geospatial communities that host public access sites, and community economic development activities). Coupled with the increased demands of government and industry investors, these internal stakeholder games consumed a number of third generation community networks across Canada as their external funding sources began to diminish by the late 1990s (Cf. Clement et al. 2004; CRACIN.ca). As community intermediaries, their business side organizes in ways similar to my definition of a social enterprise model in Chapter 1. What distinguishes them from the social enterprise, as I describe it, is their lack of involvement in issues of local loop ownership.

2.1.2 Community networking in Canada: A brief history

Canada's experience with third generation community networking is about as old as the Boulder Colorado Network described above (Kubicek and Wagner 1998). It also appears that the influence of Canada's federal government has been more direct and explicit than in the American historical experience (Longford 2005). In 1993-94, Canada's federal government established the Community Access Program (CAP) under Industry Canada to fund geospatially targeted public access sites across rural Canada. CAP sites targeted underprivileged users, gathered local information, and offered public access terminals, often blending internet infrastructure with community services such as employment skills training. They depended largely on public sector funds and donations to maintain connectivity, hardware, and system upgrades. CAP would prove to be a template for future funding programs, and modified versions of it appeared in higher bandwidth networks after the millennium. It worked synergistically with other Industry Canada programs such as Computers for Schools, Skillsnet, and Schoolnet, and community networks of the third generation variety could apply to each and cobble infrastructure together through piecemeal project funding.

To maintain operations most of the not-for-profits hosting these community networks had to learn to combine multiple funding strategies based on partnerships with federal departments, provincial ministries, telecom operators and suppliers, regional agencies, and so forth (Cf. Ramirez 2000, Longford 2005, Rideout et al. 2006). They became responsible for a variety of different approaches to shaping and combining layers of internet infrastructure. Sometimes they fell prey to too narrowly conceived visions of what constituted internet development and content/services as they sought to satisfy narrow funding criteria and corollary reporting requirements.

At the core of third generation community networks is a community development model. Drawing on parallels between community networks and the flexible networking model of Italian manufacturing, Gurstein and his collaborators in Atlantic Canada (Dienes 1997, Gurstein 1999) hypothesized a regional network of autonomous and cooperative CAP sites. Under the right conditions, they proposed, community networks may enable isolated and remote communities to pool and organize capital and labour, in order to handle projects and costs they could not otherwise handle on their own. The ability to harness ICTs for collaborative regional development goals would complement the individual CAP user's attempts to master ICTs for self-identified goals. In their implementation of the regional plan, however, Gurstein and his colleagues' hypothesis did not meet the expectations of administrators at Industry Canada's CAP program. Fund administrators were not willing to leverage the kinds of financial and sociopolitical support that would enable individual CAP sites to collaborate and form a regional flexible network (Dienes 1997). Moreover, industry leaders in the region felt threatened by the notion that a not-for profit sector of community networks would be in direct competition with commercial ISPs and retail application service providers. Internal stakeholder factionalism also contributed to the flexible network's abortion. Community leaders, lacking the political facilities to organize into a regional stakeholder coalition, withdrew from the flexible networking concept. As a result of these intermingled external and internal games, the developmental trajectory that Gurstein and his collaborators theorized had no opportunity to be realized.

The history of community networks teaches that these internet-based not-for profit activities are vulnerable to a variety of external and internal games, and increasingly so as ICT infrastructure and its ecology evolve. As community networks increase their constituency base, they admit a greater variety of internal stakeholder groups, which increases the variety of games that tug at network resources. Moreover, the need for diverse and continued funding partnerships to sustain network resources may also force external agendas on a community network, which creates further constraints on the community agencies that manage it. If the community agency behind a community network fails to manage the specific and timely alignments between internal and external stakeholders, its organization will be pulled apart internally or pushed off into an agenda of someone else's design.

2.1.3 The First Nations community networking movement in Canada: 50 years of communications history

The emergence of community networks in Canada's remote First Nations began with an external intervention. Remote First Nations communities first encountered telecommunications in the 1950s when the federal government established military radar and microwave communication stations on their territories (Cf. Liebow 1961). The 1970s introduced civilian operated radio stations (through federal transfers of technical infrastructure), which, coupled with local stakeholder interest, enabled community radio and the emergence of not-for-profit Native Communications Societies (Hudson 1977).

As Hudson (1977) documents, there was clearly a demand in the First Nations to experiment with the technologies. Native Communications Societies sprouted across Canada and played an important early intermediary or agency role between Canada's Department of Communications and local community interests. They resemble third generation community networks, applying radio and other analogue media in support of local information aggregation, community development services, and the representation of remote First Nations communities. Wawatay Native Communications Society in Sioux Lookout Ontario for example, operated a radio station, newspaper, and Oji-Cree translation services, covering a region of 25 First Nations across northwestern Ontario (Mohr 2001).

Digital information communications technology came to remote First Nations in the late 1970s. From the late 70s to early 80s the federal Department of Communications and Telesat deployed Hermes and Anik B satellite field trials in remote and rural communities including Inuit and First Nations. These trials included satellite broadcasting, telemedicine, and distance education (Philips 1982). By the 1980s, Wawatay and other Native Communications Societies acquired rights to broadcast public access television in partnership with Telesat and public broadcasters such as TV Ontario. Yet despite these advances in broadcasting, the remote First Nations' access to reliable two-way communications infrastructure was seriously curtailed. Until the late 90s the most reliable telecommunications options for remote First Nations were radio and satellite. Past the 50th parallel, analogue telephony continued to be a difficult option for remote fly-in communities, and party lines were their common baseline (if telephones were available at all). Digital upgrades to the northern trunks of ILECs (past the 50th parallel) did not seriously advance until after the Canadian Radio-Television and Telecommunications Commission (CRTC) hearings on high cost serving areas in 1998 (see Chapter 4).

The 1990s introduced the first experiments with computer-mediated communication in First Nations communities. The earliest experiments were grassroots driven Bulletin Board Systems that resembled second-generation community networks in look and feel (although in the beginning, users did not require specific profiles). K-Net BBS in the Sioux Lookout district of northwestern Ontario was one of the first known remote First Nations operated Bulletin Board Systems (circa 1994; Fiser et al. 2005).

The 1990s also marked a renewal of public telecommunications funding in Canada. In 1995 the first concerted effort to specifically establish internet infrastructure in First Nations communities emerged under Industry Canada's First Nations SchoolNet (FNS) program, which drew partnerships from First Nations schools, provincial ministries, regional not-for-profit agencies, and the telecommunications industry. FNS was closely linked to Industry Canada's Community Access Program, and Computers for Schools. Like CAP, FNS funded connectivity for public access. The lack of community centres and the multi-purpose infrastructural role played by schools in remote First Nations made primarily elementary and some secondary schools a more convenient option for public internet access. Computers for Schools distributed refurbished hardware to rural and remote schools. Altogether these programs created a computing environment that resonates with Kubicek and Wagner's (1998) third generation community network. These programs attempted to link internet infrastructure with not-for-profit facilities that supported community development, particularly in terms of education and employment skills training. Not-for-profit community-based organizations were necessary to implement the programs and manage service delivery through the schools, which were grossly under-resourced in terms of ICT awareness and support.

Until 2000, First Nations SchoolNet schools served as the original hubs of First Nations community networks and were mainly supported by a shared 500 Kbps symmetrical DirecPC satellite system (Fiser 2004, Chapter 6). This system of carriage constrained the range of options available to apply ICTs in the communities. Satellite bandwidth was shared by First Nations schools across Canada (and later with urban sites). Users were effectively limited to browsing low-resolution websites. Their ability to upload data was severely curtailed, which severely limited their ability to produce content for the World Wide Web[23].

[23] In northwestern Ontario, phone connections were inadequate, so the KO-KNET team worked with Industry Canada to use their MSAT network to establish the data feed (a 4.8Kbps connection) from the community. This development involved the creation of a small KO-KNET developed, flashed router that provided the connection between the local computers, the MSAT satellite service and the DirecPC connection. In 1998, FedNor supported the purchase and installation of a second MSAT unit to double the community out-bound speed to 9.6Kbps (see Chapter 3 and http://knet.ca/documents/KNet-paper-Guelph-conference-1998.pdf and http://www.knet.ca/nslstory/story1.html for more information about these early connections in the remote communities in northwestern Ontario).

In these early examples and continuing on today, local control over the infrastructure and responsibilities for change management belongs to not-for-profit community-based organizations that harbor specific regional policy concerns and split internal/external stakeholder focus. Whether on contract with the federal government or acting on behalf of government through transfer agreements, these intermediary agents operate network services and applications on behalf of and in partnership with their community stakeholders. The dominant First Nations community networks operating today started out as helpdesks with the First Nations SchoolNet program (Fiser 2004). Although examples of First Nations agencies acting as commercial ISPs and ASPs exist[24], the dominant organizations and longest lived are all not-for-profit (Fiser 2004). They constitute a heterogeneous band of tribal councils, education authorities, and employment service agencies. They resemble the community development agencies behind third generation community networks (Kubicek and Wagner 1998) and have learned to survive by assiduously seeking out grants and partnerships from multiple sources.

By the late 1990s the FNS program's DirecPC satellite infrastructure was slowly being replaced by improved terrestrial carriage facilities, such as T1s and DSL (where available), which inaugurated a transition to broadband telecommunications infrastructure that facilitated the first forays in First Nations community networking beyond the schools. With this new developmental trajectory came new external stakeholders. Partnerships with Health Canada in 1998 for example, introduced Switched 56 and ISDN based experiments with videoconferencing and telemedicine in First Nations communities. Improved carriage facilities funded through Industry Canada programs such as the Federal Economic Development Initiative for Northern Ontario (FedNor) led to remote experiments with IP video in 2000. Improvements to carriage also came about through the joint efforts of provincial ministries, municipalities, and regional telecom providers (Fiser et al. 2006). First Nations community networks were now branching beyond the school environment. The successful community intermediaries that served the schools under

[24] Turning back to the 2009 INAC sample data only 2.8% of the 576 broadband communities had a First Nations commercial enterprise in control.

FNS became even more important as brokers of the various external and internal stakeholder partnerships that escalated with the coming of broadband.

While their organizations expanded into more recognizable ISP and network management roles (as opposed to satellite dish installation and repair under First Nations SchoolNet), the not-for-profit community based organizations also gained more opportunities to take on explicitly community economic development roles. With the increased availability of broadband applications they introduced a range of new devices, software, and content/services to Band Offices, health clinics, and other community agencies serving First Nations. Those communities on the cutting edge of innovation adopted flash portals, intranets, voice-over IP, videoconferencing units, and telemedicine workstations (Ramirez et al. 2003). However, in the majority of cases late adopters started to catch up to the innovators, learning how such pre-broadband affordances that were available in schools (e.g., email, web-browsing) could become functionally integrated into other community services such as community administration, policing, childcare, and so forth.

The second millennium marked a strengthening of federal commitment to furnishing broadband internet access to willing First Nations. Programs such as the SMART (broadband) Demonstration Project, Broadband for Rural and Northern Development (BRAND), the National Satellite Initiative (NSI), and Canada Health Infoway (CHI) boosted the capabilities of remote and rural First Nations community agencies to make a business case for broadband based on community aggregation and e-government services. This era marks the greatest intensification of First Nations community networks. SMART and NSI enabled the first demonstration projects with broadband. CHI opened the road to telemedicine and piloted a business model for broadband in the communities based on Health Canada's transition to e-government services.

Nevertheless, Canada was in a continued state of pilot project programming. Federal and provincial governments remained reluctant in terms of committing core funding to community networks for possible public e-services. Moreover, in all these cases the viability of broadband was predicated on government partnerships with the regionally focused not-for-profit organizations that placed the onus on the communities as so-called Community Champions. Being a community champion implies the ability of community agencies (now acting as network operators and community economic development agencies) to bring a critical mass of communities onside to support market demand for industry bandwidth. In the community champion model, not-for-profit organizations have to demonstrate a capacity to pool resources (e.g., monies, in kind contributions, human resources, bandwidth) from their constituent communities, and shape development goals and applications around federal program delivery needs and funding constraints (Cf. Ramirez et al. 2004; Rowlandson 2005; Walmark et al. 2005; Fiser et al. 2005). They then largely have to pass that money on to an incumbent telecom service provider to maintain a viable market for bandwidth in the First Nation. It is possible that under this scenario the not-for-profit community development ethos becomes co-opted by the industry's demand that users pay for bandwidth. But it is a reality of telecommunications development in Canada, just as governments are reluctant to pay the telcos directly to subsidize community networks, they are also reluctant to commit beyond a policy cycle of pilot projects.

In their public statements (Beaton and Fiddler 1999) the community agents of First Nations community networks want the balance of power to remain with the First Nations communities that host emerging broadband infrastructure. At the same time, they are mindful of the industry costs, and recognize that uncommitted governments are their largest sources of revenue, based on possible e-government services to First Nations, primarily in health care (Assembly of First Nations 2003, Aboriginal Voices 2004). The state of affairs surrounding broadband is therefore globally uncertain as it continues to create an openly contested and evolving ICT development game. Its layers of technology and rules of engagement continue to evolve as government programs, industry players, communities and community agents negotiate the terms for sustaining network resources, development, and applications in an environment of escalating bandwidth requirements (but still relatively scarce bandwidth supply).

2.2 Community networking in theory: Community informatics on community-based ICT development

The CRACIN research project situated K-Net within the interdisciplinary boundaries of Community Informatics (Cf. Gurstein 2000; O'Neil 2002; Loader and Keeble 2004; Simpson 2005). One of CRACIN's founding initiatives was the Journal of Community Informatics (JoCI), and KO Tribal Council staff such as Brian Beaton (K-Net Services Coordinator) and Brian Walmark (KORI Director) contributed case studies about the network. In this section I introduce some of the relevant theoretical concerns within CI research and practice, and discuss how CI can reflect upon its sociopolitical context.

CI draws a range of practitioners from not-for-profit community-based organizations, universities (sciences and humanities), governments, community activist groups, and industry. What binds these disparate practitioners, at least in theory, is a common interest in the development and use of information communications technology by and for communities. Communities in the CI design and research context are primarily geospatial and physical in orientation. Gurstein, one of the founders of the field, and a CRACIN PI, writes in his introduction to CI (2000: ii), that communities "give us the means for sharing the burdens and opportunities of our physical well-being with our neighbours and allow us to participate in the shaping of the immediate components of our daily lives". As for the informatics component of CI, according to Gurstein (2000: i):

> [It] implies something that is lost in the terminology of science, that is the capacity to act on and through the technology with which one is working. Where computer "science" suggests the dispassionate gaze and the formal engagement of the scientist, "informatics" looks towards the applications of the technology, towards its use in and on the world in which we are living.

Fundamentally, CI practice rests on the assumption that community is a pre-eminent site of human problem solving and productive capabilities. It then follows that CI research is charged with interrogating that assumption, to test how far it can stretch (O'Neil 2002). Communities must have boundaries and limitations. As Kubicek and Wagner's historical review of CI models found, community resources may be scarce and require careful stewardship if CI projects are to maintain sustainable growth. Nevertheless, as Gurstein indicates, it is these resources that make place-based communities more relevant than ever amidst the escalating pervasiveness of computers and other forms of electronic ICTs in global society (e.g., radio, telephone, television, chips, Internet, etc.). He writes (2000: ii):

> Increasingly communities are the contexts within which we can find ways of intervening in and responding to some of our modern dilemmas and critical problems in the environment, in the bridging of social and economic divides, in maintaining the kind of

> physical surroundings in which we wish to live. They are the means through which we participate in our culture as producers and not simply as consumers.

In its hopeful guise CI proposes that ICTs (including computers) can reinforce and amplify the community's endogenous productivity, by creating new tools for community development to tackle local community problems, whether they be socioeconomic, environmental, sociopolitical, cultural, or a combination thereof.

Many of CIs practitioners are unabashedly ideological in hoping that communities and ICTs lead to positive community development. Some, such as Gurstein (2001) or Loader and Keeble (2004), promote CI's appropriation of ICTs through community networks as part of a communitarian sociopolitical movement to devolve community development and public service down to grass roots civil society. Others, such as O'Neil (2002) warn researchers to maintain a critical distance from practitioners, in order to improve CI's knowledge of how community development and ICTs interact.

CI practitioners hold a range of views on the positive and negative roles of technology in community development. As Loader and Keeble (2004: 4) summarize in their review of CI projects from the United Kingdom and Europe:

> Community relations continue to figure highly in policy debates to tackle social exclusion and deprivation…. At a time when there is concern that such community relations and intermediate spaces are declining (Putnam, 2000), it is perhaps unsurprising that new ICTs should be regarded both as a possible contributing factor in this demise and as a means for the regeneration of disadvantaged communities.

Despite their concern about potential ambiguity, the authors do not appear to be concerned by differences in theory and practice, and espouse without qualification CI's adoption by activists, policymakers, and academics "across the world" (2004: 4). They envision an arbitrating role for academics, to, by reason of their professional status, contribute to the promotion and legitimation of CI within government and industry. Unlike O'Neil, they do not appear to be concerned by tainted objectivity. While O'Neil (2002) sees possibilities for the cooptation of academic rigor by CI practice, Loader and Keeble see clear indications of a power differential between activists, academics, industry, and policymakers. In their view, policymakers and industry primarily holding the purse strings of funded CI projects, while the grassroots activists implement development, and the academics operate in between. In their view, academics can be sociopolitical agents, positioned to address UK policymakers and articulate the relevance and benefits of CI projects on behalf of CI's grass roots.

In terms of its organizational outlook, CI practice privileges community as an organizational model for ICT development. CI research accordingly presents active models of CI practice, based on socially animated communities as its organizational metaphor. As Simpson (2005: 80) indicates in her Australian review:

> CI research provides insights into how CI projects can be better implemented by considering the contextual and social factors that affect CI developments and use (O'Neil, 2002), and by identifying and understanding barriers to technological diffusion in communities (Kling, 2000). In this way, the impact of sustainable CI initiatives, providing ongoing opportunities for access to ICTs and participation in community activities can extend, well beyond enabling access to ICTs, to strengthening social networks and increasing community social capital.

Thus CI projects are socially connected and co-extensive with historical community processes. But how do communities organize to develop CI projects? In their reviews of CI research, O'Neil (2002) and Loader and Keeble (2004) barely mention the organization of community-based ICT design, omitting such basic observations as management issues or the division of labour within CI project lifecycles. Simpson's (2005) more recent Australian review suggests useful areas for organizational inquiry, treating management issues and local labour in terms of social networks and relationships that embed CI workflows and technology design issues in legacy community dynamics.

2.2.1 Vulnerabilities of community networks: Communities and economic dependence

The heavy stress on community development is not simply a feature of CI's dominant ideology (Cf. O'Neil 2002). It is a syndrome of the economic and institutional constraints that typically shape CI projects. Loader and Keeble (2004), in the summary conclusion of their review, discuss the conjoint problems of innovation and sustainability in CI. CI initiatives appear to be caught in between a need for each. They write (2004: 40):

> On the one hand, many CI projects are supported as innovative social experiments designed to shape the new media for diverse community objectives and support virtual spaces and networks. On the other hand, communities may need projects to be sustained for longer periods than short-term experiments.

Loader and Keeble (2004) hypothesize that historically, CI project lifecycles have a tendency to pass from innovation to extinction or colonization (by public or commercial interests). They draw on Kubicek and Wagner's (1998) historical analysis of CI's evolution since the 1970s, to conclude that CI projects are characteristically early innovative social experiments. The work of Kubicek and Wagner (1998) supports Loader and Keeble's conclusion. Their historical analysis notes the important and largely dominant role of governments and the public sector as a funder, evaluator, and potential client of CI initiatives. Similarly O'Neil (2002) and Simpson (2005) note the critical role of external funders, (federal, state, philanthropic, and corporate), as fundamental shapers of CI project goals and outcomes.

2.2.2 Conflicting goals: Digital divides versus developmental trajectories

In light of government's controlling influence over CI practice, Gurstein (2003) positions CI research at a critical distance from what appear to be the dominant themes in international ICT development, as represented by the first *World Summit on the Information Society* (*WSIS*) in 2003. As a participant observer in the preparations leading up to *WSIS* 2003, (the same event Jesse Fiddler attended on behalf of K-Net), Gurstein found the various government delegates and sponsors there to be preoccupied by an issue they called the digital divide. To orient readers Gurstein cites a number of definitions for the digital divide. Among them the OECD definition is typical:

> The term "digital divide" refers to the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard to their opportunities to access information and communication technologies (ICTs) and to their use of the internet for a wide variety of activities. The digital divide reflects various differences among and within countries (in Gurstein 2003: 3).

The digital divide is a useful concept for CI stakeholders, particularly project funders at national policymaking levels, who wish to track the availability of internet and other information communications technologies, or target zones for investment, partnership, and development, etc (see Chapter 4). What it cannot explain is how actual CI development projects emerge and evolve. It also cannot explain how sociopolitical relationships between funders, CI practitioners, markets, and researchers govern actual developments.

Gurstein juxtaposes two broad developmental trajectories that hinge on a distinction between internal and external intermediaries. This is similar to the power differentials observed between layers of infrastructure in Clement and Shade's Access Rainbow model (2000). The externally managed trajectory is based on third party agencies (ISPs, NGOs, government programs, etc.) developing and managing ICT services on behalf of client communities and external principals (government bureaus, donors, etc.). Conversely, the internally managed trajectory is based on communities actively appropriating internet and related information communications technologies to complement their existing societal infrastructure.

Regarding the externally managed trajectory, if infrastructure is provided to a client community in the exclusive form of service, it downplays the capacity and responsibility of communities and their agents to understand the infrastructure (beyond the layer of services it offers). Regarding the internally managed trajectory it localizes control in the community, but also forces the community to be responsible for maintaining the layers of infrastructure that support ICT services to its constituents. Obviously neither extreme is free of costs or stresses. In reality there will likely be a combination of external and internal intermediaries contributing to internet infrastructure development. Moreover, this complex reality creates opportunities for the emergence of intermediaries that specialize in specific layers of infrastructure and/or work between the external and internal intermediaries to facilitate their cooperation and alignment and/or regulate competition, etc.

Studying the competition and alignment of models and games as they emerge from various intermediaries in an evolving CI project thus complements the research that attempts to index and compare available infrastructure (or a lack thereof) in communities. CI research stands to contextualize the cross-sectional data and surface level models of technology deployment that hinge on how wide or slim is a country or region's digital divide, with deeper longitudinal case studies that describe how communities (and their agents and intersecting stakeholders) conceptualize and play out the development of evolving ICT infrastructures. I believe that effort begins by acknowledging the sociopolitical dimensions of CI practice, research, and policy.

2.2.3 Infrastructure development as political contest: The ecology of games model

At various phases of infrastructure development multiple stakeholders may come together with different models of infrastructure and planned activities in mind. Inevitably these stakeholders must decide to coordinate and mobilize available resources to further their goals and interests. If more than one stakeholder proposes alternative development models, and the shared situation is one of finite resources, then decisions to compete or cooperate are unavoidable; and as a result, some stakeholders may derive more benefits from their actions while others may derive less.

At first glance, this appears to be a game of winners and losers, where not all stakeholders have equal chances of influencing the path of development. The tensions that ensue from competing goals and interests, coupled with the relative capacity of each stakeholder (or group) to mobilize resources and influence, together generate a power differential among the stakeholders who may search for more powerful allies or arbiters to help create rules that will regulate an order and outcomes to their liking.

In this context of political games, rules symbolize stakeholder attempts at balancing power differentials to make their interactions more equitable and organized. However, the rules of a game may not be predicated on a "zero sum" outcome where some actors clearly win and others clearly lose. The politics of infrastructure development are not mathematically precise and neither are the contending goals and interests necessarily quantifiable in any satisfactory way (for the stakeholders involved). They are not motivated to close something as abstract as a digital divide. They pursue local objectives that may or may not fit in with higher level abstractions. The stakeholders pursue infrastructure development for a variety of (potentially unique and local) reasons. Some may be content with outcomes that for others appear to be obvious losses or immaterial gains.

There are various kinds of rules that stakeholders may create or invoke. Spontaneous disagreements or creative differences between stakeholders may come to be self-regulated. Rules, such as participatory design methods and open source development models in CI, control different aspects of design and production without resorting to legal sanctions or even formal contract (Cf. Bjerknes 1987, Fish 2004). These forms of self-regulation produce various effects. They may rebalance power differentials between stakeholders (e.g., users as co-developers and co-managers). They may tighten controls on creativity and error, or, on the other hand, amplify creativity by admitting greater numbers of stakeholders to influence development decisions. The rules are therefore not simply about winning or losing. They can regulate infrastructure development and the design of applications amongst a distributed collective stakeholdership.

Power differentials internal to a particular infrastructure or community may be complemented (and further complicated) by power differentials between internal stakeholders and (players they may perceive to be) external actors. As Dutton (1992, 2006), Clement and Shade (2000), and Gurstein (2003) note, external regulation, through the intervention of a regulatory or monopolistic agency, often affects the entire ecology in which communities come to participate in infrastructure development. This type of encompassing influence may oppose or complement forms of self-regulation by the communities themselves. Clement and Shade (2000) discuss the important regulatory separation between different layers of infrastructure, such as carriage and content. Regulation attempts to standardize the conceptual models and referents of infrastructure, though as we have seen the standards are subject to dispute and change (Cf. Bowker and Star 1999 and Chapter 4).

Infrastructural change does not occur at random or by some techno-logic of innovation. The transformation of models over time derives from the inherently political contest of infrastructure design. Who governs infrastructure development is therefore a perennial question, despite the potential for change. To impress the point Clement and Shade (2000) give governance its own layer in their Access Rainbow model. However, following their admission of the contradictions and tensions between layers (such as carriage and content), it is more realistic to consider a fractal distribution of governance matters, with governance appearing at every layer contended over by stakeholders. Such an approach would enable a good fit between Clement and Shade's comprehensive framework (2000) with more explicit political models, such as that proposed by Dutton (1992, 2006) who describes an 'ecology of games' shaping infrastructure.

Gurstein (2000), in his theoretical introduction to the terrain of CI research explicitly frames CI as "…an extension from organizations to communities" (2000: 2). He calls for CI research to study such organizational behaviours as:

> …how to manage and situate the organizations providing access in the community; how to organize a technology context (institutional, organizational, training, etc.) which optimizes the use of the technology and the related opportunities; and how public or community-access opportunities are to be linked into ongoing non-technical service or other organizational structures as, for example, linking public access sites into existing public facilities in the local community (2000: 3).

The K-Net broadband governance model contributes to filling some of the conceptual gaps in CI's understanding of the sociopolitical interplay between organizations, markets, and regulation. It explicitly provides an organizational framework that focuses analysis around the decision-making process of CI project organizations and its relationship to the fundamental constraints that shape CI projects, namely their community basis, policy program environment (governments), and inter-organizational environment with industry (ILECs, CLECs). It also presents a social enterprise model that focuses attention on the important role that technological actors, in this case local loops, play in the ecology of games to determine who owns and controls a community network. In its ecology of games K-Net provides a set of principles to guide its members' and collaborators' actions in the ecology. To reiterate from Chapter 1, these principles specify that K-Net should be:

1. A carriage-level network of community networks, that focuses on the provision of telecom and/or other ICT services to a multi-sector user ecology that includes a core constituency of unincorporated communities, municipal-like authorities, small-medium enterprise, public sector programs, and larger private sector for-profit members (including ILECs and CLECs), as well as free riders and online communities (via free services);

2. A system of governance through partnerships under a not-for-profit business manager and network operations centre. The business manager manages accounts and transactions. The network operations centre manages network traffic, as well as co-ownership and co-management arrangements of local loops with public and private sector parties. The system of governance goes beyond a community intermediary role to facilitate the economic creation of local enterprise through the use of local loops. Local enterprise (whether for- or not-for-profit) must include

internet service and may include the provision of broadband services such as voice/video/data over IP or other protocols compatible with the network.

3. A social economy organization that derives value from a primarily non-monetary position rooted in a democratic process (Cf. Quarter et al. 2003) that strives to articulate the demands and capabilities of the community constituents it serves. In this case, value is derived from acquiring a standard of communications for one's constituents, and protecting, sustaining, and elevating that standard through ownership and control over broadband resources at the local loop level.

Through social enterprise K-Net has focused its energies on the design of durable ICT infrastructure in remote communities that have lacked access to basic telecom services as defined by the communities, their supporters, regulating authorities, and the government of Canada. How this social enterprise organization conducted its CI initiatives during its formative years to the present, was subject to a legacy of funding constraints and resource challenges similar to what other CI projects have encountered internationally, as indicated in my review of Gurstein (2000, 2003), O'Neil (2002), Loader and Keeble (2004), and Simpson (2005) and in the historical review of Kubicek and Wagner (1998). Unlike most of the community intermediaries that CI has focused on, however, K-Net built its infrastructure from the foundational carriage level up to the various layers of applications and services that Clement and Shade present in their Access Rainbow (2000). It started with local loop ownership to better secure a place for applications and services. In Chapter 3 I explain how K-Net evolved from the particular sociopolitical relationship that remote First Nations have had with incumbent telecom service providers and the federal government programs that shape community communications and public services. I do so by tying K-Net's evolution as a social enterprise to the ecology games its constituents had to face as part of K-Net's sociopolitical and socio-technical history.

Chapter 3

3 How K-Net changed the rules of telecom for High Cost Serving Areas: K-Net in/as an ecology of games

In his ecology of games framework, Dutton (2009) defines a game as an arena of competition and cooperation, which in the case of telecommunications development, pertains to some stratum or strata of telecom infrastructure. In each game, players rely on (potentially flexible) rules and assumptions about the strategies of other players, to pursue their objectives in shaping infrastructure. Some things they know with certainty, other things they can only surmise. Their contractual relations thus blend formal and informal procedures.

What shaping infrastructure development means depends on the game. The rules, strategies, and players in different games offer, in Dutton's framework, a 'grammar' for "describing the system of action shaping technological change in the overall ecology" (2006: 3). Rules and grammar in this context are not to be taken in a formal game-theoretic sense. This is an interpretive framework, as Dutton writes (2009):

> The grammar of games employed here is less precise and rigid, used as sensitizing concepts, but nonetheless of equivalent value in simplifying and revealing the complexity of the underlying dynamics of the interplay between interrelated and continuously coevolving social, institutional and policy arenas (Dutton 2006: 3).

Dutton's *ecology of games* framework, adapted from (Long 1958), problematizes the study of telecommunications infrastructure policy. It refuses to separate policy influence by sector, acknowledging that telecommunications issues are part of community development. It refuses to reduce power-relationships to either sociological or economic forces (Cf. Williamson 1975: 258 versus Pfeffer 1981: 3), acknowledging that power manifests through the ecological nexus of sociopolitical, economic, and technological relationships (Dutton 2009). Market power, bureaucratic control, technical capabilities, and interpersonal relationships all play a part in structuring K-Net's development, as I examine in Section 4.2 below. It thus takes up Long's (1958) original challenge by refusing to treat politics as a relationship between governing elites and influential interest groups. Moreover, unlike certain conflict theories (Garnham 1987) it does not filter sociopolitical relationships into ideological alternatives (e.g., left versus right); and unlike certain neoclassical theories it does not reduce political problems to an aggregate mass of discrete individual decision-making problems (Samuelson 1963). As such it does not consider policymaking to be limited to particular sectors or classes of society, or capable of separating itself from other sociopolitical relationships and practices as if it were an isolated game. Instead, it proposes that stakeholders in various interrelated arenas or serious games related to infrastructure development, whether gaming in federal departments, not-for-profit organizations, loosely coupled civil society groups, or First Nations Band Offices, and so forth, do so in pursuit of local issues and benefits rather than to shape or control the telecom infrastructure in its totality. In such a view there is no comprehensive *Connecting Canadians* agenda beyond the uses that local actors make of it. It is the ecology of local actors in their combined gaming (and pursuit of local issues and benefits) that catalyzes infrastructure development, and no one is clearly in complete control of development.

To study such an ecology of games begins with the models that stakeholders develop and deploy to understand infrastructure (relative to their local pursuit of issues and benefits). A model in this context is defined to be a stakeholder's answer to the question 'what constitutes infrastructure'. Moreover, following Dutton (1992, 2006), we must go further to include the stakeholder's understanding of the 'grammar' that actors employ when interacting to shape the layers of infrastructure in question. This grammar of basic rules, objectives, and models represents how stakeholders think about infrastructure and their relationships with the other stakeholders involved in the process that shapes infrastructure.

Dutton has taken minor criticism for deploying an ontology that for some appears reductionistically individualist, denying "structures and institutions an independent ontological and explanatory status" (Shields 1995). In his response to critics Dutton (1995) claims that the range of actors admitted by the ecology of games metaphor is not limited to individuals, their properties, goals, and beliefs. Indeed most of Dutton's analyses of telecommunications and internet policy concentrate on institutional actors (Cf. 1992, 2006). He proposes that such macro-actors as institutions, associations, and communities, etc. emerge from the micro-interaction of individuals. Following lines of thought introduced by (Long 1958) and new institutionalism (March and Olsen 1984, 1989), Dutton suggests that macro-actors gain consistency and can be said to pursue goals and interests based on the symbolic-interactions of individuals that work for them. Such macro-actors as schools, corporations, and hospitals thus come to recursively structure micro-interactions only after individuals come to associate them with various rules, regulations and customs, games, and practices, etc. Such a line of thought is resonant with research in for example, new institutionalism (March et al. 1984), ethnomethodology (Garfinkle 1984), organization studies (Strauss 1985), and Soft Systems Methodology (Checkland 1998), and STS (Callon 1987; Law 1987). It is methodologically qualitative and based on participant observation, and it does not require one to believe in the existence of macro-actors apart from the symbolic interaction of individuals and their imputed beliefs in macro-actors.

The ecology of games captures decision-making in telecom infrastructure development and use. In an ecology of games model multiple decision-makers or players (and networks of players) compete and cooperate over the direction of telecom infrastructure (Dutton 1992, 2009). The framework is sensitive to both historical dynamics and institutional inertia, sidestepping particular limitations in earlier political science models that were discretely dedicated to professional "interest groups" (e.g., lobbyists), or societal elites (e.g., government officials, industrialists, "town fathers", etc.). Instead of locating power in interest groups or elites, Dutton proposes that, by their various interlocking capacities, interests and goals, players in an ecology of games mobilize the resources and activities that establish, and possibly sustain (layers of) telecom infrastructure.

3.1 K-Net's historical development and the complementary configuration of technologies and sociopolitical economic relationships

In this chapter I focus primarily on K-Net's historical development within a constellation of economic and sociopolitical arrangements[25] that correspond to Dutton's conception of an ecology of games. With its inception in 1994, as a 14.4 kilobaud Bulletin Board System, K-Net is one of the oldest surviving initiatives studied under CRACIN. Its achievements since 1994 also distinguish K-Net from other cases, both in terms of the scale of its infrastructure development, and in the scope of its service orientation. Currently K-Net comprises over 100 broadband Points of Presence (POPs) in Aboriginal communities and related organizations across Ontario, Quebec, and Manitoba, Canada. These POPs enable locally controlled internet access as well as cooperatively controlled broadband applications such as KO Telemedicine, and the Keewaytinook Internet High School (Fiser et al. 2006). In this chapter I examine the hypothesis that KO sustained K-Net's technical development by levering sociopolitical relationships, particularly at the federal level, to shift the economic arrangements that structured telecommunications development in Northwestern Ontario in favour of broadband deployment in high cost serving areas. As I seek to explain in this chapter, K-Net has evolved into a configuration of technologies and complementary sociopolitical/economic partnerships that accommodate community owned broadband telecom infrastructure. The complementary configurations of technology and sociopolitical/economic partnerships instantiate the K-Net broadband governance model. I argue that the model's evolution into its present form was greatly accelerated by K-Net's involvement in a coinciding national policy vision, Industry

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[25] Readers interested in the network's technical arrangements may refer to (Chapter 5 and Fiser & Clement 2008). Readers interested in the evolution of K-Net's organizational arrangements may refer to (Fiser 2004, Fiser et al. 2006, Fiser & Clement 2007), as well as the case studies of Ramirez et al. (2000, 2003), which examine K-Net in terms of information communications technology for development. Finally, KO and partners have issued a number of important documents discussing the First Nations' local goals and regional strategies for K-Net's development. In particular we refer readers to K-Net's online information portal at http://knet.ca, and KO's research branch http://research.knet.ca, and recommend the work of (Beaton et al. 1999) and (Rowlandson 2005).

Canada's *Connecting Canadians* agenda. In particular, K-Net has been a vehicle for nearly all of Industry Canada's major community connectivity initiatives, including First Nations SchoolNet, the Community Access Program (CAP), the Smart program, and C-Band Public Benefits initiative.

I argue that KO and key allies such as Industry Canada FedNor and First Nations SchoolNet, made K-Net's broadband deployment possible by establishing over several years, and within the critical timeframe of the federal *Connecting Canadians* agenda, a social enterprise that enables independent First Nations to co-manage internet and broadband e-services such as videoconferencing and VOIP, under the leadership of KO and with the involvement of key partners in government and industry. K-Net's social enterprise institutes a broadband governance model that addresses the needs of remote Northern and Aboriginal communities in Canada, and it presents a business strategy to overcome some of the economic constraints of Canada's remote high cost serving areas. Nevertheless, questions remain open around the issue of how the various partners negotiate control over network resources within a model of decentralized community ownership. In part two of this thesis I will examine these questions in terms of an institutional analysis of the historical developments examined in Chapter 3.

3.2 Early telecommunications deployment in Northwestern Ontario: Costs versus needs

Large-scale telecommunications infrastructure development in the remote regions of Canada is encumbered by higher than average costs due to the low population density of these regions with respect to the vast distances that separate their communities. In Northwestern Ontario, the average distance between the 24 resident First Nations and their nearest town service centre is approximately 300 kilometres by air (See Figure 15). The region is around 385,000 square kilometres, with a total population under 30,000 (including the populations of the two nearest towns). Under these conditions the provision of a viable broadband telecommunications system for the region has been a challenge to the non-cooperative competition-oriented business strategy that dominates the telecom industry.

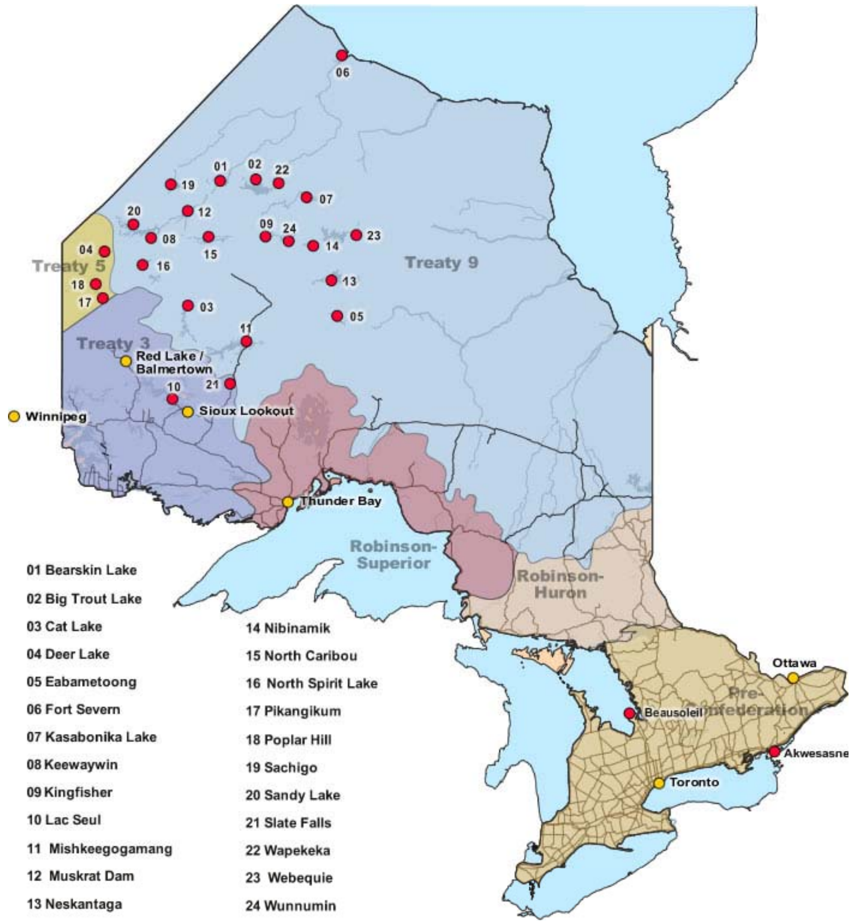

Figure 15: Map of Sioux Lookout District (Source KO-K-Net Services)

While a non-cooperative telecom business feeds off the demand of high-density markets, telephone companies in remote regions do not readily have a critical mass of subscribers to help them recover the costs of physical infrastructure development. Risk on investment is high, unless mitigated through such measures as cooperation with consumer groups. Public sector consumers become an ideal target in this regard, as their needs are more often tied to stable budgets and large capital outlays, unlike the individual residents of remote communities whose incomes are typically less than the national average. Public sector consumers also tend to dominate the economies of remote regions. This is especially the case in First Nations where federal departments such as Indian Affairs and Health Canada provide core funding for community infrastructure, services, and employment as part of the federal government's treaty-based fiduciary obligations to the First Nations[26].

While market discipline is a valuable driver of telecom innovation in higher density urban sectors, effective competition in the remote regions is difficult to achieve[27]. The telephone company willing to incur the higher than average sunk costs of infrastructure development in a low-density market usually becomes a monopoly incumbent local exchange carrier (ILEC) for that region, with little to no threat of facilities-based competition by other telcos. In Northwestern Ontario, Bell Canada (now Bell Aliant) has been the monopoly ILEC since the mid 1970s, and its only commercial threats have been municipally focused independent operators, such as the Thunder Bay Telephone Company, or the Dryden Municipal Telephone Company, which have so far had little impact on Bell's monopoly[28] over the First Nations' telecommunications option(s)[29].

Public subsidy dominates the moves of the telephone companies in Northwestern Ontario. Bell's entry in the 1970s was spurred by public investments on the part of Ontario's Ministry of Transportation and Communication. One of its first customers in the First Nations was Health Canada, which bulk purchased HF radios and later telephone links for its nursing stations in the most populous communities (which also served as health centres and hubs for smaller neighbours) (Dunn et al. 1980).

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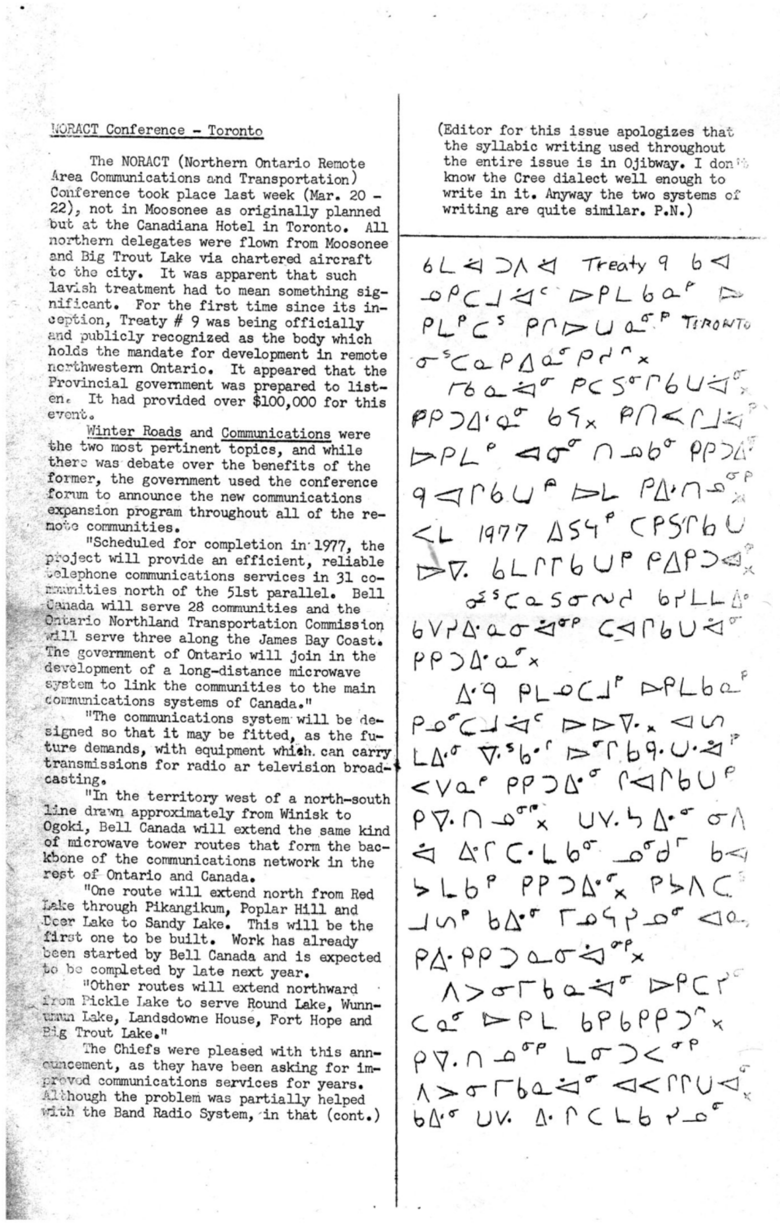
[26] Under the Federal Indian Act, recognized First Nations, or Indian Bands have no municipal tax based from which to draw funds. These communities are dependent on federal program funds to resource local community services such as waste and water management, electricity, housing, roads, schools, clinics, and telecommunications.

[27] This includes commercial satellite options, which have proven to be expensive and less than adequate for broadband applications in remote Canadian and Northwestern Ontario communities. Moreover, during the timeframe of this historical inquiry (circa 1994 to 2007), Telesat Canada, the monopoly satellite carrier, was a division of Bell Canada Enterprises.

[28] This is not the case for cellular telephony. In 2009, K-Net has embarked on a series of pilots partnered with Dryden Tel and Rogers cable to deploy community-owned IP-cellular to member First Nations. See http://mobile.knet.ca

[29] One of the reasons being that these independent operators have a substantial cost-disadvantage compared to Bell's already established infrastructure.

Consumer demand for the technologies varied. HF radio (or trail radio as it was called) was not considered to be a reliable communications device for public services, but was taken up by residents who, by the mid -70s, had formed a Native Communications Society (Wawatay) to produce local media and maintain ad hoc networks between remote communities and family camps "on the land". As it grew throughout the -70s and -80s, Wawatay became an advocate and resource centre for the local uptake of communications technology, and successfully established a Northern Ontario Aboriginal radio station (in partnership with the Canadian Broadcasting Corporation), as well as a bilingual newspaper featuring Northern Ontario news in Oji-Cree and English (Cf. Hudson 1977, Mohr 2001). Figure 16 below provides an early example of Wawatay's community media.



NORACT Conference - Toronto

The NORACT (Northern Ontario Remote Area Communications and Transportation) Conference took place last week (Mar. 20 - 22), not in Moosonee as originally planned but at the Canadiana Hotel in Toronto. All northern delegates were flown from Moosonee and Big Trout Lake via chartered aircraft to the city. It was apparent that such lavish treatment had to mean something significant. For the first time since its inception, Treaty # 9 was being officially and publicly recognized as the body which holds the mandate for development in remote northwestern Ontario. It appeared that the Provincial government was prepared to listen. It had provided over $100,000 for this event.

Winter Roads and Communications were the two most pertinent topics, and while there was debate over the benefits of the former, the government used the conference forum to announce the new communications expansion program throughout all of the remote communities.

"Scheduled for completion in 1977, the project will provide an efficient, reliable telephone communications services in 31 communities north of the 51st parallel. Bell Canada will serve 28 communities and the Ontario Northland Transportation Commission will serve three along the James Bay Coast. The government of Ontario will join in the development of a long-distance microwave system to link the communities to the main communications systems of Canada."

"The communications system will be designed so that it may be fitted, as the future demands, with equipment which can carry transmissions for radio ar television broadcasting.

"In the territory west of a north-south line drawn approximately from Winisk to Ogoki, Bell Canada will extend the same kind of microwave tower routes that form the backbone of the communications network in the rest of Ontario and Canada.

"One route will extend north from Red Lake through Pikangikum, Poplar Hill and Deer Lake to Sandy Lake. This will be the first one to be built. Work has already been started by Bell Canada and is expected to be completed by late next year.

"Other routes will extend northward from Pickle Lake to serve Round Lake, Wunnumun Lake, Landsdowne House, Fort Hope and Big Trout Lake."

The Chiefs were pleased with this announcement, as they have been asking for improved communications services for years. Although the problem was partially helped with the Band Radio System, in that (cont.)

(Editor for this issue apologizes that the syllabic writing used throughout the entire issue is in Ojibway. I don't know the Cree dialect well enough to write in it. Anyway the two systems of writing are quite similar. P.N.)

Figure 16: Newsletter, March 1974 (early Wawatay News), (Source Wawatay)

Yet on the telecom front, while Wawatay worked with the ILEC and institutions to deliver innovative regional services (such as an Oji-Cree telephone translation service), it did not have the resources to challenge the economic arrangements instituted by Bell, Health Canada, Indian Affairs, and the province. It did however, pass on an important strategic legacy to the community groups that would eventually form K-Net. As an agent in K-Net's prehistory, Wawatay represents the importance of community relationship building to tie resource-poor consumers together and build capacity. It successfully diffused new communication technologies beyond the public sector, and developed local knowledge and technical capabilities for community applications (Mohr 2001), strategic points that K-Net would later expand upon. What was missing from Wawatay's environment were opportunities to form sociopolitical relationships at federal and provincial levels, and to be a part of a national policy that could support its growth, as Industry Canada's subsequent *Connecting Canadians* agenda would do for K-Net. NORACT's 1970s agreement with Bell did not include a role for not-for-profit organizations such as Wawatay. Moreover, support for community media such as newspapers and radio began to drastically decline after the 1980s. In the early -90s, Wawatay and Canada's other forty or so Native Communications Societies suffered drastic cutbacks in federal support (Mohr 2001). Their decline coincided with signs that the federal government (i.e., Industry Canada) was beginning to seek out new media opportunities to invest in through an emerging Information Highway initiative.

3.2.1 The pre-K-Net ecology of games: Public sector monopsony reinforces private sector monopoly

During K-Net's pre- and proto-history (1970s to mid-90s) the public sector consumers in the communities acted as gatekeepers for subsequent innovations in telecom, and without their sociopolitical interest and financial investment the resource poor consumers were left to adapt what technologies they could salvage (e.g., RF radios). Moreover, as applications expanded, the absence of more than one or two telephone lines in the remote communities created zero sum games between consumers over restricted bandwidth. Informal rules evolved as a result, to periodically alleviate the tension between public service requirements and residential needs.

Evaluations at the time (Dunn et al. 1980) noted that community members would periodically appropriate nursing station telephones, which became switching points for clinical and social uses. These informal tactics developed as families at home desired to know the progress of kin convalescing in town (and nurses, recognizing the benefits of social therapy, relaxed clinical restrictions). Yet the general estimation of government stakeholders and evaluators was that public sector consumers, Health Canada and Indian Affairs, had a greater right to the telephone system's bandwidth than other consumers and could therefore dictate its use (Dunn et al. 1980).

Figure 17: Resident Margaret Kakegamic waits by the only public telephony option for individual consumers in North Spirit Lake First Nation, Northwestern Ontario, (circa 2000), (Source KO-K-Net Services)

With such public ownership arrangements in place the monopoly ILEC thus found a complementary monopsonist in the First Nations communities' largest public sector consumer(s). Weaker resource poor consumers would have to play along unless they could find a way to change the rules by gaining market power through an internal coalition of consumers, and/or by appealing to external players such as Canada's national telecom regulator, the Canadian Radio-Television and Telecommunications Commission (CRTC), or new public sector investors with mandates for technology development (see Figure 17 above). Moreover, to be beneficial to everyone, (the ILEC, the constituents of the monopsony, and weaker consumers), a change in the rules would have to be in kind, through improvements to technology (i.e., carrier capacity) and to the output of goods (i.e., bandwidth). Otherwise, zero sum games would continue to divide the community, for the rules structuring use would merely be adjusted by degree to reapportion the scarce goods (i.e., bandwidth) stuck at the output level of the existing technology. For the game to change, an opportune moment had to arise when new players outside the communities would be aligned to invest in high cost serving areas.

In my account I use the ecology of games as a sensitizing concept to emphasize the role that market power and consumer coalitions played in Northwestern Ontario's telecom history and in K-Net's ensuing development. Yet the zero sum games that emerge from observations of economic scarcity echo more deeply embedded sociopolitical arrangements, which exhibit a richer set of rules and possible actions in the high cost serving areas. It is these sociopolitical arrangements that will subtend my discussion of K-Net and the emergence of a cooperative broadband governance model that would enable social enterprise to organize a community owned broadband telecom infrastructure.

By invoking a language of games, I are not suggesting recreational play, but rather that there are identifiable players determinedly pursuing their own, quite serious, goals and objectives. Nor is my intention to depict a world of clear winners and losers, determined by formal rules and fixed relationships as might be suggested by a static equilibrium analysis of telecom provision. My intention is to connect K-Net's economic arrangements to a historical sociopolitical context, following Dutton's ecology of games (1992). As Dutton (1992) warns, the players involved in telecom policy are interdependent and not fully informed by the consequences of their actions or the actions of others. The state of play is dynamic, and the field of play is complex and stratified. The players do not benefit from perfect information; and in fact, their institutional context may unduly influence their appreciation of other players' interests, while cultural and cognitive biases may unduly affect their capacities to understand and communicate with one another for the sake of articulating mutual self-interest.

Geography is particularly important. The distance between the remote First Nations and the towns that serve them translates into remarkable institutional and cultural differences. The First Nations of Lac Seul, which are about 60 km away from the town of Sioux Lookout, can drive to the district hospital. This is impossible for members of Fort Severn First Nation, who depend on the same hospital but live 720 km away from Sioux Lookout and are without road access. Moreover, and staying strictly within the public sphere, the distances between the First Nations, their in-town service organizations, and the central offices of the government bureaucracies that support Aboriginal public services translate into further differences, and greater opportunities for non-alignment.

In studying sociopolitical arrangements we must also be wary of conflating the analytic vocabulary of games and rules with an assumption that the players take fixed sides or enact some sort of irreconcilable difference in beliefs. I assume that players may be pragmatic, cooperating on some initiatives while taking a non-cooperative stance on others (creating possibly conflicting sub-goals within shared higher level goals, etc.). Some players seen to be on the same side may want more of a good (e.g., bandwidth) than others, and yet others on their side may want a little bit of the good for everyone, etc. In an ecology of games, every game has possible sub-games (Dutton 1992). These inconsistencies in game play are particularly acute in telecom policy, given its multiple layers of infrastructure and service and the opportunities for different players to cooperate at one layer and conflict at another.

My conception of a (sociopolitical) consumer coalition is therefore used to invoke a loosely coupled organization of interests, an ecology of games (Cf. Long 1958; March & Olsen 1984; Dutton 1992), that involves multiple interactions between particular consumer groups and external investors, as well as national regulatory bodies, ILEC monopolies, and institutional monopsonies, all mutually attracted by their interest in changing the telecommunications system and its prevailing economic arrangements, or conversely, in maintaining the status quo, (or perhaps in making minor adjustments to the system). As I will examine in part 2, particularly in Chapter 6, it was this coalition that created the potential for something more organizationally stable to develop via KO Tribal Council's social enterprise.

Thus at the juncture where I left off in this historical analysis, we find a consumer coalition emerging in the 1990s with a desire to establish new rules for telecom ownership, amidst a public sector monopsony (that had no impending need to challenge the status quo monopoly conditions of Bell's analog telephone system). The weaker resource-poor consumers within the emergent coalition cannot be seen as homogeneous, and in fact, some operated from within the extended organizational body of the public services (e.g., nursing stations in communities, Indian Affairs regional offices in the closest towns). But their actions were nonetheless prospectively aligned to reconfigure ownership and control over the prevailing telecommunications system by acquiring broadband (i.e., improved carriage and bandwidth) and developing local knowledge and technical capabilities[30] to cooperatively shape and manage community-based broadband applications.

3.3 K-Net's emergence

In Northwestern Ontario the First Nations' telephone infrastructure has been based around two Bell owned/controlled microwave backhaul systems (one north of Red Lake, the second north of Pickle Lake). These were the systems Bell developed in partnership with Ontario's Ministry of Transportation and Communications under an initiative known as the Rhodes agreement (between 1975 and 1979). Total capital expenditure on the original analogue systems was approximately CAD $15M, largely paid for by the Ministry under a mandate to invest in Northern Ontario Remote Area Communications and Transportation (NORACT).

Almost 20 years after their original construction, the digital upgrades to these systems, in anticipation of broadband deployment, cost over CAD $20M and were undertaken between 1998 and 2000, this time by Bell, federal partners (Industry Canada, Indian Affairs, Human Resources Development Canada), and the province's Northern Ontario Heritage Fund. The ILEC Bell had no internal incentive to make these upgrades, nor was its complementary public sector monopsony (a combination of Health Canada and Indian Affairs) prepared to be sole or majority investors in a broadband solution that could be extended to weaker resource-poor consumers. How the digital upgrades came about, and how they came to be community-based, can best be explained by an examination of the historical emergence of new players (particularly Industry Canada) and of a national review of the rules of telecom business in Canada's high cost serving areas under Canada's national regulator (the Canadian Radio-Television and Telecommunications Commission, CRTC).

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[30] This reference to endogenous technical capability echoes our observation of Wawatay's work in radio and newsprint.

3.3.1 1994 to 1999: A new internal coalition and a new external investor

Under an initiative called Merlin, Health Canada had been experimenting with broadband satellite in the mid-90s on a limited trial period to support clinical videoconferencing between two community nursing stations[31], the Zone hospital in Sioux Lookout, and the Indian Health Services Regional Office in Ottawa. It concluded that the experiments were too costly to extend as services. Indian Affairs had no specific mandate for broadband, and in some small, very remote communities it had no mandate to support plain old telephony. Since the 1970s it had become heavily invested in other costly forms of community infrastructure such as sewage, water treatment, electrification, and improvements to community buildings and housing, and its managers were eager to let other government actors take on the Aboriginal capital development portfolio[32].

Meanwhile, in Northwestern Ontario a coalition of First Nations, and service organizations based in the hub towns of Sioux Lookout and Red Lake/Balmertown, was exploring options to work around the established telecommunications system. The coalition reached out to external players such as Industry Canada and the Province of Ontario, lobbied Canada's national regulator the CRTC, researched local needs, and tapped industry contacts to study the technical and economic feasibility of alternate technologies such as MSAT satellite phones (K-Net Services 2001).

The coalition called itself the Northern Ontario Telecommunications Working Group (or NOWG). Wawatay Native Communications Society took initial lead in the mid-90s. Other members included:

1. Regional Aboriginal service organizations such as the Sioux Lookout Aboriginal Area Management Board (SLAAMB), Nishnawbe Aski Development Fund (NADF), Nishnawbe Native Education Council (NNEC, tied to Indian Affairs);

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[31] Kitchenuhmaykoosib Inninuwug and Webequie.

[32] This information is sourced from CRACIN research interviews with former SchoolNet and INAC managers undertaken in 2004.

2. The Sioux Lookout First Nations Health Authority, the Sioux Lookout Zone hospital (tied to the province and Health Canada), Nishnawbe Aski Police Services, Nishnawbe Aski Legal Services, Nishnawbe Aski Nation; and

3. Tribal Councils such as KO, Shibogama, Windigo, Matawa, Wabun, the Independent First Nations Alliance (IFNA), and Mushkegowuk (on the East) (K-Net Services 2001).

Most of the service organizations were driven by particular mandates in health, education, or policing, and had interests to improve the quality of service of their internal communications networks for administrative purposes. A few like SLAAMB and the NADF had mandates to invest in Aboriginal community economic development and were less driven by an expectation of what broadband should do in terms of service delivery. As for Aboriginal organizations directly representing the communities, Nishnawbe Aski Nation, the Tribal Councils and First Nations had an immediate interest to improve communications and services for community constituents. It was in the best interest of all the coalition members to develop a system that was reliable, affordable, and scalable. In terms of its overall direction the coalition was fairly consistent, although Wawatay suffered from organizational upheaval brought on by diminished resources (from federal cutbacks to Native Communications Societies) and in 1998 transferred its leadership role to KO's K-Net Services branch.

KO Tribal Council, K-Net's founding partner and management organization, had a special interest in changing the telecommunication system as it existed. KO represented six First Nations communities: Deer Lake, Fort Severn, Keewaywin, McDowell Lake, North Spirit Lake, and Poplar Hill (see Figure 18). Two of these communities had no direct telephone access. A fourth was Ontario's most northern community with limited telephone access (and little hope for terrestrial broadband access). A fifth depended almost entirely on access to the town of Red Lake/Balmertown for services.

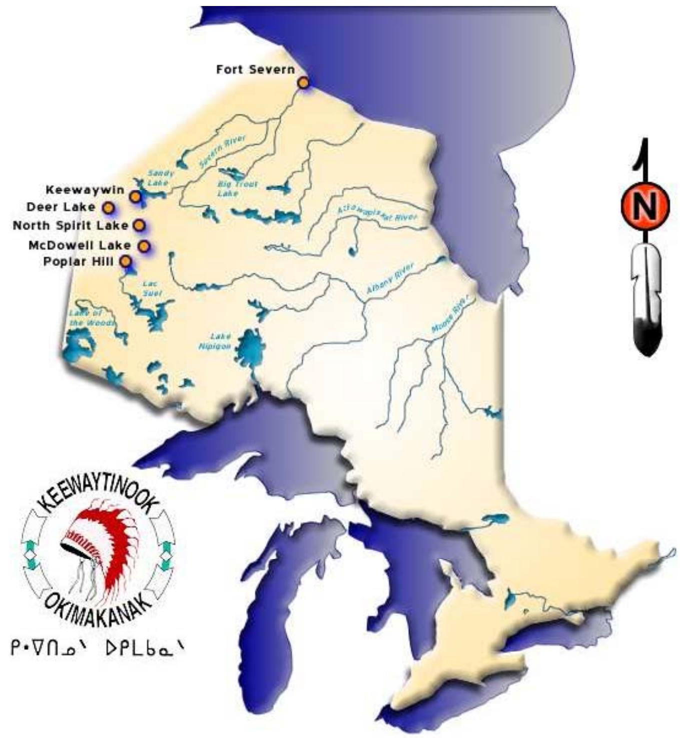

Figure 18: Map of Keewaytinook Okimakanak First Nations, (Source KO-K-Net Services)

The elected Chiefs of these First Nations felt the pressure of disappointed constituents and thus made telecom a priority. KO also had two education program staff members, Margaret Fiddler and Brian Beaton, who had initiated and implemented Wahsa, one of Northern Ontario’s early success stories in distance education (McMullen & Rohrbach 2003). Under Fiddler and Beaton’s direction, Wahsa combined all available communications media, including radio broadcasts, paper-based course packs, periodic community visits, telephone follow-ups, and even faxes where applicable. With their background and a mandate from the KO chiefs to improve learning opportunities for First Nations youth, Fiddler and Beaton were primed to explore computer-mediated communications over the telephone system. K-Net Services appeared in 1995 after a year of planning and small-scale pilots. The earliest K-Net Services programs focused on training unemployed First Nations members to learn about computer hardware and software. Figure 19 below reproduces one of the earliest project plans from 1995.

K-NET SERVICES PROJECT OBJECTIVES

To provide training and support services for one unemployed First Nation resident in each of the Keewaytinook Okimakanak communities;

To deliver training in the areas of computer hardware and software operation and maintenance, office procedures, small business development, employment skills;

To develop and deliver training materials and support services using the Keewaytinook Okimakanak computer communications network (K-Net) for the 1995-1996 fiscal year;

To support people who are fluent in an Aboriginal Language;

Figure 19: K-Net Services training plan for SLAAMB project (circa 1995), (Source KO-K-Net Services)

In its historical milieu KO was a young tribal council, having been incorporated in 1992. Other Sioux Lookout District councils such as Windigo and Shibogama had paved the way for winter roads, electrification, and air transport in the 1970s and -80s, and though not every First Nation shared in such amenities, these councils helped make the possible real, and were already legacy keepers by the time KO appeared in the -90s. In terms of positioning the KO communities in this local sociopolitical and economic landscape, KO's chiefs had found a relatively unoccupied operating niche and an important source of symbolic capital[33] in the computer services and telecommunications field – where K-Net Services rapidly became a recognized leader, legitimated by the endorsements of area First Nations, councils and Nishnawbe Aski Nation[34] (Kakekaspan & Beck 2003). This regional sociopolitical context should not be discounted from an assessment of KO's goals and motivations to improve telecom, for it complements K-Net

[33] Following Bourdieu (1989) we use symbolic capital to evoke the intangible benefits (and sources of power) that accrue from a position of respect, recognized authority, leadership, and so forth.

[34] Yet, KO's quasi-monopoly over K-Net's core technical competencies (e.g., routing, satellite management), its partial control over K-Net's Wide Area Networking arrangements, as well as its significant financial role as a regional manager of public subsidy to support not only core network services but also community Local Area Networks, presents a potential source of ambiguity in its power sharing arrangements with communities and service organizations. This ambiguity is mitigated by KO's not-for profit status, yet it remains a source of potential controversy.

Services' ensuing strategy to work out a vision for regional broadband infrastructure by reminding us that the First Nations were active shapers of regional Aboriginal policy and not passive recipients of federal technology transfers.

KO built its reputation early by coupling technology development with local employment/training initiatives. From 1995 to 1999 KO's K-Net Services team worked with SLAAMB on a series of human resource development initiatives to deliver computers and computer skills training to the 24 Sioux Lookout District First Nations. With initial support from SLAAMB and Indian Affairs they developed a K-Net Bulletin Board System (see Figure 20) over the existing analogue telephone infrastructure.

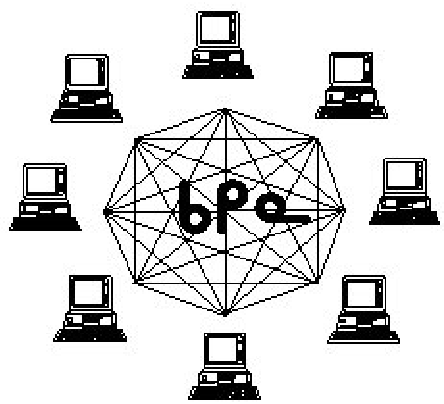

Figure 20: Stylized Oji-Cree logo of the K-Net BBS, (Source KO-K-Net Services)

K-Net Services' original mandate for the BBS was to allow email between the First Nations and area First Nations high school students at the local boarding school Pelican Falls. It soon became a platform to deliver training courses and host virtual conferences on behalf of the First Nations and regional service organizations (particularly in education). Figure 21 below reproduces an online encounter between two Computer Technician trainees from 1996.

RAY (Bearskin First Nation)

```
===========================================================================
  Date: 12/10/96 (6:49 AM)               Number: 6
  From: RAY                              Refer#: 5
    To: RUTH                             Received: Yes
  Subj: late start                       Conf: (111) 111-CTTBusin
---------------------------------------------------------------------------
Ruth>   good-after everyone,I,the trainee feel that i need more time
Ruth>   to learn this C.T.training.. i started late. i need more time.
Ruth>   I.m not good at writing letters.
Ruth>   Bye Ruth @ round...
Good afternoon Ruth. I myself started late too,so you're
not the only that's alone. We're in the same boat. There did that make you
feel better. I started about one month later, on this training course.
I'm getting the hang of this computer thang. <slowly>...smiles..
I know that 4 months isn't long enough, for us to become computer
geniuses...did i spell that right...Well I guess that's about
it for now....HAVE A NICE DAY RUTH...TALK TO YOU LATER ALLIGATOR!!
RAY@BEARSKIN....tHIS IS THE FUTURE

---
 * OLXWin 1.00 * Unable to locate Coffee -- Operator Halted!
===========================================================================
```

Figure 21: K-Net Bulletin Board messages from two computer technician trainees (circa 1996), (Source KO-K-Net Services)

As K-Net BBS expanded across the region in 1996, four of the 24 First Nations still had no access to the telephone system (and KO couriered floppy disks back and forth to enable their participation “online”). None of the First Nations could access the internet through K-Net (which was strictly a BBS at the time), but through parallel developments an ISP was established by a group at Lakehead University in Thunder Bay, LU-Net. A memo from Brian Beaton to coalition stakeholders, (reproduced in Figure 22 below), captures the cooperative spirit of these early communications partnerships.

FAX COVER

F.N. Councils: Grace Teskey, Executive Director, IFNA
Geordie Kakepetum, Executive Director, Keewaytinook
Brian Davey, Deputy Grand Chief, Nishnawbe-Aski Nation
Doug Semple, Executive Director, Shibogama
Frank McKay, Chairperson, Windigo
Organizations: Tom Hawke, Executive Director, AHA
Barbara Angeconeb, Program Coordinator, Equay-wuk
Lawrence Martin, Community Services Coordinator, NAPS
Frank Beardy, Executive Director, NNEC
Bob Bruyere, Executive Director, SLAAMB
Kenina Kakekayash, Executive Director, Wawatay
Janet Gordon, Zone Director, Zone Hospital
Education: Richard Morris, Education Advisor, Keewaytinook Okimakanak
Heather Mutch, Education Coordinator, Shibogama
Kevin Sherlock, Education Advisor, Shibogama
Cecilia Fiddler, Education Coordinator, Windigo

FROM: Brian Beaton, K-Net Computer Technician

DATE: October 31, 1996

RE: LUNet application to T.A.P.s

****

Yesterday I participated in a teleconference meeting with Bob Angell, Director of the Communications Technology Resource Centre at Lakehead University. They are the folks who established LUNet throughout Northwestern Ontario over this past year.

The Telecommunications Access Partnerships program had an application deadline of yesterday, October 30. So we worked together to get a "letter of intent" submitted from "the north for the north". I drafted a list of the First Nations and the First Nation Councils for his "letter of intent". Enclosed is the material that was sent in, for your information.

Bob Angell and his crew have proven themselves by moving ahead in the development of an Internet service for this region without any public funding support. They are probably in the best position to research and develop the type of telecommunications infrastructure we require for the communities we serve. With many of the regions First Nations applying for Community Access Program grants to establish local Internet access service, it is important to ensure the proper infrastructure is in place to provide the best possible service for the users.

Working together to develop the type of telecommunication infrastructure required throughout the north will ensure future generations will have equitable access to the information, markets, services and programs available to others throughout the province. To access the funding and resources required to develop this infrastructure requires a lot of political and corporate action.

Figure 22: K-Net Services memo to coalition about Internet service plans (circa 1996), (Source KO-K-Net Services)

First Nations with access to K-Net BBS and/or dialup internet via LU-Net, experienced frequent data transmission failures, and paid long distance charges as high as CAD $25 an hour. There was little to no residential access outside the towns. Users connected in the remote First Nations frequented community access sites, which typically consisted of a computer terminal within an Indian Affairs funded school or Band office (administrative centre).

However, in 1997 K-Net Services received a substantial boost after it won a contract to become a helpdesk for Ontario’s 144 First Nations schools under Industry Canada’s First Nations SchoolNet program. Figure 23, page 134 below, reproduces a portion of their proposal, which details the goal and objectives of the program, as well as K-Net Services’ strategic positioning to blend SchoolNet program dollars with the regional initiatives that consortium members already had underway.

December 17, 1996

PROPOSAL TO INDUSTRY CANADA

Proponent: K-Net Services
Brian Beaton, Coordinator
c/o Keewaytinook Okimakanak
Box 1419, Sioux Lookout, ON, P8T 1B9

Organization Name: Keewaytinook Okimakanak

Brief statement of mandate, objectives or overview of activities:

K-Net Services proposes to establish a HelpDesk for the Industry Canada First Nation SchoolNet Project to assist schools throughout Ontario with the set up and operation of the computer and DirecPC equipment being supplied to each First Nation school by Industry Canada.

Statement of Work:

- Provide an 800 telephone service for First Nation schools throughout Ontario to contact the helpdesk;
- Travel to First Nations, as directed by Industry Canada, requiring this type of support to set up and operate the equipment
- Have two trained computer technicians available to assist the First Nation schools with the set up and operation of the equipment supplied by Industry Canada;
- Use the K-Net Bulletin Board System (BBS) for the First Nation Schools in the Sioux Lookout District to share their experiences and information about using this equipment and the Internet;
- Identify ways and available software to effectively utilize this equipment to access information on the Internet (ie. Scheduling programs for Internet browsers and e-mail services, etc.);
- Maintain records and prepare monthly invoices for Industry Canada detailing the work completed during the billing period.

Background:

Industry Canada is in the process of connecting up to 450 First Nations Schools to the Internet using DirecPc satellite terminals and Pentium computers, in the majority of cases. The First Nations schools are in all provinces and generally in remote or rural locations. Help desks will be set up on a regional basis. This proposal is to establish the help desk for approximately 100 First Nations schools in Ontario.

Generally speaking, schools are expected to be able to install the DirecPc terminals and the computers with minimal assistance via the telephone. However, in some cases, it will be necessary to either provide considerable assistance via the telephone, or in exceptional cases, to visit the school to assist with the installation. In addition, Industry Canada requires a small amount of administrative assistance in putting in place and administrating the loan agreement for the equipment and the contracts for the Internet connectivity.

This contract is to provide technical and administrative assistance to Industry Canada for the installation of DirecPc satellite terminals and computers in First Nations schools throughout Ontario. The services shall be available to Industry Canada on an as-when-required basis.

Figure 23: K-net Services Help Desk proposal to Industry Canada First Nations SchoolNet (circa 1996), (Source KO-K-Net Services)

SchoolNet had emerged in 1993 as part of a federal Information Highway mandate and grew to prominence under Industry Canada's *Connecting Canadians* agenda (1998). Industry Canada, largely an outsider to the Aboriginal service economy, had a mandate to subsidize community internet access points, to deliver computers for schools, and to build up Canada's connectivity profile on the world stage through its Information Highway Applications Branch (IHAB). Although SchoolNet was its national showcase, IHAB also instituted a community access program (CAP), a refurbished computer delivery program, Computers for Schools, and a web content creation initiative, Canada's Digital Collections, to promote wider public uptake of computers and the internet.

K-Net Services coordinated grant submissions with all of the Sioux Lookout District's tribal councils to lever each of these funding programs, and by their joint initiative an internet accessible community computing infrastructure was woven together in at least 17 of the 24 First Nations by 2000, with 35 Ontario First Nations in total having public internet access through a K-Net Services supported SchoolNet connection. Although dependent on government grants for capital and operating funds, this computer-mediated communications infrastructure became community owned through the care of local (K-Net Services and SLAAMB trained) Computer Technicians, school staff, and volunteers, who together with KO and its government partners, offered K-Net BBS to individual consumers and civil society as their Aboriginal version of an Information Highway.

Riding the wave of federal policy accelerated by *Connecting Canadians*, K-Net Services helped the national First Nations SchoolNet program equip First Nations schools with DirecPC satellite connections (1996 to 1998), which ironically, were donated by Bell Canada and the (now defunct) Stentor Alliance of telecommunications companies (including Telesat). Technologically this was a temporary measure that did not actually change the rules of the game because it was not broadband deployment.

In 1998 published tariffs from Bell had specified a monthly cost of CAD $7000 for 1.544 mbps of community access in Northern Ontario (K-Net Services 2001). Though broadband was still unattainable, what the coalition gained from this intense time period of developments, immediately before the digital upgrades in 1999 – 2000, was an opportunity to rapidly build a community computing infrastructure on top of the entrenched telecommunications system. Their activities constituted a socio-technical information infrastructure that First Nations managed, and that individual consumers could access by cooperating through K-Net and with Industry Canada.

In 1998 Industry Canada's mandate expanded in scope under the federal *Connecting Canadians* agenda, which enlarged the purse of its Information Highway Applications Branch (IHAB) and redirected its focus towards more ambitious projects such as overall community connectivity and broadband deployment (at a minimum target bit rate of 1.544 mbps following the recommendations of Industry Canada's Communications Research Centre). Yet it appears that so long as the First Nations had no property rights over the POPs and local loop infrastructure that distributed the ILEC's bandwidth, they and their allies would be locked into the prevailing monopoly/monopsony arrangement, or other narrowband solutions like DirecPC, and would not have a chance to create affordable broadband connections for individual consumers and civil society.

This diagnosis pertains to the coalitions' observation that Bell would not, and given the capital costs, (between $400K and $1.5M per community[35]), probably could not make a business case without public subsidy. Coalition members and K-Net Services in particular, also understood that the public sector monopsony of Indian Affairs and Health Canada, would not commit to broadband as a public good in itself, but only as a means for the delivery of specific mandates in health and education. With narrow mandates these federal departments could not recognize the benefit of resource sharing and aggregate consumer demand for inclusive broadband deployment, even if the service organizations that extended their services into the communities could.

At times the service organizations participating in the coalition had difficulty following KO's lead, in part due to their stricter service mandates for health, education, or policing, and their institutional ties to the dominant federal departments that funded them (i.e., Indian Affairs and

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[35] These figures are based on Bell's estimates from 1998, in response to questions from the Northern Ontario Telecommunications Working Group before the CRTC's hearings on high cost serving areas.

Health Canada). KO’s technology partnerships with Industry Canada were unique in the region. They enabled its core team at K-Net Services to become experts in the field. Notwithstanding KO’s mandate to share resources and knowledge, and facilitate the transformation of First Nations, Tribal Councils, and other coalition members across the region, KO and K-Net Services set the pace for innovation.

Moreover, through KO’s various coalition partnerships, K-Net was the coalition’s showcase technology, a simultaneous revelation of the entrenched telecommunications system’s inadequacies, and a demonstration of the possibilities that could be harnessed if broadband infrastructure was in place throughout the Sioux Lookout District and greater territory of Nishnawbe Aski Nation (K-Net Services 2001).

K-Net represented the First Nations and service organizations’ likely future orientation, particularly in terms of their communications needs and the partial transformation of their public services into broadband e-services. The disjuncture between partial visions and realities thus created tension within the coalition, particularly around the question of how to steer K-Net’s development while balancing KO’s leadership role and unique technical capabilities with decentralized community ownership over POPs and Local Area Networks.

Some members of the service organizations, particularly staff at the Nishnawbe Native Education Council (NNEC), circa 1997, which disbursed Indian Affairs education funds, openly wondered if K-Net should remain a KO Tribal Council initiative and not become absorbed into a regional service organization like NNEC. After all, KO officially represented only six of the 24 Sioux Lookout District First Nations, notwithstanding more than 20 others in the larger Nishnawbe Aski Nation of Northern Ontario. KO’s chiefs were directly answerable to their community constituents (who elected them), but were not specifically responsible for any of the other communities or services that K-Net Services connected. In every regional partnership it catered to, K-Net Services always had to walk a fine line between taking leadership (particularly in terms of its technical expertise) and deferring to local authorities for direction (particularly in terms of hiring community technicians, operating access points, and other local details).

KO’s leadership role ran deeper than the politics of representation, for it was KO’s chiefs who had identified the opportunity to develop a competitive advantage in the field of telecommunications, and now its staff had the capabilities and sociopolitical ties to make broadband development a regional economic reality. No other organization had that capability during the specific timeframe wherein the *Connecting Canadians* agenda was primed to take off into further rounds of investment in telecommunications high cost serving areas. Given the regional path dependence behind KO's capabilities it is difficult to envision feasible alternatives for broadband development.

Moreover, representatives from the service organizations such as the Sioux Lookout First Nations Health Authority and Nishnawbe Aski Police Services were in no position to fund the capital costs of infrastructure development, let alone support the ongoing operating costs on their own. At this time their public service mandates were not aligned with any concrete connectivity policy, and thus, they were writing appeals to Industry Canada in support of KO's community computing infrastructure strategy, simply to enable internet access for their staff operating in the First Nations. For their part, the health organizations were severely restricted by Health Canada, which would not commit to K-Net until 2002, after KO and the service organizations undertook a series of pilot projects and delivered an extensively researched regional proposal for community based telemedicine (Rowlandson 2005). Similarly, the NNEC had few funds in its education mandate to commit for long-term connectivity procurement or programming, and its managers where dependent on KO's ability to draw connectivity funding from First Nations SchoolNet and other Industry Canada initiatives.

3.3.2 1997 to 1999: An opportunity to change the rules of telecom

Industry Canada's partnership with the coalition was a major force for change, but the catalyst for a change in the rules of the game was a national regulatory review of the state of telecommunications high cost serving areas by the Canadian Radio-Television and Telecommunications Commission in 1997 (97-42). As luck would have it, the CRTC's review coincided with the coalition's gathering strength and the escalation of Industry Canada's Connecting Canadians agenda. Through Wawatay, the coalition had earlier appealed to Industry Canada FedNor, the federal economic development initiative for Northern Ontario, which gave them a grant to undertake extensive research before appearing at the CRTC hearings.

In 1995 FedNor had funded an Aboriginal Working Group to advise on regional telecom policy, as well as a study of 48 First Nations across Northern Ontario to assess their telecommunications and computing needs against the prevailing realities of the telecommunications systems in place. It concluded that extensive investment in infrastructure would be required if broadband was to become feasible in the remote regions. In the 1990s FedNor was investing approximately CAD $50M annually in diverse Northern Ontario economic initiatives (municipal, Aboriginal, not-for profit and private sector). The development of telecommunications and information technology has been one of its specific mandates (particularly after the nineties turn in federal policy and because of the leadership role taken by Industry Canada). FedNor's interests dovetailed well with the interests of Wawatay, KO, and the coalition. It also had no interest in managing infrastructure (or some layer of service within), as were the existing institutional players (Indian Affairs/Health Canada) and even SchoolNet to some extent (in education), but instead, was open to supporting a First Nations controlled broadband deployment model provided that it could work with the incumbent telephone companies (to promote the industrial sector).

3.4 How the rules of telecom changed; and what K-Net achieved

At the heart of the CRTC hearings was the question of what incumbent local exchange carriers owed to their customers in high cost serving areas. Though Wawatay and later KO's K-Net Services lobbied valiantly at the CRTC hearing for a broadband-service option in the negotiated bundle of essential services to high cost serving areas, their proposals were overwhelmed by the pressure of the incumbent local exchange carriers. The CRTC concluded that broadband was not an essential service, at least not one it would subsidize through the national system of subsidy the regulator managed to make essential services relatively affordable in high cost serving areas.

Nevertheless, the coalition and other consumer groups from high cost serving areas did score points on a number of important issues including the elimination of long distance charges for dialup internet (e.g., CAD $25/hour in some communities), and the implementation of single line touchtone service, operator and directory assistance services, and 911 emergency call services. Moreover, the national regulator let the broadband debate continue, acknowledging the value of innovation in telecom and a need for new public-private partnerships such as those FedNor was converging upon. In response, the coalition continued with its plans, hopeful that Industry Canada was prepared to support broadband deployment as a public good.

From 1998 to 1999, KO had been working on a grant proposal to establish a Wide Area Network between its six member First Nations and offices in Sioux Lookout and Red Lake/Balmertown.

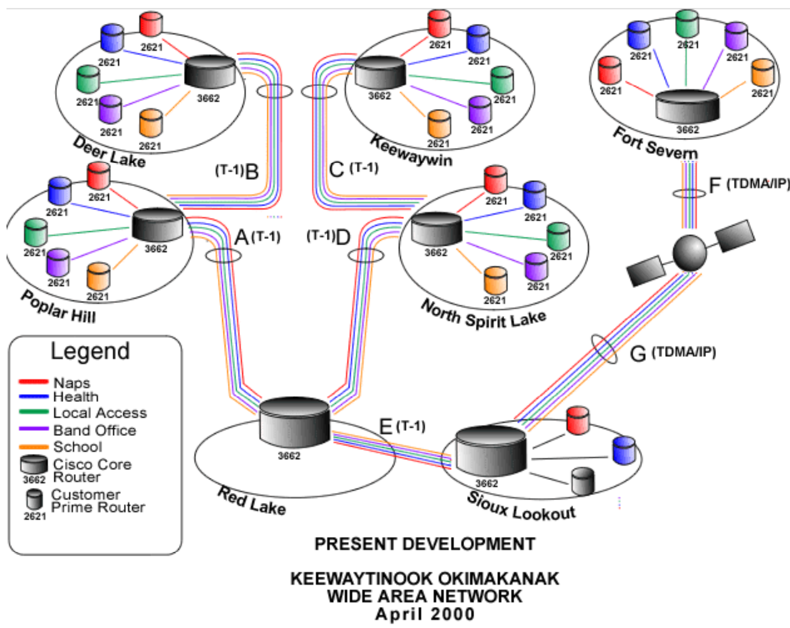

Figure 24: KO's proposed Wide Area Network, (Source KO-K-Net Services)

FedNor was an early investor as was its provincial counterpart, the Northern Ontario Heritage Fund Corporation (NOHFC), a crown corporation with a similar economic development mandate. The vision that was to become realized in this third iteration of K-Net[36] was of a First Nations controlled IP network that would ride atop existing leased terrestrial and satellite carrier infrastructure (see Figure 24 above). The vision acquired further legitimacy after KO won Industry Canada's Smart Communities demonstration project status, acquiring a purse of CAD $5M (in 2000 after two years of proposal work) based on its designs for a Wide Area Network of community-based broadband networks (Ramirez et al. 2003). Yet during the period between

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[36] The first two iterations being, 1994 to 1996 (K-Net BBS: modem over Plain Old Telephone Service (POTS)), and 1996 to 2000 (K-Net BBS: DirecPC/MSAT and modem over POTS).

1999 and 2000 two physical obstacles stood in the way: 1) carrier backhauls had to be upgraded or established (in the case of satellite), and 2) community local loops had to be upgraded and/or built.

Between 1999 and 2000 approximately CAD $20M in capital expenditures was spent by the ILEC Bell to upgrade its Northern Ontario systems to digital service infrastructure. Bell had made this decision to invest based on its reading of the climate for public-private partnerships and the joint federal-provincial commitment to growing broadband services (particularly in public sectors of the high cost serving areas). In Northwestern Ontario Bell invested approximately CAD $8M in upgrades to Central Offices, with about CAD $1M of additional support from FedNor. In addition FedNor, the NOHFC, and institutional partners such as Indian Affairs, and Human Resources Development Canada, invested in the local First Nations infrastructure, for a combined investment of approximately CAD $3.2M (K-Net Services 2001). This series of concentrated public-private investments substantially reconfigured the telecommunications system, resulting in the availability of terrestrial broadband points of presence in 13 of the First Nations, and spurring the development of a special not-for profit cooperative satellite arrangement for the remaining 11, also with substantial support from Industry Canada FedNor (see Figure 25).

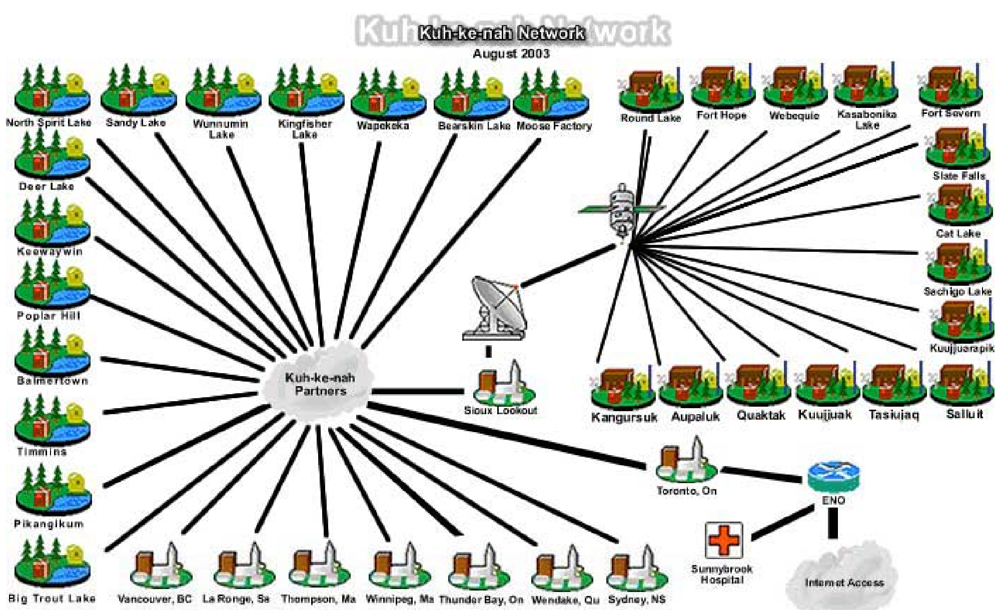


Figure 25: K-Net diagram, circa 2003, (Source KO-K-Net Services)

3.4.1 New broadband infrastructure: Backhauls and points of presence

Since 2000, terrestrial broadband Points of Presence in Northwestern Ontario have entailed T1 connections, or 1.544 mbps, leased from the ILEC Bell. Our research with K-Net has found that the price of a T1 connection (1.544 mbps) to remote communities of Northwestern Ontario has been as high as eight times the price offered to communities in large metropolitan areas such as Toronto (e.g., CAD $8000:1000/month). In this case the prices are set by Bell's rate band system, based on population density. With ongoing technological change and government subsidy, particularly from FedNor and the NOHFC, the T1 price gap was narrowed to approximately four times the high-density urban price (CAD $1270:350/month), but other significant differences remain between the quality of service offered to remote communities and their high-density urban counterparts. Connections to remote regions come with minimal service guarantees due to the distance of the communities from the nearest telephone company's service depot. This means remote customers wait longer for repairs, and have to devise local technical capabilities and human resource strategies to enable effective monitoring and repair of local telecom equipment (particularly in terms of local loop infrastructure and Customer Premises Equipment owned by the communities' vested authority and customers).

Wawatay had experienced similar human resource challenges during its early HF radio days, and with the maintenance of its community-based radio network (Mohr 2001). KO had experienced this human resource challenge as its two person staff worked with over 50 First Nations to establish DirecPC satellite connections under First Nations SchoolNet, and earlier during its BBS days. Early on KO had worked with the Sioux Lookout Aboriginal Area Management Board (SLAAMB) to establish the knowledge local First Nations technicians would require to maintain computers, internet access points, Ethernet LANs, and wireless area networks. It had worked with Industry Canada FedNor to devise an alternate MSAT phone solution that made DirecPC feasible in remote communities that lacked the infrastructure for a dialup uplink (as required by the technology). These learning experiences (over a span of five years) prepared KO and the coalition to demand community owned local loops and convinced FedNor staff that First Nations ownership, and not institutional ownership or total Telco ownership, was the proper investment option for broadband deployment in the region.

With FedNor onside (as a complementary regional representative, based in the metropolitan area of Thunder Bay, Northwestern Ontario) it was easier for KO and the coalition to communicate their interests before other government players and the incumbent local exchange carriers. Thus KO's WAN project was implemented and became a prototype for broadband infrastructure development across the 24 First Nations (gradually and with multiple investors between 2000 and 2005). Yet between 2000 and 2002 the missing link in Northwestern Ontario was a broadband option for 11 of the First Nations, which were not slated to benefit from the upgrades to the telephone company's infrastructure and/or had no direct access to the telephone system due to their remoteness and small size.

The provision of satellite infrastructure was critical in bringing these First Nations online, but it was not to be a commercial satellite option. The solution was also granted by an opportune moment for KO, which had been working in 2000 on a satellite solution for its member community of Fort Severn (Ontario's northernmost community). Bell and Telesat (which it owned at the time) had worked with KO on a series of trials supported by Industry Canada. K-Net had just been awarded demonstration project status with Industry Canada's Smart Communities and KO now had a substantial purse to invest in telecommunications and computer infrastructure for its six member communities (Ramirez et al 2003). However, the solution for Fort Severn would not prove to be affordable if undertaken through Bell's commercial line (Fiser & Clement 2007), and satellite would not have been a development option if Telesat's R&D department, impressed by KO's endogenous technical capability to manage the satellite solution internally, had not decided to let K-Net experiment with a portion of the R&D transponder on a trial basis.

Then in 2001, Telesat made a deal with Industry Canada to reserve 30 MHz or one transponder on its Anik E satellite for public benefits (to be determined by Industry Canada) in exchange for orbital space. Noticing that Industry Canada had no immediate plans for the public benefits transponder, Telesat's VP (knowing of K-Net's reputation) contacted KO's Brian Beaton, now K-Net Services Coordinator, to inform him of the opportunity for access. With support from FedNor, SchoolNet, and the management team at the Smart Communities program as well as support from Telesat R&D, KO then lobbied Industry Canada to dedicate a portion of the public benefits resource to remote Aboriginal community networks based on the K-Net model (Fiser &

Clement 2007). What apparently secured the deal was Industry Canada's awareness (at the deputy minister's level) of K-Net's feasibility and endogenous capabilities (largely informed by KO's direct participation in various Industry Canada programs).

Though it worked in collaboration with Industry Canada and Telesat, the organizations responsible for Anik E, KO proved that it could manage its portion of the satellite resource without close government or private sector involvement, and engineered the satellite resource to reflect K-Net's cooperative enterprise structure. KO became the satellite carrier and implemented a protocol to dynamically allocate about 15 MHz of public benefits bandwidth for broadband e-services in the 11 communities. That translated to approximately 780 kbps for each POP, but under the protocol this could be augmented to bursts of up to 2 mbps concentrated in one POP.

K-Net Services' acquisition of the satellite resource had broader sociopolitical and economic linkages as it augmented the organization's goal to extend the cooperative enterprise and share the public benefits of broadband (i.e., bandwidth) with Aboriginal groups throughout and beyond Northern Ontario (thus creating a stronger network of communities upon which to justify further public sector innovation and investment). Other groups became interested by the public benefits project and lobbied Industry Canada for a portion of the transponder. The Northwest Territories and Nunavut took their portions in 2002 (leaving KO with 15 MHz), but chose not to work with K-Net and pool their resources under a cooperative scheme.

In 2004 an additional transponder was allocated to the public benefits project and KO convinced the Kativik Regional Government (Northern Quebec) and Keewatin Tribal Council (Northern Manitoba) to pool their allocated resources with K-Net Services (thus creating 30 MHz of shared bandwidth). Finally in 2007, K-Net and its Quebec and Manitoba partners received additional transponder space creating a shared resource of 90 MHz, which dramatically changes the rules for these satellite communities.

In K-Net's case as (usually forced) changes to technology disrupt existing rules of the telecommunications system and make dramatic shifts in the production of goods (i.e., increased bandwidth), what appears consistent is the importance of local knowledge creation and technical capability for linking community level interests with the interests of external investors. Endogenous technical capability helps convince external investors that community ownership of the system is feasible and cost effective. K-Net Services staff has called this strategy “walking the talk”. Moreover, as with the satellite carrier case, endogenous technical capability can persuade investors and the dominant commercial carriers to relinquish control over the system to community organizations, such as KO’s K-Net Services and its partners in Quebec and Manitoba. Without their ability to demonstrate the K-Net model, K-Net Services would only be left with advocacy tactics, which the Northern Ontario Telecommunications Working Group had undertaken with mixed results, having made few inroads at the CRTC hearings on high cost serving areas, but gaining local ground in terms of rallying service organizations and Aboriginal groups together.

Nevertheless such arrangements are part of a constellation of strategic focal points, and if sociopolitical and economic arrangements are not in place to establish the parameters of capital investment (and such aspects as good will, respect, legitimacy, etc.), endogenous technical capability will be an insufficient element. Although speculative, given the lack of available options in the high cost serving areas, it is worth asking whether KO could have realized K-Net’s growth into a broadband network had it not undertaken to balance its control over K-Net Services with a decentralized community ownership model at the local loop level.

3.4.2 Special conditions for Indigenous property rights: community ownership of local loops

While local loop options from the telephone company have traditionally been copper, remote First Nations in Northwestern Ontario have been fortunate to have had FedNor, the NOHFC, and others co-invest in local community cable and/or wireless infrastructure, which can be used to internetwork and/or distribute broadband POPs to serve multiple locations within a single community (see Chapter 1 for the 2009 INAC sample). The First Nations’ authority, or an appointed Small Medium Enterprise, retains ownership over the loops and a measure of control over bandwidth and services. Consumers (institutional, residential, etc.), do not have to individually subscribe to the ILEC, but rather, share the costs and bandwidth of a single or multiple POP(s) through a local enterprise structure (see Chapter 6 for full details). There are indeed bottlenecks, as the collective shares one or two POPs (at around 1.544 mbps), but through appropriate network management and improvements to technology, a lot can be done to provide the quality of service required to support video streaming, telemedicine, and other broadband applications (see Chapter 6 and Appendices 3 and 4, for an in depth explanation; Cf. Rowlandson 2005).

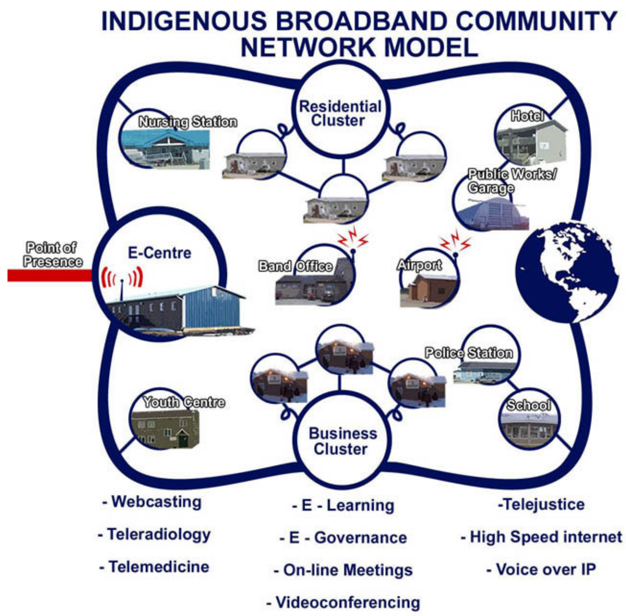


Figure 26: K-Net Services representation of a K-Net community network, (Source KO-K-Net Services)

Shared broadband becomes technically and economically feasible, because by pooling resources consumers can support the employment and training of a community technician. Community support for human resources is also further augmented by investments from economic development projects such as those undertaken by KO and SLAAMB with First Nations throughout the 1990s (see Chapter 5, Section 5.4 and Appendix 6). By working under a coalition structure such as K-Net's, the communities may also take advantage of bulk rates for commodity bandwidth that KO can leverage on account of K-Net's procurement of multiple POPs versus a single buyer or single purpose institutional buyer (like Health Canada; See Figure 26 above). Moreover, because K-Net is an IP overlay network (that is logically separated from the satellite and terrestrial carriage systems), the communities take part in locally driven IP applications that KO and the communities support by virtue of their endogenous technical capabilities (Fiser & Clement 2008).

These applications include residential internet, public videoconferencing, and residential VOIP, community services managed by the First Nations government or an appointed SME, and funded by individual consumers in each First Nation.

The availability and range of applications is significantly predicated on the presence of regional services to maintain appropriate demand aggregation on the operational side of K-Net's community-based networks (see Chapter 6). Currently, for example, videoconferencing is not a consumer luxury, but an experimental feature of public services to participating K-Net communities. Holding the applications and supporting economic relationships together is KO's social enterprise. The social enterprise provides a relatively stable structure for First Nations, public sector agencies, and private sector technology vendors/bandwidth supplies to reach agreements over applications development. In K-Net's case, the most successful applications have been for education and healthcare. I explore this role at length in Chapter 6.

3.5 Coalitions into social enterprise

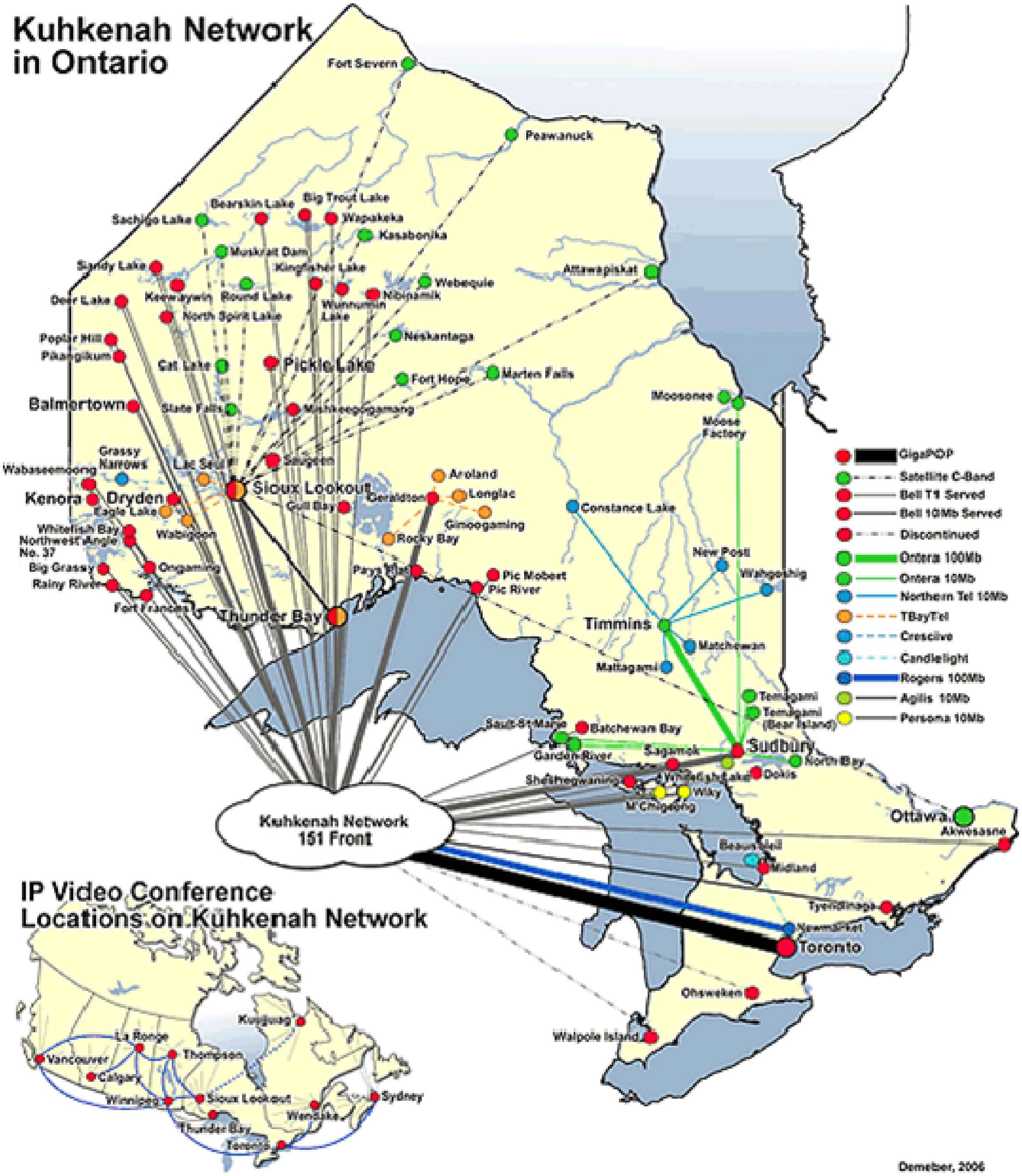
To build and maintain telecom infrastructure in these remote regions (particularly backhauls to backbones) an ILEC insists on subsidy from the national regulator and government. Yet even after the physical infrastructure becomes affordable to develop, the monopoly may still lack a viable consumer base to recover the ongoing costs of operations and maintenance, let alone to make a profit that will satisfy shareholders. Residential subscribers, a major source of revenue in high-density markets, are few and far between in the remote communities. Their weakness is matched by the paucity of business subscribers in remote regions. Remote businesses are typically Small Medium Enterprises, and their needs may be difficult for urban-centred sales offices to recognize or cater to. Such pockets of individual residential and business consumers in remote regions represent diminutive sources of revenue compared to the ILEC's other business lines in the cities, and as in the case of Northwestern Ontario, they usually have little to no influence over how the ILEC allocates internal resources to develop its various business lines. Only a regional coalition of consumers, or a large institutional monopsony, has enough power to influence the monopoly ILEC's prevailing strategy and even it requires support from external investors to pay down the capital development costs that fundamental changes to carrier infrastructure require.

Consumers in remote regions (i.e., high cost serving areas) cannot appeal to the ILEC's profit motive. They depend on a public goods justification for telecommunications service. Without acknowledgement by the various players involved in remote telecommunications that broadband addresses community needs (embodied in individual consumers and institutional services), there is very little that can be done to spur investment in innovation. Moreover, without a strategy for infrastructure development that exceeds a profit-motive for service delivery, the ongoing capital and operational costs of remote telecommunications will be difficult to address for the long term. In that respect a cooperative enterprise may be better suited to operationalize service based on the different business constraints of remote regions and the needs of their communities and institutions. Such a business model does not preclude the ILEC and other private sector operators from delivering services (and recovering costs), but it places a community-oriented not-for profit organization such as KO in the driver's seat. Indeed the ILEC Bell continues to absorb approximately 75% of the revenue generated by K-Net's terrestrial POPs, notwithstanding K-Net's arrangement of First Nations ownership and control.

From studying K-Net we have learned that a not-for-profit driver such as KO can take some of the risk away from the private sector, can improve local monitoring, operations and maintenance, and can build effective consumer demand by responsively aggregating the purchasing power of remote businesses, residential subscribers, and public service organizations. It cooperates with institutions without alienating weaker resource-poor consumers, and supports individual users of technology as it supports the narrower service mandates of institutional consumers.

With an evolving repertoire of endogenous technical capabilities directed to the IP-overlay, KO's K-Net Services can facilitate applications development by the communities for individual consumers. It has guided the successful deployment of videoconferencing in over 50 communities, and has nurtured locally managed residential Voice Over IP services in several satellite-based communities. A conventional monopoly telecom with its multidivisional business lines lacks the ability to speak to the remote community consumers as a member of the community. It is not as flexible as the locally rooted not-for-profit organization, and cannot shape a business case around their particular needs. It does not know the details of the local communities' needs. It lacks an understanding of their history, and their development goals. It has a habit of identifying the strongest institutional consumers and dividing them against weaker consumers. It is not directly accountable to the communities or their region. It is not directly motivated by their needs to innovate. The contention that KO is more accountable stems from the close ties it has nurtured with First Nations and regional service organizations, and its extension of federal and provincial sociopolitical and economic partnerships to support decentralized community ownership.

Since 1994 - 1996, when K-Net was a text-based Bulletin Board System connecting to First Nations communities at 14.4 kilobaud, KO's mission has been to establish connectivity within the parameters of local community ownership and cooperative community control because that is what the First Nations have historically wanted, at least since RF radio became available in the early 1970s and Wawatay began to ask regional Aboriginal policy questions about communications technology. Throughout its historical mission KO has always had to work with the monopoly ILEC Bell to develop its services, but it has striven to secure infrastructure that the First Nations could recognize as something they too owned. Yet its mission was successful through successive iterations of development, culminating in broadband deployment, only after the internal coalition of consumers that K-Net represents met the external investment capability of Industry Canada. Without a simultaneous internal and external recognition of telecommunications and broadband as public goods, goods that individual consumers have a right to access irrespective of institutional mandates, there would have been no K-Net model to speak of. In this way K-Net and its allies significantly re-wrote the rules of telecom, for the benefit of remote Northwestern Ontario First Nations.



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Chapter 4

4 The Formation of K-Net's Social Enterprise Principles: The Northern Ontario Telecommunications Working Group before the CRTC proceedings on High Cost Serving areas (circa 1997 to 1999)

As telecom infrastructure matures within a nation the question may arise whether the incumbent telecom operator in each of its regional service areas should have some legal obligation to provide basic telecommunications services to consumers subject to the availability of network infrastructure and economic circumstance. The CRTC addressed this question when it established a framework for local competition in 1997 (Sinclair et al. 2006). The Commission concluded that it was not appropriate to designate one carrier as having "carrier of last resort" responsibilities in markets characterized by effective facilities-based competition. However, the Commission also concluded that market forces alone would not achieve the statutory objective set out in Section 7(b) of the *Telecommunications Act* (1993) "to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada." In other words, the CRTC concluded that an obligation to serve should continue to be placed on incumbent carriers in markets where effective facilities-based competition had not developed[37]. This amounted to admitting that regional monopolies would persist in spite of an avowal to promote competition within industry and the State. That persistence is particularly acute in high cost serving areas (HCSAs).

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[37] Although the CRTC continues to impose an obligation to serve on incumbent carriers in non-competitive markets, only Bell Canada has an explicit statutory obligation, which is set out in s. 6 of the *Bell Canada Act*[37]. The CRTC has not applied the obligation to serve to new entrants.

Through the imposition of an obligation to serve, the CRTC can thus order service improvements, enforce open access rules to encourage competition, and acquire industry contributions to subsidize incumbent network services. In the case of HCSAs such forms of regulatory intervention and subsidization seek to reduce subscriber thresholds by empowering industry to offer services at lower prices or even below marginal cost. As acts of non-market intervention (and symbolic state sovereignty) they are however, based on market signals, tariffs, and industry sector lobbying, as well as weaker/intermittent signals from minority consumers and public advocacy groups. The regulatory imposition is not exactly unilateral, despite its formal basis in the law. Much of what develops is at the discretion of Commissioners.

4.1 CRTC Decision (99-16): Basic Service Objectives (BSOs) and High Cost Serving Areas (HCSAs)

In 1999 the CRTC established a list of Basic Service Objects (BSOs) that incumbent telecom service providers had to adopt throughout their territories, including rural and remote high cost serving areas. The BSOs and supporting mechanisms structure the provision of essential telecom services to HCSAs (below marginal cost). My examination of them provides a bridge to understanding why and how K-Net developed between 1999 and 2003, particularly as a response to the inadequacy of the CRTC BSOs in supporting the broadband visions of remote Northern Ontario First Nations. In Section 4.2 I examine the alternative set of objectives that contributed to shaping K-Net's broadband governance model, and which consisted of a three way split between government, community, and industry.

Regulatory reforms in the mid 1990s culminated in a list of Basic Service Objectives under CRTC decision 99-16. It was the regulator's attempt to specify a universal service obligation for incumbents. The list consists of a minimum basket of essential services that incumbent local exchange carriers must provide throughout a serving area:

1. Single line touch-tone access;
2. The capability to access the Internet at low speed without paying long distance charges
3. Access to 9-1-1;
4. Voice relay services for the hearing impaired;

5. Directory assistance services;
6. Long distance services; and
7. A copy of the local telephone directory.

In its entirety the list provides the CRTC's specification of what service quality means under Section 7b of the Act. As part of decision (99-16)'s implementation phase, the Commission ordered incumbents to file service improvement plans (SIPs) for all HCSAs in their area (based on the incumbents' own research and the reports that representatives of unserved and underserved communities had submitted during the proceedings leading up to the decision. The CRTC then assessed the SIPs and upon review, ordered the respective incumbents to implement service upgrades through separate decisions related to specific incumbents or groups of incumbents.

The SIP(s) for each HCSA therefore reflected the incumbent's relative interpretation of cost and could vary with incumbent accounting procedures. However, following the CRTC's order in decision (99-16), incumbents had to design their SIPS to:

1. Incorporate least-cost technology
2. Target larger communities or areas first
3. Serve unserved areas prior to providing upgrades; and
4. Serve permanent dwellings before seasonal ones

Due to the range of possible costs that incumbents could incur by extending basic services throughout their HCSAs, as well as due to the relative remoteness of communities in HCSAs, a number of SIPs continue to be underway over ten years after the Commission's original decision. Conspicuously absent from the list is any mention of a broadband service objective. As I will discuss in this chapter, the CRTC did not see a possibility of reconciling a broadband service objective with its desire to control costs and promote competition in Canadian telecom markets.

4.2 Founding visions of the K-Net broadband governance model: Intersecting views from government, community, and industry

As a regional public advocacy group the NOWG took advantage of the CRTC proceedings leading up to decision (99-16) to organize and develop plans for a regional telecommunications and broadband deployment policy. These activities culminated in the NOWG's presentation of an alternative institutional framework parallel to the CRTC's emerging BSOs (see Section 4.2.2 and Appendix 5). They were especially important drivers in K-Net's future broadband deployment for two primary reasons:

Firstly, with funding from FedNor, Industry Canada's regional development organization for Northern Ontario, and other regional sources, the NOWG was able to study needs and interests across over 50 Northern Ontario First Nations communities and related regional public services in education, health, and Band administration, to help its members prepare a comprehensive broadband service strategy for the region. (See Chapter 3).

Secondly, from collecting information about local HCSA telecommunications conditions and needs the NOWG was able to build a business case for service improvements beyond the CRTC's BSOs, with FedNor and other government partners. What resulted was a consortium of NOWG members and government partners under KO and FedNor's joint leadership. It led to co-investments with ILEC's Bell and Northern Tel that upgraded the incumbents' Northern Ontario carrier systems and instituted a precedent of community ownership over local loops that would come to support First Nations control over Internet service provision and broadband services.

I examined the implications and outcomes of these two advocacy, research, and development paths at length in Chapter 3. For the remainder of Section 4.2 I relate the alternative service objectives that FedNor and the NOWG co-developed, and examine their implications for K-Net's broadband governance model. I then conclude with an examination of the incumbents' perspectives and the CRTC's reaction.

4.2.1 FedNor's alternative service objectives: Government as regional developer, broadband deployment as regional development

In 1996, FedNor established an Aboriginal Working Group (AWG) with a mandate to increase First Nations access to FedNor programs and services. The AWG was a voluntary working group that included representatives of Northern Ontario's First Nations Political Territorial Organizations, and economic development organizations (such as Tribal Councils), as well as Industry Canada's FedNor and Aboriginal Business Canada. AWG members immediately indicated a priority to improve telecommunications systems in the First Nations. See Table 11 and Figure 27 below for a summary and map of the extent of AWG and NOWG's reach in Ontario.

Through its study the AWG identified short, medium and long-term strategic priorities for upgrading telecommunications systems in Northern Ontario First Nations, particularly the designated FedNor area north of and including the census divisions of Parry Sound and Nipissing. The scope of work included the development of a telecommunications infrastructure inventory and the preparation of a strategy to address identified gaps.

FedNor then contracted Buteo Networks Inc. to carry out the project. Buteo conducted a telephone survey with 153 First Nations communities in the study area, and visited 50 (of the 153). Distribution of the surveys was as follows (Table 11):

Aboriginal Stakeholder Group (Political Territorial Organizations)	Number of Communities Surveyed
Grand Council Treaty #3	24
Independent First Nations	7
Metis Nation of Ontario	5
Nishnawbe-Aski Nation	48
Ontario Federation of Indian Friendship Centres	15
Ontario Metis Aboriginal Association	5
Ontario Native Women's Association	18
Union of Ontario Indians	30
Association of Iroquois and Allied Indians	1

Table 11: FedNor's Aboriginal Working Group membership (by Aboriginal Stakeholder Group)

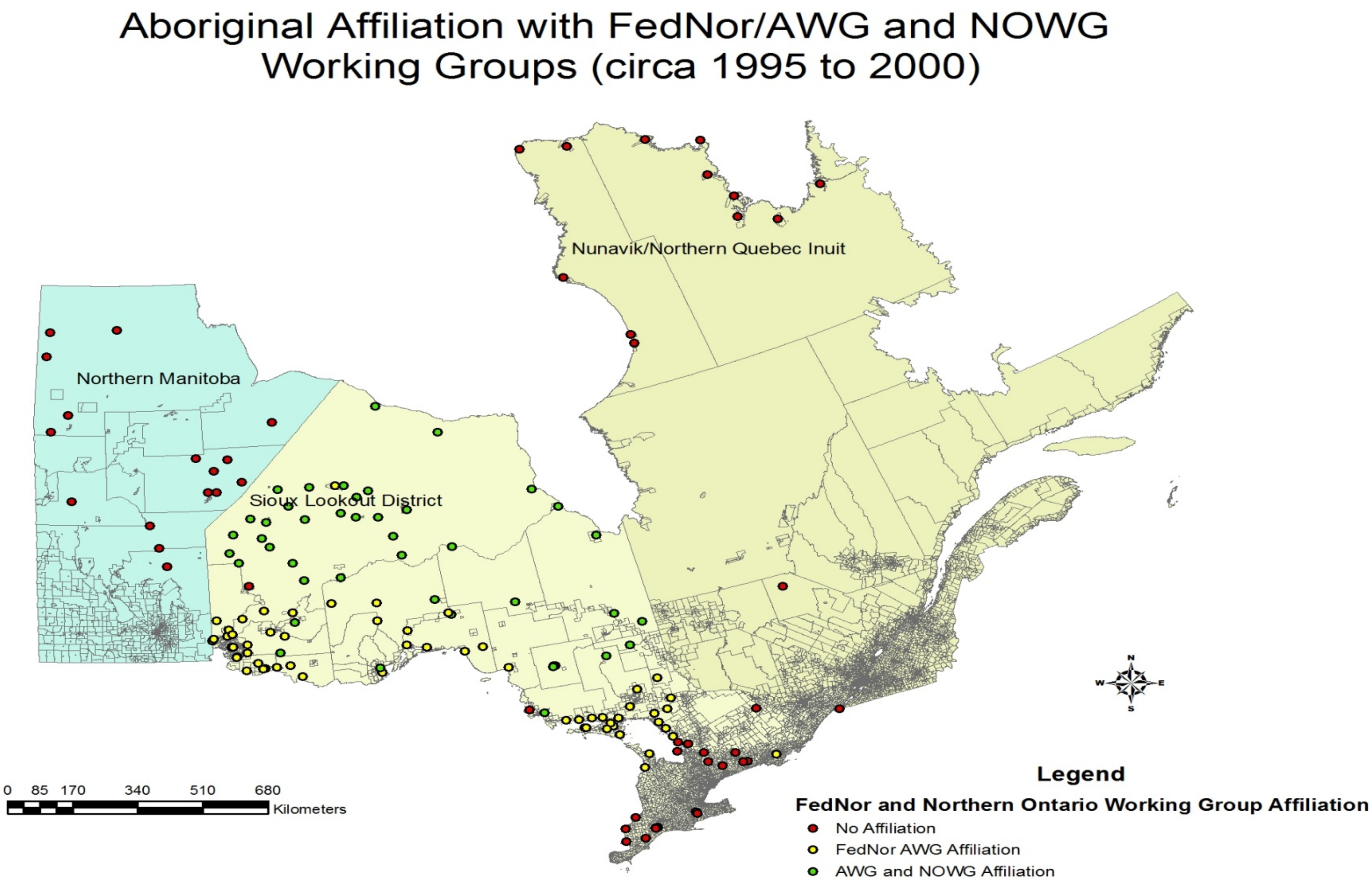

Figure 27: Map of FedNor AWG & NOWG affiliations

The study found that:

1. There are about a dozen communities in Northern Ontario that don't have basic phone systems;
2. Approximately 89% of Aboriginal communities make some use of public information networks like the Internet;
3. A 28.8 Kbps modem is the most common method currently in use for connecting to the Internet;
4. Only 38% of First Nations communities use Local Area Networks for their computer systems;
5. Prospective broadband applications included tele-health, distance education, judicial support, videoconferencing and electronic commerce
6. Partnerships that include FedNor, INAC and the Northern Ontario Heritage Fund Corporation are being formed to finance basic phone systems for communities that do not have them;

In light of the above findings, the report recommended the following service objectives that First Nations, commensurate with their financial capabilities, and government should pursue:

1. Collaborate and invest with major telecommunications providers to provide basic local and long distance phone service and modern digital data network access to all Aboriginal communities;
2. Invest in development of local dial-up Internet service in all Aboriginal communities;
3. Invest in state-of-the-art Local Area Networks (LANs) to connect computer systems in individual community offices;
4. Invest in the establishment of Municipal Area Networks (MANs) in First Nation communities where multiple sectors of a community can share bandwidth and technical resources;
5. Invest in connecting MANs to large Community Based Networks (CBNs) for cost savings through the bulk purchase of telecommunication services and technical expertise;
6. Invest in computer and Internet training at all levels, from office to home use;
7. Regulatory commissions should approve local calling zones to link geographically dispersed Aboriginal peoples with family, tribal or cultural ties;
8. Funding sources should invest in designs and proposals that are modular. That is, government should insist on designs where changes and growth in office systems do not require a corresponding change in connection systems like phone and telecommunications transports, and vice versa;
9. Continue to fund smaller initiatives that conform to one or more of the objectives above. At the same time, funding sources should encourage projects that provide the greatest benefit to the widest geographic and organizational scope of communities.

FedNor staff accepted these recommendations as objectives for a mandate to upgrade telecommunications systems in the North with community and industry partners. They will come to figure prominently in Chapter 5 (and Appendices 3 and 4) when I discuss how FedNor partnered with KO Tribal Council to enact them in Northern Ontario.

4.2.2 The NOWG's alternative service objectives: HCSAs as self-governing community-based networks

FedNor's strategic and financial support bolstered NOWG's presence at (CRTC 97-42). The working group made two written submissions to the Commission and almost 100 written interrogatories to 67 different parties over the course of the proceedings. Not surprisingly, its statements of policy focused on defining objectives to modernize and sustain the development of telecom infrastructure in the underserved and unserved communities of Northern Ontario. This included targeting broadband and emphasized a governing role for local and regional institutions.

In its statements before the CRTC the NOWG established two opposite starting points from which to base a universal service obligation and basic service objectives:

1. One could take as a starting point the cost implications for the telecommunication service providers (which the majority of ILECs, such as Stentor had chosen (see Section 4.2.3 below); or
2. One could start from the point of view of the consumer.

The NOWG argued on behalf of consumers and drew extensively from Section 7(b) of the Telecommunications Act (1993). Section 7(b), it is worth repeating, states that one of the objectives of Canadian telecommunications policy is to "render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada". In its interpretation of the legislation, the NOWG proposed that the Commission should first establish a set of regulatory principles for the pursuit of universal service that would anchor whatever basic service objectives (BSOs) or "minimum basket" of telecommunications services, evolved from negotiations between the CRTC, industry, consumer advocates, and government.

These principles for anchoring the meaning of "telecommunication services of high quality", under Section 7 (b) of the Act, were as follows (NOWG Timmins 1998: 23 - 24):

1. All Canadians must have the ability to participate fully in society through universal, equitable access to telecommunication services.

2. Equitable, affordable access means being able to break down the barriers to economic and social growth which have persisted because of past inequalities in telecommunications infrastructure. Such economic instruments include community access to banking machines, debit and credit on line, toll free access to an ISP, government information services, etc.

3. Equitable, affordable access means having the same education opportunities as are available in urban areas available to rural and remote areas through advanced distance education and fully interactive information linkages, including video conferencing.

4. Residents of rural and remote communities should have access to the same level of broadband services as urban areas on an affordable basis.

5. To offset past inequalities in telecommunications infrastructure development in Canada where areas of the country who need new services the most have received them last, Canadian policy on telecommunications development will encourage all suppliers to offer services universally, to all parts of the country, rather than allowing urban and high density areas of the population to receive preferential treatment with more choices.

The NOWG asked the Commission to maintain these five principles and translate them into more specific service objectives – that could evolve with changing technology trends – but one does not have to read too deeply into principles 2 and 4 to see a definite outline of the NOWG's preferred service objectives. Here we find access to "banking machines, debit and credit on line, toll free access to an ISP, government information services", and access to "the same education opportunities through advanced distance education and fully interactive information linkages, including video conferencing".

Moreover, the NOWG went further to suggest a list of 17 essential services that articulated its principles more clearly. This list reflected its research in over 50 remote Northern Ontario First Nations, as well as information acquired through the (1996) FedNor study of 153 Ontario First Nations, and discussions with regional Tribal Councils, businesses, and community services (such as through the Nishnawbe Aski Nation, see Figure 28). None of the Ontario telecom service providers had anything comparable to this profile as an overview of Northern Ontario's telecommunications situation and the needs of its consumers.

Figure 28: Map of K-Net's First Nations constituency by Tribal Council affiliation (within the political territory of Nishnawbe Aski Nation), (Source KO-K-Net Services)

The NOWG's list of essential services consisted of the following elements (NOWG Timmins 1998):

1. Voice-grade local service
2. Touch-tone service
3. Single-party service
4. Local usage, covering all major public institutions (e.g., schools, hospitals, and municipal government offices) serving the community
5. Access to toll service
6. Local access to emergency services
7. Access to operator services, including directory assistance
8. Access to Message Relay Service (for the deaf)
9. Toll-free access to dialup Internet services
10. Line quality capable of local and interexchange facsimile transmission
11. Line quality capable of local and interexchange data transmission at 28.8 Kbps using a modem
12. Connectivity with all public wireline and wireless, local and interexchange networks
13. Toll blocking, 900 and 976 blocking, blocking of other pay-per-use services, Call Display blocking, Call Trace
14. Access to optional digital services such as Call Management Services (e.g., Call Waiting, Call Display, Call Screen)
15. Telephone directory listings plus the option of being an unlisted subscriber
16. Equal access for competitive long distance carriers so customers of competitive carriers do not have to dial extra digits when placing a long distance call; and
17. Capability at the switching centre to provide services on a user-pay basis of sufficient bandwidth to permit applications such as two-way, full-motion video conferencing service to support telemedicine and tele-education at user rates that are comparable to rates charged for such services in urban areas

Of these services the NOWG considered the first 16 items to be services that every individual subscriber, whether residential, business, public service, or otherwise, should have. Item 17, was the only exception to this, which the NOWG added to institute an element of dynamism within the universal service obligation.

Item 17 approximates a minimum broadband standard with a scenario that would become integral for Canada's federal broadband policy. Like the NOWG's fourth principle, Industry Canada FedNor's Aboriginal Working Group had indicated that videoconferencing was integral to an emerging platform of broadband applications in health, education, justice and commerce. The NOWG's objective of providing sufficient bandwidth to support "two-way, full-motion video conferencing service" did not specify any actual line rates for such a platform but proposed a benchmark for assessing service quality and achieving a minimum broadband standard.

The "two-way full motion video" scenario would later become part of the Canadian National Broadband Taskforce's benchmark in its report to Industry Canada in 2001 (that K-Net Services Coordinator Brian Beaton contributed to). As part of Industry Canada's First Nations SchoolNet and with its growing ties to FedNor, K-Net Services was becoming closely aligned with Industry Canada's emerging broadband policy. It was this federal perspective that the NOWG had to fall back on when the CRTC distanced itself from instituting a national broadband service objective. Moreover, knowing that First Nations healthcare and education are federal responsibilities, the NOWG's reference to telemedicine and tele-education on a "user-pay basis" in item 17 implied a lead fiscal role for federal programs in the establishment of broadband infrastructure on First Nations. As we saw with FedNor's recommended service objectives this idea was circulating among various levels of First Nation, provincial and federal governance.

If instituted, item 17 would require incumbents to maintain appropriate capabilities at switching centres in order to be able to scale services to meet escalating and changing consumer demands. CRTC funding mechanisms would have to be in place to support them and provisions for open access collocation would be required to enable competitive service provision where available. Though competition was unlikely in the small remote First Nations, the open access provision would support the initiative of local entrepreneurs and community services to establish overlay networks for Internet service provision and broadband services such as VOIP, videoconferencing, and so forth. Under this institutional framework incumbents in HCSAs would likely remain monopoly carriers (largely of economic necessity), but applications and services could emerge beyond the telecom service provider's control (See Chapter 6 for an examination of K-Net's Network Management policy).

Moreover, the NOWG specified that increased bandwidth capabilities would not have to be uniform across a carrier network but could be differentiated according to tiers of service through a multi-stakeholder governance process. The governance process called for a community-based network model, where consumers from different categories, such as residential, business, and public service, shared the cost of common infrastructure and shared bandwidth based on their characteristic information needs. It was a translation (in regulatory terms) of the FedNor study's recommended objectives that regional stakeholders:

3. Invest in Municipal Area Networks (MANs) in First Nation communities where multiple sectors of a community can share bandwidth and technical resources; and
4. Invest in connecting MANs to large Community Based Networks (CBNs) for cost savings through the bulk purchase of telecommunication services and technical expertise;

The resulting system of telecom governance would be a partnership between government, community, and industry stakeholders, who would share the costs of broadband deployment, as well as a common pool of network resources based on universal service principles that the CRTC would maintain. The NOWG proposed three possible examples of service tiers for different stakeholder partners in the community network model (for illustrative purposes only):

Tier 1: Basic service for individual homes, small businesses and elementary schools would include: Basic telephone service (with digital switching), single-party line with touchtone and dial-up access (with modem) to computer networks and Internet gateways. These items could be provided through wireless systems, where appropriate.

Tier 2: Basic service for community access points (such as libraries and secondary schools), municipal and First Nation government offices, distance education/learning centers (linked to secondary or post-secondary programs elsewhere), and some larger businesses would include Tier 1 service, plus high-speed modem or direct connection to wide area networks and/or the Internet. Tier 2 would require the capability to support one-way full motion videoconferencing (with two-way audio) or slow scan/compressed two way video via land lines/satellite.

Tier 3: Basic service for medical centers, universities, business parks, or enterprise zones would include Tiers 1 and 2, plus very-high-speed data communication links and two-way, full-motion video conferencing (fibre-optic trunk lines to fibre or satellite backbone).

The NOWG's tiers are socioeconomic categories that map needs and services onto a common telecom infrastructure. The tiers form a hierarchical system of governance based on the assumption that bandwidth would be scarce in HCSA communities and that basic service objectives would have to balance personal and collective needs. Moreover these would be needs that a unified broadband Internet service market must (be able to) fulfill as part of a shared community infrastructure in HCSAs.

The NOWG proposed a "high cost" or "universal service" fund to stimulate an HCSA market's ability to foster and support the tiers of service. The fund's purpose would not be to subsidize every consumer, down to the level of the individual home or business. Customers in HCSAs would still have to recognize the cost of broadband service. According to item 17, higher tier services had to be within the capability of the carrier systems in the exchange area to support. In this way the NOWG argued, actual telecommunications services would come closer to meeting Section 7(b) of the Telecommunications Act's call for "services of high quality" without undermining industry cost-recovery requirements. Instead of investing in least cost technology – that supported the minimum BSO requirements -- as the CRTC called for in decision (99-16), this provision followed FedNor's objective to invest in modular technologies, "where changes and growth in office systems do not require a corresponding change in connection systems like phone and telecommunications transports, and vice versa".

The community-based network model begged a number of questions including how to monitor regions and assess needs, how to determine where consumers fit in the hierarchy of tiers, and how to determine the thresholds by which to assess sufficient demand for service improvements. It was essentially a first step towards designing the regional institutional framework that K-Net would become through the joint efforts of KO's K-Net Services and Industry Canada FedNor. It presupposed an organizational structure and system of governance that did not yet exist, but that could integrate public services, large businesses, households and small businesses within a single HCSA market framework based on a shared telecommunications infrastructure. NOWG members wanted a means to acquire broadband services and were willing to pay a portion of the share. Their model of tiers suggested roles for governments and public services as anchor tenants within the third tier, but presupposed a willingness on the part of incumbents to have switching facilities in place to support lower tier members' future expansions into upper tiers (instead of least cost systems that would have to be torn down and replaced by successive iterations). The strategy this implied was to exploit government needs for broadband services in HCSAs to increase and pool bandwidth availability throughout HCSA communities. Once in the communities broadband technologies could be used to share and manage bandwidth with lower tier users (households, small businesses, etc.). Higher end consumers would pay the larger share of the total infrastructure costs. If CRTC subsidy wouldn't pay for the infrastructure, governments and communities could try through public-private partnerships with industry. Section 4.2.3 below examines how incumbents responded to the NOWG and FedNor's underlying strategy.

4.2.3 The Incumbent telecom service providers' service objectives for High Cost Serving Areas: Public Private Partnerships (PPPs) without an obligation to serve

At the time of the CRTC proceedings the Stentor Alliance of telecommunications service providers was the largest consortium of industry players in Canada. Stentor's views on high cost serving areas were therefore largely representative of the industry as a whole. It also captured the position of Bell Canada, the lead Stentor member and a dominant carrier in the Northern Ontario HCSAs where K-Net developed. The other lead industry view during the proceedings belonged to Sasktel, a Crown corporation of the Government of Saskatchewan that, at the time, was also the only non-federally regulated carrier. I will contrast these industry views using Stentor's arguments as a framework for capturing and drawing distinctions within the industry view.

Stentor's views on HCSAs at the time of (97-42) consisted of six major arguments (Stentor Resource Centre Inc). To paraphrase, these were:

5. Consumers choose to live in HCSAs for lifestyle reasons and should therefore carry the burden of costs to acquire high cost services;

6. Competition has eroded the internal cross-subsidies that eased the burden of incumbents' costs in HCSAs;

7. If governments (including municipalities and First Nation governments) want to pursue a broadband service objective in HCSAs, they should pay for the requisite infrastructure upgrades;

8. Public private partnerships are a better vehicle for public investment than regulatory levies/subsidies;

9. Incumbents should not be considered "carriers of last resort" in HCSAs; and

10. If the CRTC decides to create a HCSA service fund it should allocate subsidies through a competitive bidding process and not as a direct flow-through to incumbents.

Geography is a lifestyle choice

Stentor's written submission to the CRTC in (97-42) indicated that in rural Canada, paying more for some goods and services has come to be viewed as a trade-off for lifestyle, such as cheaper real estate and lower taxes. Stentor indicated that historically the price of telephone service in Canada's rural regions had gone against the tendency for higher prices in rural and remote areas: Although the cost of providing telecom service was generally higher for the telephone company, the price of basic service had typically been lower for non-urban consumers than the price paid by urban consumers (Stentor Resource Centre Inc 1998: 10). This, what Stentor called an "anomaly," was the result of the tradition of value-of-service pricing, where fewer people within a local calling area had meant lower prices (due to the lower value of service). Such a pricing approach, Stentor claimed was possible under monopoly conditions through cross-subsidies from an incumbent's other services. This was no longer feasible with intense competition eroding the regional incumbents' sources of subsidy.

Competition eroding cross-subsidies

The CRTC's push for long distance competition in the 1980s (CRTC 1979, 1982, 1984, 1985 in Stentor Resource Centre Inc 1998: 7) led to its adoption of a new regulatory framework in the 1990s that allowed resellers to offer local and long distance services and approved facilities-based competition in local and long-distance services (CRTC 1990, 1992, 1994 in Stentor Resource Centre Inc 1998: 7). These changes, Stentor claimed, had driven incumbents to eliminate value-of-service pricing, as competition was eroding incumbents' cross-subsidies from long distance services and business rates in urban areas and other local services that had been traditionally available to keep rates in rural and remote areas low. As well, Stentor claimed, the capabilities of modern high quality communications – such as those services that broadband represented - were becoming increasingly valuable to rural customers for economic and social reasons (Stentor Resource Centre Inc 1998: 8). Incumbents however, could not provide the full range of capabilities to rural and remote consumers without new incentives and partnerships.

Stentor members were reacting to broader industry dynamics, and HCSAs became another platform to drive home their deeper concerns and desires. According to Winseck (1998) cable industry profits coupled with CRTC mechanisms to protect cable monopolies while allowing cable systems to compete in telecommunications, had driven Stentor members to seek a reinterpretation of the Act that would allow them to offer a broad range of information and video services – through integrated broadband networks.

Stentor had already petitioned the CRTC to exempt incumbents from common-carrier status in order to compete as content providers (CRTC 1994 in Williamson 1999). In 1994 Stentor had put forth the Beacon Initiative, a plan by Stentor members to spend $8.5 billion dollars to make interactive broadband networks available to 80% of Canadian homes by the year 2005 in return for removal of CRTC restrictions on cross-media ownership and allowing the telephone companies to obtain broadcast licenses (Stentor Resource Centre Inc 1998: 9). They were willing to extend these networks to high cost serving areas provided that partnerships were in place.

With a substantial rural population, Sasktel and the government of Saskatchewan framed the value of service issue in terms of the price one had to pay for universal and equitable service. Escalating competition in core urban markets had convinced incumbents that rate rebalancing between the urban and rural/remote consumers was necessary, yet Sasktel indicated that it was not right to expect individuals and provincial/territorial governments to assume full financial responsibility.

Consumers and governments should pay for broadband deployment

Stentor acknowledged the existence of unserved territories where communities have insufficient resources to pay the costs of obtaining service. It suggested that if the CRTC and/or some level(s) of government were to decide in the future to have incumbents connect these communities to carrier networks, in order to meet policy objectives such as social or economic development, then such service extensions should involve government funding and not regulatory action (Stentor Resource Centre Inc 1998: 9).

Stentor claimed that the best way to ensure that as many Canadians as possible can benefit from competition is to allow market-based pricing to prevail. However, if the regulator wanted to keep prices "artificially" below cost, governments must play a key role in supporting private sector efforts to meet the challenges of providing high quality service to those living in rural and remote Canada. Just as governments had funded various industry sectors through direct investment, tax credits or other means, government, Stentor claimed, must facilitate the provision of quality local service for those living in rural and remote regions of the country.

Public Private Partnerships as ideal funding model

Stentor indicated that there is a range of funding options available to governments within public private partnerships and urged the Commission to work in partnership with incumbents, other industry participants and all levels of government to obtain the funding necessary to improve accessibility to high quality telecommunications services in certain high-cost serving areas. In particular, Stentor identified the following models as exemplary partnerships (Stentor Resource Centre Inc 1998: 11):

11. Industry Canada's Community Access Program ("CAP") provides funding for the tools to link communities to the information highway. By January 1998, Industry Canada had funded CAP sites in more than eight hundred rural and remote communities. The 1998 federal budget provided an additional $205M over three years for this program and associated initiatives.

12. The Canadian Space Agency's Advanced Satcom Program, in partnership with the private sector, provides funding for the development of communications services to regions not covered by terrestrial systems. A total of $50M is available for this program over the next several years. Contracts involving federal spending of about $20M have been entered into with Nortel and Telesat Canada.

13. Through the Federal Economic Development Initiative in Northern Ontario ("FedNor") and Human Resources Development Canada ("HRDC"), the federal government contributed $360,000 in 1997 and 1998 to the implementation of communication services in sixteen communities in Northern Ontario.

14. In partnership with municipal governments, certain telephone companies have received funding assistance under Canada/province federal infrastructure programs. Northwestel Inc.

("Northwestel") obtained \$1.3M funding for service extensions completed in 1997. In 1998, some remote communities in BC TEL's territory expect to receive funding for the provision of telephone service as part of a \$70M infrastructure project.

15. The Northern Ontario Heritage Fund Corporation, an agency of the Ontario government, provided \$600,000 in capital in 1997 for a remote switching centre and fibre optic transport facilities in the township of Atikokan.

I shall revisit FedNor's role in Chapter 5 below. Industry Canada FedNor, and the Information Highway Applications Branch (with its CAP, First Nations SchoolNet, and Connecting Canadians programs), would prove to be important for K-Net. Bell Canada, K-Net's most important incumbent in Ontario, and the Stentor lead, had an already developed appreciation of these funding models as the incumbent for Northwestern Ontario.

Abolish carriers of last resort

Stentor claimed that the incumbents' regulatory obligations to serve were obligations developed in the context of the monopoly supply of services to end users when the regulator had considered telephone companies to be natural monopolies (Stentor Resource Centre Inc 1998: 23). The Companies' tariffs, Terms of Service and, in the case of Bell Canada, the Bell Canada Act, defined the extent of the obligations to serve placed on the Companies in terms of distance from existing facilities and the prices which they could charge for service extension beyond the limits of existing facilities. These obligations generally did not require an incumbent to extend service if to do so would result in the company incurring an unusual expense and the customer was not prepared to pay that expense.

In the proceedings leading up to an earlier CRTC decision (97-8), Stentor argued that an obligation to serve (or carrier of last resort obligation as it is sometimes termed) is inconsistent with and not needed in a competitive marketplace. In decision (97-8), the Commission agreed that "it would not be appropriate, in markets characterized by effective, facilities-based competition, to designate one carrier as having carrier of last resort responsibilities". However, the Commission also stated that it "considers it likely that market forces will not, on their own, achieve the Act's accessibility objective in all regions of Canada". The Commission had thus maintained the Companies' current obligations to serve, pending the outcome of the HCSA proceedings (and this remained the case with 99-16's service improvement plans).

Stentor claimed that once incentives to serve were in place, either through pricing flexibility or a subsidy mechanism, competitive entry could be expected to occur even in high-cost serving areas. Competitive entry, Stentor maintained, would make redundant any obligation to serve or carrier of resort obligation. Indeed, Stentor warned, imposing an obligation to serve, or carrier of last resort obligation, in a developing market could lead to distortions and have counter-productive consequences.

Stentor's alternate subsidy mechanism

According to Stentor's submission additional funding obligations placed on incumbents increase industry costs, which incumbents then have to recover from customers through higher overall prices (Stentor Resource Centre Inc 1998: 20 – 31). Thus, Stentor claimed, if the CRTC decided that some portion of any explicit subsidy funds should support the extension of service to unserved areas – it would have to permit rate increases for cost recovery. The evidence Stentor gave presented a portrait of subsidy requirements that threatened to overwhelm any potential subsidy fund. BC Tel for example, the second largest Stentor incumbent (at the time), stated that for 1998 its subsidization requirement in total exceeded the estimated contribution revenue for 1998 by $43 million. On average, according to Stentor member, Télébec (part of the Bell parent company), it would cost incumbents around $800,000 to extend services to an unserved settlement within 50 km of a switching centre.

Whatever factual evidence underlay this claim, Stentor admitted that it had not studied the dynamics of any actual subsidy mechanisms for the extension of services into unserved areas. It did however propose a mechanism, strikingly similar to the NOWG's, by which carriers would tender to undertake one or more pre-specified portions of a service extension program in HCSAs, with subsidy/service contracts awarded to the competitive carrier that required the lowest amount of explicit subsidy to undertake a given portion of service extension at a specified Commission-mandated price to the end customer.

4.3 Regulatory compromise: Pathways for ICT development in HCSAs after CRTC Decision 99-16

Stentor's proposed solution for HCSAs dovetails with a number of the NOWG and FedNor's core service objectives. It pushed for "least cost technologies" but acknowledged the rural and remote communities' needs for urban grade services that only a digital switching system could support. Thus, in its view, so long as government was willing to partner, least cost did not necessarily preclude higher capacity technologies that could lead to decreased monthly rates and scalability in the long term (See Appendix 3). Unlike the NOWG, Stentor downplayed the regulator's role and the incumbent's obligation to serve, but like the NOWG and FedNor promoted a champion user role for governments. The concept of user-pay broadband held these three stakeholders together.

As to whether the NOWG believed its arguments would sway the CRTC to institute mechanisms to support its principles of universal service, including capabilities for user-pay broadband, there is clear evidence from the NOWG submissions that it felt overshadowed by a telco-centric agenda (Northern Ontario – Telecommunications Infrastructure – Working Group 1998):

> We understand that the Commission intends to hold another round of proceedings after the 97-42 proceedings are concluded on the contribution mechanism. We doubt that we will be able to play a large part in those future proceedings because of their technical complexity, the "user-unfriendly" way in which the CRTC conducts such proceedings, and because we do not have the financial resources that are likely required to play a meaningful role. We therefore will have to trust that the Commission will act in the public interest and set mechanisms in place, through a future high cost fund, the contribution mechanism regime, or both, to insure that local rates for all telecommunication services remain affordable to all Canadians, regardless of our financial or geographical status.

As decision (99-16) came into effect the Commission directed all incumbent local carriers to file service improvement plans for Commission approval, or to demonstrate that the basic service objective has been and will continue to be achieved in their territory.

The incumbents` plans had to include proposals to fund such improvements. When funding proposals included rate increases, a reasonable balance would have to be achieved between the speed and cost of implementation and the need to maintain affordable rates. With their service improvement plans, incumbent local carriers had to file a proposed tracking plan that would monitor the progress of all service extension and upgrade programs and to verify that these programs were in effect. As a consequence, the Commission also required Incumbent local carriers to consult stakeholders prior to preparing their service improvement plans. In addition, incumbents had to give communities and other organizations an opportunity to comment on the reasonableness of the carriers' proposals before the Commission would rule on them.

Decision 99-16 set three goals to be achieved over time: extend service to unserved areas, upgrade service levels in underserved areas, and ensure that existing levels of service do not erode under competition. Estimating that level of telephone service throughout Canada is around (99%), the Commission identified a basic level of service that all Canadians should have access to and took steps to ensure that, over time, this basic level of service would be made available to currently unserved and underserved areas.

1. Single line touch-tone access;
2. The capability to access the Internet at low speed without paying long distance charges;
3. Access to 9-1-1;
4. Voice relay services for the hearing impaired;
5. Directory assistance services;
6. Long distance services; and a copy of the local telephone directory.

In its decision the Commission noted that during the proceedings, several groups representing consumer interests, such as the NOWG, had suggested that basic service should include a telephone line capable of local and interexchange data transmission at a modem speed of 28.8 Kbps or higher. Several carriers retorted that it would be difficult to provide any guarantee of data transmission rates. They added that such network changes would be prohibitively expensive and would provide incumbents with almost no additional revenue to offset the costs. The Commission concluded that the benefits of upgrading a local network must be balanced against the subscribers' ability to pay for upgrades. For a higher level of basic service, subscribers would have to pay more and costs to provide the service in remote areas would increase (as per the arguments Stentor made in Section 4.2.3 above). Costs could, in turn, affect subsidy rates levied on profitable markets, and distort the competitive nature of those markets. The Commission stated that it expected that, over time, competitive pressures and improvements in network technology would permit basic service to include faster transmission speeds. It thus decided to wait and see what markets and governments could achieve.

Finally, some parties, including Stentor and the NOWG, had proposed that incumbent local carriers and other service providers be permitted to bid on providing new service to a high-cost area. What they proposed was a form of competition for market entry, whereby a successful bidder would then receive funding to recover capital costs and operational costs for providing service (thus replacing the incumbent). The Commission denied this approach for a number of reasons. First it concluded that a regulated bidding process would make HCSA fund administration more complex, and would unduly slow the implementation of basic service in certain high cost serving areas. Second, it claimed that given the small number of Canadians without access to telephone service, incumbent local carriers, with their widespread infrastructures, would likely be the only providers of service to these areas in the foreseeable future. The Commission found that given the relatively small number of Canadians in scattered locations who do not have access to service that meets the basic service objective, the most appropriate approach was for incumbent local carriers to provide service over a reasonable time period. The Commission concluded that extending service to those now unserved was generally the responsibility of the incumbent local carrier providing service in that territory.

Faced without a regulatory solution to its broadband deployment needs, the NOWG, and particularly KO-K-Net Services looked to the partnerships it had been carefully cultivating at the same time as it made its pitch for a regional subsidy mechanism. Chapter 5 will take us through the historical evolution of those partnerships and explain their critical role in giving K-Net’s social enterprise a chance to exist.

Chapter 5

5 Connecting Canadians and the role of government partnerships

With the CRTC forbearing from Canada's emerging broadband marketplace, incumbent local exchange carriers (ILECs) and governments largely controlled the fate of broadband development in high cost serving areas. Chapter 3 provided an overview of how the situation played out for K-Net's social enterprise. In this chapter I take a closer look at the role of government partnerships in K-Net's ecology of games. Within a span of five years (form 1997 to 2002) K-Net achieved its most important developments as a social enterprise, thus far. This is the transition period discussed in Chapter 3, when K-Net changed the rules of telecom.

This chapter thus explains the extent of government's involvement in K-Net's establishment of community-based broadband through social enterprise. It starts from the various perspectives of key government players, such as within Industry Canada, and ends at the economic, technological, and sociopolitical relationships that KO Tribal Council and its regional constituency codeveloped with key government players to establish K-Net's governance in the form of a KO-driven social enterprise. The role of industry is not absent in this chapter, however, it is not a leadership or active policymaking role. As I discussed in Chapter 4, the incumbent Bell, as part of the Stentor Alliance, had indicated a willingness to engage in broadband deployment to remote communities, so long as government was willing to play lead investor, through public-private partnerships. Throughout the time period of 1997 to 2002, Canada's ISP market was only beginning to take off. Bell and other incumbents, were starting to pay attention, but also became pressed by cable companies and CLECs in the high density urban markets where they battled to provide residential internet and digital entertainment services. See Figure 29 below (right) for Bell's projected subscribership for high speed internet service between 1992 and 2000. The black bars indicate the combined market share of Rogers, Cogeco, Videotron, and other, primarily urban, Ontario cable companies, whom Bell clearly saw as a threat to its DSL rollout in the emerging residential high speed/broadband market.

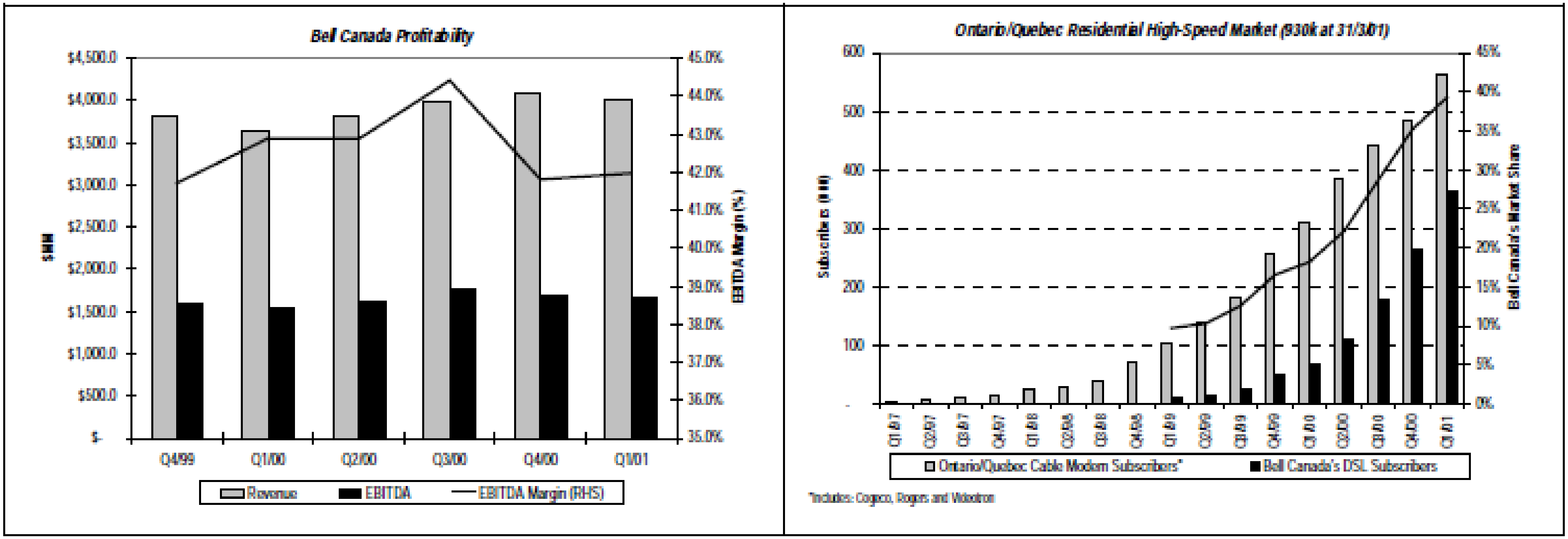

Figure 29: Bell Canada projected high speed subscribership (on Right), and projected profitability (on Left), (Source Bell Canada 1998)

Within its own ecology Bell was thus preoccupied with DSL penetration and cableco competition in the urban markets. Its vision for internet in HCSAs had stopped with the Stentor Alliance's DirePC networking partnership with Industry Canada SchoolNet and the Community Access Program. Between 1997 and 2002, commercial DSL rollout to rural and remote communities was not on the incumbent's agenda[38] for Northwestern Ontario.

This chapter thus describes the government induced public-private partnerships that lead Bell to agree to deploy broadband through K-Net's social enterprise, an entirely different approach to broadband, based on community-ownership and public service applications for education and health (see also Appendices 3 and 4). Government provided inducements, but it was reluctant to take responsibility for the outcomes, or take on a public ownership role. This reluctance created an opportunity for the First Nations and allies in the not-for-profit sector to participate in governance, through the economic management of partnership funds and the socio-technical management of partnership technologies at the local loops. The K-Net governance model is an instantiation and stabilization of that opportunity at this particular historical conjuncture of government's willingness to invest in connectivity and the incumbent's passive role in high cost serving areas. The process of partnerships was certainly mutable, both in terms of the governments' willingness to pay, and the incumbent's willingness to engage/disengage from any K-Net related projects. Nevertheless, it proceeded in K-Net's favour.

[38] Indeed Bell had traditionally never maintained a commercial sales office in Northwestern Ontario, northwest of Sudbury. Bell's taste for Northwestern Ontario changed in 1996 when it merged with Aliant (ILEC for the Atlantic coast). The new company Bell Aliant became Bell Canada Enterprise's Northwestern Ontario service and opened up a commercial office in Thunder Bay (six hours from Sioux Lookout, 20 hours from Sudbury). Northwestern Ontario's key market is in/around Thunder Bay, which is home to North America's largest independent telephone company TBay Tel (with municipal shareholders). Market demand for commodity bandwidth only became serious enough to entice Bell after the province and federal programs invested in cellular telephony and municipal fibre along Highway 7/Lake Superior (from 1997 to 2005). These government investments lead to and complemented the investments around the Sioux Lookout District and allied First Nations, discussed in this chapter, which were, worth pursuing given Bell/Bell Aliant's incumbency and the government's willingness to pay. It showed good faith on the part of the incumbent and boosted its relatively lackluster presence in the region and surrounding ecology of games.

I will thus examine the important conjunctures where the public, private, and not-for-profit perspectives involved in K-Net's ecology of games shaped moments of conflict as well as cooperation.

5.1 The Federal Perspective (Circa 1997 to 2002)

In its 1997 Speech from the Throne, the Canadian government had already committed itself to making "information and knowledge infrastructure" accessible to all Canadians by year 2000, as part of its pledge to make Canada "the most connected nation in the world" (Governor General 1997). This federal commitment became known as the *Connecting Canadians* agenda, and Industry Canada's Information Highway Applications Branch (IHAB) was the government's appointed lead. The 1997 throne speech also emphasized a federal commitment to "expanding opportunities in Aboriginal communities", which was an explicit acknowledgement that First Nations were part of this innovation agenda.

Connecting Canadians was a Liberal party policy initiative that had begun to percolate in 1993 when the Chretien government came to power. Its presence (at least in terms of a semi-consistent bundle of federal programs) would persist through successive iterations until the Liberal government's defeat in 2006 (under Martin). Two subsequent throne speeches during that timeframe, in 1999 and in 2001, further addressed where the government had intended to take its evolving framework of information infrastructure policies. Throughout this time Aboriginal peoples acquired a relatively decent profile, with connectivity programs set aside especially for rural and remote First Nations.

I summarize the higher level policy messages below, to help prepare the reader for a deeper analysis of the Connecting Canadians' approach to broadband governance and its dominant influence on K-Net's evolution in a post-CRTC (99-16) institutional environment. I beg the reader's indulgence to consider these higher level policy statements, as fundamental to setting the stage for a subsequent analysis of their local operationalization under K-Net's social enterprise. I contend that so much of what K-Net became, in terms of its capabilities (examined in Chapter 6) was due to its stakeholders' reactions to Connecting Canadians policy, particularly within First Nations SchoolNet and Industry Canada FedNor, much like (but even more so) K-Net and FedNor's objectives reacted to the climate of the CRTC proceedings on high cost serving areas (97-42), as discussed in Chapter 4. There is however, a lot to take in before one can fully appreciate the ecology of games that Connecting Canadians comprised, and its effect on federal investments in broadband. The high level details thus provide important background information for a deeper look at First Nations SchoolNet and FedNor's activities alongside K-Net's parallel growth, as Connecting Canadians evolved up to 2006[39]. I now continue the federal narrative with the second throne speech from 1999.

In its 1999 Speech from the Throne, the Canadian government committed to "improving Canada's information infrastructure", pledging to (among other objectives):

> Provide increased access to high-speed Internet service for classrooms and libraries and stimulate the production of Canadian multimedia learning content and applications.

This was a time when Industry Canada IHAB's flagship connectivity programs, SchoolNet and CAP, focused federal telecommunications infrastructure investments on public internet access sites. IHAB's First Nations SchoolNet program was the first national effort to introduce internet connectivity in Aboriginal communities (through the classroom). (It also helped to kick start K-Net's technical infrastructure side as discussed in Chapter 3 and Section 5.2 below).

In 1999 the Government pledged that it would become "a model user of information technology and the Internet". In terms of a guiding perspective for infrastructure investment, the throne speech indicated that the federal government's objectives for investing in networks and ICTs had to focus beyond "high-tech companies" to the level of communities (Governor General 1999):

> It is an economy in which all sectors strive to use leading technologies and processes. It is an economy in which rural Canada also benefits from value-added activity, environmentally astute land management, and new job skills and opportunities. It is an economy in which clusters of technology development already exist in smaller

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[39] To reiterate: 2006 marked the defeat of the Liberal government and initiated a freeze on federal connectivity programming, with few exceptions, such as the National Satellie Initiative, during the regime change to Harper Conservatives in 2006-2007. New broadband programming has just begun to take shape in 2009.

> communities all over Canada. Indeed, it is an economy in which technology can lead to greater economic stability for the primarily rural regions in which cyclical resource industries - agriculture, fisheries, forestry, mining and tourism - are the dominant sources of wealth. The Government will encourage the development and adoption of new technologies in all sectors.

To promote this vision beyond IHAB programs such as SchoolNet and CAP, the federal government pledged to work with provinces, municipalities, Aboriginal communities, and the private sector to reach - by the end of the year 2000 - agreements on plans for improving physical infrastructure in urban and rural regions across the country. These plans were to set out shared principles, objectives and fiscal parameters for all partners to increase their resources directed toward infrastructure, focusing on areas such as transport, tourism, telecommunications, culture, health and safety, and the environment (Governor General 1999). Telecommunications thus appeared to be part of a holistic socio-economic ecology, but its promised investments came with no actual technical specifications, such as what leading technologies and high-speed Internet should mean for Canada's citizens or whether there was a minimum standard to achieve. (I grant that a throne speech may not be the most appropriate rhetorical device for conveying technical standards such as line rates and circuit capacities; however my point is that in 1999 nothing in the federal Information Highway policy discourse had furnished a technical standard for "information highways"). What drove the technical side of Connecting Canadians at this time was CAP and SchoolNet's arrangement with the Stentor Alliance to furnish schools and community sites with Direc PC satellite connections. The implicit standard was approximately 400 kbps inbound and 56 kbps (or lower) outbound (see Fiser 2004 and Chapters 2 and 3). It would last till 2001, when the Stentor Alliance disbanded at the same time as the federal government adopted new standards for telecommunications investment and an explicit broadband policy discourse (see Section 5.2 below).

The final stop in this high level tour is the 2001 Speech from the Throne. As in 1999 the federal government reiterated its *Connecting Canadians* agenda, but this time through the specific mention of "broadband". In 2001, a planning committee known as the National Broadband Taskforce (NBTF) released its report to Industry Canada, in which it suggested 1.5 mbps (for two way full motion video) as Canada's broadband benchmark. The NBTF was similar in intent to what Industry had done prior to 1997 with its Information Highway Advisory Council. Also sitting on its board was K-Net Services Coordinator Brian Beaton, who had been invited to participate by Industry Canada ADM Michael Binder (thanks to attention K-Net had gotten through FedNor and IHAB's First Nations SchoolNet and Smart program). The NBTF's purpose was to shape a policy for specific broadband programs. With this in mind, the Governor General's throne speech stated that (Governor General 2001):

> The private sector today is expanding high-speed access to the Internet in many regions. The National Broadband Task Force will advise the Government on how Canadians together can achieve the critical goal of making broadband access widely available to citizens, businesses, public institutions and to all communities in Canada by 2004.

In terms of its fiscal scope, Connecting Canadians was fairly modest compared to other OECD nations with relatively similar population densities (Fiser & Clement 2008). Canada's population density was around 3.2 persons per km^2 between 1997 and 2007. Australia's population density was around 2.6 persons per km^2. By comparison, Sweden's population density was around $20/km^2$. In terms of their densities these three nations are presently ranked 194th (Sweden), 219th (Canada), and 235th (Australia).

Here's how they compared in terms of national connectivity strategies around the time of *Connecting Canadians*: Between 1997 and 2006, the Australian Commonwealth invested over AUD $496.5M for its *Networking the Nation* strategy, which extended network services to rural and regional HCSAs. Comparably, Sweden's *National Broadband* program invested over EUR $564M between 2000 and 2006 to provide affordable, universal access to all of its citizens. Sweden, (total pop. 9M) invested approximately CAD $814M (in 2006 currency values) or CAD $214 per household. Australia, (total pop. 20.4M) invested approximately CAD $507.522M (in 2006 currency values) or CAD $69 per household. Canada, (total pop. 33.39M) invested approximately CAD $600M (in 2006 currency values) or CAD $55. These numbers paint a broad-stroked portrait of investment and portray the federal fund as a monolithic entity that can spread its resources evenly over a national population. Drilling down, one finds that in Canada, relevant federal funding programs had to target specific clusters of constituencies, such as urban, rural, and remote. For governance they depended on partnership agreements at various levels through the official basis of contributions and grants (with informal use of procurement, as I will discuss).

Sections 5.2 to 5.5 below, examine how IHAB's prototypical partnership mechanisms (First Nations SchoolNet 5.2/5.3) coupled with regional initiatives (SLAAMB in 5.4), and exceptional cases of project brokering (FedNor in 5.5). Together, these three approaches shaped the rules for Connecting Canadians program contributions to support broadband deployment in Northern Ontario's First Nations and high cost serving areas. They were all complicit in K-Net's social enterprise, serving as key partners at times when the federal government (i.e., Treasury Board) was hesitant about its role in broadband internet services.

5.2 First Nations SchoolNet: model subsidy mechanism

About a year into the First Nations SchoolNet program, in 1995, Canada was experiencing important developments in connectivity. Canada's incumbent telecommunications service providers were laying fibre-optic trunks across the nation, education networks were emerging in the provinces, and the DirecPC partnership between SchoolNet and the Stentor Alliance was in the works. These forces converged to focus IHAB's attention on the citizen's right to consume information. As Byron James, then chair of SchoolNet's advisory board, proclaimed:

> It means that every Canadian student, regardless of her or his location, will have the means to access the best educational content from all over the world (Industry Canada 1996b).

Throughout the 1990s, inadequate telecommunications infrastructure was a common concern for rural and remote communities/schools, and especially First Nations. Communities were organizing regionally in search of solutions. In Northern Ontario for example, the Wawatay Native Communications Society, with funding from the Ontario Network Infrastructure Program (1994), was investigating connectivity solutions for a number of First Nations that lacked telephone services[40]. In Quebec, by contrast, the Kitigan Zibi Education Council was already relatively well connected, and advancing to become an ISP for its local Algonquin community and the neighbouring town of Maniwaki. This diversity of local realities, which underlay the common concern for rural and remote First Nations connectivity, presented a major challenge for IHAB's national strategy.

From 1994 to 1999, IHAB's overriding concern for rural and remote communities/schools was to prepare them to receive educational content and services. Its initial strategy was to draw support from the provinces (given their jurisdiction over education), and encourage them to expand their emerging network infrastructures to rural and remote communities. The inspiration for that strategy was a successful SchoolNet pilot project in New Brunswick (1993); but it failed to inspire significant participation from the other provinces.

The provinces were amenable to linking urban schools, as urban centres were the starting points and hubs for their emerging education networks[41]. Rural schools had to wait (and hope) for provincial expansion, unless federal or industry partnerships could be found. As for Canada's 615 First Nations bands, their schools' connectivity concerns required a federal response.

First Nations schools are a federal fiscal responsibility (tracing back to Treaty agreements and the formation of reserves). Although school services would have logically been the purview of Indian and Northern Affairs Canada (INAC), the department had no explicit connectivity policy and had little budgetary capacity to serve such a goal if it had wanted. INAC assisted IHAB in identifying communities/schools that had indicated an interest in connectivity, especially those remote First Nations that were off the beaten path, but this took the form of referring SchoolNet to the schools and letting Industry Canada staff sort out the logistics. At this point SchoolNet

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[40] Participating communities included Slate Falls, Keewaywin, North Spirit Lake, Koocheching, McDowell Lake, and Mishkegokamang.

[41] This was no guarantee that urban schools and libraries would be served, but their chances of provincial service were greater than the rest.

managers envisioned their program rapidly converging on the millennium without a national connectivity solution (Fiser 2004).

Then in 1995/96 an unexpected solution presented itself. The Stentor Alliance of Canada's major telecommunications companies (including Telesat) approached IHAB with a proposal to achieve rural/remote connectivity. The new fibre-optic trunks that Stentor companies had laid across Canada enabled the industry alliance to free up excess bandwidth on two satellite channels.

The alliance proposed a partnership with IHAB SchoolNet to provide bandwidth and DirecPC satellite technology (via Telesat) through to the year 2003. The partnership was a massive multi-million dollar undertaking, and it would help the federal government temporarily achieve its connectivity targets at a rate it could never have achieved alone or through piecemeal regional/provincial strategies. The project totaled CAD $16 million from 1996 to 1998 (of which the federal government contributed CAD $4 million[42]). Stentor contributed an additional CAD $3 million from 1998 to 2003 to sustain the project.

The DirecPC technology seemed like it would solve the technical problems that remote First Nations schools faced. Schools did not need to be as concerned about telephone line quality to dial out. In a number of the more remote cases, e.g., in Northern Ontario, Telesat offered MSAT phones (and a flat rate to government) to help communities/schools adopt DirecPC. Industry Canada FedNor and CAP provided extra funding to support K-Net Services in this initiative, allowing it to improvise community networks out of two MSAT phones and a DirecPC connection. Communities/schools paid $30.00 a month for unlimited access (plus regular ISP charges), and could download information at speeds up to 400 kb/s (over the shared bandwidth resource of Stentor's two channels). The technology emphasized downloading, however it gave (primarily children) in remote communities/schools the opportunity to explore the Internet directly. It also gave local technical staff some experience in the operation and maintenance of

[42] FNS spent $7.3 million to cover costs of connectivity from 1994 through 1999 (Industry 2000c: 63).

satellite technology (see SLAAMB in Section 5.4 below). Apart from being able to meet its millennial targets, SchoolNet had found a truly national strategy and avoided having to contend with too many stakeholders.

But this national DirecPC strategy required more from SchoolNet staff than it could handle alone. In 1996, the SchoolNet office consisted of a Manager and three staff members. They loaned the DirecPC technology (along with one computer per school) through a central warehouse in Ottawa. The task amounted to shipping equipment and tracking equipment loans for roughly 420 schools. They were ill-equipped to help schools troubleshoot technical installation and maintenance problems.

Telesat – the national distributor of DirecPC technology – offered to help. It served as a national helpdesk for the project and dealt with schools through a toll-free number from offices in Toronto. SchoolNet staff however, opted to find technicians who had experience working in First Nations communities. The national strategy thus required regional support, and it needed to identify and contract organizations that First Nations could hold a measure of trust in. SchoolNet therefore ran mini RFPs with the National Indian Education Foundation to hire seven regional helpdesks that would maintain regional hotlines and visit partner communities and schools to provide technology assistance (see Chapter 3 for KO-K-Net's local perspective on this development).

The organizations SchoolNet hired were diverse: There was a First Nations Tribal Council (KO in Northern Ontario), a First Nations Federation (Saskatchewan), First Nations education authorities (Quebec, Maritimes), and small First Nations enterprises (Southern Ontario, BC, Alberta, Manitoba). In the case of BC and Alberta the helpdesk (No Limits) was one individual, Ian Cameron, a former truck driver who had grown accustomed to traveling long distances between communities. In 2001 Cameron drove 85,000 km, and put in another 10,000 km by plane, and another 6,000 km by boat (Industry Canada 2002a: 4). In the case of Northern Ontario, Quebec, and the Maritimes, staffed First Nations organizations were providing support, and simultaneously developing further partnerships with IHAB/SchoolNet.

KO, in Northern Ontario, had received CAP funding for 10 sites the year it became a helpdesk in 1996. Kitigan Zibi, an education authority in Quebec had ties to the SchoolNet Advisory Board (via the Assembly of First Nations), as did Mi'maw Kina'matneway, an education authority in Nova Scotia. Both education authorities were exploring other IHAB SchoolNet initiatives such as Grassroots, and the Network of Innovative Schools (to produce web contents, and video experiments). In Saskatchewan, the Federation of Saskatchewan Indian Nations suffered from high staff turnover rates, and was eventually replaced by a First Nations commercial enterprise called TP Technologies in 2002/03.

Notwithstanding some heroic struggles on the part of entrepreneurs like Ian Cameron in BC and Alberta, the not-for-profit institutions proved to program staff that they made a better model for the helpdesk role. The not-for-profits represented constituencies and applied a collective vision to what connectivity could achieve in the communities they represented. They also matched SchoolNet funds with efforts to leverage other government connectivity programs (such as FedNor, and IHAB initiatives such as CAP). Unlike their small business counterparts they were moving well beyond the parameters of a contract-based technical support model. They were building community networks.

As equally important, FNS gave the helpdesks opportunities to improve their technical skills, and trusted them to accomplish and maintain its connectivity targets. One particular example stood out at this time (Fiser 2004). At one point Telesat had to switch the Stentor network to a new satellite system which meant that all the 420 or so DirecPC dishes had to be repositioned. Instead of flying Telesat technicians out to fix the network's dishes, SchoolNet trusted and contracted the helpdesks to get the job done. Their local community technicians did, and proved that community networks could coordinate to help maintain a national system.

5.2.1 Moving beyond the Stentor Alliance's national network

At the same time as the DirecPC technology was rolling out, a greater vision of SchoolNet's connectivity goal was beginning to foment. It can be clearly read in a statement made by Ovide Mercredi, then National Chief of the Assembly of First Nations, in 1996:

> SchoolNet is giving First Nations students access to the information and data that many schools would otherwise not have been exposed to. This project will increase the awareness of First Nations culture, and provide for an exchange of information which will enhance First Nations curricula development (Industry Canada 1996b).

The first part of Mercredi's statement echoed the citizen's right to information, the right to consume; but the second part presented a model in which First Nations communities/schools produced content, and maintained a presence on the internet based on reciprocal exchange. To achieve maximal effect, in terms of two-way multimedia connectivity, this model would require broadband solutions of bandwidth sufficient to carry multiple voice, video or data channels simultaneously (e.g., bandwidth associated with a benchmark of 1.544 Mbps or higher).

In a 2000 study of two-way multimedia connectivity, Industry Canada had presented a model of schools with the capacity to do high-speed Internet access and distance learning (e.g., videoconferencing or audio plus graphics). It was based on a projection that 59% of transmissions would be Internet traffic and 41% would be real-time video or audio. It required a minimum of 538 kbps dedicated access, as a conservative estimate (Industry Canada 2000b).

The DirecPC technology was on loan to schools under a limited agreement with Stentor. That agreement would come to a close on March 2003, if not earlier (as the case turned out to be). The technology worked; but at a top download speed of 400 Kbps (over a satellite resource the 420 or so First Nations schools shared with other IHAB user groups), it fell short of Industry Canada's conservative estimate for a broadband benchmark. Also, around 2000/01 Industry Canada opened up the two satellite channels made available through the agreement, to libraries and urban schools, which significantly curtailed transfer speeds for all. IHAB had to find new options. This time however, FNS had a number of federal and regional partners working in concert on broadband connectivity strategies for First Nations communities (e.g., such as the Ontario, Quebec, and Atlantic helpdesks).

In 2000, the federal government's throne speech presented a vision of broadband connectivity in every community by 2004. In 2001 Industry Canada's National Broadband Taskforce released its June 2001 report, *The New National Dream: Networking the Nation for Broadband Access*, which provided a blueprint for federal broadband programming that was open to community networks. New opportunities presented themselves for remote and rural communities. In Northern Ontario, a number of remote First Nations began working with Industry Canada FedNor and KO to establish local broadband points-of-presence (POPs). In 1999/2000 Industry Canada/IHAB created the Smart Communities Demonstration Project to provide a means for communities to develop local broadband applications. KO won Smart status in 2000, in a competition amongst First Nations, and began developing the Keewaytinook Internet High School and Tele-health services, which required access to videoconferencing and sufficient bandwidth to carry high-speed IP applications (e.g., T1 or beyond). These opportunities also solidified regional partnerships with provincial networks such as the Education Network of Ontario, and Ontario's NORTH Network (for health applications), (Ramirez 2000, Ramirez et al. 2004). Another example of First Nations broadband is the Keewatin Career Development Corporation (KCDC) in Saskatchewan, which also won Smart status in 2000, for its Headwaters Project. Like Keewaytinook Okimakanak, KCDC had solidified multiple partnerships between First Nations communities, provincial networks, and rural and remote communities.

5.2.2 The era of RMOs

Connecting Canadians was originally, in part, a federal response to an international discourse on global trade and the "Information Economy" (Cf. Raboy & Abramson 1999). SchoolNet's connectivity goal was initially packaged as part of Industry Canada's 1994 response to the "global economy":

> SchoolNet, a joint federal, provincial, and territorial initiative, is providing Canadian teachers and students with valuable and exciting electronic services to stimulate the skills needed in the global information economy. Over 4,000 of Canada's 16 500 schools are already electronically connected to the information highway through SchoolNet (Industry Canada 1994b).

During the timeframe roughly between 1994 and 2000, Industry Canada's SchoolNet program worked furiously to implement DirecPC satellite based access for First Nations schools and remote communities. Through these years, they had a minimalist organizational infrastructure and relied on external contractors, such as the helpdesks, to manage the allocation of resources to implement the DirecPC initiative and cultivate relationships with their constituents in the communities/schools.

SchoolNet and its related sub-programs, such as FNS, were originally profiled under an Operations & Management funding envelope. In the case of FNS, the contracts were heavily contingent on negotiations between its staff and available contractors (e.g., the BC/Alberta helpdesk was Ian Cameron). FNS also had to account for one-to-one relationships with each of the 420 or so First Nations communities/schools. It had loan agreements with each of them, and part of their contractual relationship was an obligation on the part of communities/schools to report back on their experiences with the technology. The inability of FNS' small staff to monitor these relationships directly, created gaps in the program's financial accounts. SchoolNet operated in this way from 1993 to 2000 at which point it and similar IHAB programs, such as CAP, faced a significantly alarmed team of Treasury Board auditors.

The Treasury Board audits in 2000 concluded that SchoolNet contracts did not offer adequate accountability for the amounts of money the program was spending (e.g., CAD $7.3 million spent connecting First Nations schools, from 1993/1994 through 1998/1999). Treasury Board intervened and demanded a cessation of SchoolNet's contract based policy implementation. SchoolNet was re-profiled to a system of transfer fund protocols based on an envelope of contribution agreements and grants. The contribution agreements demanded ongoing program monitoring, based on a Results Based Management Accountability Framework (devised in 2001) that narrowed the program's scope to achieving connectivity targets. These program changes required FNS' national office to explore new ways of administering its distribution of funds. If contracts under DirecPC were a pain, any new funding envelope to migrate communities/schools onto a variety of available ILECs and CLECs would be crippling for the national office to handle on its own.

From being a centrally managed contractor and warehouse distributor, FNS had to evolve to enhance the accountability of what, in reality, was a loosely coupled system of contractors and 420 or so First Nation schools. In theory it could use contribution agreements to make these regional networks absorb more program risks and take on more formal monitoring and governance procedures to satisfy Treasury Board. But it had to respect its partners, lest it disrupt the regional networks its staff and helpdesks had carefully negotiated.

Between February and August 2002 FNS began an accelerated transformation. In February and March FNS managers and staff consulted with federal partners (such as INAC) about possible models for distributing contribution agreements. Of the possible program delivery models available, FNS chose a geographical model of Regional Management Organizations (each operated by autonomous organizations external to Industry Canada and the federal government).

From May to mid-June, FNS managers and staff consulted with regional Industry Canada offices and Aboriginal Business Canada agencies to draw up a list of reputable candidates. The RMOs were to be similar to the not-for-profit helpdesks of Ontario, Quebec, and the Maritimes. They needed to be First Nations based, experienced with telecommunications connectivity, and leaders in the socio-economic development of remote and rural communities (preferably with some interest in education initiatives). Through contribution agreements, they would be responsible for distributing and accounting for FNS funds in their respective regions.

As June turned to July, FNS sent out a call for proposals across Canada. Thirty organizations were recommended, of which twelve responded to a request to submit business proposals. With its August deadline close at hand, FNS chose six RMOs to represent its activities geographically. All three not-for-profit helpdesks became RMOs in 2002, given their broad community ties and multiple relationships with IHAB/SchoolNet and other federal departments such as INAC and HRSD[43]. Three other organizations of similar stature or ambitions joined them.

Through this schema there came to be one RMO for each province (except the Atlantic regions which share Mi'maw Kina'matneway and Saskatchewan-Alberta which share KCDC[44]). The RMOs included tribal councils (Ontario, Manitoba), First Nations education authorities (Quebec, Maritimes, BC), and a not-for-profit skills training centre (Saskatchewan-Alberta). Their organizational structure was similar, based on not-for profit community intermediaries that operate between First Nations and settlers, to promote social economy initiatives such as adult education, literacy, social work, and access to information communications technologies.

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43 Kitigan Zibi being absorbed by the broader Conseil en Éducation des Premières Nations, which officially became the RMO for Quebec.

44 In 2009 KCDC pulled out of Alberta to be replaced by TSAG.

Upon accepting its role under SchoolNet for 2002/2003 and 2003/2004, each RMO was put in charge of the disbursement of contributions and grants to communities/schools in its region. The initial contribution agreements, signed in December 2002 were as follows:

British Columbia: First Nations Education Steering Committee - $1,449,500
Saskatchewan-Alberta: Keewatin Career Development Centre - $1,430,795
Manitoba: Keewatin Tribal Council/Broadband Communications North - $905,125
Ontario: Keewaytinook Okimakanak, K-Net Services - $1,549,770
Quebec: Conseil en Éducation des Premières Nations - $582,310
Atlantic: Mi'maw Kina'matnewey - $461,000

At this time, the FNS program and its helpdesk partners had described the nationally shared bandwidth of the DirecPC solution as "being equivalent to dialup in peak periods" (Drouin 2002). Each RMO's main task was to account for First Nations school connectivity in its region and help schools identify and fund broadband connections (see Figure 30 below, for a map of FNS's DirecPC network in Ontario, circa 2002). The initial breakdowns in 2002 were as follows:

British Columbia: 153 schools/108 connected, 54% on DirecPC (nationally shared bandwidth), Average school population: 50 students

Alberta: 82 schools/61 connected, 75% on DirecPC (nationally shared bandwidth), Average school population: 200 students

Saskatchewan: 89 schools/80 connected, 9% on DirecPC (nationally shared bandwidth), Community Net providing 90% connectivity to schools, Average school population: 250 students

Manitoba: 65 schools/53 connected, 88% on DirecPC (nationally shared bandwidth), Average school population: 200 students

Ontario: 136 schools/103 connected, 79% on DirecPC (nationally shared bandwidth), Average school population: 100 students

Quebec: 48 schools/40 connected, 50% on DirecPC (nationally shared bandwidth), Average school population: 175 students

Atlantic: 32 schools/30 connected, 43% on DirecPC (nationally shared bandwidth), Average school population: 80 students

The transition to RMOs eased the pressure off FNS' national office. The RMOs created more stable and more frequent interactions between FNS and regional interests (e.g., First Nation

Schools, communities, tribal councils, and Political Territorial Organizations such as Nishnawbe Aski in Northern Ontario). They were more fluent in the sociopolitical discourse of their regional counterparts (at the PTO, Tribal Council, and community based levels). They had networks of contacts at regional and community-based social economy organizations, and many had established ties with their community constituents. Many of the RMOs' managers and workers lived in proximity to the communities they serve. Many of the RMOs also had close links to provincial and First Nations education initiatives as well as other public service initiatives in health, policing, and human resources development. They also worked with regional Industry Canada offices, such as FedNor in Ontario, or Villages Branches in Quebec, to access connectivity partnerships across federal departments and other levels of government to support the growth of community networks. The RMO structure did not emphasize any particular ownership model. As I discussed in Chapter 1, the 2009 INAC connectivity data indicates a range of options being pursued under First Nations SchoolNet. Groups like KO and KTC/BCN in Manitoba pursued social enterprise options to secure local loops for their remote northern constituents. Others, such as the RMOs in Saskatchewan, BC, and the Atlantic provinces found it easier to deal with their respective ILECs. The rest found some middle ground between locally or regionally owned community networks (under First Nations authorities) to commercial agreements with ILECs and CLECs.

In Chapter 3 I examined how KO, the Ontario helpdesk and later RMO, developed its first iterations of K-Net's regional network of community networks, through its SchoolNet work and connections with the Northern Ontario – Telecommunications Infrastructure – Working Group (see also Chapter 5). In Chapter 6, Section 6.3.4, I examine how KO-K-Net Services social enterprise has integrated First Nations SchoolNet program contributions into K-Net's broadband community-based networking strategy, alongside telemedicine and other programs. See Figure 30 below for an overview of the FNS networks that had become K-Net community-networks by 2002 (K-Net is labeled 1). (The map is intended to give a summary impression. Please refer to the map keys and tables in Appendix 7 to make particular identifications of the communities).

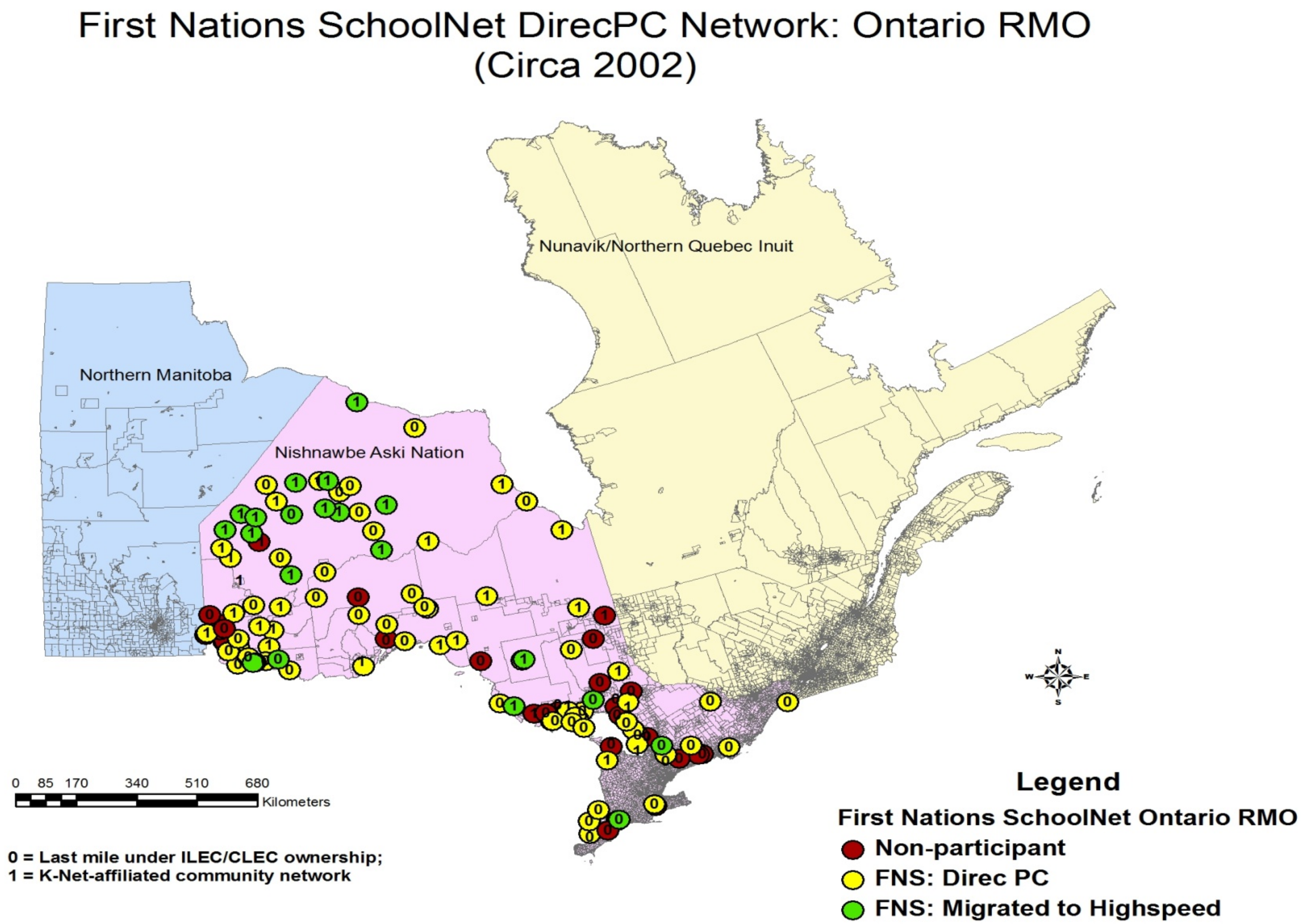

Figure 30: First Nations SchoolNet Direc PC/broadband network and K-Net, in Ontario (circa 2002)

5.3 IHAB and Connecting Canadians

IHAB contribution programs, such as the Community Access Program and First Nations Schoolnet transferred funds through partnerships that primarily targeted not-for-profit organizations or other levels of government as program recipients. CAP was the leading connectivity program under Connecting Canadians. It created public internet access sites in libraries, community centers, and other public facilities where communities could have free and open access to the internet. First Nations SchoolNet was the leading Aboriginal connectivity program under *Connecting Canadians*. It focused on enabling internet connectivity in First Nations schools.

In 2004 I interviewed IHAB managers and program staff who were, or had been, affiliated with First Nations SchoolNet (Fiser 2004). My interview participants included:

1. a senior policy advisor at Industry Canada SITT (and former FNS program manager, circa 1999 (IHAB interview 2004a);
2. SchoolNet's former connectivity manager who guided the technical design of IHAB's connectivity partnerships within the 1994 to 2004 period (IHAB interview 2004b).
3. a former First Nations SchoolNet manager who guided the program during its critical transition to transfer payments in 2002 (IHAB interview 2004c);
4. SchoolNet's Director until 2006 (IHAB interview 2004d);
5. First Nations SchoolNet's current manager since 2002 (IHAB 2004e);

This research became Working Paper No. 1 (Fiser 2004) under the Canadian Research Alliance for Community Innovation and Networking (CRACIN), which funded and supported my research on K-Net between 2003 and 2007 (see Chapter 1 and Appendix 1). Additional stakeholder meetings through CRACIN (2004 to 2007) introduced me to the perspectives of various IHAB program managers and senior advisors. Fieldwork on K-Net introduced me to First Nations SchoolNet and FedNor program staff responsible for the Northwestern Ontario region where K-Net's primary constituency resides. Recurring meetings throughout the 2005, 2006, 2007, and 2008 inform my perspective in this chapter.

My IHAB interviews indicated that IHAB's approach was consistent with the government's stated objective in 1997 to use partnerships to deliver programs and "break down silos within and between governments" (IHAB interview 2004a). At its peak over 200 individuals worked within IHAB (circa 1999). The salary budget for the 1999-2000 fiscal year, including student internships, was approximately CAD $6.7 million. For the 1998-99 fiscal year, it was almost CAD $8 million. Base funding for the Branch covered the salary for only 39 full-time indeterminate positions. The rest were various forms of contractual labour.

The relatively short duration of IHAB funded programs (typically 3-4 years maximum at a time), also led to the programs' use of secondments and term employees. These practices created what IHAB managers perceived to be an unstable environment, as employees tended to move to more stable funding opportunities when they arose. The high degree of turnover and a reliance on external contractors to disburse funds, and monitor ICT deployment, threatened to disrupt IHAB's ability to learn from its interactions with stakeholders and maintain continuity with potential partners.

From Treasury Board's perspective, external contractors, such as the helpdesks and CAP site coordinators, were less aware of the federal policy requirements associated with contracting and program delivery. Moreover, IHAB program staff members were especially unseasoned in the use of contribution agreements. Yet, Treasury Board recognized that partners, because of their lack of familiarity with government norms in delivering these types of innovative programs (new to Canadian policy), could be more flexible, and possibly, better able to identify alternative methods to achieve desired program objectives such as connectivity in high cost serving areas. The FNS helpdesks provided credence to this claim and gained the respect of upper level management and assistant deputy ministers (as Brian Beaton's invitation to join the National Broadband Taskforce can attest). Organizations such as KO-K-Net, and the other First Nations SchoolNet helpdesks and later RMOs, were looked upon as policy drivers, particularly in the remote First Nations were IHAB officers were particularly inexperienced, both with Aboriginal issues and ICT deployment.

IHAB's fast pace to achieve vague connectivity targets such as "the most connected nation in the world", created a constantly changing program environment. No federal department had tried to "connect all Canadians" before, or even knew what that meant, and IHAB program staff found it difficult to predict relevant outcomes before Treasury Board, especially in the short term. In such an environment, detailed long term planning (more than a few months in advance) was problematic. Events related to program investments did not unfold in a predictable manner. Any number of events, such as potential partners taking longer than anticipated to arrive at a decision, or delays in the approval process at all levels with respect to program design and implementation, had a significant impact on planned program timelines.

IHAB programs did not fit the typical federal policy schedule. As recounted by my IHAB interviewees, under a typical federal policy schedule, which tends to have a relatively long lead-time, the funding/resource allocation process starts in September (prior to next fiscal year). Though it reduces overall administrative requirements, a long lead time makes it difficult for program staff to be flexible with allocations, after they have provided initial projections. For IHAB, this type of rigid scheduling proved to be a relentless challenge. IHAB staff had to take actions to ensure their program objectives continued to advance while, at the same time, trying to minimize the amount of funds that would lapse (and become unavailable to partners over the life of the program). The saying "March madness" was particularly poignant for staff at CAP and SchoolNet, who sometimes used advances at fiscal yearend (i.e., March) to maintain continuity with their partners' local ICT initiatives during the budgetary gap between March and September.

The 2000 federal audit of IHAB's activities indicated that by 1999, Treasury Board was cognizant of IHAB's challenges and particularly critical of the branch's ability to govern partnerships (Industry Canada 2000a). The 2000 federal audit concluded that IHAB programs had become preoccupied with finding results, and that the pressure to create results, coupled with IHAB's limited resources, and dependence on partners, to achieve program results, translated into what the audit interpreted as an over-reliance on partners and too great an acceptance of partner risk.

IHAB had developed a distinct organizational culture within Industry Canada, which had grown around the particular influence of its Director General at the time (Doug Hull). As a senior policy advisor to Industry Canada and a former FNS manager put it: "Hull was a renegade and visionary leader. So often a lot of the policy was in his head, i.e., 'I have an idea. Can you make it happen?'" (IHAB interview 2004a).

Time was a premium within IHAB. Managers and program staff felt that they rarely had enough time to stop and confirm internal requirements for policing contracts and partner agreements. Treasury Board concluded that the high number of contractors operating in the role of program officers, and the programs' dependence on not-for-profit community intermediaries to mobilize program investments, had left the program without a set of core policies (Industry Canada 2000a). As the senior policy advisor put it (IHAB interview 2004a):

> The branch was always seen as the social face of a very economic oriented industry department. It was a value-added we provided, that IHAB had developed community networks through CAP and First Nations SchoolNet and supported partners that worked directly with First Nations and other communities to make the information highway something tangible. But we forgot to examine how we fit into the broader Industry Canada mandate within the broader government agenda. We were more concerned about external stakeholders and what they thought of us and how we were meeting their needs, as opposed to balancing that with how well we were responding to our own internal stakeholders, the rest of the department, and the rest of government.

5.4 SLAAMB: A regional human resource development strategy for K-Net's social enterprise and First Nations community networks

As one of IHAB's many external partners, KO was willing to take its program partners down a path of its own choosing. This was particularly evident in the ways that KO-K-Net Services deftly linked different IHAB programs together and with other opportunities to build community networks. (Ramirez (2000) likened K-Net's facility for using programs, to an ingenious builder with a set of Lego blocks). Particularly important was how KO-K-Net Services complemented the deficiencies of one program with strengths from another.

In a letter to NOWG partners at the Sioux Lookout Aboriginal Area Management Board, dated February 17, 1997, KO Tribal Council's Director, Geordi Kakepetum saw an important gap in IHAB programs such as First Nations SchoolNet. This was how to match the technological infrastructure with relevant human resources. Kakepetum wrote:

> As Federal government departments such as Industry Canada develop the upcoming SchoolNet connection to the Internet, it is essential to develop complementary initiatives to ensure usage of these systems in remote areas inexperienced in the technology (SLAAMB proposal Fed97).

In his letter, Kakepetum proposed a Computer Technician Training program to help Sioux Lookout District First Nations develop capacities to manage and maintain their evolving computer-mediated communications systems. His target program was the Sioux Lookout Aboriginal Area Management Board, a regional distributor of Human Resource Development Canada funding.

With SLAAMB, KO-K-Net Services made a significant contribution to ICT skills development in Northwestern Ontario First Nations (See Appendix 6 for a closer look and personal views from various program participants). Through its employment and training programs, SLAAMB assisted some of Ontario's most remote and impoverished First Nations to advance social enterprise and personal employability. Through its partnerships with KO-Net Services, SLAAMB has been a regular supporter of ICTs for education, skills development, and employment. In doing so, it provided KO-K-Net Services with the labour pool its community networks required to maintain ownership and control over local loops, and perform technical work to maintain K-Net's satellite network infrastructure.

In this section I provide an overview of SLAAMB's partnership with KO Tribal Council and K-Net affiliates, focusing particularly on SLAAMB's participation in K-Net projects across a timeline of seven years (from 1996 to 2002). The overview will demonstrate how SLAAMB has contributed to key areas in K-Net's growth, including new solutions for distance education, skills development for community computer technicians (CCTs), and technology transfer to communities. This human resource dimension was critical in helping KO-K-Net present a viable and credible bid to manage community networks through social enterprise, and acquire substantial IHAB, FedNor, and other contribution agreements to do so.

5.4.1 Origin: "Stay in school" Bulletin Board System

In 1994, KO approached SLAAMB with a project idea. The Chiefs of KO's six constituent communities had identified a need to support initiatives for First Nation student retention in the education system. They came to SLAAMB with a resolution to undertake a Stay in School initiative based on a radically different model of computer-mediated-communications, the Bulletin Board System (BBS).

With SLAAMB's critical funding support participating communities received a computer, a modem, and software to operate the BBS, as well as software to create documents, spreadsheets, graphics, and the like. The outcome of the project was K-Net BBS, a distributed communications network that enabled participating communities across the region to join various conferences and discussions over the BBS.

The impact of K-Net reverberated throughout the region. From an initial investment in six communities, SLAAMB and KO attracted further support and interest until all 24 First Nations in the Sioux Lookout district were networked through K-Net. All of this happened in the span of a year (between 1994 and 1995). With more participants the scope of the program also expanded. The modularity of the BBS empowered community members to push the boundaries of the tool's initial purpose as an institutional support system. There were conferences specifically targeted at students, teachers, parents, police, health personnel and support staff. There were sharing sessions such as "Ask a Cop", were community members could ask a regional police services representative for legal advice. Other sessions included tutorials about financial auditing, computer systems maintenance, word processing, community profiles, Ministry of Education updates, and workshops for Band administrators and O&M personnel. There were also freeform public discussion forums, such as the virtual Coffee Shop, were the public at large could dial in and chat about topics such as winter road conditions, forest fires, sports, politics, and even geese. K-Net also gave the communities their first taste of email, a tool which would become indispensable in many communities where analog telephony was an expensive luxury.

The atmosphere of the BBS was warm and convivial, but at times also spirited and raucous. It reflected the dynamics of the communities' own organic constitution. It was a community network that reached across the isolation and distance of northwestern Ontario, binding facets of work and recreation into a virtual mosaic of personal interests and collective needs.

Without SLAAMB's willingness to accept the KO Chiefs' resolution in 1994, and the commitment of critical funding dollars it made to support the initial six community pilot project, K-Net BBS and its constituents would not have been prepared for the growth they would achieve later down the line.

5.4.2 1996: Community computer technician training

The implementation of K-Net BBS required a transfer of technology and skills to First Nations who had had very little exposure to computers or digital networking, either conceptually or in practice. Band Councils in the communities had also expressed a preference to have community members administer the technology, and looked forward to the employment, training, and education opportunities offered by the BBS. The question was how to mobilize technology transfer in a way that was decentralized and responsive to local needs when community members had very little experience with the technology.

In the beginning K-Net Services staff visited round the communities to conduct training workshops with point persons in the communities, such as teachers and school staff. Through these visits, K-Net Services staff learned that the communities needed a new professional position to support the various applications that were growing out of K-Net BBS. Although they generally appreciated the BBS, Teachers and school staff had other professional priorities and were not able to dedicate enough time to learn about the technology to be able to train community members. Someone had to be responsible for the computer workstation, the modem, and related peripherals. Someone had to be responsive when phone lines failed to work, or when users faced technical challenges. These early growing pains imprinted on the communities to take infrastructure ownership and control seriously. Given their remoteness, no one else would be available 24/7 to do it for them.

The communities also needed a computer technician who could understand and sympathize with life in a remote First Nation. They thus needed their own members to take the initiative and lead by example. During their implementation of the BBS, K-Net Services staff had made contacts in each community with members who were keen to learn more and share what they had learned with others, through informal social networking.

K-Net Services saw potential in these champions, but also needed to subsidize their learning by doing, to help them make a professional vocation of their interests. To this end, KO Tribal Council approached SLAAMB with a Community Computer Technician Training project in 1996.

When KO Tribal Council first developed the Community Computer Technician concept (back in the spring of 1996), they hoped to provide an employment/training opportunity for a young person, recently out of school, with a strong interest in computers and communications. With these simple qualifications, and the critical financial contribution of SLAAMB secured, they envisioned providing each participant with the skills and support required to develop their own computer service business, a local enterprise, over a two year period. In late 1996, when KO Tribal Council approached Sioux Lookout district First Nations with their proposal, they quickly received sixteen Band Council Resolutions indicating support for the social enterprise. They were therefore confident that the communities were behind them in creating this new opportunity, that would also help the communities with the collective and personal challenge of owning and controlling an expanding roster of information communications technologies (both software and hardware based).

After the CCTT project started, KO and SLAAMB got a better sense of what they were up against. The majority of the participants had very little computer experience before starting the project. As a result, both the training objectives and the projected outcomes were changed to accommodate the needs of the participants. Aspiring computer technicians needed room to explore and test their inhibitions (See Appendix 6 for some personal reflections of the participants, courtesy of KO-K-Net Services). More emphasis was placed on skills and career development throughout the phases of the project to help participants see a vision for a local ICT enterprise (e.g., computer repair girl, IT guy, etc.). In their responses to the training in mid 1997, all the project participants reported a desire to continue working in the field, if any job opportunities became available. Meanwhile, a number decided to carry on with their informal learning, and developed an entrepreneurial base by repairing community equipment and personal devices (as more would become available over the years).

Employing the CCTT trainees to undertake technology transfer was the second major component of this KO/SLAAMB initiative. KO-K-Net Services could not afford to let them go out on their own. It needed them to expand First Nations SchoolNet, CAP, and other programs that were beginning to flow through its organization.

The trainees spent a lot of time throughout their SLAAMB projects helping other community members use their computers and software. They gained insight into customer relations, on the spot troubleshooting, and learned to rely on each other for technical advice over the BBS. As a result of these efforts the number of K-Net users increased and a new professional class of computer technicians began to emerge and embed itself in the communities as a career trajectory in the communities.

The third major component of the CCTT program was to provide an integrative platform for future computer networking initiatives and bolder technologies. Beginning in 1996, Industry Canada, FedNor, Indian and Northern Affairs Canada, Human Resources Skills Development Canada, the Northern Ontario Heritage Fund, and other federal and provincial partners initiated funding programs to increase and enhance connectivity in remote First Nations. They were responding to the federal *Connecting Canadians* agenda. Thanks to SLAAMB's pioneering investments, these centrally managed programs benefited from the presence of trusted computer technicians already established in the communities, as previously discussed under First Nations SchoolNet (FNS) in Section 5.2.

In 1997, several First Nations with the support of FNS, placed summer students under the supervision and tutelage of the local computer technicians hired under the CCTT project. The computer technicians in turn were able to gain experience from supervising and training the students. Later that year, eight First Nations received funding from Industry Canada's Community Access Program (CAP) to establish local computer access centres. The computer technician for each of these communities was appointed to take the lead to develop and promote these centres. The technicians' task also involved developing the skills necessary to provide Internet support services, such as information search, web design, virus detection, and the like. Each of the CAP sites also received funding to hire additional summer students who were busy providing programs for local young people, organizing a local computer camp, and developing

Internet web pages containing information about their communities. In most of the participating First Nations, these local initiatives and staff were supervised by the “veteran” computer technician.

From 1996, SLAAMB sponsored five years worth of training and employment through KO’s Community Computer Technician Training model. KO summarized outcomes of SLAAMB’s critical investments, as follows (See Appendix 6):

1. Computer equipment and offices established by technicians in each community;
2. Software and hardware training materials distributed and used in each community;
3. Development of computer support service established in each community in cooperation with K-Net Services staff;
4. Increased use of computer equipment by community members;
5. Computer communications via K-Net bolstered literacy skills and provides a means for community members and service staff to share information and experiences across remote and distant First Nations;
6. Recognition that the development of a community-based computer service requires a proactive strategy to support leadership in the communities;
7. Planning, development and implementation of a strategy to support the local administration and increased use of computers in the communities.

The increased usage of the K-Net BBS and other computer technologies for both communication and production placed a great demand on all First Nations to identify ways to support the effective use of their new technologies. SLAAMB helped set an example. Its staff employed K-Net BBS as a platform to deliver employment and training. SLAAMB also employed K-Net BBS to distribute training materials, provide troubleshooting support, and keep in touch with the project participants on an ongoing basis. These activities went on until roughly 2002.

5.4.3 2002 and beyond: Developing broadband network technicians

As K-Net grew in size and scope, from a regional BBS in the Sioux Lookout district to a Wide Area Network (WAN) across northern Ontario, KO-K-Net Services continued to rely on SLAAMB for investments and sociopolitical support. SLAAMB’s board was constituted by the 24 elected Chiefs of the Sioux Lookout District. It was a wonderful venue for KO-K-Net

Services to get its vision and social enterprise principles across to influential community members.

The transformation of K-Net into a WAN was made possible through a series of federal, provincial, and ILEC partnerships (see Chapter 3 and Appendices 3 and 4). The years from 1998 to 2003 saw a rapid redevelopment of northern Ontario's telecommunications infrastructure brought on by partnerships with Bell Canada, FedNor, First Nations SchoolNet, Human Resources Skills Development Canada's Office of Learning Technology, Northern Ontario Heritage Fund, and Industry Canada's Smart program, among others. Amidst this massive infrastructural change, KO-K-Net Services turned to SLAAMB for funds to upgrade the CCTT model.

Local loops had now become an issue of ownership and control. Computer technicians needed to learn more about local and wide area networking, and how to manage community networks of routers and switches that linked their schools, offices, health clinics, and other community facilities together. (There was also the promise, down the line, that households would be connected, and that local enterprise could secure a foothold for itself through internet service provision).

By 2001, technicians in KO communities were managing a variety of local area networks in schools, nursing stations, Band Offices, and in the homes. They were also becoming exposed to higher bandwidth technologies such as videoconferencing units and IP phones. The community of Slate Falls, for example, completely abandoned the concept of a Plain Old Telephone System (POTS), for Voice-Over-IP (VOIP) to the home. Local enterprise in that instance works through the community's First Nations authority, which retains technical staff trained through the CCTT programs (Seibel 2005a, 2005b).

With its technological infrastructure making leaps and bounds in only a few short years, it became evident to KO-K-Net Services that another cycle of training and employment needed to be undertaken to help the communities stay on top of the tremendous infrastructural change and growth that was taking place.

KO went to SLAAMB in 2002 with a proposal for a 40 week Network Technicians Training course. The project was to be a true district-wide initiative for all 24 First Nations. The participants remained in their own communities doing the work and receiving the training support required to develop new employment skills. The majority of the funds from SLAAMB went directly to the participating First Nations in the form of wages and training resources which were then used to benefit other community members and support the development of local social enterprise. The training format of computer mediated communications over K-Net also created new human resource capacities in the communities. It encouraged and supported (KO-SLAAMB 2002):

1. Peer-to-peer sharing and mentoring between "veteran" technicians and new recruits;
2. Reduced travel and accommodation costs;
3. Expanded opportunities for knowledge management over the Internet, including online tutorials, testing, and virtual consultations by K-Net Services staff (e.g., via email, videoconferencing, etc.);
4. Cooperative learning by virtual teams and communities of practice amongst all the project participants.

Through the progressive programming that SLAAMB and KO provided throughout the 1990s, the district First Nations had a means to develop local computer literacy and telecommunications management capabilities. SLAAMB's support for the 2002 project further enabled Sioux Lookout district First Nations to take ownership and control over broadband telecommunication services that would not have been available to them without social enterprise. Social enterprise in turn, would not have been possible without SLAAMB's support of KO-K-Net Services' vision to establish a new profession of computer and network technicians in the communities. The willingness and tenacity of the community members' themselves made that possibility a reality.

5.5 Summarizing the investments (circa 1998 to 2007): Who funded K-Net's social enterprise?

The patterns of investment that informed K-Net's broadband deployment (circa 1998 to 2007) follow a particular set of tactical decisions and strategic relationships. I have singled out FNS and FedNor as important federal partners of K-Net. I also examined the role of SLAAMB and CAP in seeding the skills, organizational capabilities, and technologies needed to grow community networks in the mid-1990s. This section reveals the complementary funding patterns and their impact on the regions of K-Net communities. What appears is that K-Net's complete community networking model is regionally localized to the Sioux Lookout District, in spite of the network's reach beyond.

5.5.1 Public Sector

What the funding patterns clearly show is that K-Net's broadband expansion required an external actor to catalyze innovation. This actor, Industry Canada, did not have an entrenched approach to funding First Nations and tribal councils. It was lead by a *Connecting Canadians* agenda, an expressly telecom and computer-mediated service agenda. As we know from examining the policy directives of Industry Canada's First Nations SchoolNet program (Fiser 2004), successful capital investments and program funds were measured in terms of the numbers of First Nations schools connected, and in student to computer ratios. Unlike INAC and Health Canada's complex formulae, which related to quality of life in First Nations, their health, education, and living standards, Industry Canada's goals could be more clearly demonstrated materially. Accountable materiality in the latter case means network uptime and other precisely quantifiable measures of technological performance (FedNor, personal communication). Accountability in the former cases means considerable controversy, as lives and livelihoods are factored into an account of technological impacts on quality of life (Fiser & Luke 2008). While computers on reserves have gotten moderate press, between 2002 and 2007 it was contaminated drinking water, overcrowding, and teen suicide rates that raised the profile of Aboriginal communities in the mass media (Cf. Brown 2005). As INAC and Health Canada had to play catch up to these more pressing social concerns, their focus on ICTs may have also been diminished. Industry Canada thus played a pivotal role in K-Net's development and in the deployment of broadband to remote Aboriginal communities.

As part of my CRACIN research with Keewaytinook Okimakanak Research Institute and K-Net Services, I examined KO Tribal Council's financial audits from 1998 to 2007. My objective was to discover possible funding preferences amongst the various government programs that have supported K-Net's development within that timeframe.

Tables 12 and 13, below, summarizes the accumulated K-Net specific investments that federal, provincial, and regional actors made from 1998 to 2007. Table 12 provides a paired samples T-test to validate my hypothesis that federal, provincial, and regional investment patterns were significantly different.

Paired Samples Test

Statistics	Pair 1 Federal - Regional	Pair 2 Federal - Ontario	Pair 3 Regional - Ontario
t	4.862	5.399	3.026
df	59	59	59
Sig. (2-tailed)	.000	.000	.004

Table 12: Paired T-test to assess significant difference between federal, provincial, and regional investment patterns

The paired T-tests in Table 12 indicate that there is a significant difference between how the federal, provincial, and regional actors invested in K-Net.

Table 13 describes what their investment patterns are, and qualifies how they differ. In Table 13 the following funding categories are reproduced from KO's audits. In order of appearance they include:

1. Capital expenditure: includes local loops, backhauls (radios, satellite dishes), routers/switches, as well as videoconferencing equipment, peripherals, and personal computing devices

2. Jobs and Training: Pertains to the employment and training of K-Net Services staff. Also pertains to the employment and training of community intermediaries in partner First Nations, and in administrative units operating outside of K-Net Services, (but within KO), who manage K-Net-based applications such as KO's internet high school, and telemedicine project. This category also includes periodic project funds to support and train employees in public internet access sites, and telecenters. Includes funding from SLAAMB, CAP, and First Nations SchoolNet, among others.

3. K-Net Administration: Administrative fees levied by KO-K-Net Services' business unit.

4. Connectivity related operational: This includes the all important connectivity fees such as internet access charges and common link charges for shared network services (see Chapter 6 for a full explanation). Presently it is dominated by federal programs (see Table 13 below).

Investments Categories	**Investment Totals (rounded, in millions)**	**Regional**		**Provincial**		**Federal**	
		Contribution and (% within)	% of Investment Totals	Contribution and (% within)	% of Investment Total	Contribution and (% within)	% of Investment Total
Capital Expenditure	$11.30	$1.4 (19%)	12%	$1.3 (45%)	12%	$8.6 (22%)	76%
Jobs and Training	$19.64	$2.4 (33%)	12%	$0.743 (26%)	4%	$16.5 (41%)	84%
K-Net Administration	$2.29	$0.65 (9%)	28%	$0.24 (8%)	10%	$1.4 (4%)	61%
Connectivity related operational	$11.27	$2.7 (37%)	24%	$0.47 (16%)	4%	$8.1 (20%)	72%
Professional Fees	$5.40	$0.15 (2%)	3%	$0.15 (5%)	3%	$5.1 (13%)	94%
Total (Rounded)	$49.90	$7.30	Read across	$2.90	Read across	$39.70	Read across

Table 13: Comparing Regional, Provincial, and Federal investments in K-Net, by investment focus and total contributions (circa 1998 to 2007)

Table 13 indicates that federal programs were the largest contributors to K-Net's capital development and operations. Together, their totals exceed the combined total regional and provincial contributions by a multiple of 3.8. Table 14 below analyses these federal actors by comparing their total contributions alongside Ontario's total contributions.

Investments (in Millions)	CAP	FNS	FedNor	Smart	INAC	Health	Ontario
Capital Expenditure	11%	27%	63%	16%	5%	7%	45%
Jobs & Training	80%	13%	7%	44%	77%	59%	26%
K-Net Administration	1%	4%	4%	1%	4%	4%	8%
Connectivity related operational	1%	31%	3%	25%	13%	29%	16%
Professional Fees	7%	24%	23%	14%	1%	2%	5%
Total (Rounded)	$1.76	$9.54	$6.49	$3.98	$7.29	$9.84	$2.90

Table 14: Comparison of Federal program and total Ontario investments in K-Net by investment focus (% within) (circa 1998 to 2007)

In terms of capital development, the critical question of K-Net-community local loops, FedNor is the overwhelming leader at CAD $4.1M (63% of its contribution), followed by First Nations SchoolNet at CAD $2.6M (27%), and provincial investments under the Northern Ontario Heritage Fund (NOHFC) and NorthNet (together at CAD $1.3M). NOHFC is a regional development organization similar to FedNor[45]. It followed FedNor's lead in supporting K-Net community network builds (Fiser & Clement 2008). NorthNet was responsible for the province's early telemedicine network and provided a small amount of funding for equipment (Fiser & Luke 2008). Its contribution is mainly for jobs and training, See Table 15 below.

[45] Since 1999, Industry Canada FedNor's Northern Ontario Development Program has invested over CAD $25M to improve telecommunications/ICT infrastructure in remote communities that would not otherwise have a chance of making a business case before their incumbent local exchange carrier. In Chapter 4, I examined FedNor's investments in support of the NOWG and other Aboriginal groups leading up to CRTC (99-16). Such investments have been part of a more comprehensive community development envelope to Ontario that has, between 2003 and 2006, invested over CAD $160M in Northern Ontario projects, and brokered close to CAD $400M in partner funds (FedNor 2007). See also appendices 3 and 4 below.

Investments (in Millions)	NOHFC	NorthNet
Capital Expenditure	74%	4%
Jobs & Training	16%	52%
K-Net Administration	1%	0%
Connectivity related operational	5%	34%
Professional Fees	3%	10%
Total	$1.62	$0.87

Table 15: Provincial investors by investment focus (% within) (circa 1998 to 2007)

True to its role as a subsidy model for connectivity, First Nations SchoolNet (FNS) is more evenly distributed, playing a role in smaller capital development projects (such as multimedia workstations) and subsidizing operating expenditures (such as internet access fees). The Connecting Canadians Smart project played a similar role in KO's six member communities (Ramirez 2000; Ramirez et al. 2004), with a greater emphasis on jobs and training for community broadband technicians. It was in that respect, a short-term, (roughly four year) version of CAP, with close to four times the funding base (see Table 14, page 208 above).

Though outside the scope of this thesis, it is worth comparing FedNor's singular, and pivotal role, in K-Net's capital development with the funding patterns of INAC and Health Canada. Funds from the latter government players overwhelmingly went to support the KO-community intermediaries that operate K-Net's applications in education (INAC) and telemedicine (Health). INAC Education funds enable KO's internet high school to employ teachers, classroom assistants, and an administrative staff (Fiser et al. 2006). Health Canada funds enable KO's telemedicine project to employ an administrative staff and community telemedicine coordinators (Fiser & Luke 2008). Health Canada, although not major contributor to capital development, has been a substantial contributor to K-Net's operations funding base. As will be examined in depth in Chapter 6, its contribution to other operational was CAD $2.8M, roughly a CAD $100K short of First Nation SchoolNet's contribution through its connectivity subsidy (at CAD $2.9M during the 1998 to 2007 period).

In their profile as regional investors, the First Nations, Tribal Councils, and associated community-based organizations behind K-Net contributed approximately 15% to K-Net's budget between 1998 and 2007. Though outmatched by their federal counterparts they are the second largest set of investors.

When we break the regional category down to its component actors we find that KO is the lead investor, followed by SLAAMB, the C-Band public benefits fund (see Chapter 6 and Appendix 3), and independent First Nations. KO's contribution to K-Net is primarily through Wages and Benefits to its staff members. As already discussed in Section 5.4, SLAAMB's primary contribution is to jobs and training. The Public benefits fund is derived from K-Net's C-Band satellite user base and will be explained in Chapter 6. Finally the First Nations constitute the smallest share of K-Net's regional contributions. The largest portion of their contribution is for capital development, followed by Wages and Benefits. Their relatively modest position as funders within the network attests to the importance of K-Net's social enterprise. Clearly the First Nations could not support such an enterprise without the ongoing participation of federal programs. Federal, provincial, and regional level programs constitute the municipal-like services in these communities, and like a municipality, must provide an important to contribution to local communications infrastructure for public services and civil society. The relatively modest contribution of the First Nations may also indicate that, at this stage in K-Net's evolution, the revenue generating potential of local ISPs and ASPs to community members, is outmatched by the operating expenditures of K-Net-related public services. Chapter 6 will examine this situation in depth.

Investments (in Millions)	SLAAMB	First Nations	Public Benefits	KO
Capital Expenditure	28%	71%	78%	31%
Jobs and Training	76%	18%	11%	31%
K-Net Administration	23%	4%	2%	2%
Connectivity related operational	49%	2%	3%	13%
Professional Fees	0%	0%	5%	9%
Total	$1.10	$0.49	$0.57	$1.15

Table 16: Regional investment profile by investment focus (% within) (circa 1997 to 2007)

Nevertheless, K-Net is a dynamic economic process, and what happened from 1997 to 2007, during its critical gestatorial period, is not necessarily what will continue to be. As indicated in the summary of Tables 13, page 207, and 16 above, the largest portion of accumulated regional investments (from 1998 to 2007) consisted of other operating expenditures (e.g., connectivity fees), followed by wages and benefits, and capital expenditures. Over time the accumulated patterns increase to show growth in regional investment, particularly around the category of other operating expenditures (e.g., connectivity fees). At the beginning of 1998, annual regional investments are below CAD $150K. By the end of 2007 they are above CAD $1.2M (see Figure 31, below). Though future research will have to judge, it appears that the hypothesis of increased uptake by local ISPs and ASPs, particularly around household internet access, and emerging broadband services, (such as IP cellular technology), could become stronger sources of revenue for K-Net's operational funding base.

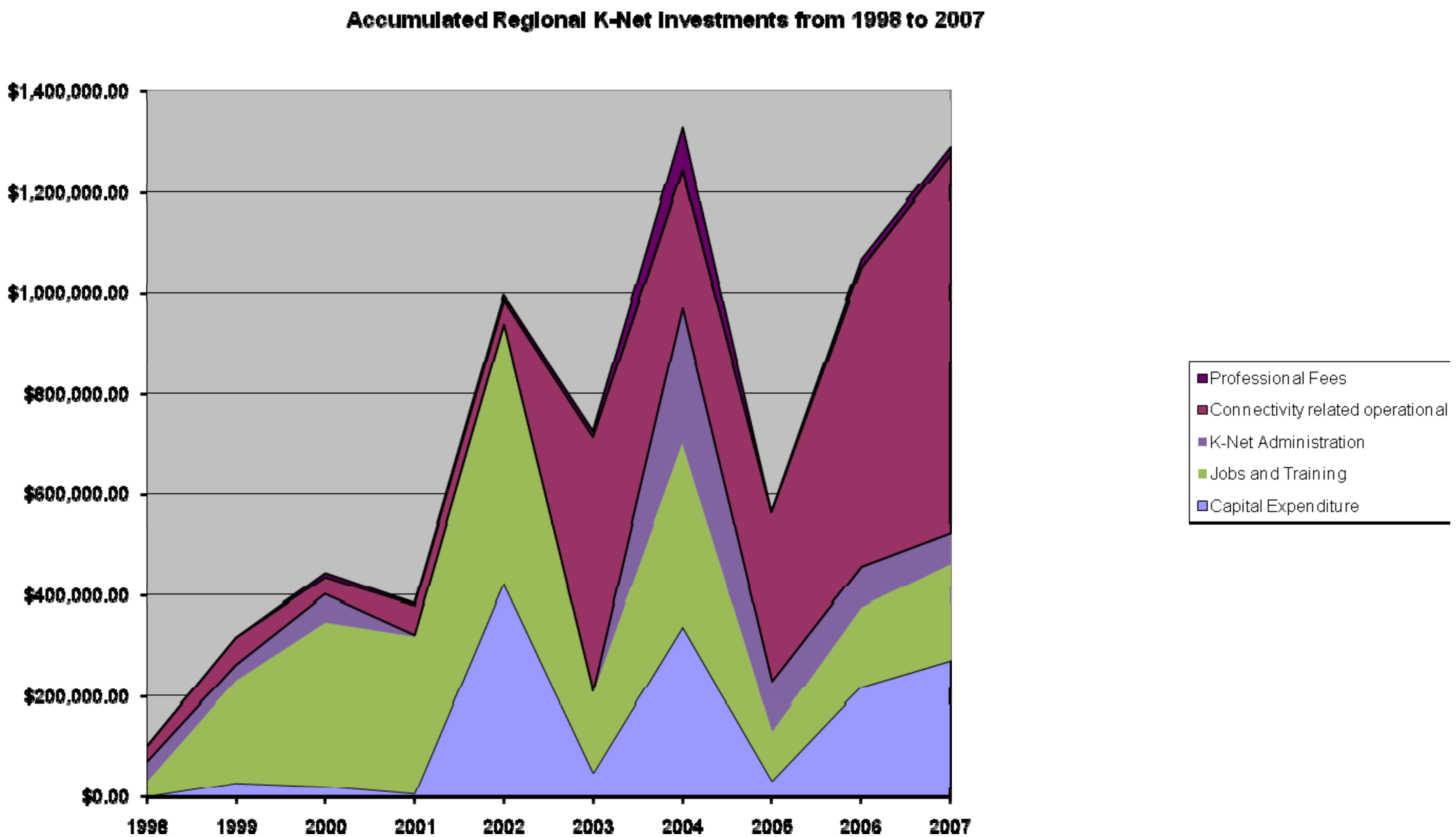

Figure 31: Accumulated regional investments in K-Net by investment focus (circa 1998 to 2007)

Chapter 6

6 K-Net's social enterprise: Standardizing the lessons learned and facing the challenge of sustainable broadband deployment

In this chapter I integrate the dominant themes of K-Net's historical conception and development with a model of K-Net's configuration at the end of *Connecting Canadians*. The purpose of this chapter is to explain how K-Net's social enterprise embodies the strategic decisions that K-Net's leaders and allies made within the institutional environment of CRTC (99-16) and *Connecting Canadians* (circa 1997 to 2007). To this end Chapter 6 identifies and describes key socio-technical management capabilities within K-Net's social enterprise that contribute to the sustainability of this broadband deployment model and its deeper sociopolitical mission.

Following CRACIN's loosely-framed participatory action research protocol (Clement et al 2004), I teamed up with staff at the Keewaytinook Okimakanak Research Institute (KORI)[46] to co-investigate the development and organization of K-Net's broadband deployment model (Beaton 2004, Walmark 2004; Seibel 2005; Fiser et al. 2006). Through a series of pilot projects (see Chapter 1 and Appendix 1) and numerous discussions, I co-shaped a research program with KORI staff to help Keewaytinook Okimakanak conceptualize the K-Net broadband deployment model as a historically evolving community-based telecom initiative and social enterprise (Fiser & Clement Unpublished). As part of our fieldwork in the First Nations we set out to understand how K-Net's social enterprise organizes and governs the community-based telecom initiative. With the data we collected I set out to identify management capabilities within the organization that could help explain K-Net's growth and current sustainability in remote high cost serving areas. My findings from this research are represented herein.

[46] http://research.knet.ca/

6.1 The new institution of broadband governance under K-Net's social enterprise

In its post *Connecting Canadians* configuration (circa 2007+) The Kuh-Ke-Nah Network (K-Net) is an autonomous telecommunications system that comprises over 100 Points of Presence (POPs) in Aboriginal communities and related organizations across Ontario, Quebec, and Manitoba, Canada. The majority of Aboriginal communities that K-Net interconnects occupy characteristically remote high cost serving areas (Fiser et al. 2006). K-Net primarily serves Ontario's Nishnawbe Aski Nation, north of the 51st parallel, where 49 First Nations communities (Indian bands), with a total population base of 45,000, occupy 210,000 square miles of territory, or 2/3 of Ontario, at a population density of approximately 0.2 persons per square mile. The vastness of the territory challenges infrastructure development. Many of these Ojibwe, Cree, and Oji-Cree communities have no permanent road access, and depend on local initiatives to maintain amenities such as diesel powered electrification, waste management, potable water, telecommunications and computer services. Given the high costs and technologies involved, contributions by federal and provincial governments, as well as partnerships with the private sector, are required to realize and support the First Nations' community-based infrastructure initiatives. (Chapters 3, 5, and 6 reviewed the institutional mechanisms and historical conditions).

The overlapping sectors and multi-stakeholder requirements involved in these community-based initiatives have created an organizational niche for social enterprise. It is a niche particularly defined by the leadership and coordinating role of Aboriginal not-for-profit organizations such as tribal councils. As forms of social enterprise, these not-for-profit organizations represent Aboriginal interests in securing collective property rights over infrastructure and in supporting Aboriginal management of local services in remote high cost serving areas. They act as sociopolitical and economic brokers between Aboriginal communities, governments, public agencies, and private sector firms. They retain core technical staff to oversee operations and assist communities in the training and retention of local technicians. They are motivated by community mandates and take direction from the elected representatives of the First Nations they serve.

K-Net began in 1995 as an initiative of Keewaytinook Okimakanak tribal council, a not-for-profit organization representing six First Nations in Northwestern Ontario and mandated by them to initiate and support remote community access to computer-mediated communications. I explained the dynamics of this initiative in Chapter 3 and the motivations of KO's Chiefs and their constituents at the time. Since then, K-Net has expanded to include over 70 autonomous Aboriginal communities, and more than 30 related community organizations, firms, and government offices in various regional centers of Ontario, Manitoba, and Quebec (see Figure 32 for a profile of Ontario).

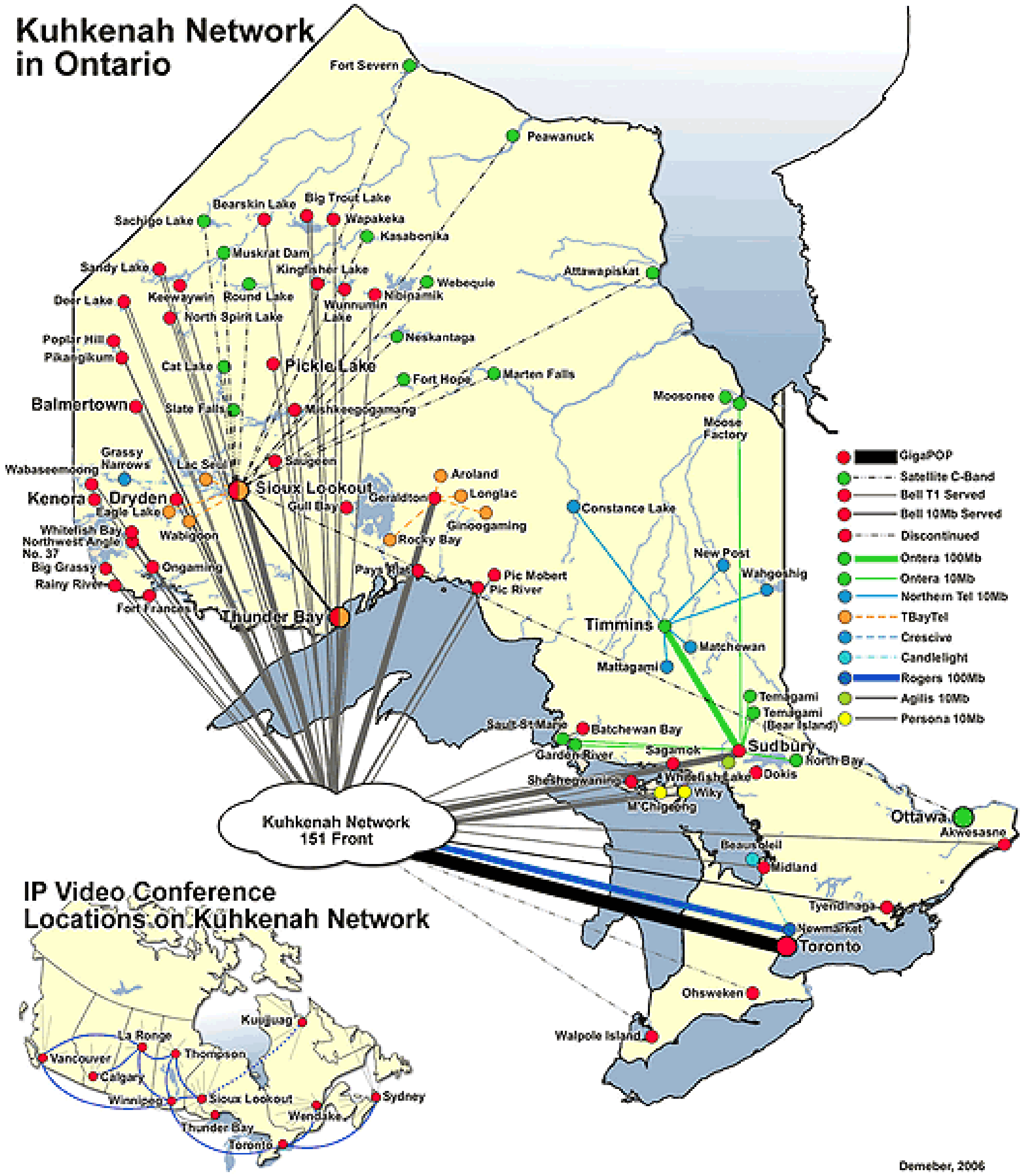

Figure 32: The Kuh-Ke-Nah Network - K-Net, circa 2006, (Source KO-K-Net Services)

6.1.1 Summary of K-Net models & conceptual framework

The following sections describe the business model and technical configuration of K-Net's network organization, and identify two network management capabilities that help explain how this social enterprise sustains network operations in remote Aboriginal high-cost serving areas.

At times in Chapter 6 I use the personal plural pronoun we to emphasize the collaborative work that underpinned my findings and my collaborative conceptual work with KORI, and my

CRACIN Principal Investigator, (and thesis supervisor), Andrew Clement. The management capabilities that our CRACIN team identified as relational governance and heterogeneous engineering are endogenous to the social enterprise's tribal council organization and networked form. In terms of established research and links to other models they situate the Kuh-Ke-Nah governance model within an interdisciplinary field of strategic management, innovation research, and science and technology studies (Law 1987; Nohria & Eccles 1992; Thompson 2003; Tushman & Anderson 2004). As a case study K-Net's social enterprise speaks to a number of issues critical to this interdisciplinary field.

K-Net Services' management team helps independent First Nations negotiate contracts and service level agreements at the local community network level with multiple governments, public agencies, and for-profit firms. In this regard relational governance and the related concepts of relationship building and trust, drawn from strategic management (Nohria & Eccles 1992; Thompson 2003) and innovation research (Tushman & Anderson 2004), are fundamental to understanding how K-Net Services manages and maintains K-Net's business partnerships. Trust and relationship-building were recurring themes throughout our interviews with K-Net Services managers, First Nations community network managers, government officials, and private sector partners, which revealed to us the importance of K-Net Service's relational governance capability.

In terms of K-Net's technical configuration, K-Net Services' Network Operations Center (NOC) supports local community level knowledge creation, employment, and technology development within K-Net member First Nations. We frame the NOC's sensitivity to the First Nation's socio-economic and technical needs using the concept of heterogeneous engineering, drawn from science and technology studies (Callon 1987; Law 1987; Hughes 1993). In our analysis of K-Net's NOC, heterogeneous engineering portrays the importance of jointly addressing technical and human factors throughout systems design. For K-Net's stakeholders, heterogeneous engineering has shaped a technical network that remote First Nations communities can locally control without resorting to third party management (apart from cooperation with the NOC). Yet this remains a technical configuration that complies with important third party standards, such as public sector Quality of Service criteria for telemedicine, and videoconferencing (Fiser et al. 2006). In theory, heterogeneous engineering, the combination of heterogeneous elements from social practices to technological devices, portrays the embeddedness of human values in technical artifacts (Callon 1987; Law 1987). Our research indicates that K-Net's technical artifact, the broadband telecommunications network, reflects a compromise in governance between the First Nations' collective aspirations for local autonomy and the socio-economic realities of infrastructure partnerships in their territory's remote high cost serving areas.

6.2 The network organization as social enterprise

In several ways K-Net appears to be like many other small-scale private networks. Its organization brokers commercial bandwidth on behalf of client POPs, and manages on-net services to deploy and establish Quality of Service for client voice, video, and data applications. However, as a community-based initiative K-Net Services pursues an extra obligation, and that is to render network services on the basis of social equity (See Chapter 3). It operates on a not-for-profit basis and its business is mission-driven to assist and empower K-Net members in addressing their communications needs. Thus K-Net Services accommodates local Aboriginal property rights in the form of community owned infrastructure and cooperatively controlled services.

K-Net's network organization is disarmingly spare, and presides over a loosely coupled system of engineering and related project management processes. It resembles a stripped down public utility with the moral character and business ethic of a lean social enterprise (Weick 1976; Dees 1998). For the sake of efficient networking, two core teams within Keewaytinook Okimakanak's K-Net Services manage these processes on behalf of the network's entire constituency. One team occupies K-Net's Network Operations Centre (NOC) and presides over the IP overlay, including WAN management over satellite and terrestrial networks, and LAN co-management (with community technicians) for the delivery of voice, video, and data services. The other team manages sociopolitical relationships and administers business accounts with member communities, partners from the public sector, and vendors from the private for-profit sector.

Out of respect for Aboriginal self-governance and to nurture (relative degrees) of community ownership over some range of POPs, K-Net Services gives discretion to community policies over such issues as local hiring, capacity building and network usage. Yet it must balance these efforts to decentralize with the NOC's network wide policy framework of Quality of Service standards, hardware/software choices, routing protocols, service level agreements, and so forth. In this balancing act, K-Net's social enterprise seeks to reconcile the needs of decentralized ownership and cooperative control, both in terms of its business model and in its technical configuration (See Section 6.3 below).

6.2.1 KO/K-Net Services: terrestrial & satellite broadband deployment

Rather than a vendor of products, K-Net Services is a facilitator for the various communities, organizations, and social groups that K-Net interconnects (Fiser 2004; Fiser & Clement 2007). In this capacity it brokers relationships between communities and various public, private, and not-for-profit sector organizations to enable broadband/information services in remote and urban POPs. The broadband/information services include IP-telephony applications for public, residential and small-medium enterprise use, and IP-video applications[47] for government, telemedicine, distance education, social gatherings, and justice. K-Net also supports content management[48] for portals, e-learning, and personal homepages[49], as well as custom multimedia production and web services. These information services may include information aggregation[50] (such as various RSS news feeds), as well as tailored ICT capacity building, and regular administrative support (including business and applications development over the network).

In 2009 the information communications technology that K-Net Services harnesses includes 30 MHz of C-Band satellite transponder space (with Digital Video Broadcast capability), an Open Source IP telephony-PBX system (Asterisk), video-conferencing and multimedia streaming platforms (Starbak, Polycom), Open Source web and email servers (Linux, Apache, MySQL, PHP – aka LAMP), and an extensive content management system (Moodle/Drupal).

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47 http://webcast.knet.ca/no_user.php

48 http://meeting.knet.ca/moodle [Doesn't work]

49 http://myknet.org/

50 http://media.knet.ca/news

6.2.2 KO/K-Net's bandwidth brokerage network

The following breakdown of K-Net's bandwidth brokerage is based on 2007 figures that K-Net Services released to the CRACIN team. My intention is to provide readers with a comprehensive overview of what K-Net's business model became at the close of *Connecting Canadians* (circa 2006).

K-Net's business encompasses a hybrid terrestrial and satellite network that it makes possible through partnerships with government, industry, and Aboriginal community sectors (including small business). On the terrestrial side there is a 75/25 split between revenues allocated to incumbent Bell Aliant (formerly Bell Canada) and revenues collected by eight other telecom service providers through K-Net Services' not-for-profit bandwidth brokerage (see Figure 32 above). The network's terrestrial circuitry (including several 100 Mbps pipes), into which the satellite side feeds, culminates at a carrier hotel in Toronto (151 Front St) that provides K-Net with access to the Internet, peering arrangements with major telecom service providers, as well as Canada's national CA*net 4 (see Figure 32 above). On the satellite side revenues are 100% allocated to K-Net under a not-for-profit business model (derived from the public benefits satellite bandwidth pool discussed in Chapters 3 and 6). K-Net Services' network management, business administration, and helpdesk service costs are shared by its satellite and terrestrial Pops.

Bandwidth brokerage – terrestrial side

On the terrestrial side, K-Net Services brokers circuits (mainly T1 services sometimes in multiples) for 38 First Nations as well as related organizations from Bell Aliant, the Incumbent Local Exchange Carrier (ILEC) for much of Northern Ontario (see Figure 33). In 2007, monthly costs per T1 ranged from CAD $1270 to CAD $1510 (not including shared costs and individual internet access charges which together added approx. CAD $600/month). All circuits culminate at K-Net's GigaPOP connection (equivalent to 600 x T1) in Toronto through which they may access K-Net's video bridge for multipoint videoconferencing, alongside network peering arrangements and Internet access.

In addition to brokering Bell connections for the majority of its terrestrial constituents, K-Net deals with seven other private telecom service providers to broker capacity for 14 additional terrestrially served First Nations and related community organizations in Central and Eastern Ontario. These Points of Presence have capacity in between 5 and 10 Mbps over fibre and wireless carriage facilities, at a cost of CAD $2000/month or less (under 2006 - 2007 pricing). They also culminate at K-Net's cabinet in Toronto.

Finally, K-Net has brokered the development of community wireless networks for three communities (Eagle Lake, Lac Seul, Wabigoon), and four First Nations schools near Geraldton Ontario. Community development organizations and community-schools own these respective wireless networks (including backhaul radios) and therefore pay no last mile charges. (They do however, pay for shared costs and internet access charges, and maintain separate maintenance and repair contracts with wireless provider Tbay Tel (of Thunder Bay).

In summary, the 2007 data shows that K-Net brokers terrestrial connectivity arrangements for 59 First Nations communities. The majority of communities acquire bandwidth from Bell Aliant at T1 capacity (1.544 Mbps) and pay in excess of CAD $2000 for carrier charges and Internet access (see Figure 33 below). To put the capabilities and limitations of this configuration in perspective consider that a standard videoconference or telemedicine application over K-Net typically operates at a minimum bit rate of 384 Kbps. If three videoconference applications ran concurrently in one of these terrestrially served communities, their network would be operating at full capacity. Moreover, even in multipoint networking situations, schools, health clinics, administrative offices, small-medium enterprises, and residents typically share a pipe/bottleneck to the community (see Section 6.3 and Figures 33, 34, and 35 below).

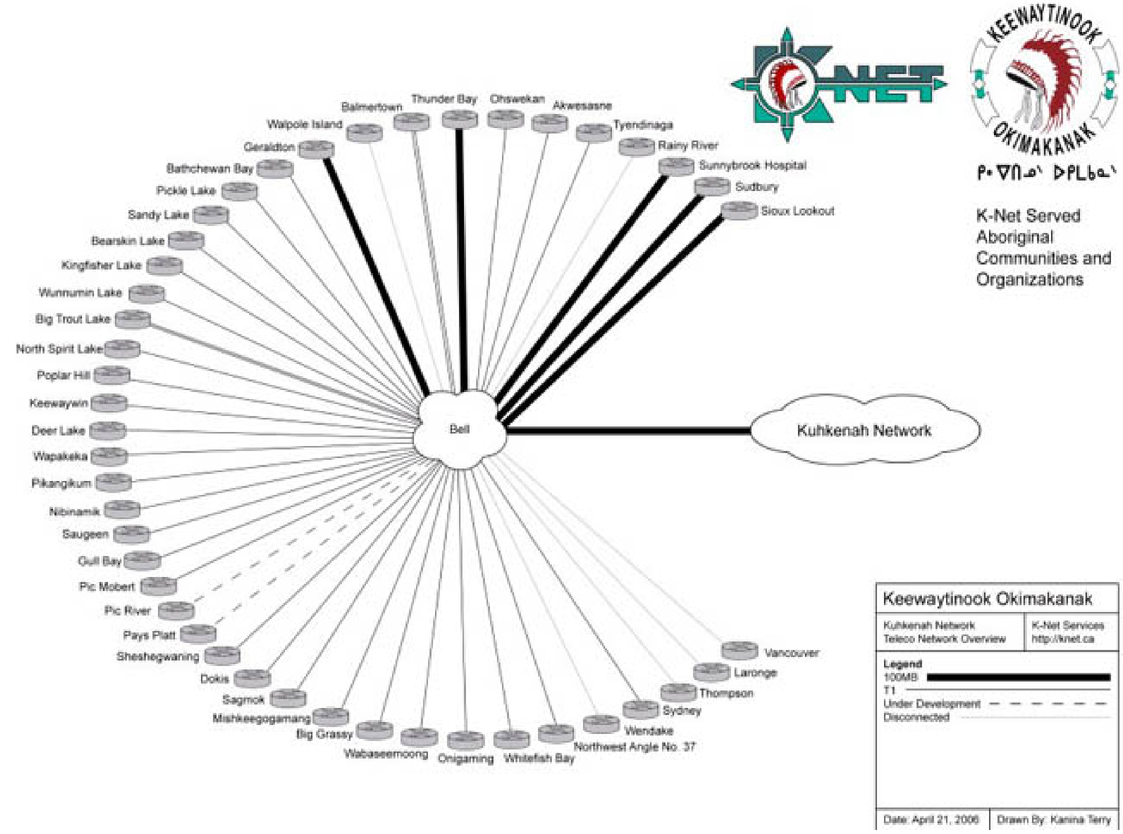

Figure 33: K-Net terrestrial POPs (routers) over leased circuits from Bell, (Source KO-K-Net Services

6.2.3 Northern Indigenous Community Satellite Network

K-Net's satellite side is part of the Northern Indigenous Community Satellite Network (NICSN), a not-for-profit broadband satellite initiative that enables Aboriginal communities to co-manage services and accommodate local community ownership (see Figure 34 and 35 below). NICSN is a cooperative venture connecting 44 remote communities from the northern regions of Quebec, Manitoba, and Ontario under three coordinating social enterprise organizations, including K-Net Services. Through an inter-community partnership between Keewaytinook Okimakanak (Ontario), Keewatin tribal council (Manitoba) and the Kativik Regional Government (Quebec), communities belonging to each of the three social enterprise organizations share access to 90 MHz of bandwidth (as of 2007). Their shared satellite resource is largely the result of Keewaytinook Okimakanak's advocacy work and technical leadership, which brought Industry

Canada as a strategic investor and Telesat Canada as a private sponsor, alongside Aboriginal governments (First Nations and Inuit) and not-for-profit community organizations, to serve the broadband needs of the participating communities (Fiser & Clement 2007; Fiser & Clement Unpublished).

In 2005 each of the three social enterprise organizations became not-for-profit stewards of NICSN transponder bandwidth that Telesat Canada had entrusted to Industry Canada as a public benefit in exchange for orbital space for its Anik E2 satellite in 2001. Under this arrangement, Telesat Canada leaves network management and ground maintenance in the hands of NICSN's three community partners. K-Net Services' NOC initially managed the satellite network on behalf of the cooperative, as its engineering staff had developed a competency for C-Band applications through previous technology partnerships with Telesat and Industry Canada (from 1998 to 2005). The NOC has subsequently transferred its technical knowhow to NICSN partners in Quebec and Manitoba, enabling their technicians to dynamically allocate scarce bandwidth using a combination of Time Division Multiple Access (TDMA), Digital Video Broadcasting (DVB), and web-based scheduling (Fiser & Clement 2007). See Figure 34 below, for a diagram of the technical configuration.

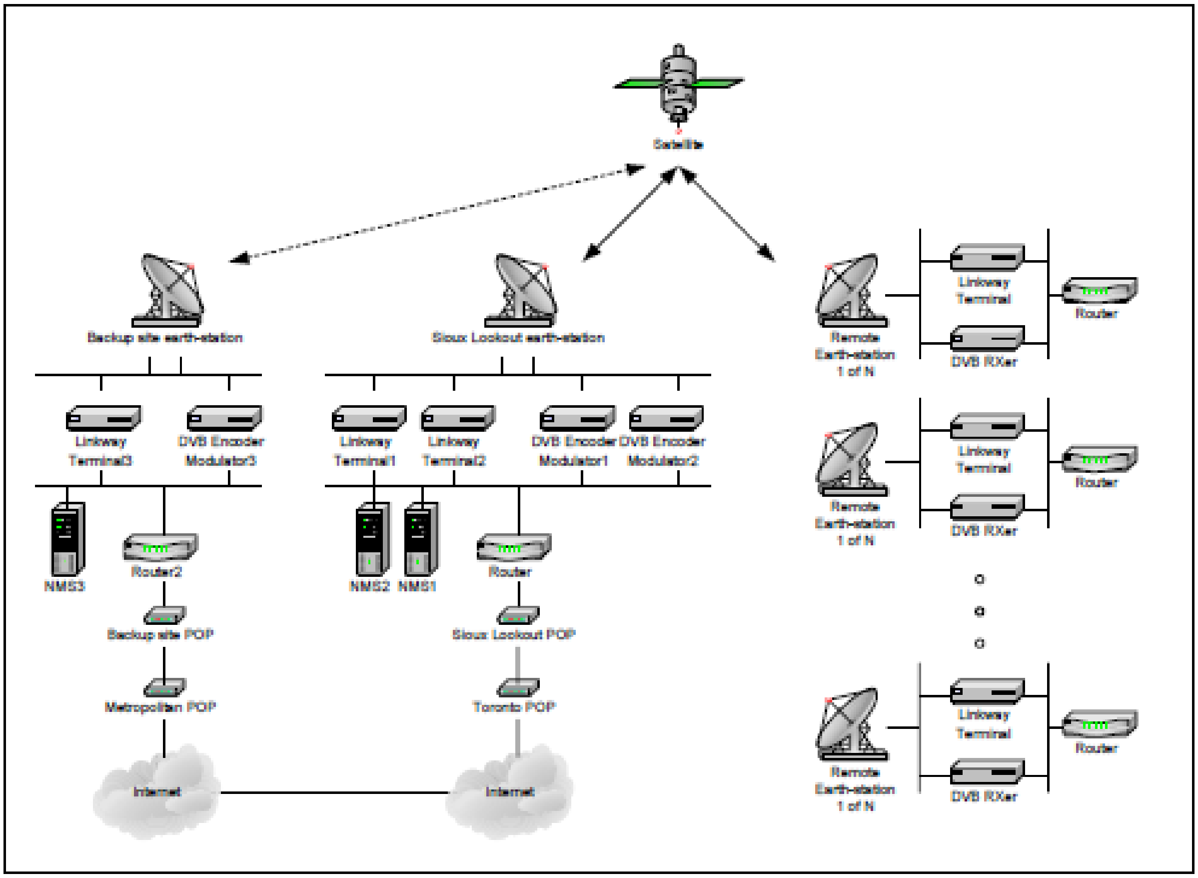

Figure 34: NICSN network management system, (Source KO-K-Net Services)

On paper the 44 satellite communities (see Figure 35 below) are guaranteed 0.768 Mbps; but through the dynamic allocation of shared bandwidth using TDMA, K-Net Services and its community partners can supply extended ‘bursts’ of up to 2 Mbps to any single community for special real time applications such as videoconferencing and telemedicine. This innovation of K-Net Services has extended the capability of a scarce resource, and with the expansion to two extra transponders in late 2007 the satellite communities are now capable of multipoint videoconferencing. Through the public benefits agreement each community pays between CAD $1275 and CAD $1675/month for connectivity and internet access. As with K-Net’s typical terrestrial arrangements, these bulk fees are shared between various public and private services operating in the communities, such as the local governing authority, nursing station, school, and residential internet service provider.

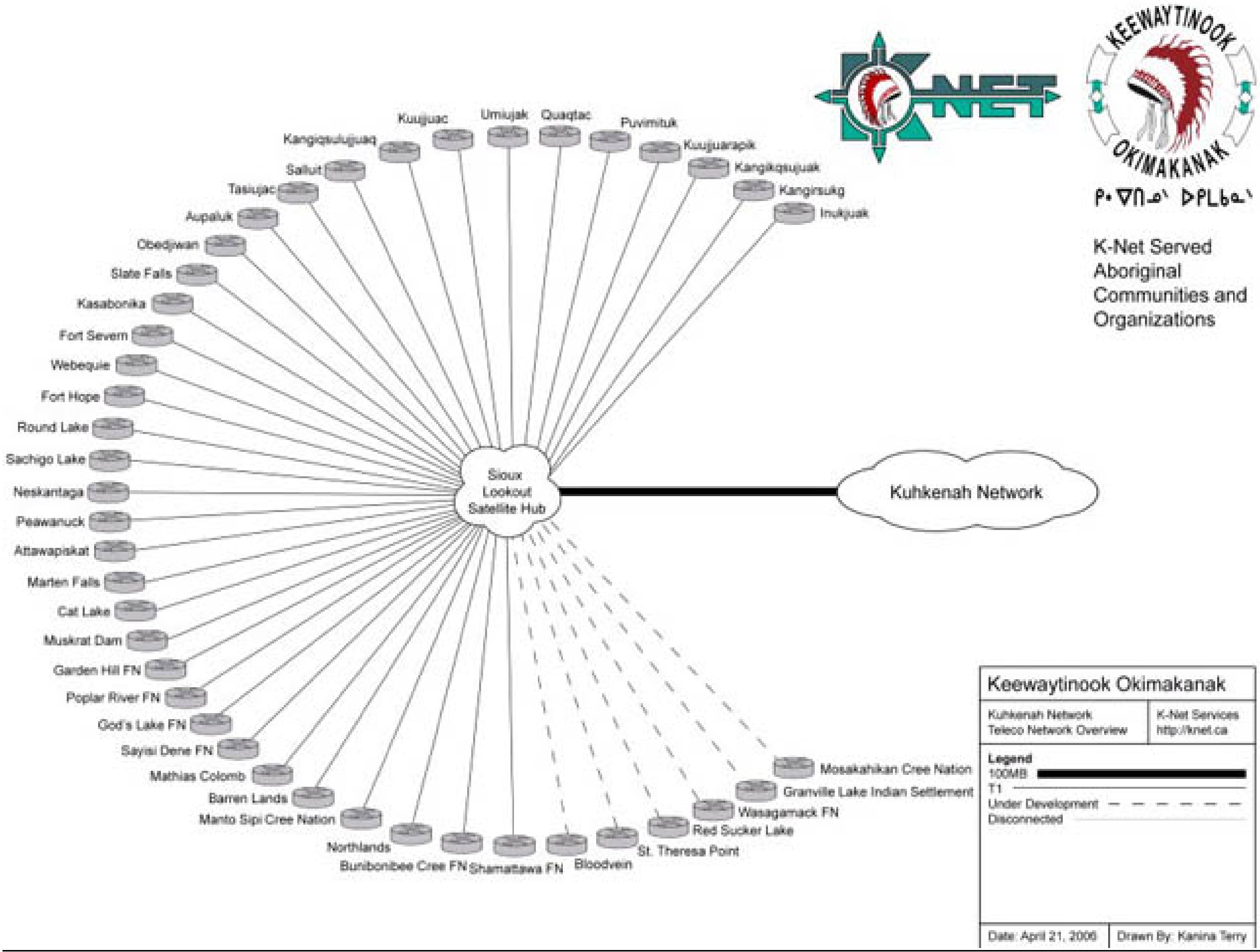

Figure 35: K-Net satellite POPs (routers) and satellite hub (cloud) with 100Mb pipe to K-Net terrestrial network (cloud), circa 2006, (Source KO-K-Net Services)

6.3 Network asset ownership and control at KO/K-Net and allied communities

In 1999, K-Net member communities such as Keewaywin, North Spirit Lake, and Slate Falls, had but a single public payphone or a trail radio to serve their constituent populations, ranging from 200 to 400 residents in remote Northern Ontario (Fiser et al. 2006; Fiser & Clement 2007). Less than five years later they, and their neighbours acquired around 1Mbps (or more) of bandwidth for community service applications and ISP services to residents. With the careful management of scarce bandwidth, these communities now have access to VoIP and videoconferencing as well as locally co-managed telemedicine and distance education applications (Seibel 2005; Fiser et al. 2006; Fiser & Clement 2007).

Each participating First Nation in K-Net's social enterprise collectively owns and manages the majority of assets that comprise the local loop in its community: e.g., cabling, repeaters, switches, hubs, and other Customer Premises Equipment, as well as IP phones, videoconferencing units, and assorted other computer devices. In terrestrially served communities, Aboriginal property rights start from the community edge router that marks their regional telecom service provider's demarcation point (see the local loop diagram from Chapter 1, reproduced in Figure 36 below). In satellite communities the service provider is one of the social enterprise organizations that co-manage NICSN.

The network assets are common property, managed and maintained by each First Nation's local administration (Band office), host public organizations such as schools, health clinics, etc., and/or a small/medium enterprise (SME) appointed by the Band office to operate as the community's Internet Service Provider (ISP). (Our account does not include individual property purchased by residents or SMEs, e.g., cable modems or wireless access devices for internet access, or laptops, printers, and so forth). Decisions to centralize or decentralize ownership of network assets depend on the mutual agreement of the social enterprise, the community's local administration, private partners, and public service stakeholders. Variations co-exist, even on the satellite side of the network. Thus while in Ontario and Manitoba, the social enterprise organizations prefer local asset ownership vested in each member First Nation's local authority, in Quebec the Kativik Regional Government (KRG) has centralized operations through its for-profit spin off Internet Service Provider, Tamaani. Unlike K-Net Service's reliance on local community owned ISPs, Tamaani serves residents throughout the entire Kativik region, and includes different accounts for KRG's public service, and private sector partners. KRG's decision to centralize reflects the regional-municipal structure of its Inuit constituents, which differs from the sociopolitical structure of local Band authorities and federal public services on reserve common to K-Net's Ontario First Nations constituents.

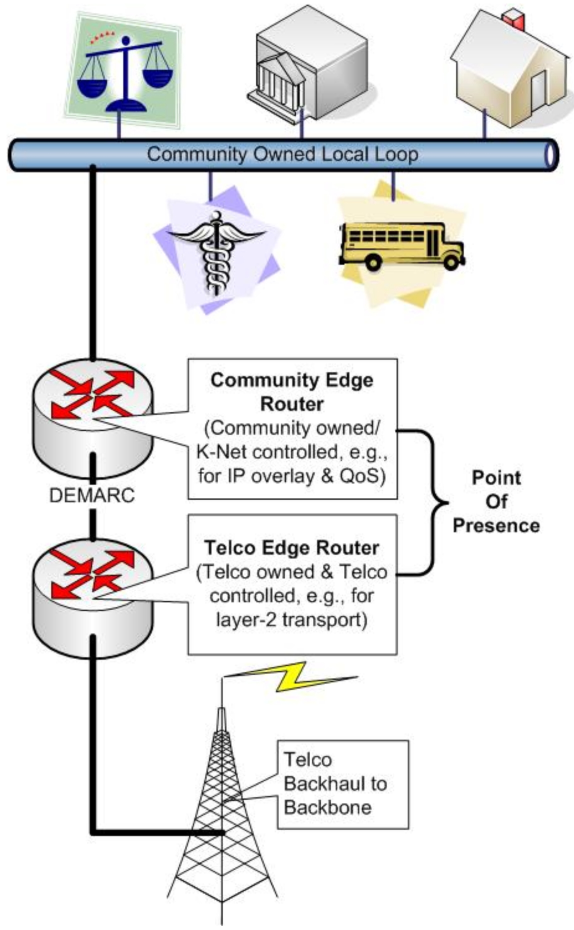

Figure 36: Demarcation point at Terrestrial Community POP establishes local Aboriginal Property Rights

With decentralized asset ownership in the First Nations, responsibilities for network management must also decentralize to local forms. In Ontario, K-Net Services requires participating communities to support the training and employment of local network technicians to cover repairs, upgrades, and general maintenance of the local loop and LANs. On the satellite side a similar arrangement prevails in Manitoba under Keewatin tribal council. Per community, these requirements commonly translate into one resident technician and additional part-time workers who become familiar with standard operating procedures and are hired as needed. The Band office or SME has to cover this salary, which, given the First Nations' social economy, derives from a variety of sources, including residential ISP fees, Band funds, tribal council support, project-based federal or provincial grants, and so forth.

6.3.1 Management as Social Enterprise: Relational Governance, Quasi-Integration, and the Protection of Aboriginal Property Rights

Throughout the network build processes that K-Net Services coordinates, its staff typically oversees transactions with public and private sector partners on behalf of a prospective First Nations community (in the case of local loops) and/or host organization(s) (in the case of point-to-point or multipoint public service nets). The prospective community or host organization is in a number of ways reliant on K-Net Services to establish and protect its network assets, such that its relationship with the organization appears to resemble a form of quasi-integration (Nohria & Eccles 1992; Thompson 2003). This is not as in vertical integration under a rigid hierarchy, but as in the acquisition of network membership and the acceptance of relational governance represented by K-Net and acted on by K-Net Services. This form of governance is recognized in the strategic management and innovation research literatures as a hybrid form in between markets and hierarchies (Nohria & Eccles 1992; Zaheer & Venkatraman 1995; Thompson 2003; Tushman & Anderson 2004). Here, we stress quasi-integration in terms of K-Net Services' temporary integration of decentralized community networks in order to facilitate the First Nations' transactions with telecom service providers, equipment vendors, and public agencies operating in their region. On the satellite side, K-Net's partner in Manitoba provides a similar kind of facilitation, while in Quebec, KRG's spinoff Tamaani maintains a vertically integrated management structure over network assets and services.

Under its arrangement with prospective members, staff at K-Net Service's NOC chooses and orders the network devices from vendors and hires contractors to help install the electronics and interconnect LANs, typically over cable or radio infrastructure (depending on the needs and interests of the prospective members and participating vendors). At this initial phase we find K-Net Services behaving like a quasi-integrated firm that confers the nascent POP with the rights and benefits of K-Net membership. In this case relational governance means K-Net Services conducts business on behalf of the member community or organization, negotiating with competing vendors for best costs (sometimes on the basis of bulk rates), and often hiring trusted contractors for network builds, as well as providing oversight, enforcement of contracts or informal agreements, and quality control. If a public sector partner becomes involved as client of the network build, K-Net Services acts as a liaison between that partner and the community or organization hosting the POP, to manage transfer funds for the build on behalf of the partner and the group.

Operational considerations must also be made as builds progress, particularly as the design of full community networks involves multipoint public sector requirements. A number of federal government departments support public services in the First Nations. Health Canada and Indian and Northern Affairs, in particular, have transferred funds through KO tribal council/K-Net Services for the delivery of network services to respective community organizations such as health clinics (internet access and telemedicine), schools (internet access and video), and Band offices (internet access and video). Their contributions help defray the total cost of community network bandwidth described in Section 6.2.2, and 6.3.4 below.

In lieu of K-Net members having to sign individual agreements with these public sector clients, KO/K-Net Services brokers contribution agreements and/or contracts on their behalf. K-Net Services' strategy has been to combine the portions public sector clients pay for network services and push their combined contribution to the community level in order to aggregate support for First Nations collective ownership and multipoint networking. Yet the sociopolitical process involved in negotiating contribution agreements can be painstaking, and is subject to the pressures of electoral cycles, bureaucracy, and shifting policy trends. This uncertainty reveals another instance of relational governance, the ability of K-Net Services' business team to pursue its core mission by striving to sustain multi-stakeholder consensus and flexibly responding to evolving stakeholder interests.

The resulting community level ISP/ASP (application service provider) model integrates all the various stakeholders into the social enterprise to help make broadband deployment affordable in high cost serving areas (see the K-Net Services community network diagram from Chapter 3, reproduced in Figure 37 below).

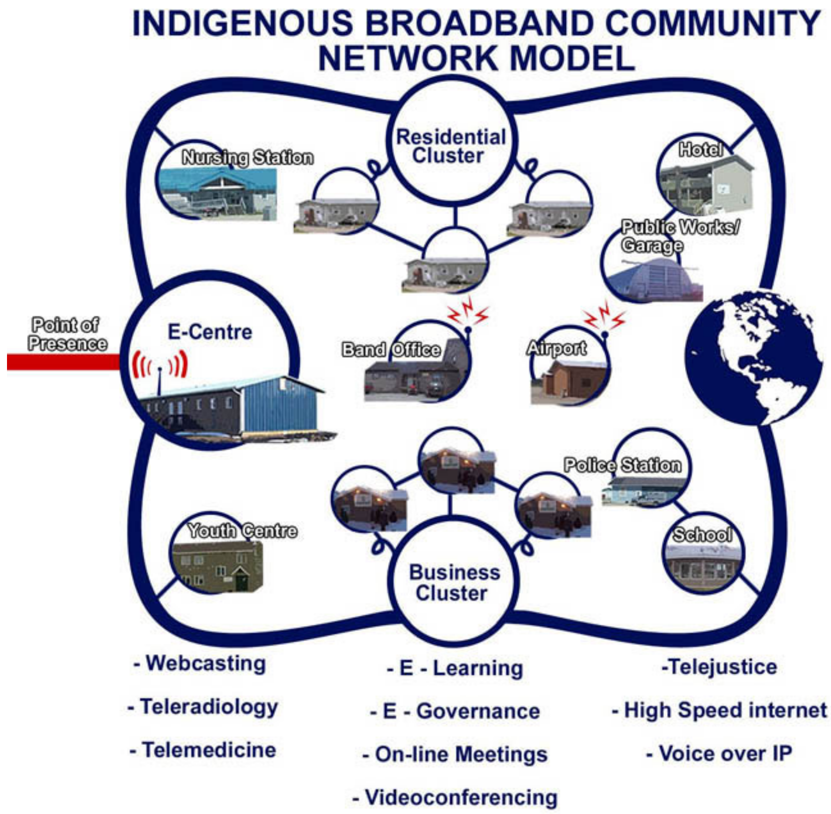

Figure 37: K-Net Community-based ISP-ASP Model: POP, Local Loop, Stakeholders and Services, (Source KO-K-Net Services)

6.3.2 Annual costs – terrestrial circuits and common links

K-Net's survival is predicated on a cooperative business model that involves partnerships across public, private, and not-for profit sectors to cover capital and operating costs in HCSAs. In this section I review the ongoing operating costs of delivering broadband to K-Net communities via terrestrial circuits and the public benefits satellite scheme.

As of 2006, K-Net's total annual expenditure on the terrestrial side included 64 **last mile circuits** and 11 **common link**[51] costs equal to approximately CAD $1.06M. That is CAD $784K for the 64 last mile circuits (including communities and urban sites), and CAD $279K for 11 common

[51] Some common link costs are shared between terrestrial and satellite sites. Others are separate.

links located in Toronto, Timmins, Thunder Bay, Sudbury, and Sioux Lookout. These expenditures constitute total revenue collected by K-Net's nine partner telecom service providers. Of that total Bell takes CAD $794K or approximately 75 per cent of K-Net's terrestrial side business with 38 sites and four common links.

In addition to the 47 last mile circuits, K-Net brokered 21 other connectivity arrangements on behalf of various agencies and communities, including:

- Ontario's Smart Systems for Health Agency (SSHA), which pays for connectivity to eight telehealth sites operated by the Métis Nation of Ontario;
- A 100M fibre optic loop in the town of Sioux Lookout;
- A 100M radio loop in Thunder Bay and Fort William First Nation;
- Community wireless networks in Eagle Lake, Geraldton, Lac Seul, and Wabigoon;
- A 2.3 Mbps connection to Winnipeg's First Nations SchoolNet Regional Management Organization;
- 10M fibre optic connections to a number of Northeastern Ontario First Nations

In total there were 68 terrestrial circuits and special connectivity arrangements brokered by K-Net, sharing (or scheduled to share) at least a portion of the network's common link costs in 2006. They were joined by 38 satellite communities for a total network of 106 sites.

All 106 sites terrestrial and satellite sites (current as of 2006) share the common link cost of K-Net's CAD $1175 per month facility fee at the 151 Front St Carrier Hotel (Peer 1 Networks) in Toronto. 104 sites split K-Net's CAD $4480 per month Internet connection in Toronto (made up of charges from Cogent, STD, Toronto Hydro, and Peer 1 Networks). 98 sites split the cost of K-Net's GigaPOP (Bell) in Toronto. The remaining common link charges are comprised of individual site access fees, a hub in Sioux Lookout that connects 38 satellite served communities, and facilities, and circuitry in Sioux Lookout that connects the satellite feed as well as five wireless network sites, to the terrestrial circuits culminating in Toronto (and K-Net's internet connection).

6.3.3 Annual costs – Public benefits satellite

In 2004 Industry Canada and Telesat made an agreement with K-Net (Ontario), the Kativik Regional Government (Quebec) and Keewatin tribal council/Broadband Communications North (Manitoba) to let these communities share and manage 30 MHz of C-band transponder space reserved for public benefits. Under this agreement K-Net, KRG, and KTC formed the Northern Indigenous Community Satellite Network, which undertakes to develop the satellite resource on the basis of a not-for profit cooperative business model. K-Net was Industry Canada's original partner for the development of the public benefits fund. Under their original agreement K-Net must charge a carrier rate comparable to an equivalent terrestrial circuit (e.g., less than T1). Currently, the 38 satellite served communities are charged CAD $675 per month, for a nominal bit rate of 0.768 Mbps. K-Net represents 13 communities, KRG represents 14, and KTC represents 11.

All satellite sites pay a monthly common link cost of CAD $300, and an additional CAD $300 for Internet access. Both costs represent the Northern Indigenous Community Satellite Network's use of K-Net's terrestrial circuitry (as reflected in the total annual common link costs described above).

Each of the three community partners now manages their own portion of the bandwidth resource. For its 13 communities K-Net Services deploys TDMA and RIP as part of its network management service. Participating communities may receive bursts up to 2 Mbps (or less than the nominal rate). Network management service charges are CAD $400 per month. Since the Kativik Regional Government and Keewatin tribal council handle their own network management services, this fee is not charged to their communities.

Total monthly charges for the 13 K-Net satellite communities are CAD $1675. Revenues accrued through the public benefits fund can only be spent according to the following terms agreed upon between K-Net and Industry Canada in 2002:

1. Helpdesk Services for troubleshooting;
2. Community and Regional Business plan facilitation;
3. Web-based lessons learned, best practices, design options, community and partnership development activities;

4. Review and evaluate community proposals;
5. Broadband application development;
6. Support to Assembly of First Nations and other political organizations to incorporate broadband connectivity;
7. Advise and support to Tribal councils and other community agencies to develop satellite broadband business plans;
8. Research to migrate to hardware and software protocols (e.g., TDMA), in cooperation with relevant federal agencies to increase efficiencies in bandwidth utilization;
9. Consultation with government agencies (Health Canada, INAC, IC);
10. Salaries equivalent to 1.3 Full-time staff – estimated between CAD $80K to CAD $120K per year;
11. Travel necessary to meeting contracted objectives and Telesat public benefit policy objectives;
12. Administration (facilities, financial, management, etc) @ 15% of actual expenses above;

The balance of revenues after accounting for the expenses above is to be used for improvements to hardware and software protocols and other activities that promote the public benefit policy objectives. In 2006 total annual expenditures per community partner were:

- Kativik Regional Government = 14 sites*CAD $600*12 = CAD $100,800;
- Keewatin tribal council = 10 sites*CAD $600*12 = CAD $72,000; and
- K-Net (Northern Ontario First Nations) = 14 sites*CAD $600*12 = CAD $100,800

These expenditures create total revenue of CAD $273,600 for the public benefits fund. In addition, there are common link charges per site which total to an annual expenditure of CAD $70.9K (which is revenue for telecom service providers in Toronto). As specified earlier this total common link expenditure is included in the total common link charges accounted for under the terrestrial circuits and common links category above (as the portion of terrestrial circuits shared with the satellite network).

6.3.4 Annual network costs and revenue streams under social enterprise (circa 2006)

In 2006, K-Net's total annual **network expenditures** for equipment (routers, switches), and a network manager and two network technicians cost CAD $357K. That is CAD $207K for staff and CAD $150K for equipment (based on an annual replacement cost for every five sites). K-Net's total annual **administrative expenditures** for 106 sites equaled CAD $472K. That is CAD $240K for helpdesk services and five helpdesk staff positions at K-Net Services; CAD $109K for administrative services at Keewaytinook Okimakanak; and CAD $123K for three administrative staff positions at K-Net Services. (Note that after hours on call helpdesk services are not included in this account).

In 2006, annual revenue from network operations across 106 links (terrestrial and satellite) amounted to approximately CAD $1.1M. Out of this total revenue commercial enterprise, i.e., ILECs and CLECs collected approximately 51% (from carrier fees and internet access charges).

As K-Net Services is a branch of Keewaytinook Okimakanak Tribal Council it operates as a not-for-profit and does not charge a mark up on any terrestrial circuits that it leases from the ILECs or CLECs. Social enterprise distributes the total costs across K-Net's participating community networks through a variety of partnerships.

To examine the distribution of costs per community, I will take a prototypical cost structure for a remote community deploying a T1 (1.544 mbps) circuit from ILEC Bell (in 2006). Note that the following figures are historically contingent, as well as context specific. I examine them here in order to help the reader understand K-Net's social enterprise at the community level. Our hypothetical community resembles the situation of small to medium sized First Nations such as North Spirit Lake, Pikanjikum, or Nibinamik.

Around 2006, a single T1 circuit purchased from Bell to connect K-Net's hub in Toronto to the community, cost CAD $1270/month. On top of this base rate, the community paid approximately CAD $90/month in common link charges (for access to internet services through Cogent, and Bell's facilities in Toronto). Moreover, K-Net collected a number of administrative costs, as part of the social enterprise, including: 1) annual local loop equipment replacement costs, at approximately CAD $10/month; and 2) administrative and (24/7) helpdesk services at approximately CAD $380/month. The total network operating cost for this community would therefore be close to CAD $1750/month. 72% of this cost is comprised by the ILEC's carrier charge and 5% goes to common link costs (which the social enterprise splits amongst its community networks). The remainder is the cost of K-Net operations (calculated on a cost recovery basis = local loop equipment replacement + helpdesk/administration).

From the total monthly cost of network operations, the community need not pay the full sum out of its own funds, although some communities, such as Nibinamik, did in 2006. K-Net operations are based on a menu of community services that can contribute operational funding for each community network. In this hypothetical case, the community hosts community intermediaries such as KO Telemedicine, First Nations SchoolNet (FNS), and Keewaytinook Internet High School (KiHS) programs. Each of these programs is bandwidth intensive and therefore contributes a fixed portion to covering the costs of the community's network operations.

Except in special circumstances most of K-Net's terrestrially served communities contribute some portion of their own First Nations authority's administrative funds, to cover network operations, e.g., in their administrative/community centre (Band office). Others rely on their local community ASP for contributions. Contributions may range from $425 to the entire cost of service. In this example, if the First Nation pays out CAD $620/month for connectivity through its First Nations authority, or from revenues generated by its local ASP, the menu of programs may cover the remainder.

In 2006, KO Telemedicine (under First Nations Inuit Health Branch, Health Canada) was the most bandwidth intensive and paid CAD $800/month. First Nations SchoolNet, (now under Indian and Northern Affairs Canada since 2006), paid CAD $300/month for connectivity to the community's elementary school. KiHS (under INAC/First Nations SchoolNet) paid CAD $450/month. KO Telemedicine utilizes videoconferencing and high-capacity data applications on a regular basis. It has been estimated that it can easily consume more than half of a T1 linked community's total bandwidth (1.544 mbps) when operating on a regular basis. First Nations SchoolNet supports connectivity for elementary schools and regional adult education programs such as Wahsa Distance Education Centres. It also pays for the connectivity needs of KiHS (grades 8 to 12). In both cases, higher-capacity applications such as videoconferencing run less frequently than under telemedicine. Other funding partners may become available in the menu of options, including police services (such as Nishnawbe Aski Police Services), justice remand programs, and social services (such as Tikinagan Child and Family Services, and Nodin Mental Health Counseling Services). The federal funding programs discussed in this community example are those which were the most stable and common funding options (circa 2006).

From the menu of funding options, it appears that total contributions to the community network are

$625 (First Nations authority or ASP): 29%

+ $800 (Telemedicine): 37%

+ $300 (First Nations SchoolNet: elementary school): 14%

+ $450 (First Nations SchoolNet: KiHS): 20%

= $2170 in contributions

This creates CAD $420/month of surplus for K-Net Services to pool for social enterprise ($2170 – 1750). Here the idea of a surplus could be misleading, unless one considers the nature of program contributions within the social enterprise, and KO-K-Net Service's ability to flexibly lever some of the menu options. As part of KO's not-for profit Tribal Council, K-Net Services cannot be a profit-maximizing commercial enterprise. The surplus therefore represents funds that accumulate in K-Net Service's operating fund (e.g., for cost recovery elsewhere in the network, assistance to fledgling community networks, and support for K-Net's roster of regional on call technicians). In any case, surpluses can arise because each contributing program specifies a fixed rate (or in some cases a sliding scale) of funding per community in advance of service delivery. These rates are negotiated between KO-K-Net Services, its KO-community intermediaries (in telemedicine, KiHS, etc.), and each relevant federal partner, outside the negotiations K-Net Services undertakes with individual First Nation authorities, local ASPs, and participating ILECs. (Table 17) summarizes:

K-Net-Community Network: T1 Link from Bell – Costs, Contributors, and Surplus/Flow Through				
Access Rainbow	**Description**	**Costs**	**Contributions**	**Surplus/Flow Through**
Governance	How decisions are made concerning the development and operation of the infrastructure	Not factored in model	Community Band funds or Local ASP revenues contributed 29%,	K-Net Services pools 19% surplus to be reinvested in K-Net for cost recovery and capacity building)
Literacy/Social Facilitation	The skills people need to take full advantage of information/communications facilities, together with the training and facilitation to acquire these skills.	(24/7) K-Net Help Desk services = approx. $190/month	Telemedicine contributed 37%,	
Service/Access Provision	The organizations that provide network access to users	Network Admin and other Admin = approx. $190/month	First Nations SchoolNet (including KiHS) contributed 34%	
Content/Services	The actual information and communications services offered	Not factored in model		
Software Tools	The program that runs the devices and makes connections to services	Not factored in model		

K-Net-Community Network: T1 Link from Bell – Costs, Contributors, and Surplus/Flow Through				
Access Rainbow	**Description**	**Costs**	**Contributions**	**Surplus/Flow Through**
Devices	These are the actual physical devices that people operate	Local Loop Equipment replacement = $10/month (also part of carriage below)		
Carriage	These are the facilities that store, serve or carry information.	Carrier Charge = $1270 Common Links = $90		ILEC Bell collects 58% flow through (for provision of T1 circuit); Common link not factored

Table 17: Terrestrial model of community network contributions, costs, surplus and flow through (Circa 2006), (Access Rainbow adapted from Clement and Shade 2000)

6.4 Instituting social enterprise: Management capabilities

Keewaytinook Okimakanak's K-Net Services harnesses two capabilities that have helped it to sustain K-Net's social enterprise and protect the property rights of its Aboriginal constituents within high cost serving areas (Fiser et al 2006; Beaton 2004; Fiser & Clement Unpublished; Fiser & Clement 2007). These are relationship building and heterogeneous engineering.

6.4.1 Relational governance: relationship-building and trust

Trust is an important and oft-cited consideration of business, especially for organizations under uncertain investment conditions; and it becomes altogether necessary for small-scale not-for-profit organizations that operate in a multi-stakeholder environment without a complicated bureaucratic or legal apparatus (Perrow 1992; Zaheer & Venkatraman 1995). Trust is also critical for maintaining proper governance over collective and decentralized forms of asset ownership and cooperative control. In theory and research it is the lubricant of organizational forms that are networked and not simply market-based or hierarchical (Nohria & Eccles 1992; Thompson 2003; Tushman & Anderson 2004).

K-Net is remarkable example of trust. Though Keewaytinook Okimakanak tribal council and K-Net Services have regularly administered public sector grants and contracts, and serve multiple federal and provincial clients, they have learned that government programs and policies in their environment rest on a foundation of uncertain sociopolitical alliances. To survive in the midst of uncertainty, they make efforts to personalize their relationships with program officers, managers and directors whose careers may outlive a short term policy or one off grant. As K-Net's coordinator Brian Beaton put it to us during one of the CRACIN panel discussions in 2007: "Social enterprise depends on working partnerships […]. Some of our greatest allies in government have been working with us since the first pilots in the 1990s. We can usually tell a good partner by the effort they take to meet us and learn what K-Net is about".

K-Net Services' management team believes conviviality leads to improved information and better positioning in terms of oncoming opportunities for network and applications development. We have observed that policy workers who have a deeper personal relationship with the First Nations also come to appreciate K-Net's vision of local collective ownership and control in First Nations' policy, and advocate for Aboriginal property rights over network assets within their respective policy programs (Fiser & Clement 2007).

K-Net Services has worked with local experts and specialists who live and/or work in the North and have worked with K-Net and member First Nations since the early 1990s (see Chapter 4; Beaton 2004; Fiser & Clement 2007). The team locates regional resources for network initiatives through an extensive sociopolitical network comprised of Northern Ontario First Nations, tribal councils, Aboriginal health and education authorities, social services, and Aboriginal regional economic development agencies [(see legacy of NOWG in Chapters 3 and 5). The composition of this informal advocacy network is reflected in the formal project based committees and working groups that KO tribal council/K-Net Services organizes to address telecom infrastructure and broadband e-services, healthcare and education delivery, public works, and other service sectors touched by community networking. Links through the informal network create the local relationships, political energy, strategic information flows, and in kind and matching contributions that support KO/K-Net Services when it seeks out federal and provincial agencies to capture large-scale grants and regional clients for K-Net expansions and applications. This informality, based on trust, is a precondition of K-Net Services' relational governance capability.

Trust is a focal point of transactions across remote Northern Ontario, particularly between the First Nations and their non-Aboriginal neighbours. It is an aspect of cultural difference, but also a legacy of Northern Ontario's colonial past and the murky politics of Treaty rights that continue to be redefined as societies evolve. In this context the communities are wary of commercial exploitation as equally as they are of state paternalism. They take their sphere of governance seriously and require their organizations and collaborators to respect its due process, particularly in terms of consensus building across First Nations Bands, tribal councils, and political territories such as Nishnawbe Aski Nation which represents over 50 Bands across Northern Ontario. Evidence of Keewaytinook Okimakanak and K-Net Services' relationship building within the Aboriginal sphere of governance is perhaps foremost evident from Nishnawbe Aski Nation's resolution (03/49) to endorse K-Net at tribal council and Band levels, to choose it over other broadband telecommunications service options in Northern Ontario (Kakekaspan & Beck 2003). In this context, K-Net's broadband deployment model contributes to the First Nations' broader nation-building process by articulating infrastructure that they trust to be Aboriginal owned and controlled (Dees 1998; Fiser & Clement Unpublished; see also Chapter 3).

6.4.2 Network Operations Centre: Heterogeneous engineering and openness

K-Net's approach to telecom and computer technology reflects a management capability that proponents of science and technology studies call heterogeneous engineering (Callon 1987; Law 1987; Hughes 1993). As Law puts it, "those who build artifacts do not concern themselves with artifacts alone, but must also consider the way in which artifacts relate to social, economic, political, and scientific factors" (1987:112). The study of heterogeneous engineering relates a technological artifact's design and build to its specific human and natural environments. The aspects of relational governance discussed in the previous section certainly reflect the sociopolitical sophistication and business acumen behind K-Net's development, but K-Net's engineering process, its technical configuration and operations, also reflects deeper human concerns in line with the social enterprise's mission.

K-Net Services developed its NOC's capabilities by cultivating an open culture of experimentation that encourages individuals to approach tasks in terms of self-study and a deepening appreciation of the network's architecture and underlying technologies. Staff members explore and expand their collective knowledge pool around various applications and modalities, such as terrestrial wireless in subarctic forest zones, community cable modem management, or the optimization of scarce satellite resources. As a small team (< 6 members) they have to be generally knowledgeable to meet and advise members on necessary service requirements; but individually, they have shown to self-select competencies in different areas of the network, thus enhancing depth as well as breadth of knowledge.

For organizations operating in remote high cost serving areas key talent is difficult to replace, and incentives to attract talent from urban centres are difficult to design. The NOC's strategy to mitigate "brain drain" is to invest in skilled personnel who have personal ties to the North and its First Nations communities. NOC staff members have typically started out as contract workers or interns under project-based employment/training. This is partially due to K-Net's business model as well as a reaction to the high job turnover rates that characterize employment relations in Canada's North. After proving and refining their abilities over a series of projects, sometimes as technicians in local community networks, K-Net's NOC staff each progressed to one of the team's few, but relatively stable, positions.

In line with K-Net's mission, the NOC has designed the network around a steady and persistent drive to make technology work at the community level under collective ownership. This decentralized and collaborative approach to technology requires staff to be personally determined, flexible, patient, and inquisitive. But the right combination of personalities and temperaments has enabled K-Net Services to achieve its present course of development within K-Net's social enterprise. This combination is advantageous for the reasons noted above, just as its reliance on a small group of key and potentially difficult to replace individuals requires careful management and consideration.

In terms of relations with industry, cost constraints and a hacker ethos have persuaded K-Net's engineering staff to research and implement open standards technologies (wherever possible), as seen in its reliance on the TCP/IP suite, its extensive deployment of LAMP server technology, and its use of open source applications for VOIP and video. Conversely, the need for certain proprietary network components has convinced K-Net Services to regularly test competing vendors' wares, while partnering with vendors that prove themselves to be reliable and supportive of K-Net's broadband deployment model. Cisco Systems for example, beyond being a vendor of choice, has come to appreciate K-Net's social enterprise, and since 2004, has partnered with Aboriginal community networks through K-Net and the federal First Nations SchoolNet program to deliver ITE1 training courses for community computer network technicians in First Nations.

By continually testing their assumptions and seeking out new applications and systems improvements through scalable projects, K-Net's engineering team has striven to compensate for its small size and relative remoteness. Each project adds to the informal resource network it maintains with vendors of network devices, engineers at partner firms, and developers in the internet and open source communities. For these individuals there is no better way to maintain operations and keep pace with industrial change. The NOC's response to K-Net's mission has been organic and flexibly response, providing a socio-technical complement to K-Net's informal relational governance.

Chapter 7

7 Conclusion: K-Net's Implications and Dilemmas

As a microcosm of 21st century society the contemporary situation of indigenous peoples presents an important test bed for the equitable provision of broadband telecommunications in an uncertain global economy. As institution builders, indigenous peoples are healing social traumas, adapting new technologies, and rebuilding traditional sociopolitical and economic structures in response to internal pressures and external opportunities and constraints. In such a context of societal transformation and renewal, large-scale infrastructure development can be critical, as well as complicated.

Within K-Net's joint development and governance there have been questions of technology access for remote and sparsely populated regions, as well as questions regarding appropriate technology choices, relevant financing options, and the role of critical partnerships in achieving capital development and organizational viability. There have also been multiple cultural challenges concerning indigenous property rights and institutional conflicts with government and for-profit incumbents, leading to questions of local ownership and control, and of what constitutes appropriate enterprise and community development.

In Canada, indigenous populations are young, regionally mobile, and increasingly urban; while their cultural homelands and traditional territories mainly lie in remote and rural geographic areas where communities are typically dispersed in relatively small populations, hundreds of kilometers away from any town or city centre. Between scattered settlements, these remote areas occupy uncharted wilderness, sacred sites, nature preserves, and contested zones for mineral exploration and natural resource extraction. In the First Nations of Northern Ontario, that K-Net interconnects, local enterprise tends to be micro-oriented and community-based, property rights over capital assets tend to be collective (vested in local publicly supported First Nations authorities), and regional ventures are typically tribal (involving partnerships between First Nations authorities and unincorporated communities).

In terms of broadband governance, and an appropriate deployment model for indigenous peoples, the curious outsider might then ask, following Clement and Shade (2000), "broadband for whom", and "for what purposes"; for without public support, only the dominant mining and forestry industries could possibly attract enough shareholder investment or turn a substantial enough profit to independently absorb the high costs of telecommunications in these remote areas.

The matter of appropriateness then, revolves around the public good. If broadband telecommunications (however defined) is to be a non-excludable form of information-communications infrastructure for all communities, including those marginal cases that occupy telecom high cost serving areas, then contemporary societies must consider instituting broadband deployment as a 21st century public good. I contend that K-Net presents a viable governance model to support broadband deployment for the public good. It does so, on the basis of social enterprise, through the cooperation of First Nations communities, governments, and industry.

In its historical profile, KO-K-Net Services changed the rules of telecom for its constituent communities. Its organization took the First Nations from a monopoly/monopsony relationship that ostensibly left residents with inferior telecommunications, (by CRTC standards), to evolving broadband community networks they can own and control as part of K-Net's social enterprise. The principles underlying KO-K-Net Services' historical practices correspond to rules for instituting telecom as a public good in remote indigenous communities, and possibly other high cost serving areas. These "rules of the game" specify that a community network management organization should be:

1. A carriage-level network of community networks, that focuses on the provision of telecom and/or other ICT services to a multi-sector user ecology that includes a core constituency of unincorporated communities, municipal-like authorities, small-medium enterprise, public sector programs, and larger private sector for-profit members (including ILECs and CLECs), as well as free riders and online communities (via free services);

2. A system of governance through partnerships under a not-for-profit business manager and network operations centre. The business manager manages accounts and transactions. The network operations centre manages network traffic, as well as co-ownership and co-management arrangements of local loops with public and private sector parties. The system of governance goes beyond a community intermediary role to facilitate the economic creation of local enterprise through the use of local loops. Local enterprise (whether for- or not-for-profit) must include internet service and may include the provision of broadband services such as voice/video/data over IP or other protocols compatible with the network.

3. A social economy organization that derives value from a primarily non-monetary position rooted in a democratic process (Cf. Quarter et al. 2003) that strives to articulate the

> demands and capabilities of the community constituents it serves. In this case, value is derived from acquiring a standard of communications for one's constituents, and protecting, sustaining, and elevating that standard through ownership and control over broadband resources at the local loop level.

In its historical profile, K-Net is thus a model of governing principles and an evolving organization tied to KO-K-Net Services' organization of social enterprise. Its positive implications are therefore intertwined with particular opportunities and dilemmas that reflect the sociopolitical and historically mutable relationships that KO-K-Net Services' successes have depended on thus far. In this dynamic context, the K-Net broadband governance model presents implications and dilemmas for policy, research, and development.

To conclude this thesis, I divide my reading of the key implications (and dilemmas), from each chapter of my analysis, into contributions that my case history of K-Net offers to researchers in the field, community-based organizations, industry, First Nations, and governments. I have grouped these contributions in terms of 7.1) research, 7.2) development, and 7.3) policy implications.

7.1 Research Implications

There is no way to adequately formalize the kinds of negotiated relationships that I experienced in pursuing my case history of K-Net. Under the Canadian Research Alliance for Community Innovation and Networking (CRACIN), my research partnership with KO-K-Net Services and KORI felt like a socialization process based on the dynamics of trust (and sometimes mistrust). At times, I felt that K-Net members had indoctrinated me. At other times I felt that the university in which I was situated had no practical solutions for the sociopolitical challenges that K-Net communities faced. Looking back, I feel that the timbre of our negotiated research partnership was integral to how we approached action research under CRACIN. CRACIN distributed power between its academic and community partners. As a researcher, in the middle of it all, I could not help feeling somewhat estranged from both sides, while I searched for ways to integrate their perspectives and demands into a meaningful body of research.

In this thesis, historical knowledge of the K-Net broadband governance model is built around reciprocal ties between multiple partners, including myself in my roles as researcher and collaborator. The sociopolitical context of these ties doubly shapes the infrastructure development process and our attempts to study it. In that context, I found that the ecology of games (Dutton 1992, Dutton et al. 1999, Dutton 2009) provided me with a perspective and a vocabulary that helped my inquiry focus on the relationships in the field, their case historical context and linkages, as well as my contemporary relationships to them. Though at times dedicated researchers, practitioners, and policymakers may take offence at the idea that broadband deployment and research can be framed as games for political animals, there is a long psychosocial history behind the metaphor of games which deserves to be taken seriously (Cf. Long 1958, March and Olsen 1984).

Dutton's (1992, 2009) ecology of games introduced a way of framing telecom infrastructure development in terms of the different institutional perspectives at play in various historical instantiations of ICT infrastructure. In my interpretation of the ecology of games, these perspectives then inform the models/principles/rules that contend for dominance via the organizational practices and strategic interactions that strive to assert or deny them. This is why I chose to focus on social enterprise as manifest in KO-K-Net Services' particular organization, and why I sought to induce a set of principles or rules from that organization's historical struggles to establish broadband in Northwestern Ontario. To what extent are K-Net's principles or rules applicable to other cases and regions? The ecology of games challenges researchers to search for the purposes and controversies behind models/principles/rules and to look for the reciprocal interactions and unintended outcomes that may establish or subvert them. In that context we cannot generalize the K-Net case history, but can only seek correspondences through concrete historical case analyses, to explore how the governance model that K-Net embodies may or may not apply.

Community informatics, and particularly Clement and Shade (2000), and Gurstein (2003), offers researchers a set of framing devices for extending case histories into a fruitful dialogue on broadband governance. It provides a growing body of research that questions infrastructure development in terms of "access for what", "access for whom", and "access for what purposes" (Clement and Shade 2000). These are important questions of governance that shift the perspective of inquiry from the triune vantage points of industry, governments, and regulators, to a decentralized network of multiple vantage points within communities, (and inclusive of citizen stakeholders). Clement and Shade (2000) for example, configure their ecological metaphor of the *Access Rainbow* around a citizen stakeholder, based on their interest in a universal access policy. Gurstein (2003), for example, situates governance within local geospatial communities, and links governance to local community policies and organizational capabilities. These examples of community informatics propose that communities are sites where internet governance takes place, just as Long's original (1958) conception of the ecology of games equated governance to the interdependent affairs of communities. Such approaches challenge researchers to acknowledge decentralized and distributed modes of governance. They beckon researchers to examine how citizen-based and community-driven principles, such as those embodied in social enterprise, may unfold. They situate communities as part of regional ICT development, where the affairs of citizens and community-based organizations overlap and correspond to the affairs of industry, governments, and national regulators.

As a point of comparison and correspondence with other possible cases, K-Net's social enterprise organization configures its governance model/principles/rules around the rights of First Nations communities to own and control local infrastructure (as discussed in Chapters 3 and 6). Yet it accommodates local First Nations community ownership by aligning social enterprise with the requirements of what, at times, appeared to be clashing organizations and perspectives, such as Treasury Board's position on project finance (in Chapter 5), or the incumbent local exchange carriers' position(s) on high cost serving areas (in Chapter 4). In these situations we see how, as an organization, KO-K-Net Services skillfully negotiated the affairs of governments and industry, by enrolling them in First Nations community affairs (and vice versa). The ecology of games and community informatics thus help us to discover how principles and practices intersect in the creation of evolving infrastructure and new principles and practices. The points of intersection and comparison in this case are organizational (March and Olsen 1984). They focus on the ways that an organization enacts sociopolitical relationships, (between individuals and communities), to shape how players compete and cooperate over infrastructure in accordance with their relative perspectives and their relative capabilities to modify and blend perspectives to form new models/principles/rules. In the ecology of games, some models/principles/rules come to dominate over others, as the state of play evolves, and as they become embedded in practice and durable community infrastructure. In some cases, formally weak and/or minority players in the focal communities, (those considered insignificant by the entrenched order) may join forces to shift relations of dominance and institutional impediments in the direction of their own agenda (and shared perspectives): As I explained in Chapter 3, K-Net changed the local rules of telecom in Northwestern Ontario; and it did so, not by dividing and conquering, but by realigning Northwestern Ontario's remote First Nations into a regional force that the dominant forces in their region could then recognize and cooperate with[52].

I found the ecology of games to be a valuable framing perspective when it came to following K-Net's staff and allies in the First Nations communities, as they constituted themselves into a regional force and aligned themselves with new federal partners such as FedNor and First Nations SchoolNet. Without the sociopolitical focus that the ecology of games brought to my analysis, the organization of relationships that shifted the state of play in favour of K-Net's social enterprise principles would have remained invisible. By attending to the sociopolitical, I learned how KO-K-Net Services' organization built a credible business case for broadband deployment in Northwestern Ontario's high cost serving area, which established the technological and economic basis for K-Net's principles of local community ownership and control over loops, access facilities, and applications.

A major challenge of applying the ecology of games and community informatics to a case history as deep as K-Net is the dual risk of losing one's way and of not being faithful to the historical context. I have limited the focus of my analysis to the implications of K-Net's carriage level infrastructure and to the demands of owning and controlling that infrastructure. Even with a narrower set of research questions and commitments, I learned, painfully, that I had to cut many parallel threads (e.g., chapters) from the historical episodes that I found to be evocative of K-Net's evolution as a social enterprise. This is not a flaw in the ecology of games or community informatics per se, but a vulnerability of case historical research and studies that aspire to ecological holism (Ragin 1989). If you cut too much from analysis, you lose the case's

[52] KO-K-Net Services' Brian Beaton has described this tactic as something akin to aikido's philosophy of turning the potentially destructive energy of one's opponent into a constructive force. Ideally, it comes through turning former opponents into allies. This is a way of describing how the remote First Nations of Sioux Lookout District went from having extremely limited access to ILEC telephones to broadband community networks they could significantly own.

evocativeness (the concreteness of being a reflection of the actors, places, times, and critical issues, etc., in question). If you add too much to a case, you risk numbing the reader in endless trivia and offer little in terms of points of comparison for other researchers and cases. I hope I have found a proper balance.

In my CRACIN research partnerships with K-Net I had to look beyond telecom to the applications that had been growing as a result of the changes that KO, First Nations SchoolNet, FedNor, and their allies have created (see Appendix 1 for a full list of my CRACIN publications, and Appendix 2 for a list of the various workshops that supported my thesis work). As a subject, K-Net presents many layers of applications and services that continue on in development. This is a good sign for future research. K-Net preserves a fertile ecology that should continue to entice researchers at all layers of its evolving infrastructure (Clement and Shade 2000).

Two areas of study stand out in terms of immediate follow-up research connected to my own case history. These are online education and telemedicine (see Fiser et al 2005 for a sociopolitical perspective on education, and Fiser and Luke 2008 for a sociopolitical perspective on telemedicine). The KO-based community intermediaries who manage the internet high school and telemedicine applications introduce their own important governance issues and are constituted by players and sociopolitical relationships that require their own dedicated case histories (and comparative research with similar applications). How they link/interact with K-Net's social enterprise as semi-autonomous organizations with shared and separate stakeholders, is particularly worth investigating in my estimation, for these sister organizations are integral to K-Net's sustainability as a network enterprise.

In terms of K-Net's continually evolving social enterprise, and its technological basis, there are numerous local enterprise issues and carriage level developments for future research to engage. Still nascent applications, and governance issues for prospective researchers to watch out for, include the coming of IP cellular telephony over remote community-based networks, the expansion of and enhancements to the Northern Indigenous Community Satellite Network, and upgrades to K-Net's fibre backhaul/backbone networks. These current developments (circa 2009) promise to introduce new models, principles, and rules of engagement within K-Net's ecology of games.

7.1.1 Note to Practitioners

Knowledge comes in many flavours. Some are formal. Others are tacit and/or relatively informal. Much of what KO Tribal Council's K-Net Services developed organizationally, and which I recognize as principles of K-Net's broadband governance model, was imbued in practice, projects, and limited contractual agreements, but not explicitly formalized, as such, until inquisitive researchers came and asked them why they did what they did[53]. What I observed through KORI and CRACIN were organizational strategies and tactics that KO-K-Net Services staff and allies had learned by doing and improvising (in the moment, as opportunities arose and as constraints had to be managed). For them, governance has a specifically organizational character, and that character must be flexible in form if it is to uphold and elevate principles such as local ownership and control amidst political changes, and evolving technological and economic partnerships.

Without sophisticated simulators and experimental apparatus, we often model after the fact to try to articulate the principles that underlie evolving practices and apparent improvisations. Principles and practices are therefore interdependent, and over time, particularly without adequate historical records, it may become difficult to differentiate one set from the other. Principles or rules are also implements (and impediments), not simply for dissertation writers, but also for practitioners in their everyday context of negotiating and rationalizing what they do (e.g., what their mission is, what their goals and values are, what their next moves should be, and so forth). I was fortunate in my case history of K-Net to have had guides within KO-K-Net Services; staff such as Brian Beaton, Jeannie and Penny Carpenter, Jesse Fiddler, Adi Linden, Dan Pellerin, Jamie Ray, and many others. In my research they embodied the qualities of what Schön called the reflective practitioner (Schön 1984). Whenever I would ask them why they did X or Y, in order to interpret some K-Net principle, if they did not have an immediate answer, they took the time to consider their motives, their environment, and the historical context, to

[53] I remember Dr. George Ferreira challenging KO-K-Net Services staff to articulate a set of principles for what they do, at a meeting of the RICTA research consortium, in Balmertown (2005). His challenge inspired KORI (Brian Walmark, Franz Seibel) and I to investigate K-Net's social enterprise as an enactment of principles.

establish reasons wherefore and why. It was a constant challenge on my part to keep up with their thinking, (particularly as their attempts to strategically frame K-Net would sometimes shift depending on which projects or partners they were addressing). However, my goal was to represent the underlying principles of social enterprise that appeared to outlast particular projects and partnerships. I did not always agree with their conclusions, particularly around sociopolitical and related research/policy issues, such as the ecology of games and its pertinence, but they commanded respect and challenged me to dig deeper in my interpretations. It is imperative that so-called action research projects and case histories lift up the practitioner's voice and not drown it out in academic or policy jargon. It is important to accept the practitioners' challenge of trying to understand the researcher as he/she tries to understand them, of trying to frame the researcher as he/she tries to frame them. I believe CRACIN was successful in providing an appropriate environment for practitioners to tell and publish their stories and to challenge the perspectives of their collaborators in government, industry, and academia. I do not believe that the thesis as presently framed by my own particular institutional context (at the University of Toronto), is a flexible enough genre to facilitate the sort of plurivocity I have in mind. (But please see Appendix 6 for some early voices in K-Net's past, related to Chapter 5, Section 5.4).

7.2 Development Implications

As with any innovative internet-based network, K-Net presents a moving target for policymakers, researchers, consumers, and other players. Nevertheless, there are a number of lessons for developers to consider from this examination of the principles underlying K-Net's evolution as a social enterprise organization of community-based networks.

To appraise broadband deployment's social value as a potential or actual public good, policymakers and researchers need to understand the claims for broadband infrastructure that presently circulate within the networks of actors and local constituencies that constitute the three distinct, yet intersecting worlds of sociopolitical and economic structure within 21st century society: These worlds are the public, not-for-profit, and for-profit sectors. For nations aligned under such institutional regimes as the G8, the World Trade Organization (WTO), and the Organization for Economic Cooperation and Development (OECD), each sector complements the others within an orienting structure of sociopolitical relationships that, in the vocabulary of my methodological discussion, comprises our globally evolving ecology of games. K-Net presents one particular focal point, a concrete historical instantiation of these overlapping sectors. In the global ecology of games each of the sectors can include multiple forms of governance and organization, as well as a variety of preferred market-based mechanisms, and non-market forms of sociopolitical and cultural exchange. Note also that not-for-profit and for-profit sector organizations are equally private with respect to the public sector's institution in government, notwithstanding the very different roles that not-for-profits and for-profits can play in extending public services and programs to communities.

In the deeper historical timeframe of my inquiry (1970s to 1997), public ownership became a less favourable governance option than private ownership. In the global ecology of games, as described in Chapters 1 and 4, OECD nations, such as Canada, have come to adopt principles of market liberalization, privatization, and competition (Intven et al 2000; OECD 2004; Sinclair et al. 2006; see also Chapter 4 for the perspectives of Canada's federal/provincial governments and incumbent local exchange carriers). In this context, and reluctant to behave as a public utility in a deregulated telecom market, the public sector feared that competing (or appearing to compete) with industry would distorts market conditions. The public accepted a more passive consumer role, and in cases such as K-Net's pre-history, positioned itself at a structural and strategic disadvantage when and where incumbent industry players could decide to hold up innovation (Cf. Williamson 1985). There are exceptions to public sector passivity, particularly at the municipal and local Aboriginal authority level, as discussed in Chapter 1. There are also hybrid ownership models, such as social enterprise, where the public sector at provincial and federal levels has found a renewed sense of co-ownership and cooperation with First Nations and industry.

Within the timeframe of my investigation into K-Net's broadband deployment (1997 to 2007), high cost serving areas (HCSAs) had an extremely limited paucity of alternatives to incumbent local exchange carriers. Monopoly situations, largely due to high technology costs, exacerbated so-called economic hold up situations, as the benefits of market liberalization, privatization, and competition failed to materialize under conditions of low population density and disaggregated consumer demand. Incumbents set the rules and had no economic incentive to deliver a broadband public good. Moreover, without allies in the HCSA communities, and without their own expert technical staff to suggest alternatives, the potential public sector investors relied on HCSA incumbents to report costs and market conditions honestly, and left themselves with few options to punish hold ups to telecom service without also punishing remote consumers (through investment delays and exit).

K-Net and its allies developed an alternative to economic holdups by instituting social enterprise. The public sector, reluctant to assume ownership and control over telecom, and reluctant to relinquish ownership and control over services to for-profit enterprise, transferred local property rights to KO and other community-based not-for-profit actors (such as the First Nations SchoolNet RMOs of Chapter 5). These property rights were embodied in the form of local loops and in the organization and knowledge/technical expertise developing around KO-K-Net Services. In such an arrangement, the not-for-profit actor works in concert with public investors to embed vulnerable market-mechanisms in local sociopolitical and socio-technical relationships. This set of options simultaneously allows the combined forces of public and local not-for-profit actors to entice and police industry participation. As KO-K-Net Services has demonstrated in its partnerships with First Nations SchoolNet and FedNor, such a combination of public and not-for-profit sectors can redeem socio-economic regions where high costs and disaggregated consumer demand distort market signaling, and where unchallenged incumbency may enable industry players to hold up public policy goals (as discussed in Chapter 3. See appendix 3 for a closer look). The public not-for profit partnership, as instituted in the social component of social enterprise, also shifts risk over to civil society, and directs the not-for-profit organization's advocacy powers and community constituency relationships into forms that can benefit the public sector and advance its goals. This assumes a level of faith in citizens and civil society, on the part of the public sector, as well as a commensurate level of investment to nurture the not-for-profit sector's capabilities as a participant in telecom development and service delivery. Ideally, social enterprise improves communication and trust between the public sector and its community constituents, by creating an alliance of engaged citizen/consumer stakeholders that vests their mutual interests and aggregate purchasing power in the social enterprise. Through the enterprise side of social enterprise, a shared infrastructure can then emerge that combines leading-edge technologies, public sector funds, and community-based resources, to make broadband deployment viable and sustainable (see Chapters 5 and 6).

The concept of community networking in the Community informatics research literature approximates this kind of social enterprise based partnership (Gurstein 2000). However, as Community informatics research has discovered, community networks are as vulnerable to public sector exit as they are to incumbent holdups, particularly when not-for profit community intermediaries have no access to capital development opportunities outside the public sector funding system.

In the case of remote First Nations in K-Net's high cost serving areas, my thesis research describes how networks of public and not-for-profit actors provided a viable basis for broadband deployment. (First Nations SchoolNet is an important national example from Chapter 5). Such community-based networks operate as community intermediaries of partnerships between the public sector and private operators, and of sociopolitical relationships between the public sector and its community constituents in their First Nations. Here community intermediaries with committed public support, supplement conventional market mechanisms and an overreliance on incumbents, to overcome an ILEC's unwillingness to satisfy consumer demand for broadband access. Such institutional innovations, their vulnerabilities and synergies, deserve deeper study and could be worth emulating more broadly, wherever communities are unserved or underserved in their demand for new technologies and infrastructure. They may also have a particular lifecycle that becomes less important once community-based infrastructure of this kind matures beyond the first 10 years of capital development and experimentation, as K-Net's case appears to indicate.

7.2.1 For First Nations, Governments, and ILECs/CLECs

Since the 1970s, the predominantly First Nations occupants of Northern Ontario's high cost serving areas (HCSAs) have striven to achieve three goals related to information communications technology: access, ownership, and control. These goals inform past and present struggles to govern communications development in their region. K-Net is the latest example of a legacy of First Nations governance and development that reaches back into the mid-1970s. The broadcast legacy of Wawatay and other civil society groups from the 1970s and -80s bespeaks an activist sentiment in the indigenous region of Northern Ontario, a persistent push to acquire means for First Nations communities to communicate better and on their own terms. The limitations of the broadcast medium do not diminish the underlying value of the lessons learned from this era: The remotest of the remote could organize, could aggregate demand, could acquire technical infrastructure, innovate locally, and shape new/unfamiliar technologies to serve their needs and circumstances. In this regard we find early manifestations of K-Net's social enterprise principles in community radio and in the Native Communications Societies (Mohr 2001).

Since it began in 1994 K-Net's mission has been remarkably similar to the Wawatay Radio Network: To support community access, community ownership, and community control, but this time over two-way communications, whether satellite or terrestrial, with the objective to continually innovate to acquire higher-capacity and more sophisticated services. Broadband continues to be a moving target in terms of the applications that drive it and the infrastructure development needs that new applications create. So far, K-Net's social enterprise appears to be scalable to meet these evolving challenges to service and governance.

K-Net's development process and approach to governance has been marked by accommodation. Its early projects established important compromises with the dominant forces of the telecommunications game in its region that continue to shape its evolution. New public sector champions, such as Industry Canada, had a connectivity agenda to share with K-Net's First Nations constituents (and other HCSAs), but only if they would play by the rules of the Telecommunications Act and balance the market/industry requirements of section 7(f) with their own demands for equitable and accessible services of high quality under section 7(b). Out of this balancing act came such provisional connectivity strategies as First Nations SchoolNet's (1997 - 2001) partnership with the Stentor Alliance, which allowed HCSAs to participate on the information highway so long as they remained predominantly spectators (i.e., the DirecPC system described in Chapters 3, 4 and 5). Such solutions, although important first steps and valuable capacity building opportunities for many HCSAs which had never had the internet (and in some cases never had a phone), were not adequate to deliver two-way communications of the kind of quality demanded by residents of HCSAs in Northern Ontario and by their local public sector partners in regional hospitals, community health clinics, social services, and schools (as discussed in Chapter 3).

While extending Stentor's Direc PC network, and "Connecting Canadians" on behalf of First Nations SchoolNet, K-Net built an alternative vision of accommodation that came to include broadband services. As the ICT arm of Keewaytinook Okimakanak Tribal Council, KO-K-Net Services studied at the grass roots to learn directly from the communities about their communications and information service needs. It cultivated extensive ties throughout Northern Ontario, participating in critical infrastructure working groups (the NOWG, FedNor's AWG). Through these working groups and their membership KO-K-Net Services developed/shared legitimate regional strategies, funding proposals and business cases. It collaborated and connected with Tribal Councils, regional health and education authorities, municipalities, hospitals, individual First Nations, human resource development organizations, and practically any other party in the region (and beyond) that shared its mission to improve First Nations community access to telecommunications and information services. In this way, KO-K-Net Services channeled its role in First Nations SchoolNet, as well as its numerous ad hoc social networks and lessons learned, into opportunities for regional demand aggregation and cooperation with the region's dominant government programs, public services, and industry players (as explained in Chapter 6 and in Appendix 3).

As I discussed in Chapter 6, Keewaytinook Okimakanak Tribal Council (KO) has forged and embedded K-Net within a network of technologies and human relationships that facilitates broadband deployment and protects indigenous property rights in high cost serving areas. It has done so through its K-Net Services management capabilities, framed in terms of what I have described as relationship building and heterogeneous engineering practices, and through its effective standardization of economic transactions between public programs, community networks, and ILECs/CLECs (to deliver a menu of service options and flowthrough funding arrangements). These management capabilities and economic standards are the organizational outcome of KO-Net Service's efforts to organize a regional force for broadband governance in Northern Ontario. They compensate for the governance vacuum left by the national regulator, the Canadian Radio-Television and Telecommunications Commission (CRTC), in its decision on HCSAs (99-16 as discussed in chapter 4).

To be an effective management organization and vehicle for broadband governance, KO-K-Net Services has had to carefully balance the needs of remote communities and key talent with the needs of public sector contributors and industry. Negotiating the push and pull of their relationships is not entirely secure or certain, particularly given this organization's relative youth and small scale (compared to incumbents such as Bell Canada, Bell Aliant, and other former Stentor Alliance members); but as the range and extent of its achievements do attest, KO-K-Net Services has managed to sustain K-Net's enterprise, in no small measure due to the tenacity and ingenuity of it remote Northern constituency. It is their cultural tenacity and ingenuity, as reflected in KO-K-Net Services' management capabilities and standards, that has helped to convince K-Net's partners to pursue broadband deployment under the stewardship of social enterprise.

7.3 Policy Implications

In the historical milieu of its first phase of broadband deployment, K-Net speaks to legislative and regulatory positions on development and governance in high cost serving areas (HCSAs). This social enterprise also speaks to incumbent local exchange carriers (ILECs) and their role in HCSAs. To both sides it says: Legislation, regulation, and industry can support the growth of local community-based networks without compromising telecommunications markets (as per Section 7(f) of the Telecommunications Act). KO-K-Net Services' social enterprise presents a viable alternative to broadband deployment and internet services delivery via monopoly incumbents or centralized public ownership/procurement (the entrenched monopoly/monopsony relationship examined in Chapter 3). This alternative to hierarchical control, (whether through the state or an incumbent's vertical organization), requires cooperation, and not simply, more competition (i.e., for market access). It presents a viable model of governance for accommodating the special needs of minority communities. It supports the integration of geographically isolated communities into regions, and establishes the regional policymaking role of community leaders and citizens.

The claims I make to justify cooperation, based on K-Net's social enterprise principles, are the following. Without public support for broadband deployment, through regulation and program policy, many communities on the margins of mainstream society and in the high cost serving areas of the mainstream economy, have no effective means to access affordable broadband ICTs. For Canadian indigenous peoples struggling to assert their institutional autonomy over community development in the early 21st century, the role of the public sector must support organizational forms that resonate with the sociopolitical and economic structures of indigenous community development. Social enterprise, as defined in this thesis, is an important example of a compatible organizational form. KO-K-Net Services demonstrates how social enterprise can operate and govern as a part of a Tribal Council arrangement that is also an extended affiliation network of multiple Tribal Councils and associate First Nations. The social enterprise organization in this case enables decentralized community networks to cooperate as part of a region (in this case, the region represented by Nishnawbe Aski Nation).

K-Net's social enterprise protects First Nations collective property rights over infrastructure, while being responsive to industry demands and responsible for public sector mandates. Nevertheless, social enterprise requires champions in government and industry. Champions, such as program officers at Industry Canada FedNor and First Nations SchoolNet, or the engineers at Bell's R&D department and Telesat, helped K-Net change dominant institutions to accept the benefits of local community capabilities and respect the needs of remote First Nations to govern themselves. These champions also gave KO-K-Net Services and its community partners, space, time, and critical resources to learn to improve their systems of governance, their technologies, and their emergent network economy. As described in Chapter 6, the communities have indicated that they want to be networked and autonomous. They want the benefits of regional status without sacrificing local community authority to decide how to harness the benefits of being an adaptive region. Social enterprise facilitates this condition by enabling cooperation with industry and the public sector.

Cooperation between the public sector and not-for-profit social enterprise can enable indigenous peoples to develop ownership and control over local infrastructure and services. Decentralized ownership and control of publicly supported infrastructure, at local levels within constituent communities, can also help public sector agencies acquire a more active and responsive constituency base. An active constituency consists of community-based organizations and civil society groups (community intermediaries) that can help the public sector monitor service delivery and collect strategic information about the regions they serve together. This is especially prescient when levels of trust between indigenous communities and the public sector have been relatively low compared to national surveys of average citizen confidence in government (Aboriginal Peoples Survey 2001). Trust building takes time, and cooperative arrangements increase the potential for long-term relationships to form and flourish. K-Net provides a governance model that supports such long-term arrangements.

Nevertheless, embedding public sector services within a not-for-profit community-based infrastructure does not absolve the public sector of its obligations to actively champion the public good. Public sector agencies must respect the not-for-profit sector's strengths and be mindful of its vulnerabilities. They should not force social enterprise to imitate government or for-profit institutions. Cooperation requires the public sector to help social enterprise develop its endogenous capabilities and develop the capabilities of community-based infrastructure's regional constituency base to help create networked and autonomous communities. Such commitments are problematic when governments operate under tight fiscal constraints, and have to answer to what may appear to be an overly diluted, yet largely undifferentiated polity of special interests in every sector of public endeavour. With diminishing budgets and increasing stakeholder demands, it may be more convenient for regulators and governments to entertain dominant industry incumbents (the biggest and most vocal players, as exemplified by Stentor in Chapter 4). This was clearly the case in Chapter 4's analysis of the CRTC hearings on HCSAs, and in Chapter 5's analysis of the Stentor DirecPC solution that IHAB accepted on behalf of *Connecting Canadians*; but it is not an adequate long-term strategy for infrastructure development in communities. More conducive to giving social enterprise a chance has been the pioneering work of program officers within IHAB and Industry Canada, particularly within First Nations SchoolNet and FedNor, who differentiated the mass of interest groups vying for public attention, connected with the right community intermediaries, and cooperated when it came down to supporting community ownership versus total ILEC control. Partially through their support and vision, communities in K-Net's high cost serving areas have a fundamental carriage level base to build from, and the ILECs still have a funding base to maintain critical backbone/backhaul services (if only at the level of cost recovery for the public good).

A vision of public and not-for-profit sectors cooperating on moral grounds, for the public good, cannot afford to alienate the for-profit world of industry. The goal of cooperation is not to undermine markets, but to instantiate a vision of the public good that markets can assist (but for-profit players cannot simply exploit). Instead of threatening industry, social enterprise relies on a tripartite agreement between the public, not-for-profit, and for-profit worlds, for without the economies of scale and scope that the telecommunications and computer industries have developed over successive iterations of publicly-funded and market driven technology development, there could be no means of efficiently producing and distributing broadband ICTs. Moreover, industry can overcome market distortions in the remote communities and high cost serving areas by cooperating with the public and not-for-profit sectors (see Chapter 3 and Appendices 3 and 4 for a closer look). By cooperating with constituency-driven, social enterprise organizations that have sociotechnical competencies on par with KO-K-Net Services, industry can more effectively identify consumer demand in high cost serving areas, test alternative carrier technologies (e.g., based on cost/efficiency), and compete for public investments more efficiently to enhance services and carrier infrastructure. (See Chapter 3. See also Appendix 3 for more on the role of technology and evolving costs when social enterprise is involved).

Within their tripartite agreement, the public sector can, in turn, resource and utilize community-based social enterprise to monitor and police emerging and distorted markets when industry players have little or no incentive to cooperate for the public good (as discussed in Chapter 4 in the relationship between FedNor, the NOWG, and KO-K-Net Services).

It is thus the cooperation of public agencies, and not-for-profit social enterprise, with an eye to the public good in constituent communities, as well as the cooperation of industry players, with an eye to efficient technology development, that will sustain broadband deployment in remote indigenous communities and in other high cost serving areas. It is my contention that without the mutual agreement of these three worlds, and guiding principles to direct their alignment, as embodied by K-Net social enterprise (circa 1997 to 2007), the hopeful vision that former Assembly of First Nations Grand Chief Coon Come raised before *IPSA* in 2001, has little chance of reaching all indigenous peoples in Canada or abroad. As he said:

> *We can use technology. With access to new internet infrastructure that can be applied with the best networking capacities that are there, we can connect our communities, our hospitals, and our schools…. we missed the Industrial Revolution; we will not miss the information technology revolution. (Matthew Coon Come IPSA 2001)*

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Appendix 1: CRACIN K-Net Case Study Workplan and Correspondence with Spinoff Projects and Thesis Research Program

Year	Sponsor	Project	Research Objectives	Collaborators	Methods	Outputs	Thesis Chapter	CRACIN Questions
Summer 2004	CRACIN	K-Net Case Study	Meet K-Net Services	K-Net Services	Participant-Observation	N/A	1	What is K-Net?
Fall - Winter 2003	CRACIN	K-Net Case Study	Meet K-Net's First Nation community networks	KORI	Participant-Observation, Interviews	A	1, 2, 3, 6	Who are K-Net's First Nations Constituents?
Fall 2004	CRACIN	CIRN Prato Doctoral Consortium	Compare K-Net to Community Informatics	K-Net Services (Jesse Fiddler)	Participant-Observation	B	1, 2	How does the K-Net case fit with Community Informatics?
Fall 2004	CRACIN	K-Net Case Study	Meet IHAB and First Nations SchoolNet	K-Net Services, First Nations SchoolNet	Interviews	C	2, 3, 4,5, 6	How did K-Net's development intersect with Federal/provincial policy?

[A] Success Stories

[B] Fiser A. "ICTs for Education in Ontario First Nations", Prato Doctoral Students Colloquium, Community Informatics Research Network, Prato, Italy, September 29 to October 1, 2004

[C] Fiser A., "First Nations SchoolNet Regional Management Organization Backgrounder", Canadian Research Alliance for Community Innovation and Networking, Working Paper No. 1

Year	Sponsor	Project	Research Objectives	Collaborators	Methods	Outputs	Thesis Chapter	CRACIN Questions
Winter 2005	RICTA, CRACIN, KO Tribal Council	K-Net Case Study	Meet KO Tribal, Chiefs, and core communities	KORI, K-Net Services,	Participant-Observation	D	3, 4, 5	What is KO Tribal Council? What are the Northern Ontario First Nations' regional policies?
Spring 2005	CRACIN, First Nations SchoolNet RMO	K-Net Case Study	Meet K-Net Youth workers	K-Net Services RMO	Participant-Observation	E	5, 6	Who works for K-Net in the First Nations communities? How do they work?
Winter & Spring 2006	Princess Margaret Hospital, KO Tribal Council	PePTalk Project	Meet seasoned K-Net Community Network Managers	K-Net Services RMO, KO Telemedicine,	Participant-Observation	F	5, 6	Who manages K-Net applications in the First Nations community networks? How do they manage?

[D] Fiser A., Clement A., and B. Walmark, "The K-Net Model of broadband development", Telecommunications Policy Research Conference, Arlington VA, USA, September 23 to 25, 2005, 58pp. http://web.si.umich.edu/tprc/papers/2005/447/K-NetTPRC05.pdf

[E] Fiser A. (2005) "Through Their Eyes: Worker perceptions of the Youth IT program", Keewaytinook Okimakanak Tribal Council Report for Industry Canada First Nations SchoolNet Program Ontario Regional Management Organization

[F] Fiser A., and R. Luke (2008) "Between the Clinic and the Community: Pathways for an Emerging E-Health Policy in the Remote First Nations of Northwestern Ontario" in Mediating Health Information, Eds. N. Wathen, S. Wyatt, and R. Harris, Hampshire, England: Palgrave Press, pp. 128 - 149

Year	Sponsor	Project	Research Objectives	Collaborators	Methods	Outputs	Thesis Chapter	CRACIN Questions
Summer 2006	CWIRP, CRACIN	K-Net Case Study/Lac Seul Community Wireless Network	Understand how K-Net Services manages network builds	K-Net Services, KORI, Lac Seul First Nation	Interviews, Field visits	G	3, 5 Appendices 3, 4	How did KO/K-Net Services and FedNor organize network builds? How did they govern their relationships?
Fall 2006	CRACIN	K-Net Case Study	Understand K-Net Services Human Resource Development Process	K-Net Services, KORI	Participant-Observation, historical research	G	5, 6, Appendix 6	How do K-Net affiliated community network personnel train on the job?
Winter 2006 – Spring 2007	CRACIN	K-Net Case Study	Understand K-Net's origins and developmental trajectory as an ecology of	K-Net Services	Electronic Archival Research & Document analysis	H, I	1, 2, 3, 6, Appendix 3	How is K-Net's governance like ecology of games?

[G] Fiser A., and A. Clement "The K-Net Broadband Deployment Model: Enabling Canadian Aboriginal Community Control of Telecom Infrastructure Through Relationship Building and Heterogeneous Engineering", IEEE International Symposium on Technology and Society, Fredericton NB, Canada, June 26 to 28, 2008

[H] Fiser, A. and A. Clement, "The K-Net broadband deployment model: How a community-based network integrates public, private, and not-for-profit sectors to support remote and under-served communities in Ontario", research report to Ontario Ministry of Government Services (MGS), Toward a Broadband Research Agenda for Ontario, submitted May 18, 20007, 91pp.

[I] Fiser, A. and A. Clement, "The K-Net broadband deployment model: How a flexible, open, and decentralized community-based network integrates remote and urban sectors of Ontario", presented at the final CRACIN research workshop, Concordia University, Montreal PQ, Canada, June 20-22, 2007.

Year	Sponsor	Project	Research Objectives	Collaborators	Methods	Outputs	Thesis Chapter	CRACIN Questions
			games					
Winter 2008	CWIRP	K-Net Case Study/Lac Seul Community Wireless Network	Understand K-Net's social enterprise business model	KORI	Interviews, Videoconference	J	All (see thesis questions in chapter 1 for specification)	How is K-Net's governance a feature of its organization by social enterprise?

[J] Fiser A. and A. Clement "K-Net and Canadian Aboriginal Communities" in IEEE Technology & Society Magazine, Special Issue International Symposium on Technology and Society '08, Eds. S. O'Donnell, and B. McIver, (Forthcoming)

Appendix 2: Research workshops that supported my thesis work and related CRACIN deliverables

2008	"First Nations Application Service Providers Online Workshop" Community Wireless Infrastructure Research Project (CWIRP) and Keewaytinook Okimakanak Research Institute (with Franz Seibel), (multi-site videoconference and Moodle), Faculty of Information, University of Toronto, Toronto ON, Canada, January 29, 2008
	"Research partnerships with the Faculty of Information, University of Toronto", in "National Briefing on the Northern Indigenous Community Satellite Network (NICSN)", Northern Indigenous Community Satellite Research Consortium with Telesat Canada, (videoconference), Ottawa ON, Canada, September 26, 2008
2007	"Canadian Research Alliance for Community Innovation and Networking, Community Information Corps Panel" (with Clement A., MacDonald S., and M. Wong) School of Information, University of Michigan, (videoconference), November 9, 2007
2006	Fiser A. "Reconfiguring Access to Aboriginal Ontarians: Opportunities for Research in a Broadband Enabled Ontario", Toward A Broadband Research Agenda for Ontario; Ontario Ministry of Government Services & KMDI – University of Toronto ON, Canada, December 4, 2006
	"Community Informatics Workshop", at the i-Conference 2006, Research Frontiers in Information, University of Michigan, Ann Arbour MI, USA, October 15 to17, 2006
	"K-Net PePTalk Workshop with First Nations Health Professionals and Community-based Researchers" Patient Education Prescriptions Research Project - (with Darlene Rae and Kanina Terry), (multi-site videoconference and Moodle), KMDI/University of Toronto, Toronto ON, Canada, June 6, 2006
	"K-Net and Community Economic Development" RICTA workshop National Research Council and Keewaytinook Okimakanak Tribal Council (with Brian

Beaton), (multi-site videoconference and Moodle), Faculty of Information, University of Toronto, Toronto ON, Canada, May 16, 2006

"Rural and Remote Broadband Panel", (with Gurstein G., Peddle K., and F. Winter), in "Integrating Research for Sustaining Community Networking Initiatives", fourth CRACIN (Canadian Research Alliance for Community Innovation and Networking) research workshop, University of Toronto, Toronto ON, Canada, March 3 to 5, 2006

2005 "K-Net Case Study", in "Graduate Student Colloquium", third CRACIN (Canadian Research Alliance for Community Innovation and Networking) research workshop, Concordia University, Montreal PQ, Canada, December 8 to 9, 2005

"Panel Discussion: Canadian Research Alliance for Community Innovation and Networking" (with Bell, B., Dechief D., and G. Longford), Canadian Communications Association Conference, London ON, Canada, June 2 to 4, 2005

"Research on ICT with Aboriginal Communities (RICTA)", RICTA S.S.H.R.C. Strategic Research Cluster, National Research Council and Keewaytinook Okimakanak Research Institute, Balmertown ON, Canada, March 11, 2005

Fiser A., Ray R., Toulouse T., and B. Walmark, "Keewaytinook Okimakanak: Youth Initiative Training", Summit 2005: Strategic Use of Information and Communication Technology for Communities, Vancouver, BC, February 25 to 26, 2005

2004 "Evaluating the K-Net Experience", in "Learning from Experience", second CRACIN (Canadian Research Alliance for Community Innovation and Networking) research workshop, Ottawa ON, Canada, November 26 to 27, 2004

"Background and Direction Setting", first CRACIN (Canadian Research Alliance for Community Innovation and Networking) research workshop, Montreal PQ, Canada, May 14 to 16, 2004

2003 “Towards a Research Alliance for Community Innovation and Networking ” A two day proposal preparation workshop, University of Toronto, Toronto, ON, Canada, June 20 to 21, 2003

Appendix 3: A closer look at how KO/K-Net Services and Industry Canada/FedNor established K-Net's broadband deployment

One example of the impact decision 99-16 had on indigenous communities' access to broadband is in the Sioux Lookout District of Northwestern Ontario where 24 remote First Nations communities reside. This was territory that Bell Canada held as an incumbent carrier.

In response to CRTC 99-16, Bell Canada submitted a Service Improvement Plan that it intended to roll out over four years from 2002 to 2005. Under this plan, the ILEC would provide service to all qualifying localities provided that at least one customer within a target locality requested service and was willing to contribute a maximum of CAD $1,000. Localities would qualify for the SIP when the average capital cost per premises in a particular locality, whether permanent or seasonal, did not exceed CAD $25,000, including a CAD $1,000 customer contribution. The aggregate capital cost allowance in each locality was calculated using a 100% take rate, for all premises within the locality. Bell Canada submitted that its total SIP capital cost was now estimated at CAD $127.8 million.

In terms of the CRTC's call for least cost technologies to satisfy the upgrades, Bell Canada submitted that some progress had been made in the area of code division multiple access (CDMA) technology, and that existing CDMA customers were now able to access the Internet at very low speeds. The ILEC submitted that it expected CDMA Internet access speeds to improve in the future, as the technology was further refined. Bell Canada also submitted that existing CDMA technology would be improved with the addition of the Call Trace functionality, which is necessary to meet the BSO.

As directed in Decision 2002-34, Bell Canada undertook to provide customers in the Northern Ontario exchanges of Pickle Lake, Gull Bay and Armstrong local access to the Internet through the establishment of extended area service (EAS) to a neighbouring exchange where at least one Internet service provider was located. In early 2003, the following exchanges would have EAS: Pickle Lake with the independent company exchange of Dryden, Gull Bay with Nipigon and Armstrong with Nipigon. Bell Canada stated that it would notify customers in the affected exchanges through a short informational message on their bills at least 30 days prior to the effective date of the new EAS link. This low speed outcome of the Bell Canada SIP will serve as a baseline comparison for K-Net model, which started north of Pickle Lake.

Between 2000 and 2001, Bell Canada, the ILEC for Northwestern Ontario, invested CAD $20M on two microwave lines to fulfill its service improvement plan in the region, in response to the CRTC's decision. This capital expenditure covered the cost of digital upgrades along its backbone network to enable the ILEC to provide telephone service to 12 remote First Nations communities in accordance with the CRTC decision (see Figure 38).

1. Bell Capital Investment 20 Million – upgrade network facilities in Northern Ontario to ensure access to the technology necessary for services such as distance learning, Tele-medicine and videoconferencing . (NOTE: this required $250K for the North of Red Lake build, $400K for Deer Lake, $500 for Nibinamik from FedNor)
Upgrade of Analogue Radio to Digital Radio. Communities are as follows: Poplar Hill Sandy Lake Wunnumin Lake Kingfisher Lake Bearskin Lake Big Trout Lake
2. Bell Capital Investment – 120K
Increased capacity for Local Access Growth within the Community of Pickle Lake
3. Bell Capital Investment – 105K (requiring a 210K investment by FedNor)
Data Services Small Communities - Partnership Initiative to provide high-speed telecomm Network – Frame Relay – Hyperstream services. Partners – Fednor – Communities – Bell Canada
Communities are as follows: Keewaywin Sandy Lake Pikangikum Poplar Hill Deer Lake North Spirit Lake
4. Bell Canada Capital Investment – 121K - requiring a Government Investment of over $3.2 million – Plus yearly Ongoing expense associated with the Maintenance, and Access Costs to maintain the service once provisioned. Provisioning of Telephone Services to the Following Communities: North Spirit Lake Keewaywin Mishkeegogamang

Source: Bell Canada: 2001

Figure 38: Bell Canada investments in remote Northwestern Ontario First Nations (circa 1998 to 2001), (Source Keewaytinook Okimakanak 2001)

As there was no CRTC decision concerning access to data switching services in HCSAs, consumers were at the mercy of the ILEC, which had little incentive to risk providing higher-level services to these unserved consumers without a convincing business case. Moreover, the CRTC exempted the ILEC from having to include the Sioux Lookout District's 24 remote fly-in First Nations from its Service Improvement Plans.

In Northern Ontario, the CRTC's decision primarily defined the role of Bell, the ILEC for Northwestern and Central Ontario (North of the 49th parallel). To improve services to HCSAs in response to CRTC 99-16, Bell invested approximately $20M in infrastructure upgrades along its two microwave backbone (western, central). A third backbone along the coast of James Bay was managed by Northeastern ILEC ON Tel and upgraded to a fibre-optic network.

At the time of the decision there were six Northwestern Ontario First Nations that still had no access to basic residential phone service. These First Nations were: Keewaywin, Koocheching, Mishkeegogamang, North Spirit Lake, Slate Falls and Wahgoshig. Available data from the Western and Eastern infrastructure upgrades indicates that Bell would not contribute to the cost of community local loops and required 100% of capital up front before undertaking community builds. To make the business case K-Net (now leading the NOWG) worked with a group of public sector partners, led by Industry Canada FedNor.

FedNor, Industry Canada's regional development agency for Northern Ontario, had, since a 1996 Aboriginal Working Group, been coordinating with members of the NOWG, HCSA communities and connecting towns, First Nations leaders, and K-Net to plan a regional telecommunications and information service upgrade. FedNor's program officers had visited the HCSAs, and maintained a strong communications link with the various working groups, like NOWG, that had emerged locally to plan regional strategy. FedNor was also instrumental in attracting other public sector partners. Its willingness to take a risk on HCSAs and make the first investment signaled to other public sector players that there was value in the region. FedNor program officers worked in parallel with the regional working groups as their membership (particularly Tribal Councils) negotiated with Bell, and submitted grant proposals to Indian and Northern Affairs Canada, and Ontario's Northern Ontario Heritage Fund Corporation, and FedNor. With the right public-not-for-profit partnerships in place, K-Net and FedNor were able to broker business cases that Bell would agree to. Bell was convinced and entered into a relational contract with KO, based on a Memorandum of Understanding they called the Gold Circle Partnership (see Appendix 4 below for a full reproduction). The MOU was contingent on

KO's ability to aggregate a consumer base of remote communities, through K-Net. It specified relatively affordable pricing conditions that reflected a regional cluster of communities as opposed to unaffordable rates charged to individual remote locations. Thus, the MOU stated:

> Bell Canada commits best price and service delivery to this partnership. Best price is based on total price for the terrestrial network, as opposed to a price to an individual location, and, it is intended to be a competitive price comparable to a community network in Central and Eastern Ontario. If Bell Canada cannot meet this commitment, KO may entertain the purchase of these services from alternate providers.
>
> KO commits to providing Bell Canada with the first right of refusal for the delivery of services not supplied by KO. KO also commit to a three year contract on goods and services.

With K-Net's bulk purchasing agreement in check, the capital development process for higher bandwidth community networks made steady progress. The following timeline (1999 and 2001) describes the work that was done to improve the ILEC backbones and service to each of the six unserved First Nations communities on the basis of these public-community partnerships (Cf. K-Net Services 2001):

1. In January, 1999 the NOWG submitted a formal proposal to guide the introduction of digital services north to Sandy Lake (along the Western backbone). The CAD $8.665M project showed a Bell Canada investment of CAD $5.4M and identified a range of broadband applications that could utilize the network once it was operational (two-way video, telehealth, distance education, e-governance, e-commerce). This business case provided the backdrop for a similar upgrade of the Central microwave backbone (completed March 2001). These two projects comprise Bell's investment of CAD $20M (on top of public sector investments of CAD $3.2M). The backbone upgrades progressed as follows (including the James Bay Coast project):

2. **Western backbone** - digital local loop and transport in Sandy Lake, North Spirit Lake, Keewaywin, Pikanjikum, Poplar Hill, Deer Lake. This project was broadly supported by the development of the North of Red Lake Business case completed by local consultants Hoshizaki and Woolner in December 1998. The study showed multi-level funding partnerships, a cost-effective digital upgrade strategy and an applications base for utilizing new digital resources.

3. **Central backbone -** Digital local loop and transport in Bearskin Lake, Kitchenumaykoosib Inninuwug, Wapekeka, Wunnumin Lake, and Kingfisher Lake by March 2001. Nibinamik had digital data service by December 2001 through a 100% infrastructure build requiring $583K from FedNor and INAC. This project went forward, partly as a result of the business case that was demonstrated for the western microwave upgrade and partly because the cost of maintaining the analogue radio plant had become excessive. In 1999, Shibogama Tribal Council prepared a project proposal on behalf of Wapekeka to upgrade its service to digital. The proposal was incorporated into Bell Canada's plan to accelerate its digital overlay north of Pickle Lake.

4. **James Bay Coast -** On the east coast, fibre optic capacity was to be extended in conjunction with the hydroelectric plant and electrification program. The proposed privatization of ILEC OnTelecom would impact the timing and potential outcome of this upgrade plan. In 2007 communities such as Constance Lake are still disconnected from this fibre network running right outside their boundaries.

As the backbone upgrade projects progressed K-Net, Bell, and the aforementioned community and public sector partners proceeded to upgrade community local loops as follows:

1. In 1999, Wahgoshig received $129K from FedNor and $49k from the Northern Ontario Heritage Fund Corporation to provide basic access to telephony. Wabun Tribal Council contacted K-Net to support an access agreement between Bell and the community. The primary issue was the Telco required 100% of the funding to develop the required infrastructure because there was no community business case for service extension. Eliminating proposed per subscriber mileage charges of $100.00 per month was resolved with CRTC intervention. K-Net followed-up with meetings through 1999 and supported Wabun Tribal Council and the community in their efforts to secure basic services. Bell installed an SRS-500 microwave link to the community in Fall 2000 and dropped the mileage charge, which enabled local access to dial-up internet and community capacity to extend dedicated services.

2. In 1999, Bell phone service was extended to Mishkeegogamang on the basis of 100% government funding of the capital costs (approximately $600K).

3. In 1998/99, K-Net worked with Bell Canada and HRDC, INAC, FedNor and the Northern Ontario Heritage Fund (NOHFC) to provide full digital services access to North Spirit Lake. Provincial and federal public sector partners contributed $1.2M (100% of the capital costs) to cover the cost of residential telephony and data services. Services became available in May 2000. North Spirit Lake was connected to K-Net in September 2000.

4. In 1999-2000, K-Net worked with Bell Canada, Indian and Northern Affairs Canada, the Ontario Native Affairs Secretariat, NOHFC and FedNor to extend full digital services access to Keewaywin. Provincial and federal public sector partners contributed more than $1.5M to cover 100% of the capital costs for residential telephony and data services. The project was completed in December 2000, and Keewaywin joined K-Net.

5. Bell Canada had no plans to extend subscriber services to Koocheching and had flagged reliable power supply issues as their primary concern. However, the digital upgrade to Sandy Lake made a wireless IP telephony connection to Koocheching possible via the Keewaywin exchange. Windigo Tribal Council had worked with K-Net to develop an implementation plan. Four proposals have been submitted since 2001 and none of them were able to entice Bell's interest. Koocheching continues to be without service.

6. In 2000 Windigo Tribal Council and the community of Slate Falls entertained a proposal by Superior Wireless of Thunder Bay to access broadband services. The community decided to work with K-Net on an alternative solution, and subsequently joined K-Net's satellite network in 2001.

As the timeline indicates, Community access to basic telephony has been tied to the parallel extension of advanced digital telecommunications services. This approach ensured that residents would have access to basic private line services and that the community would be able to acquire broadband services at an affordable rate. Furthermore, the public sector funds contributed to subsidizing more than the required customer premises equipment. In later funding iterations FedNor delivered a computing package (at around CAD $500K) to cover the basic components needed to create and interconnect Local Area Networks in the communities, support capacity building (K-Net workshops) and furnish a public access centre. These computing packages were essential for activating the potential of digital services following CRTC decision (99-16).

Another essential factor was FedNor's Digital Services to Small Communities program (DSSC). This work made frame relay services available to HCSA communities providing them with affordable data switching services at rates of 1.544 Mbps. Under this scheme DSSC upgraded and extended digital services to 69 central offices in Northern Ontario. In the Phase1/pilot of 16 communities Bell and FedNor each contributed 50% to the CAD $45K capital cost of installation of a data multiplexer. Since the pilot, Bell and FedNor agreed on a flat-rate FedNor contribution model of CAD $35K per office representing 70% of the CAD $50K cost. Bell made up the difference.

As the regional digital upgrades progressed, and more HCSA communities joined the K-Net consortium, Bell's projected service rates fell dramatically. In 1999 K-Net staff had estimated a per community connectivity cost of CAD $7500/month (based on frame relay service at 1.544 Mbps). Following the subsequent upgrades and demand aggregation across the HCSAs north of the 51st parallel, K-Net staff was able to negotiate a monthly connectivity cost of CAD $1840 (frame relay at 1.544 Mbps). Onwards to 2007 and prices have dropped to between CAD $1270 and CAD $1510 per community per month, thanks to the public-community partnerships that mobilized technology upgrades and demand aggregation.

The cooperation of KO/K-Net Services, the Northern Ontario -- Telecommunications -- Working Group (NOWG), First Nations constituents, FedNor, and various public-sector partners made a business case that convinced Bell to upgrade its microwave networks to digital and broadband services. Broadband services have subsequently become more affordable.

Without public subsidy Bell would have had no incentive to upgrade services, and despite public-private partnership it continues to operate at a distance from the HCSAs it serves. When network components need maintenance, allocating spares from Bell's depot in southern Ontario to Sioux Lookout, Pickle Lake or Dryden takes at least three days. Once the parts arrive, the ILEC schedules a trip into the community, during business hours and subject to weather delays. Because of these challenges and an inadequate supply chain, the ILEC does not extend the same service guarantees to locations in the North as locations in the South. A comparable circuit in Southern Ontario is entitled to reimbursement if the circuit is down for a certain amount of time. That is not an option in Northern locations.

The western/central terrestrial network, a compromise with the Bell monopoly, is a particular example of a public-private-community partnership for broadband deployment in HCSAs. It works in many respects, despite the ILEC's lack of commitment beyond its minimum universal service obligations and the incentives of public subsidy (via federal and provincial partnerships) that have pushed it to accept HCSA demands for broadband services. Nevertheless, this scheme had not been able to reach at least 13 other HCSA communities, too remote for the ILEC. Their demand for telecommunications would have to be served by other means, which as we shall see, enabled K-Net to develop a radically different social enterprise model based on KO/K-Net Services' partnership with Industry Canada/FedNor.

Cooperation, brokerage and the evolving costs of broadband technology

Supply side technology advances in routing, switching, and transmission media for example, may lead to more competitive pricing[64] – though mostly enjoyed in the cities with higher-density populations. With government intervention, those technology advances can reach HCSAs.

During their early negotiations with Bell Canada, circa 2000, FedNor, KO, and participating First Nations faced a dilemma. Bell offered outstanding communities such as North Spirit Lake, an opportunity to have telephone service and low speed dial up internet access for a capital development cost of CAD $150K. The package constituted approximately 100 telephone lines. Bell would manage the infrastructure, and there would be no middleman. However, if the communities could attract additional funds, for CAD $400K they could acquire a 1.544 mbps

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[64] For example, K-Net's GigaPoP in Toronto (1000 Mbps or 600x T1) costs less than CAD $3000 per month, which is less than the cost of two T1s in HCSAs. The competitive rate for T1 service in Toronto is less than CAD $400.

Point of Presence, which would allow them to have plain old telephone service in addition to a potential broadband service. The proviso was that an intermediary would likely have to operate in the community to manage IP network services.

When Industry Canada (FedNor) and K-Net Services initially negotiated orders for T1 frame relay service (1.544 Mbps) to First Nations along K-Net's planned terrestrial network, following the CRTC (99-16) digital upgrades, Bell Canada responded with a rate exceeding CAD $8000 per community per month. This was an impossible rate for any First Nation and most communities in Northern Ontario's HCSAs to afford. However, less than two years later, the rates for T1 service fell to CAD $1840/month shortly after the FedNor led public-private partnership to upgrade switches and community local loops was completed. Currently, prices for T1 service in Northern Ontario communities have fallen to as low as CAD $1270[65] due to supply side efficiencies.

Since around 2004, HCSA communities south of the Bell owned microwave lines of Northwestern Ontario (which serve twelve First Nations) have become positioned to take advantage of further ICT industry advances. Bell has been incrementally stringing dark fibre south of Red Lake and Ear Falls (northwest of Sioux Lookout) as well as along Highway #17 (where Thunder Bay's TBay Tel provides competition between Thunder Bay and Sault Ste. Marie). A number of First Nations can be served from Bell Central Offices along this route, but again, not without public subsidy.

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65 This cost does not including internet access, hands and feet, and common link charges which push the monthly total community cost above CAD $2000.

When Keewaytinook Okimakanak and the community of Pic River (300 KM east of Thunder Bay) approached Bell for a quote on broadband service, the telco offered T1 service (1.544 Mbps) at CAD $1270 per month. Pic River considered leasing two T1s, but realized that if the dark fibre was lit, its community could acquire 10 Mbps at a book price (according to Bell's established rate band) of CAD $1510 per month. The First Nation and its social enterprise partner contacted Industry Canada FedNor, and together they approached Bell with a proposal to upgrade the closest central office, CO, in the town of Marathon. FedNor paid CAD $35K or 100 per cent of the necessary upgrades to Bell's electronics. This decision not only benefited Pic River First Nation but it created the capacity for Marathon's CO to serve any other community in its vicinity, including a range of public and private sector services in Marathon such as Contact North (a distance education provider), Confederation college, Marathon Pulp and Paper Mills, the local school board, and others.

Similarly, the town of Geraldton (North of Highway #17 between Thunder Bay and Marathon) acquired an upgrade from T1 (1.544 Mbps) to 100 Mbps thanks to a CAD $75K subsidy from the Northern Ontario Heritage Fund (FedNor's provincial counterpart described above). Geraldton, its surrounding communities, and neighbouring First Nations can now acquire 60 x T1 capacities at a cost of CAD $3000 per month (which is less than the cost of two T1s under the present Bell rate bands).

C-Band public benefits: The emergence of Canada's Northern Indigenous Community Satellite Network (NICSN)

Faced with no affordable terrestrial broadband solution to serve at least seven remote fly-in First Nations in Northwestern Ontario, K-Net, as community champion, decided to re-explore the possibility of satellite service. K-Net staff did not want to revisit the DirecPC solutions provided by Telesat and Bell under the First Nation SchoolNet program (which had since upgraded its subsidy to support broadband strategies). They wanted a VSAT solution and put out an RFP to regional vendors. Three vendors responded, Blair Electronics (of Thunder Bay), TRG Communications (of BC), and Bell. (Table 18) summarizes the costs:

Vendor	Equipment (excluding installation)	Total Monthly satellite costs	Other costs	Notes
Blair Electronics	CAD $105,543	CAD $3,758	Network Management System	
TRG	CAD $55,000	CAD $4,000	None	
Bell	CAD $120,000	CAD $3,750	None	100% customer owned and operated

Table 18: K-Net Services' RFP for Market entry into the K-Net satellite market

K-Net staff assessed each proposal as follows (Fiser & Clement 2008):

1. Blair Electronics had cable networks in several communities in Northern Ontario and maintains cable installation crews in Thunder Bay for work in the north and other areas. As a business BE is flexible and able to adjust business plans to meet the changing needs of customers. As a Telesat space segment reseller, BE has access to certain pricing discounts from them. BE also has access to some engineering and design support from Telesat. The proposal called for a First Nations consortium and required that a numbers of employees be hired under the consortium in each satellite served community. There was no mention of how the network operators would be paid and by whom. The rates for space segment are lower but may need to be offset with network management fees and operators on standby. There is also a CAD $234K network management system mentioned but no details are included.

2. TRG Communications has a different business model in that they go into a partnership with the customer on a 50/50 basis for hardware. TRG maintains the hardware and is responsible for upgrades to the system. Network management is performed by TRG. They have systems in operation at present and have an internet feed that provides a separate download internet feed. This is not mentioned in the proposal and K-Net staff had no intention to route internet traffic to Vancouver.

3. Bell Canada’s solution is to be a broker in the sale of bandwidth and equipment. The equipment is to be customer owned and operated. This is a different method of operating for Bell and does bring about some questions of further ongoing support from Bell. As this would be customer owned there are some questions that would need to be answered by the customer. Bell has the resources of Bell Nexxia, Bell Canada, and Telesat to ensure that this initially gets off the ground

> working well. Bell will provide the relevant equipment and network management software, as well as training for four people to maintain the management system. They will provide support for configuring routers and some technical support initially. Their relationship with Cisco will allow K-Net to access resources on an ongoing basis (probably for a fee unless they see growth).

K-Net staff discarded the BE option (mainly based on cost) and narrowed their prospects down to two alternative deployment strategies:

1. If the customer wants an owned and operated system then Bell Canada's solution would be best. Bell also offered integration into the Frame and Dedicated network, and since K-Net would be purchasing in large dollar amounts from Bell, K-Net staff assumed that Bell would not want to jeopardize the revenue stream by putting in competing services. They might even offer additional help later on in expanding the service and in integrating services. As they are also a reseller of goods, the salespeople will be more willing to continue working with us if they make the sales of goods.
2. But, if the customer is looking to a managed solution then TRG offers a package that is proven, has support and is a partnership with individual communities. They have demonstrated knowledge of the needs and the ability to accommodate them. Spares are available in Vancouver. However with an increasing number of VSAT units in North Western Ontario they would likely have to locate sparing in Sioux Lookout (K-Net Services' headquarters).

Based on the comparative costs and its preference for community control and community ownership of the access infrastructure, K-Net decided to explore the Bell proposal. Over a two year period (1999 – 2000) K-Net pursued the Bell Canada option, but ultimately faced a per community monthly carrier charge (CAD \$3750 + internet) that was more than twice Bell's per monthly terrestrial carrier charges (CAD \$1840 + internet) and less than half the terrestrial bit rate of 1.544 Mbps. Bell/Telesat had shown a competitive and uncharacteristically community-oriented infrastructure model (community owned/controlled) but the carrier charges would be too much for the consortium of public sector and community customers to bear even with demand aggregation. As the access model was being processed through Bell/Telesat's commercial channels this cost structure was apparently as low as their sales departments were willing to go.

FedNor's role: Federal brokering mobilizes public sector players

All the while, FedNor had been monitoring the negotiations and making its own decision whether to fund the capital costs of the satellite project. K-Net staff met with FedNor program officers and agreed that they needed to push the community-owned/community-controlled satellite access model through other channels. A strategy was forming. K-Net was fortuitously positioned to take advantage of public sector channels. Since 1998 it had been developing a comprehensive business model for broadband applications under Industry Canada's SMART Communities competition process. K-Net would eventually become the Aboriginal SMART Community in 2001 and acquire a purse of CAD $4.65M (with matching funds) to develop e-learning, e-health, and public access e-centres, among other projects (documented in Ramirez 2000a and Ramirez et al. 2003). Equally important, the SMART process opened federal doors and exposed K-Net staff to the CRC and Telesat's R&D department. CRC and Telesat's R&D team had been working with SMART Labrador on a cost-effective satellite solution for HCSAs. After learning about K-Net's interests and the situation of remote Northern Ontario HCSA communities, the Telesat R&D team was able to internally argue on K-Net's behalf to let the network access Telesat's C-Band R&D bandwidth.

FedNor and K-Net staff thus decided to build their own earth stations and acquire access to the C-Band resource through Telesat R&D. The total cost of the project to FedNor, including equipment for two locations (Fort Severn and Sioux Lookout) totaled at CAD $479,595. This initiative however, was a limited solution in that it would not allow K-Net to expand beyond the community of Fort Severn. Nevertheless, the resulting R&D pilot project enabled K-Net to test its requirements and build internal engineering capacity to manage the satellite resource. One particular technical innovation stands out: K-Net had requirements for two-way video to support emerging applications for telehealth, e-learning, and e-governance. None of the commercial platforms available (early SCPC and now Linkway TDMA) supported the kind of video QoS required by HCSAs out of the box (especially in a mixed traffic environment). It is not that video was not supported; the challenge was in providing QoS on demand when there was not enough bandwidth available to support concurrent applications. It appears that delivering bandwidth to communities and providing QoS applications via satellite has been uncharted territory for the private and public sectors. K-Net's technical staff tested and implemented the viable protocols and developed a web-based scheduling system that would allow bandwidth on demand.

In the Fall of 2001, FedNor and K-Net staff met with the Vice-President of Telesat who suggested they try to acquire access to a Public Benefit C-Band transponder on its Anik E satellite. Telesat had reserved 36Mhz of transponder bandwidth for Industry Canada as part of a transaction to access the orbital space Industry Canada regulated. It had almost been a year since Telesat had committed the transponder space to Industry Canada and the VP of Telesat was concerned that no plans were forthcoming to develop this resource valued at CAD $10M for the life of the satellite.

After the meeting K-Net staff submitted a letter to Industry Canada's assistant deputy minister (Spectrum Information and Telecommunications Technology) requesting that K-Net become SITT's agent in the development and management of the C-Band Public Benefits resource. The letter indicated an opportunity for Industry Canada to extend its broadband connectivity agenda to HCSAs that would continue to be unserved without creative public intervention beyond the usual subsidization of private sector solutions.

K-Net staff had taken a leap of faith and had no idea what Industry Canada's SITT executive would think. They had come to know many of these players through their participation on the NBTF, SMART, SchoolNet, and the post-CRTC (99-16) infrastructure upgrades and had earned a reputation for innovative and reliable not-for-profit enterprise and network management capabilities. But was it enough? It turned out that one of the major strengths of K-Net's proposal was K-Net's status as a not-for-profit community-based network, an attribute that enabled it to mitigate two of Industry Canada's major concerns since acquiring the transponder space: How to ensure that the Public Benefits resource was managed at a distance from Telesat, in order to avoid creating the perception of public sector collusion with private industry; and how to maximize the R&D potential of the resource in HCSA communities (to build capacity, aggregate demand, etc.). No other organization, whether public, private, or not-for-profit had K-Net's level of experience with networking HCSA communities.

K-Net's letter set the government bureaucracy in motion and by December 2001, K-Net had a business case approved by Industry Canada after a number of rewrites (and support from FedNor, the Education Network of Ontario, and key SITT/IHAB analysts to push the business case through the proper channels).

As the business case was being clarified into an agreement in late 2001, Industry Canada had contacted the government of Nunavut to see if they would want to participate in a similar Public Benefits agreement. Nunavut assented and took half of the transponder bandwidth, leaving K-Net with 18Mhz.

Nunavut's business case was a public-private partnership between the government of Nunavut (to whom the Public Benefit was bequeathed) and a regional ISP, Ardicom, which took over network management for profit. K-Net's business case cites the NBTF community aggregator model and positions K-Net, the community champion, in a not-for-profit network management role.

K-Net's proposal was later ratified in 2002 under an agreement between K-Net and FedNor (Industry Canada's chosen agent): FedNor would provide its usual oversight function and contract K-Net (for CAD $1.00) to manage the C-Band Public Benefits resource (18Mhz) as a cooperative enterprise. The list of conditions agreed between K-Net and FedNor are as follows:

1. Keewaytinook Okimakanak (K-Net) shall develop a portion of the satellite benefit channel on Anik E2 C-Band satellite, which Telesat made available at no charge for public institutions and benefits pursuant to the licensing conditions of satellite position 118.7° West as follows:

2. Provide bandwidth for a variety of public benefit applications, such as tele-health, education as well as other community-based non-commercial benefits in three communities - Fort Severn, Slate Falls (Ontario) and Anahiem Lake (BC) by spring 2002;

3. Work with other communities in remote areas across Canada who require C-Band capacity, with the cooperation of Telesat Canada, to assist them in using the available capacity for public benefit applications, such as tele-health, education as well as other community-based non-commercial benefits;

4. Work with Telesat Canada, the CRC, Industry Canada and others toward efficient use of the benefit available to as many remote communities as feasible;

5. K-Net shall assist remote communities which demonstrate a sustainable plan for community wide aggregation of bandwidth demand in the execution of an agreement with Telesat Canada for C-Band service.

6. K-Net shall charge remote communities for service provided by Telesat Canada public benefit at a price equivalent to the cost of terrestrial service to remote communities.

7. The current price, which is based on CAD $2,700 per month for 1.5Mbps service, may be changed by mutual agreement of FedNor and K-Net. K-Net shall collect these revenues only while this agreement is in force.

8. Revenues raised under the terms of this agreement will be used to pay expenses incurred in accordance with K-Net's proposals to Industry Canada to deploy the public benefit to remote communities across Canada.

9. K-Net, with FedNor approval, may adjust the proposed activities and expenses eligible for payment by revenues under this agreement throughout the life of the agreement should Industry Canada determine that such changes enhance the deployment and policy objectives of Telesat's C-Band public benefits channel.

Under these conditions, K-Net not only acquired a satellite network for Northern Ontario HCSAs but it created a new public institution for the (potential) benefit of numerous Canadian HCSAs beyond Northern Ontario.

In April 2002 K-Net facilitated a conference in Winnipeg to officially launch the Public Benefits agreement with Telesat, Industry Canada, Nunavut, and a cross-section of HCSA interests from Labrador, Saskatchewan, Manitoba, Yukon, BC, Quebec, and the Northwest Territories. The groups appeared split between Nunavut, the Northwest Territories and Yukon (favouring Nunavut's public-private partnership), and the rest favouring K-Net's cooperative enterprise model. There was also an underlying technical difference: K-Net believed that the public benefit would be more effective if it was shared dynamically using a TDMA-based management system supported by a web-based scheduler K-Net staff had developed to facilitate a cooperative use of the bandwidth resource for higher-capacity video applications. Through TDMA K-Net demonstrated that it could allocate bursts up to 2Mbps for scheduled video applications over the shared bandwidth resource. For its part, the government of Nunavut decided to use the SCPC protocol, which enabled it to divide its bandwidth into fixed channels, based on the policy that one larger channel would serve government communications and the rest would serve community applications and public access. The result for Nunavut was that despite having community bandwidth double or even quadruple previous bit rates of 64Kbps, many users reported little noticeable effect (Government of Nunavut 2005). Without TDMA and a scheduling system in place to flexibly regulate what was in fact a shared resource, Nunavut had no means of controlling access. End-users flooded the fixed channels.

Following the Winnipeg conference, the Government of the Northwest Territories (GNWT), which had contemplated public benefits access through K-Net, decided to negotiate its own benefits deal with Industry Canada, due in part to an existing contractual agreement it had with its incumbent Northwestel. GNWT applied to SITT in the summer of 2002, for its own bandwidth after the first public benefit transponder had been fully allocated to Nunavut and K-Net. After discussions with K-Net, and the governments of NWT and Nunavut over the summer of 2002, Industry Canada decided to transfer 3Mhz each from Nunavut and K-Net to dedicate approximately 6Mhz to the GNWT initiative. GNWT then proceeded to adopt the Nunavut access model. K-Net was left with 15Mhz.

Growth and stabilization of K-Net's C-Band access model: birth of NICSN

K-Net had chosen to undertake a cooperative enterprise model. K-Net staff worked with Tribal Councils across Northern Ontario to begin to connect the remaining HCSA First Nations to the satellite resource. Windigo Tribal Council had three satellite-served communities: Cat Lake, Sachigo Lake and Weagamow Lake. Shibogama First Nations Council had one satellite-served community, Kasabonika. Matawa Tribal Council had four satellite-served communities, including Webequie, Eabametoog, Marten Falls and Neskantaga. The Independent First Nations Alliance (IFNA) had one satellite-served community, Muskrat Dam. As a working group K-Net partnered with the Tribal Councils and the individual First Nations communities, to expand network management, mobilize local community champions and develop proposals to secure capital funds (via FedNor).

When a second round of transponder deployments became available in 2004, K-Net's proven access model attracted the Kativik Regional Government (KRG) from northern Quebec and the Keewatin Tribal Council (KTC) from northern Manitoba. KRG brought an additional 11Mhz and KTC added 4Mhz, thus providing K-Net with a shared bandwidth resource of 30Mhz. In particular, K-Net staff had demonstrated that the cooperative model worked in providing equitable and affordable access after it flexibly leveraged its 15Mhz to provide KRG with the bandwidth it needed to begin connecting its remote Inuit communities after INAC unexpectedly withdrew CAD $500K in funding from KRG's development initiative. By the time these three organizations (K-Net, KRG and KTC) officially declared their partnership to be the Northern

Indigenous Community Satellite Network in January 2005, there were 38 satellite served communities managed by K-Net. Further in 2005-06 K-Net Services and FedNor partnered with Peawanuk, Marten Falls (Ogoki) and Attawapiskat First Nations to bring them onto the C-Band Public Benefit resource.

Appendix 4: The Gold-Circle Partners MOU (Relational Contract between KO, FedNor and Industry Players)

Memorandum of Understanding

This Memorandum of Understanding (MOU) is between:

The ***Keewaytinook Okimakanak*** (Northern Chief's Tribal Council), a Tribal Council in Balmertown, Ontario representing the communities of Deer Lake, Fort Severn, Keewaywin, McDowell Lake, North Spirit Lake, Poplar Hill with sub-offices in Fort Severn, Sioux Lookout and Thunder Bay,

and:

Bell Canada, Canada's largest provider of advanced telecommunication services with corporate headquarters in Montreal, Quebec, and a wholly owned subsidiary of Bell Canada Enterprises (BCE).

The purpose of the MOU is to define a partnership which will allow the Keewaytinook Okimakanak (KO) First Nations communities, the remaining communities in the Sioux Lookout District and, potentially, other NAN (Nishnawbe-Aski Nation) communities, to harness information and communication technologies (ICTs) to improve local access to health, education and information services.

The Project

As part of an on-going process, beginning in 1994, KO are looking to create a world class demonstration project using ICTs in such a way that will fundamentally change the way communities use information technologies. The current project is to create a new SMART community, linking the people of; Fort Severn, Keewaywin, Deer Lake, North Spirit Lake and Poplar Hill. Over time, the goal is to link twenty-four sites (23 communities and the Education Network of Ontario-ENO) to this network.

Some key benefits to the SMART project are: the creation of economic opportunity; delivery of services for Health, Education, Governance, Justice, Business, etc.; the provisioning of Internet Access; the opportunity to take advantage of emerging technologies, and; the transference of skill sets in information technology. To attain this, KO will build and maintain this SMART network.

KO will look to its partner, Bell Canada, for such things as: delivery of bandwidth to the Communities; expanded capability to the core network and services; design expertise and training, and; collaborative opportunities to deliver infrastructure. Bell Canada will look to KO as a front line provider of specific networked services to the end user. Each service will be identified and the "provider" agreed to by both parties to ensure there is no duplication of service within the community.

The Partners

The KO organization:

KO is a tribal council providing second level services for the communities of Keewaytinook Okimakanak. As such, it takes its direction from the Chiefs of Keewaytinook Okimakanak. The KO SMART Communities Project is represented by a project Management Team. This team will coordinate the day to day activities and implement the SMART project as defined in the SMART Proposal. Decisions beyond their scope of authority will be approved by the Chiefs of Keewaytinook Okimakanak.

Bell Canada:

Bell Canada, KO's prime partner in this initiative, recognizes the need for every community to have access to state-of-the-art, cost effective, telecommunication services and fully supports these efforts. The Bell Canada project team believe they have the essential elements to enabling the effective delivery of services as well as to attract/retain business for sustained economic prosperity. In order to create an effective working relationship, Bell Canada will assign a "point" person to interface with KO and with other members on the Bell Canada project team. Refer to Appendix A for definition of "point" person.

Gold Circle Partners

Both lead partners recognize the need for other "best of breed" companies to be involved in this project from time to time. These companies will be known as the Gold Circle Partners. Current known partners are:

ADCOM Videoconferencing

Cisco Systems

Telesat Satellite Services

SBC Datacomm

ENO - Education Network of Ontario

Others partners may be included on the approval of both lead partners.

It is expected that KO will have a direct working relationship with these Gold Circle Partners. KO will keep Bell Canada informed of this relationship and the activities underway. Equipment and recurring services provided by the Gold Circle partners will be billed through Bell Canada. In turn, Bell Canada will keep KO apprised of their work with the Gold Circle Partners, as it relates to this project.

Commitment

Bell Canada commits best price and service delivery to this partnership. Best price is based on total price for the terrestrial network, as opposed to a price to an individual location, and, it is intended to be a competitive price comparable to a community network in Central and Eastern Ontario. If Bell Canada cannot meet this commitment, KO may entertain the purchase of these services from alternate providers. Working with Telesat, Bell Canada will also endeavor to create a solution to link the Satellite served locations, at prices equivalent to the terrestrial network. It is the agreement of both parties that the terrestrial network pricing will not be increased to cross-subsidize the satellite rate.

KO commit to providing Bell Canada with the first right of refusal for the delivery of services, not supplied by KO. KO also commit to a three year contract on goods and services.

Conflicts

If at any time, either party is not satisfied with the other's performance or with the progress of the project, a review of the MOU may be requested. If the parties are unable to resolve their differences, the next stage would be to call a review by a third party arbitrator.

Partnership Review

As this project evolves, it is important to ensure that the partnership is working well for both parties and that it brings value to KO's emerging network. Other interested parties (Communities, Government, Stakeholders, etc.) will also be monitoring the project to:

- ensure it is meeting the project description;
- assess the opportunities to trial additional new services and emerging technologies, and;
- determine the potential of importing the process to other geographical areas.

These interested parties will want to know that a process has been established to identify; lessons learned, best practices, etc.

To accomplish this, a Partnership Review will take place at regular intervals through the course of the project, beginning with a six month review from the date of signing the MOU. FedNor has been selected to perform this independent review.

Approvals

KO	**Bell Canada**
Name:	Name:
Title:	Title:
Signature:	Signature:
Date:	Date:

Definition of the responsibilities of Bell Canada's Point person

At the signing of this MOU, Bell Canada will assign a "point" person to this project. This person will:

- become the Bell Canada primary interface for the KO project team
- assemble the Bell Canada project team for this project and provide KO with the team's names and contact numbers
- acknowledge receipt of KO's queries within 48 hours of receipt and define an action plan for responding to the query
- ensure that KO is given priority treatment in terms of providing design expertise for the KO network
- ensure best price and service delivery, as defined in the MOU

Appendix 5: A closer look at the NOWG's regional contribution mechanism

In Chapters 3 and 4 I examined the Northern Ontario – Telecommunications Infrastructure – Working Group's proposal to establish a set of basic service objectives that included broadband service (item 17). In this proposal the NOWG envisioned a system of national subsidies to support its model service tiers. The vision called for a flexible universal service regime that regional Fund Administrators would co-manage under CRTC oversight. If any region or community in Canada did not have the "basic minimum telecommunication services" set by the Commission, that area would become eligible for assistance to add those services. Under this scheme consumer advocates had an equal voice in the determination of subsidy. Through its mechanism a submission to add additional services could be submitted by an ILEC, a competitive service provider, or a coalition of community-based consumer advocates seeking to upgrade their access to a higher tier of service. The Fund Administrators would then make an allocation decision based on a list of average national costs for adding these services. The "national costs lists" would include allowable variances for recognized special higher construction or operating costs, such as difficult terrain and remote locations with no year-round roads (especially important for Northern communities).

Moreover, the subsidy the Fund Administrators paid out would be:

1. Retroactive (i.e., only paid out after the installation had been completed, an audit done and a performance test report filed); and
2. Known before construction began, based on submissions filed and approved in a contract signed by the approved applicant(s) and the Fund Administrators before work begins.

The NOWG contended that under these safeguards the Commission could avoid having to fix a set percentage of subsidy for service upgrades. The regional fund administrators would have access to strategic market information and national averages to assess competitive bids.

As a representative of unique HCSA environments across Ontario, and from exchanges with other HCSA working groups, the NOWG knew how different conditions could be across Canada for service upgrades: regional carriers differ, and equipment replacement costs vary, as do the costs of supplies, labour, construction, and the transportation of materials, etc. The NOWG recommended that National standards (such as its list of 17 items) should guide the process, while the determination of eligibility for funding assistance should be left in the hands of regional Fund Administrators (with only general guidelines set by the Commission).

Furthermore, the NOWG called for the institution of a robust information management strategy that would not only collect statistics of average national costs, but also maintain links with regional information units[66] that could research local telecom costs and consumer needs in order to assist with the flexible allocation of subsidy and maintain a running list of services tacked to the dynamic requirements of item 17 (broadband).

Notwithstanding its regulatory structure, the fund could operate through a competitive bidding process, as those applying for construction subsidies in a HCSA could bid to receive less than the nationally established subsidy for a particular item on the list of services (e.g., if that competitor had a more innovative technology solution or lower cost of operations based on efficiencies).

[66] As far as we know no organizations were proposed to carry out the information management strategy. We believe the existing working group models utilized by the CRTC (and the FedNor research) might satisfy the requirements provided that regional carriers and consumer groups could be open about their capabilities and needs.

That way, no company would receive more than the nationally established capital subsidy for a particular line item in the "universal service basket," but it could improve its chances of winning a bid by proposing to receive less than the nationally-set subsidy. The regional Fund Administrators would therefore act as the heads of a national consortium of regional community-based networks, gathering the requisite expertise and regional information to weigh national average costs against the known conditions of HCSAs, while overseeing a competitive bidding process to maintain universal service in HCSAs with full involvement from the private sector.

As Chapter 4 examined, the CRTC declined to adopt any new institutional models that would shift decision-making power to consumers. The Commission noted in decision 99-16 that it saw some merit to a bidding process to implement service to high-cost areas. Such a process, it claimed "could provide opportunities and incentives for interested providers to establish a presence in a particular area", and "encourage companies to operate more efficiently, using more cost-effective technologies". In addition, the CRTC claimed, "a subsidy to the successful bidder would limit service providers' risk to acceptable levels and provide for competitive equity among incumbent and competitive local carriers". However, the Commission concluded that that a bidding process would make administration more complex, and would unduly slow the implementation of basic service in certain high-cost areas. Given the small number of Canadians without access to telephone service, the Commission was of the view that establishing a new bidding mechanism to provide basic service was not warranted. Since its vision was limited to the BSOs of 99-16, the Commission judged that incumbent local carriers would likely be the only providers of service to HCSAs in the foreseeable future. It did not consider the possibility of independently owned and operated broadband applications and services using the incumbent carriers and thus requiring a multi-stakeholder approach to governance. Instead, the CRTC claimed that given the relatively small number of Canadians in scattered locations who do not have access to service that meets the basic service objective, the it found that extending service to the unserved and underserved was generally the responsibility of the incumbent local carrier providing service in that territory. In other words, the CRTC created a narrow regulatory framework that included decision-making roles for itself and the ILECs, but substantively precluded coalitions of consumers.

Appendix 6: KO Computer Technicians Training Report to SLAAMB (Circa 1999)

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MEMO (7 pages included)

TO: Ziggy Beardy, Project Officer, S.L.A.A.M.B.

FROM: Darlene Rae, Project Manager

DATE: October 8, 1999

RE: The Telecommunications Support Technician Project Second Interim Report for the period (July 19 to Oct 8, 1999)

(Project # DW990004)

****

Support Technicians in the northern communities are learning the new technology that we now have access to. Each individual has learned an amazing amount while working on their own. Everyone is very comfortable writing and asking questions if they need help in the different on-line conferences set up for this training. Toll free telephone support, travel into each First Nation by K-Net Technicians / facilitators, and the training guide also provide much needed support for each of the project participants. This project is very much an example of self-directed learning by each participant.

Changes to the staff during this reporting period are as followed: Cat Lake, Irene Oombash took another job offer, she was replaced by Grace Oombash, who then returned to school and was replaced by Kevin Sakakeesic who recently returned to Cat Lake. In North Spirit Lake, Maxine Kakegumick resigned for personnel reasons and was replaced by Eddie Meekis who has been working with both Paul and Maxine throughout their time with the project. In Poplar Hill, Gabriel Wassaykeesic resigned for personnel reasons was replaced by Anita Strang who worked with Gabriel throughout the summer under the Science and Technology Camp program..

The following information is obtained from each of the participants who provide regular updates about the work and training they are doing in their community.

Bearskin Lake - Jeffrey Beardy

Bearskin Lake has internet access at the band office, co-op store, economic development office, motel, Wahsa Centre, Michikan Education Authority office, the school and resource office. Next phase is to connect NAPS and Nursing Station to the internet. These will be hooked up to the internet through the school using the WAN.

Jeffrey spends time helping others to learn how to set up e-mail addresses, composing mail, sending mail with attachments and just plain surfing. He has shown people software applications like running coral draw, word 97, microsoft works, etc... Currently Jeffrey is working on a home page for Bearskin Lake, their tourist camp and a Arts and Crafts web site. The new Bearskin Lake web site is now ready to be posted and Jeffrey is now completing all the final links to make this site work.

Big Trout Lake - James Sainnawap

Kitchenuhmaykoosib has 16 terminals networked to the Internet at the Learning Centre through the setup with Industry Canada's Schoolnet Program. Their ISP server is Education Network of Ontario. James created the Kitchenuhmaykoosib web site which K-Net is hosting (http://216.211.97.41/~communities/bigtrout/index.html). He posting new information to their web site on a regular basis (see the Ms. First Nations Pageant '99).

James has learned a lot within the last few months with telecommunications. This involves taking care of the network in the community, as well as computer software and hardware problems. He is pretty active in helping community members with computer problems or if they would like to know more about the Internet.

James wants to learn as much as he can about computers, networking, and creating web pages. In his spare time, he gives support to a airline that serves Wapekeka, Bearskin, Big Trout and Sioux Lookout by helping the staff with software and hardware, office equipment, creating business forms, letterheads, and business cards. For a detailed report from James on some of the work he is doing under this project, see the attached e-mail sent on August 27.

Cat Lake - Kevin Sakakakeesic

Kevin started setting up the Cat Lake Community Access Centre under this program. Then he left the community for a short time and several other people covered his position until he recently returned to complete this contract. He is now supporting community members in using the Internet to research information and to send and receive e-mail messages.

Deer Lake - Steve Meekis

Steve spent most of the summer working with the different youth programs that we set up in Deer Lake. His ability to relocate the satellite equipment, run cable to the different computers in all the offices in the Band office, the school and the nursing station is proving to keep him very busy. He is also supporting a number of college students who are taking their programs the K-Net Conferencing system. Steve is now looking into moving to Thunder Bay in January to take a college program in computers.

Fort Severn - Madeline Stoney

Madeline has learned a lot since the first day she has started working with us, nearly two years ago. With the work she is involved in, she takes care of the community computer network that is set up in Fort Severn. The Band office, school, nursing station, and police station are all connected to the Internet using the wireless connection with local area networks established in each building..

She has a good understanding for adding another computer to the network, which includes running the cable and adding the connectors. With individual community members, she takes the time to answer their questions, but if she can't answer them, she calls the office and asks for assistance.

Kasabonika Lake - Ernest Anderson

Working with Ernest on this program has shown that he has learned how to take care of the MSAT phone that was set up in Kasabonika Lake school. He helped with the Directpc dish that was set up.

He has learned how to take care of the network, and knows how to add another computer to the network.

Ernest has learned quite a few things from this program, which I'm sure will be useful to him in the future to assist if asked to look after the equipment. He arranged to for the Band office to fund a two day training session in Sioux Lookout at the K-Net office.

Keewaywin - Allison Kakepetum

Allison is involved in taking care of the network that was set up in Keewaywin that hooks the Band office, clinic and school to the Internet using the wireless connection. In the evenings she takes the time to go to the office so she could open the CAP site and let community members get on the Internet if this time is more convenient for them.

During school hours, she has shown students about K-Net, how to read and write messages in the different conferences that have been set up. The younger students like Gr 2 and 3 check out the sites, PBS, Yahoolagans, and Crayola Crayons.

Kingfisher Lake - Sonny Mamakwa

In Kingfisher Lake, Sonny Mamakwa works with the students at the school during school hours. In the evenings he opens the CAP site so community members can have access to the Internet, he keeps the centre open until 10:00 or 12:00 at night.

He does what he can with the hardware problems he encounters, and he does call the office if he has any difficulties in making the connection with the MSAT phone. In the future he is thinking of returning to college to go into computers, as he would like to learn more.

Koocheching - Terrance Meekis

Koocheching has five computers at the Band Office and five computers at the school. Terrance helps the Band Council with their e-mail address and getting information from the internet, which includes proposals. He also helps community members if they have questions about the computers or internet.

Terrance works with the school children to show them how to use the digital camera, and is working on the web page for Koocheching.

McDowell Lake - Margaret Lawson

Working with Margaret on previous training programs has shown that she is a person who is capable of learning new things. She deals with computer hardware problems where she does trouble shooting, and gets the computer to work again. Margaret works in the Red Lake Keewaytinook Okimakanak office and looks after the network for Keewaytinook Okimakanak.

Presently she is involved in learning the new technology of video conferencing which she is interested in developing for the McDowell Lake community members. She has a room set up in the Red Lake office which she is taking care of by having a chart where the room is to be booked ahead of time. This room has five computer available for public access as the McDowell Lake CAP site. Margaret provides computer support for the McDowell Lake Band office located in Chief Albert James' house.

Muskrat Dam - Shawn Kakegamic

Muskrat Dam has a CAP site where Shawn is presently working. He takes care of the network along with the help of a fellow employee who use to work there. He is learning about setting up and maintaining the network, but he is most interested in learning and mastering Web designs.

In the evenings they keep the children busy with games that they have downloaded from the internet. He keeps the CAP site open until 11:00 pm.

In the future he would he would like to go to College and learn more about computers.

North Spirit Lake - Eddie Meekis

In North Spirit Lake, Eddie Meekis has helped out with the equipment that has been set up. Throughout the community, the Band Office, Health Office, Police Station, Nursing Station, and School have internet access using the wireless connection.

Eddie spends time with community members and shows them K-Net, how to read and write messages using the different conferences that have been set up.

Poplar Hill - Anita Strang

Poplar Hill uses the wireless connection that was set up in their community. The offices that have internet access include the Band Office, Nursing Station, Police Station, and School. Anita took part of the Science and Technology Camp program, then she was hired to take over for Gabriel Wassaykeesic who resigned for personnel reasons.

Sachigo Lake - Leonard Mekenak

Leonard feels good about the experience that he has learned on this program, he would like to learn more about WAN (Wide Area Network) and to gain more knowledge about computers. Before he took this training, he took the training program at the Big Trout Lake Training Program.

The Band Office and the Learning Center has access to the Internet. Leonard takes care of the network in his office, he feels confident that he could take care of the network if it went down. During office hours or even after hours, he works out a schedule so community members can have access to the CAP site.

Sandy Lake - Joy Fiddler

Working with Joy on a few training programs, has shown that she has the capability to take care of the local computers and is a fast learner. She has been told at one time, “Your born with a computer chip in your brain.” Looking after the network and helping different organizations with the MSAT phones that have been set up is part of her duties for Sandy Lake.

Slate Falls - Lana Bighead

Slate Falls there has one phone for community members to use, so waiting for your turn to use the phone can be a long wait at times...   The Band Office, and Police Station now have internet access.

The CAP Site at the school in Slate Falls has a total of six computers, three printers and a scanner.

At the CAP site in Slate Falls, Lana is active in getting a volunteer committee for the site, which would include making decisions, computer policy, fund raising for more equipment, computers, desks, etc.

Lana is pretty active in getting community members involved in giving ideas with the home page for Slate Falls.   Presently she is working on making a home page for the school, Gas Service and a little shop owned by a local community member.

Weagamow Lake - Peter Kakekayash

Peter works at the school library in Weagamow Lake. Other offices in the community call him if they need help with computer problems. In the evenings he goes to the school so community members can get access to the Internet. Peter has one computer set up to use the phone line to dial into K-Net. Band office has one computer hooked to the Internet.

Report from James Sainnawap, Big Trout Lake

August 27, 1999

Hello everyone, it has been a nice learning experience so far. I can honestly say I've learned a lot over the last few months about writing, reading, telecommunications, computers, internet and the whole technical thing. It's been a steady road in my personal and professional development as a person and technician/designer.

It's been nice to meet and communicate with other people who share the same gifts, skills and goals on this planet, called earth. It sure is nice to be able to communicate and learn from people in other parts of the world and communities. Technology sure has come along way up here in the north, it's just a matter of knowing how it works, being able to maintain it and using it for the right purposes.

Everything that we see and use comes from the earth, once just matter. It's amazing what people can do and have done to get this far, humans have created tools, equipment to survive and come up with faster means of transportation. They have also discovered many things, invented many things, of which technology is one of them.

Now for my report about the project so far and looking ahead. When I came on, I was eager to development my skills in the areas of desktop publishing, design and web page design. Also to learn more about the internet, networking and the technical side of computers, such troubleshooting, upgrading, more about the insides, and how the thing works.

LOCATION

In Kitchenuhmaykoosib, we have twelve(12) public terminals, networked to one printer and four(4) office terminals, each has its own printer. The sixteen terminals are all networked to the internet, by one computer(wingate) through the phone line. The ISP is eno/reo. We also have a digital camera and a flatbed scanner.

I would say the drawbacks are space and not having the directpc equipment, but we should be getting this equipment soon.

There still needs to be networking to do. This building houses the BTL Training Program, the Kitchenuhmaykoosib Education Authority(KEA) and Wahsa Distance Education.

WORK

Read CAP proposal, tst job description to make sure I knew what this project was about and what I had to do.

Community Access Program

Developed internet & computer use policy, general guidelines, poster design, CAP log sheet, project community contacts, job descriptions, organizational structure, floor plan of building.

CAP Youth Worker

I've been working with the youth worker, Josh Mathews, since July. Got him registered on K-Net and showing him how to use the computer and navigate the internet. We have worked on the Kitchenuhmaykoosib Page, which is posted up on K-Net community pages. As well as gathering information about Y2K. Assisting people sign on with K-Net. Also, collecting magazines, books about computers and the internet. We(staff) delivered a computer workshop for the Health Staff, in which we covered computer components(parts), Windows 98 and WordPerfect 8. It was real positive.

I did a computer inventory of most of the computers in the community. Most people work with PCs. Wordprocessing being the most common activity as well as Accounting. I've also been toubleshooting and upgrading computers, changing cpus, sound cards, ram memory chips(simms), hard drives, etc. Provided computer and technical support with community members in areas such as purchasing computers, hardware and software, troubleshooting, wordprocessing, tips.

NAN Telecom Project

Provided a community contacts list for K-Net.

PLANS/CHANGES

I would say we need more space, for people to come in and space to deliver training sessions about computers and the internet. Another thing is equipment, we need better equipment. But the directpc is coming which will be a big help.

More training for staff is another thing. If there are not enough people, somebody will get burnt out or has to do everything.

The thing(s) I like best about this job is web page design and designing publications, something that's creative. I feel just being a technician is too limited. It helps to know a bit about everything, not just one specific area. This job demands being somewhat of a jack of all trades. It helps to know something about science, electricity, electronics, how

appliances work, office equipment, bookkeeping, accounting, math, english.....etc.

That's my two cents worth,

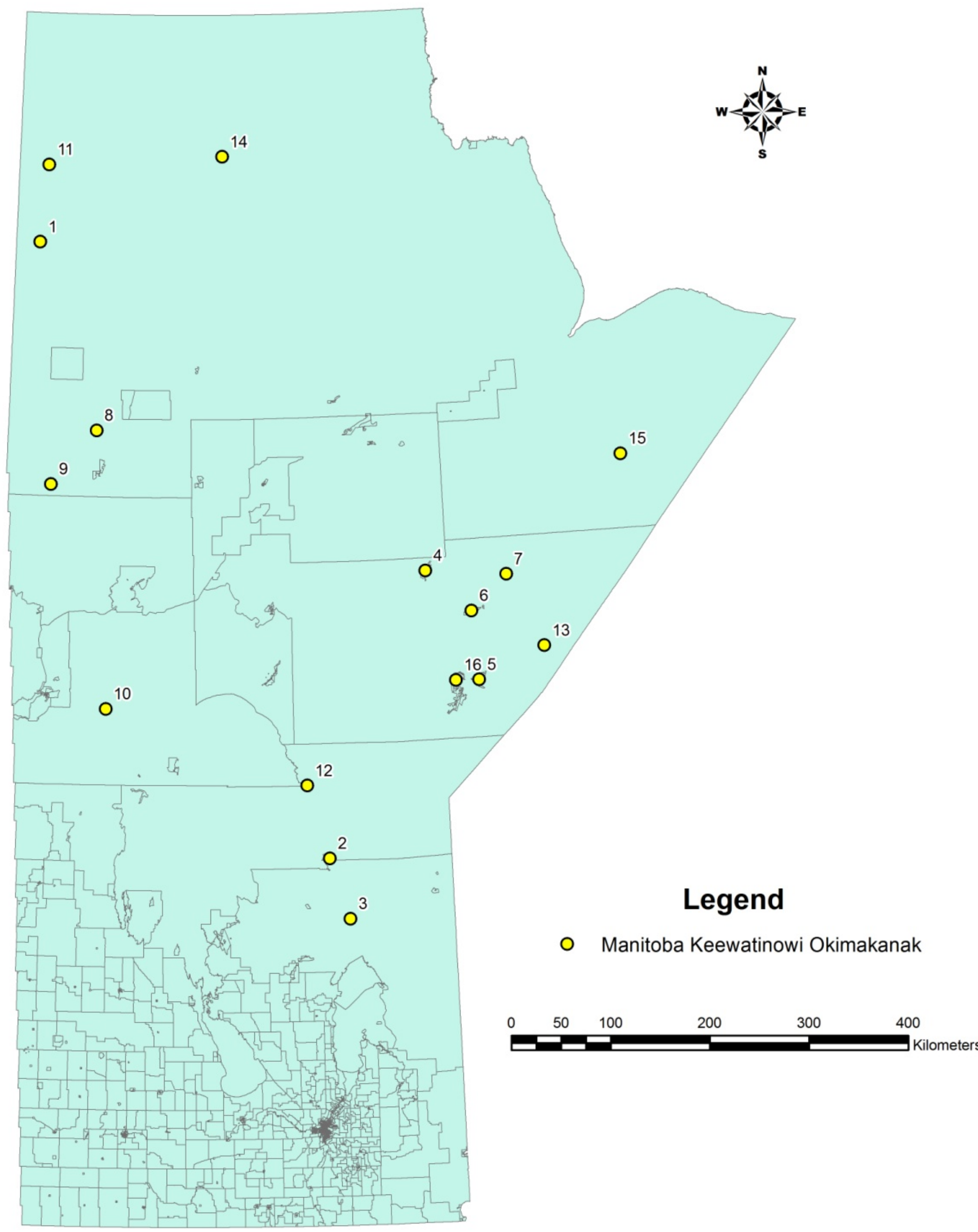
Thanks for visiting.

James Sainnawap, TST

Kitchenuhmaykoosib Inninuwug

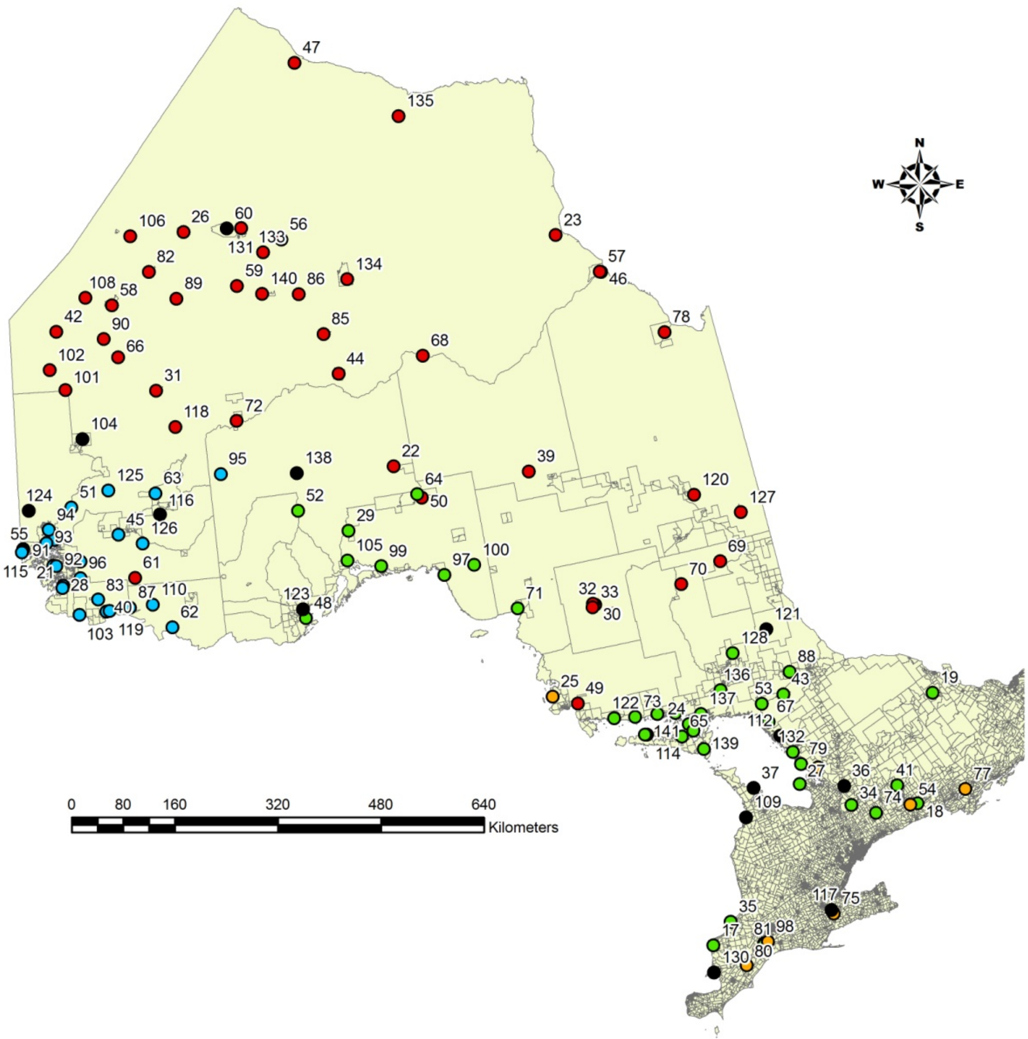
Appendix 7: Map Keys and Tables of Correspondence for Geographic reference

Map key: Manitoba communities featured in the case study, by political territorial affiliation



See table of correspondences to identify communities

Map key: Ontario communities featured in the case study, by political territorial affiliation

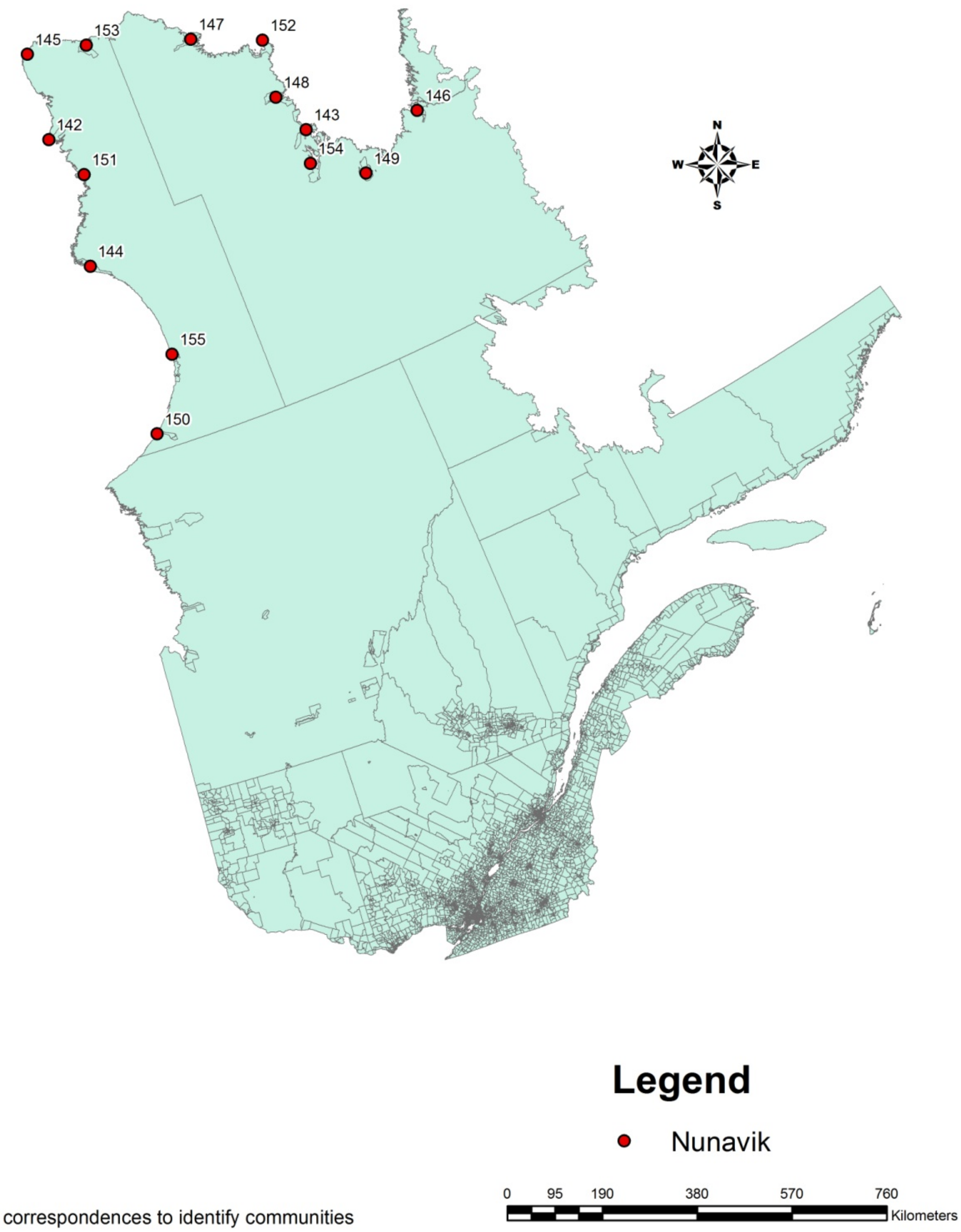


Legend

- No Political Territorial Affiliation
- Anishinabek Nation (Union of Ontario Indians)
- Association of Iroquois and Allied Indians
- Grand Council Treaty #3
- Nishnawbe Aski Nation

See table of correspondences to identify communities

Map key: Quebec communities featured in the case study, by political territorial affiliation



See table of correspondences to identify communities

May Key for relevant First Nations and Inuit communities of Manitoba, Ontario, and Quebec (K-Net affiliates and allies)

	Map ID	First Nation/Inuit Community	Community Census Sub-Division Name	Political Territorial Affiliation	Tribal Council/Regional Gov Affiliation	Latitude	Longitude	Area in Square Kilometers	Population as of 2006 Canada Census
Province Manitoba	1	Barren Lands	Brochet 197	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	57.921180	-101.595320	38.3339	306
	2	Berens River	Berens River 13	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	52.335684	-96.960677	24.5287	739
	3	Bloodvein	Bloodvein 12	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	51.782065	-96.682028	15.4833	576
	4	Bunibonibee Cree Nation	Oxford House 24	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	54.910832	-95.326410	51.007	1947
	5	Garden Hill First Nations	Garden Hill First Nation	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	53.896498	-94.588519	82.4778	1898
	6	God's Lake First Nation	God's Lake 23	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	54.523433	-94.640817	46.7433	1105
	7	Manto Sipi Cree Nation	God's River 86A	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	54.834246	-94.062274	1.5828	556
	8	Mathias Colomb	Granville Lake	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	56.226912	-100.562573	2.3339	98
	9	Mathias Colomb	Pukatawagan 198	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	55.728877	-101.278270	16.7414	1478
	10	Mosakahiken Cree Nation	Moose Lake 31A	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	53.702803	-100.329533	1.5103	698
	11	Northlands	Lac Brochet 197A	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	58.624475	-101.491628	4.9853	604
	12	Poplar River First Nation	Poplar River 16	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	53.000667	-97.272012	16.5919	643
	13	Red Sucker Lake	Red Sucker Lake 1976	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	54.164854	-93.551917	1.2311	845
	14	Sayisi Dene First Nation	Churchill 1	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	58.716403	-98.484089	2.0289	330
	15	Shamattawa First Nation	Shamattawa 1	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	55.834212	-92.087535	21.5959	920
	16	Wasagamack First Nation	Wasagamack	Manitoba Keewatinowi Okimakanak	Keewatin Tribal Council	53.904154	-94.944268	80.6252	1160

(cont.)

May Key for relevant First Nations and Inuit communities of Manitoba, Ontario, and Quebec (K-Net affiliates and allies) (cont.)

	Map ID	First Nation/Inuit Community	Community Census Sub-Division Name	Political Territorial Affiliation	Tribal Council/Regional Gov Affiliation	Latitude	Longitude	Area in Square Kilometers	Population as of 2006 Canada Census
Province Ontario	17	Aamjiwnaang	Sarnia 45	Anishinabek Nation (Union of Ontario Indians)	Southern First Nations Secretariat	42.923243	-82.409290	12.5732	706
	18	Alderville First Nation	Alderville First Nation	Anishinabek Nation (Union of Ontario Indians)	Ogemawahj	44.174410	-78.081264	12.5286	506
	19	Algonquins of Pikwakanagan	Pikwakanagan (Golden Lake 39)	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	45.564885	-77.245850	7.4478	406
	20	Anishinabe of Wauzhushk Onigum	Kenora 38B	Grand Council Treaty #3	Anishinaabeg of Kabapikotawangag Resource Council	49.731817	-94.425410	18.8766	350
	21	Anishnaabeg of Naongashiing	Big Island Mainland 93	Grand Council Treaty #3	Anishinaabeg of Kabapikotawangag Resource Council	49.085201	-94.300654	1.1459	10
	22	Aroland	Aroland 83	Nishnawbe Aski Nation	Matawa	50.226786	-86.963581	3.2091	325
	23	Attawapiskat	Attawapiskat 91A	Nishnawbe Aski Nation	Mushkegowuk	52.923780	-82.428131	1.1891	Not included
	24	Aundeck-Omni-Kaning	Sucker Creek 23	Anishinabek Nation (Union of Ontario Indians)	United Chiefs and Council of Manitoulin	45.960914	-81.996732	6.4906	346
	25	Batchewana First Nation	Goulais Bay 15A	Association of Iroquois and Allied Indians	North Shore	46.707147	-84.534350	6.4223	82
	26	Bearskin Lake	Bearskin Lake	Nishnawbe Aski Nation	Windigo	53.860444	-90.926360	125.7816	459
	27	Beausoleil	Chrstian Island 30 and 30A	Anishinabek Nation (Union of Ontario Indians)	Ogemawahj	44.824264	-80.159476	52.2199	621
	28	Big Grassy	Big Grassy River 35G	Grand Council Treaty #3	Anishinaabeg of Kabapikotawangag Resource Council	49.053305	-94.313053	32.7398	204
	29	Biinjitiwaabik Zaaging Anishinaabek	Rocky Bay 1	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	49.438777	-88.131954	0.4121	154
	30	Brunswick House	Duck Lake 76B	Nishnawbe Aski Nation	Wabun	47.835335	-83.331337	1.9487	82
	31	Cat Lake	Cat Lake 63C	Nishnawbe Aski Nation	Windigo	51.699685	-91.934492	17.0395	492
	32	Chapleau Cree First Nation	Chapleau 75	Nishnawbe Aski Nation	Mushkegowuk	47.854264	-83.372460	1.1492	92
	33	Chapleau Ojibway	Chapleau 74A	Nishnawbe Aski Nation	Wabun	47.807622	-83.391267	7.6282	20
	34	Chippewas of Georgina Island	Chippewas of Georgina Island First Nation	Anishinabek Nation (Union of Ontario Indians)	Ogemawahj	44.375555	-79.294208	14.546	353
	35	Chippewas of Kettle and Stony Point	Kettle Point 44	Anishinabek Nation (Union of Ontario Indians)	Southern First Nations Secretariat	43.193079	-82.004131	9.2027	1020
	36	Chippewas of Mnjikaning First Nation	Mnjikaning First Nation 32 (Rama First Nation 32)	No Political Territorial Affiliation	Ogemawahj	44.654425	-79.341794	10.6959	846

(cont.)

May Key for relevant First Nations and Inuit communities of Manitoba, Ontario, and Quebec (K-Net affiliates and allies) (cont.)

	Map ID	First Nation/Inuit Community	Community Census Sub-Division Name	Political Territorial Affiliation	Tribal Council/Regional Gov Affiliation	Latitude	Longitude	Area in Square Kilometers	Population as of 2006 Canada Census
Province Ontario	37	Chippewas of Nawash First Nation	Neyaashiinigmiing 27	No Political Territorial Affiliation	No Tribal Council Affiliation	44.912823	-81.039606	63.7833	591
	38	Chippewas of the Thames First Nation	Chippewas of the Thames First Nation 42	Anishinabek Nation (Union of Ontario Indians)	Southern First Nations Secretariat	42.809719	-81.477715	39.1061	747
	39	Constance Lake	Constance Lake 92	Nishnawbe Aski Nation	Matawa	49.817726	-84.125471	26.2014	702
	40	Couchiching First Nation	Couchiching 16A	Grand Council Treaty #3	Fort Frances	48.685752	-93.425046	65.0393	691
	41	Curve Lake	Curve Lake First Nation 35	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	44.482454	-78.360547	6.6224	1060
	42	Deer Lake	Deer Lake	Nishnawbe Aski Nation	Keewaytinook Okimakanak (KO)	52.635168	-94.082302	17.8485	681
	43	Dokis	Dokis 9	Anishinabek Nation (Union of Ontario Indians)	Waabnoong Bemjiwang	46.063876	-80.052125	153.1583	195
	44	Eabametoong First Nation	Fort Hope 64	Nishnawbe Aski Nation	Matawa	51.614791	-87.836601	245.5895	1144
	45	Eagle Lake	Eagle Lake 27	Grand Council Treaty #3	Bimose	49.741415	-93.043544	34.3978	232
	46	Fort Albany	Fort Albany (Part) 67	Nishnawbe Aski Nation	Mushkegowuk	52.281038	-81.629508	3.3115	1805
	47	Fort Severn	Fort Severn 89	Nishnawbe Aski Nation	Keewaytinook Okimakanak (KO)	55.977612	-87.702380	44.0868	Not included
	48	Fort William	Fort William 52	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	48.313682	-89.268816	58.1698	909
	49	Garden River First Nation	Garden River 14	Nishnawbe Aski Nation	Mushkegowuk	46.549675	-84.068227	163.1351	985
	50	Ginoogaming First Nation	Ginoogaming First Nation	Nishnawbe Aski Nation	Matawa	49.731927	-86.477915	68.3355	175
	51	Grassy Narrows First Nation	English River 21	Grand Council Treaty #3	No Tribal Council Affiliation	50.171309	-94.014123	39.6062	633
	52	Gull Bay	Gull River 55	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	49.809178	-89.142306	41.6902	206
	53	Henvey Inlet First Nation	French River 13	Anishinabek Nation (Union of Ontario Indians)	Waabnoong Bemjiwang	46.006930	-80.508406	26.5399	99
	54	Hiawatha First Nation	Hiawatha First Nation	Association of Iroquois and Allied Indians	United Anishinabeg Councils	44.184569	-78.215468	8.0669	483
	55	Iskatewizaagegan #39 Independent First Nation	Shoal Lake (Part) 39A & Shoal Lake 34B2	No Political Territorial Affiliation	Bimose	49.627863	-95.106869	33.8869	472
	56	Kasabonika Lake	Kasabonika Lake	Nishnawbe Aski Nation	Shibogama	53.577798	-88.666889	104.713	681
	57	Kashechewan	Kashechewan	Nishnawbe Aski Nation	Mushkegowuk	52.291389	-81.652222	Not included	Not included
	58	Kee-Way-Win	Kee-Way-Win	Nishnawbe Aski Nation	Keewaytinook Okimakanak (KO)	52.943878	-92.762680	189.7824	318

(cont.)

May Key for relevant First Nations and Inuit communities of Manitoba, Ontario, and Quebec (K-Net affiliates and allies) (cont.)

	Map ID	First Nation/Inuit Community	Community Census Sub-Division Name	Political Territorial Affiliation	Tribal Council/Regional Gov Affiliation	Latitude	Longitude	Area in Square Kilometers	Population as of 2006 Canada Census
Province Ontario	59	Kingfisher	Kingfisher Lake 1	Nishnawbe Aski Nation	Shibogama	53.022729	-89.839425	7.7497	415
	60	Kitchenuhmaykoosib Inninuwug	Kitchenuhmaykoosib Aaki 84 (Big Trout Lake)	No Political Territorial Affiliation	Independent First Nations Alliance	53.833787	-89.905556	319.8538	916
	61	Koocheching First Nation	Koocheching	Nishnawbe Aski Nation	Windigo	49.124935	-92.762680		40
	62	Lac La Croix	Neguaguon Lake 25D	Grand Council Treaty #3	Fort Frances	48.389655	-92.062621	63.1023	257
	63	Lac Seul	Lac Seul 28	Grand Council Treaty #3	Independent First Nations Alliance	50.273835	-92.164051	239.0947	821
	64	Long Lake No.58 First Nation	Long Lake 58	Anishinabek Nation (Union of Ontario Indians)	Matawa	49.791127	-86.563723	2.5222	417
	65	M'Chigeeng First Nation	M'Chigeeng 22 (West Bay 22)	Anishinabek Nation (Union of Ontario Indians)	United Chiefs and Council of Manitoulin	45.815619	-82.176811	32.9035	766
	66	MacDowell Lake First Nation	MacDowell Lake	Nishnawbe Aski Nation	Keewaytinook Okimakanak (KO)	52.210561	-92.723744	1.9353	0
	67	Magnetawan	Magnetewan 1	Anishinabek Nation (Union of Ontario Indians)	Waabnoong Bemjiwang	45.748706	-80.461391	47.3002	78
	68	Martin Falls	Marten Falls 65	Nishnawbe Aski Nation	Matawa	51.668997	-85.915617	81.4317	221
	69	Matachewan	Matachewan 72	Nishnawbe Aski Nation	Wabun	48.037087	-80.644245	33.6275	72
	70	Mattagami	Mattagami 71	Nishnawbe Aski Nation	Wabun	47.855661	-81.525695	45.9257	189
	71	Michipicoten	Gros Cap 49	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	47.991371	-84.901192	34.5729	54
	72	Mishkeegogamang	Osnaburgh 63A & Osnaburgh 63B	Nishnawbe Aski Nation	No Tribal Council Affiliation	51.158157	-90.227208	162.8063	500
	73	Mississauga	Mississagi River 8	Anishinabek Nation (Union of Ontario Indians)	North Shore	46.212289	-82.998945	18.2641	414
	74	Mississaugas of Scugog Island First Nation	Mississaugas of Scugog Island	Anishinabek Nation (Union of Ontario Indians)	Ogemawahj	44.192550	-78.884681	2.5836	72
	75	Mississaugas of the Credit	New Credit (Part) 40A	Association of Iroquois and Allied Indians	United Anishinabeg Councils	42.999089	-80.096738	20.0492	492
	76	Mohawks of Akwesasne	Akwesasne (Part) 59	No Political Territorial Affiliation	No Tribal Council Affiliation	45.004992	-74.715080	11.8626	Not included
	77	Mohawks of the Bay of Quinte	Tyendinaga Mohawk Territory	Association of Iroquois and Allied Indians	No Tribal Council Affiliation	44.191776	-77.144283	71.0574	Not included
	78	Moose Cree First Nation	Factory Island 1	Nishnawbe Aski Nation	Mushkegowuk	51.266793	-80.594395	3.0788	Not included
	79	Moose Deer Point	Moose Point 79	Anishinabek Nation (Union of Ontario Indians)	Ogemawahj	45.082749	-80.040704	2.6673	208

(cont.)

May Key for relevant First Nations and Inuit communities of Manitoba, Ontario, and Quebec (K-Net affiliates and allies) (cont.)

	Map ID	First Nation/Inuit Community	Community Census Sub-Division Name	Political Territorial Affiliation	Tribal Council/Regional Gov Affiliation	Latitude	Longitude	Area in Square Kilometers	Population as of 2006 Canada Census
Province Ontario	80	Moravian of the Thames	Moravian 47	Association of Iroquois and Allied Indians	Southern First Nations Secretariat	42.567235	-81.881001	12.6059	412
	81	Munsee-Delaware Nation	Munsee-Delaware Nation 1	Anishinabek Nation (Union of Ontario Indians)	Southern First Nations Secretariat	42.797367	-81.479752	11.2231	167
	82	Muskrat Dam Lake	Muskrat Dam Lake	Nishnawbe Aski Nation	Independent First Nations Alliance	53.359496	-91.835810	20.5775	252
	83	Naicatchewenin	Rainy Lake 17A	Grand Council Treaty #3	Fort Frances	48.861415	-93.580089	14.3004	183
	84	Naotkamegwanning	Whitefish Bay 32A	Grand Council Treaty #3	Anishinaabeg of Kabapikotawangag Resource Council	49.406329	-93.893602	18.7653	622
	85	Neskantaga First Nation	Neskantaga	Nishnawbe Aski Nation	Matawa	52.192693	-88.034498	8.3009	265
	86	Nibinamik First Nation and Neskantaga First Nation	Summer Beaver	Nishnawbe Aski Nation	Matawa	52.790850	-88.456391	17.1663	362
	87	Nicickousemenecaning	Rainy Lake 26A	Grand Council Treaty #3	Fort Frances	48.716629	-92.920978	23.7693	128
	88	Nipissing First Nation	Nipissing 10	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	46.343721	-79.826598	61.2207	1413
	89	North Caribou Lake	Weagamow Lake 87	Nishnawbe Aski Nation	Windigo	52.946222	-91.262437	95.7464	700
	90	North Spirit Lake	North Spirit Lake	Nishnawbe Aski Nation	Keewaytinook Okimakanak (KO)	52.480581	-93.012448	19.5046	259
	91	Northwest Angle No.33	Northwest Angle 33B & Whitefish Bay 33A	Grand Council Treaty #3	Anishinaabeg of Kabapikotawangag Resource Council	49.374338	-94.482415	25.6672	93
	92	Northwest Angle No.37	Lake Of The Woods 37 & Whitefish Bay 34A	Grand Council Treaty #3	Anishinaabeg of Kabapikotawangag Resource Council	49.365713	-94.419405	17.2893	152
	93	Obashkaandagaang	Rat Portage 38A	Grand Council Treaty #3	No Tribal Council Affiliation	49.694750	-94.597790	29.8423	316
	94	Ochiichagwe'babigo'ining First Nation	The Dalles 38C	Grand Council Treaty #3	No Tribal Council Affiliation	49.877608	-94.533172	32.5471	156
	95	Ojibway Nation of Saugeen	Ojibway Nation of Saugeen (Savant Lake)	Grand Council Treaty #3	Windigo	50.448720	-90.706239	56.5909	98
	96	Ojibways of Onigaming First Nation	Sabaskong Bay 35D	Grand Council Treaty #3	Anishinaabeg of Kabapikotawangag esource Council	49.177421	-93.918003	5.9264	390
	97	Ojibways of the Pic River First Nation	Pic River 50	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	48.627864	-86.276523	3.6468	383
	98	Oneida Nation of the Thames	Oneida 41	Association of Iroquois and Allied Indians	Southern First Nations Secretariat	42.821621	-81.403144	22.1639	Not included
	99	Pays Plat	Pays Plat 51	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	48.884794	-87.558834	2.189	79
	100	Pic Mobert	Pic Mobert (North & South)	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	48.692048	-85.629885	2.0733	241

(cont.)

May Key for relevant First Nations and Inuit communities of Manitoba, Ontario, and Quebec (K-Net affiliates and allies) (cont.)

	Map ID	First Nation/Inuit Community	Community Census Sub-Division Name	Political Territorial Affiliation	Tribal Council/Regional Gov Affiliation	Latitude	Longitude	Area in Square Kilometers	Population as of 2006 Canada Census
Province Ontario	101	Pikangikum	Pikangikum 14	Nishnawbe Aski Nation	Independent First Nations Alliance	51.811716	-93.969839	8.3593	2100
	102	Poplar Hill	Poplar Hill	Nishnawbe Aski Nation	Keewaytinook Okimakanak (KO)	52.104083	-94.295308	7.0165	457
	103	Rainy River First Nations	Long Sault 12 & Manitou Rapids 11	Grand Council Treaty #3	Fort Frances	48.665040	-93.996106	71.0323	261
	104	Red Lake/Balmertown	Red Lake/Balmertown	N/A	N/A	51.112679	-93.664588	610.3766	4526
	105	Red Rock	Lake Helen 53A	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	49.030917	-88.241934	0.6873	283
	106	Sachigo Lake	Sachigo Lake 1	Nishnawbe Aski Nation	Windigo	53.877465	-92.184647	38.1004	450
	107	Sagamok Anishnawbek	Sagamok	Anishinabek Nation (Union of Ontario Indians)	North Shore	46.151947	-82.206410	97.6506	884
	108	Sandy Lake	Sandy Lake 88	Nishnawbe Aski Nation	No Tribal Council Affiliation	53.075755	-93.358678	45.6881	1843
	109	Saugeen	Saugeen 29	No Political Territorial Affiliation	No Tribal Council Affiliation	44.546278	-81.301211	40.781	758
	110	Seine River First Nation	Seine River 23A	Grand Council Treaty #3	Fort Frances	48.729031	-92.434822	15.499	272
	111	Serpent River	Serpent River 7	Anishinabek Nation (Union of Ontario Indians)	North Shore	46.189281	-82.556328	75.7507	340
	112	Shawanaga First Nation	Shawanaga 17	No Political Territorial Affiliation	No Tribal Council Affiliation	45.525387	-80.301891	31.8968	193
	113	Sheguiandah	Sheguiandah 24	Anishinabek Nation (Union of Ontario Indians)	United Chiefs and Council of Manitoulin	45.861638	-81.933142	20.4519	160
	114	Sheshegwaning	Sheshegwaning 20	Anishinabek Nation (Union of Ontario Indians)	United Chiefs and Council of Manitoulin	45.942834	-82.844408	20.2846	107
	115	Shoal Lake No.40	Shoal Lake (Part) 40	Grand Council Treaty #3	Bimose	49.584745	-95.139906	4.7835	105
	116	Sioux Lookout	Sioux Lookout	N/A	N/A	49.974178	-92.107891	378.6131	5183
	117	Six Nations of the Grand River	Six Nations (Part) 40	No Political Territorial Affiliation	No Tribal Council Affiliation	43.053991	-80.125195	157.3267	Not included
	118	Slate Falls Nation	Slate Falls	Nishnawbe Aski Nation	Windigo	51.168574	-91.592607	8.749	164
	119	Stanjikoming First Nation	Rainy Lake 18C	Grand Council Treaty #3	Fort Frances	48.690844	-93.349890	17.6426	95
	120	Taykwa Tagamou Nation	New Post 69A	Nishnawbe Aski Nation	Mushkegowuk	49.008008	-80.838719	1.2247	73
	121	Temagami First Nation	Bear Island 1	No Political Territorial Affiliation	No Tribal Council Affiliation	46.983371	-80.069856	2.9055	Not included
	122	Thessalon	Thessalon 12	Anishinabek Nation (Union of Ontario Indians)	North Shore	46.252878	-83.412424	9.7862	112
	123	Thunder Bay	Thunder Bay	N/A	N/A	48.443268	-89.309508	2550.4013	122907

(cont.)

May Key for relevant First Nations and Inuit communities of Manitoba, Ontario, and Quebec (K-Net affiliates and allies) (cont.)

		Map ID	First Nation/Inuit Community	Community Census Sub-Division Name	Political Territorial Affiliation	Tribal Council/Regional Gov Affiliation	Latitude	Longitude	Area in Square Kilometers	Population as of 2006 Canada Census
Province	Ontario *	124	Wabaseemoong Independent Nations	Wabaseemoong	No Political Territorial Affiliation	No Tribal Council Affiliation	50.161690	-94.944979	75.5532	786
	*	125	Wabauskang First Nation	Wabauskang 21	Grand Council Treaty #3	Bimose	50.368058	-93.182114	29.9782	85
	*	126	Wabigoon Lake Ojibway Nation	Wabigoon Lake 27	Grand Council Treaty #3	Bimose	49.593113	-92.540486	46.272	147
	*	127	Wahgoshig	Abitibi 70	Nishnawbe Aski Nation	Wabun	48.617124	-79.983340	78.7023	114
	*	128	Wahnapitae	Wahnapitei 11	Anishinabek Nation (Union of Ontario Indians)	Waabnoong Bemjiwang	46.776057	-80.835295	10.626	52
	*	129	Wahta Mohawk	Wahta Mohawk Territory	Association of Iroquois and Allied Indians	No Tribal Council Affiliation	44.984364	-79.739680	60.4407	Not included
	*	130	Walpole Island	Walpole Island 46	No Political Territorial Affiliation	Southern First Nations Secretariat	42.559745	-82.497555	137.2831	1878
	*	131	Wapekeka	Wapekeka 2	Nishnawbe Aski Nation	Shibogama	53.815618	-89.566358	21.4749	350
	*	132	Wasauksing First Nation	Parry Island First Nation	Anishinabek Nation (Union of Ontario Indians)	Waabnoong Bemjiwang	45.270260	-80.144063	71.1748	350
	*	133	Wawakapewin	Wawakapewin (Long Dog Lake)	Nishnawbe Aski Nation	Shibogama	53.438593	-89.137421	53.9099	21
	*	134	Webequie	Webequie	Nishnawbe Aski Nation	Matawa	52.892627	-87.304846	303.419	614
	*	135	Weenusk	Peawanuck	Nishnawbe Aski Nation	No Tribal Council Affiliation	54.993133	-85.433240	1.5179	221
	*	136	Whitefish Lake	Whitefish Lake 6	Anishinabek Nation (Union of Ontario Indians)	North Shore	46.322401	-81.239413	171.1308	349
	*	137	Whitefish River	Whitefish River (Part) 4	Anishinabek Nation (Union of Ontario Indians)	United Chiefs and Council of Manitoulin	46.061738	-81.717592	40.5001	379
	*	138	Whitesand	Whitesand	No Political Territorial Affiliation	Independent First Nations Alliance	50.330671	-89.060195	8.2634	247
	*	139	Wikwemikong	Wikwemikong Unceded	Anishinabek Nation (Union of Ontario Indians)	No Tribal Council Affiliation	45.583847	-81.815419	412.9656	2387
	*	140	Wunnumin	Wunnumin 1	Nishnawbe Aski Nation	Shibogama	52.868323	-89.287122	57.7086	487
	*	141	Zhiibaahaasing First Nation	Zhiibaahaasing 19A (Cockburn Island 19A)	Anishinabek Nation (Union of Ontario Indians)	United Chiefs and Council of Manitoulin	45.945673	-82.879323	6.0076	52

(cont.)

May Key for relevant First Nations and Inuit communities of Manitoba, Ontario, and Quebec (K-Net affiliates and allies) (cont.)

		Map ID	First Nation/Inuit Community	Community Census Sub-Division Name	Political Territorial Affiliation	Tribal Council/Regional Gov Affiliation	Latitude	Longitude	Area in Square Kilometers	Population as of 2006 Canada Census
Province	Quebec	142	Aupaluk	Aupaluk	Nunavik	Kativik Regional Government	59.294483	-69.577228	30.1195	174
		143	Inukjuak	Inukjuak	Nunavik	Kativik Regional Government	58.577506	-78.270864	428.3892	0
		144	Ivujivik	Ivujivik	Nunavik	Kativik Regional Government	62.403609	-77.861061	35.2121	349
		145	Kangiqsualujjuaq	Kangiqsualujjuaq	Nunavik	Kativik Regional Government	58.703071	-65.960313	35.0492	735
		146	Kangiqsujuaq	Kangiqsujuaq	Nunavik	Kativik Regional Government	61.588353	-71.929722	12.5558	605
		147	Kangirsuk	Kangirsuk	Nunavik	Kativik Regional Government	60.085059	-70.153701	529.3954	0
		148	Kuujjuaq	Kuujjuaq	Nunavik	Kativik Regional Government	58.269336	-68.434935	320.8011	0
		149	Kuujjuarapik	Kuujjuarapik	Nunavik	Kativik Regional Government	56.283479	-76.514673	293.6592	0
		150	Obedjiwan	Obedjiwan	Nunavik	Kativik Regional Government	48.668657	-74.928840	8.6751	1782
	*	151	Puvirnituq	Puvirnituq	Nunavik	Kativik Regional Government	60.056495	-77.322190	85.734	1457
	*	152	Quaqtaq	Quaqtaq	Nunavik	Kativik Regional Government	61.035676	-69.579563	26.5371	315
	*	153	Salluit	Salluit	Nunavik	Kativik Regional Government	62.103612	-75.600274	596.8418	0
	*	154	Tasiujaq	Tasiujaq	Nunavik	Kativik Regional Government	58.731061	-69.945698	66.5394	248
	*	155	Umiujaq	Umiujaq	Nunavik	Kativik Regional Government	56.545437	-76.500584	27.7209	390