HARNESSING ICTS: A CANADIAN FIRST NATIONS EXPERIENCE

K-NET NETWORK DEVELOPMENT

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INTRODUCTION

In the late 1990s, two of the Keewaytinook Okimakanak (KO) communities only had a single public phone to serve 300-400 residents.

"…there were no phones here. So many times I had to make a phone call, I had to go to the Band Office – there was always someone on the phone. I had to wait, wait, wait… Because my call was important, I had to wait till the phone was available – sometimes I had to wait for an hour." – Lawrence Mason, Mental Health Coordinator

What K-Net has accomplished in less than a decade in terms of network and technical infrastructure development is incredible: communities have gone from one phone for 400 people four years ago to accessing broadband services from individual homes. There are few rural communities in Canada – and particularly few remote ones – that have experienced such a dramatic transformation.

The K-Net network that we see today is the result of several key factors that have come together in the development process:

☞ An organization made up of champions/visionaries working on behalf of the communities;

☞ Constant evolution of the organization to keep pace with technology, policies and community demands, while at the same time influencing how the technology is adapted, how policies are formulated, and how community demands are channeled;

☞ A significant number of government programs have been harnessed by K-Net to achieve a multiplier effect in terms of technology, costs and skills development;

☞ An ongoing advocacy effort to lobby federal regulators to develop policies that serve rural and remote communities;

☞ The private sector has expanded infrastructure as a direct response to the above pressures.

These factors are the building blocks that have created the K-Net network and services now in existence. For other groups wanting to replicate this effort, this foundation is key; community needs and demands drive technology and network infrastructure development. Of course, the K-Net experience merely reflects how the above building blocks have come together in this particular part of Canada – any other community around the world that wishes to create a local network will have to respond to its own unique geographic, political, financial and social situation.

K-Net servers receive more than 20 million hits in October!
Posted by: Brian Beaton, brian.beaton@knet.ca
on Saturday, November 01, 2003 - 06:10 AM GMT

Personal web pages at MyKnet.org continue to be the most popular on-line space for the Nishnawbe Aski to browse. In October there were over 13 millions hits on this K-Net server (an additional 2 million hits from the previous month)!

All together there were over 20 MILLION hits occurring on the six most popular monitored K-Net servers throughout September. Specifically, on these six servers with traffic graphs, there were a total of 20,619,828 hits made to these on-line services provided by Keewaytinook Okimakanak. The six servers include myknet.org, knet.ca, webmail.knet.ca, hosting.knet.ca, highschool.knet.ca and photos.knet.ca.

Most of the K-Net servers that are being monitored for hits, visits and usage statistics using the webalizer program again showed an increase during the month. But http://myknet.org rose by another 2 million hits to demonstrate the rapid take up of these communication tools among users across the north. Source: http://knews.knet.ca/modules.php?op=modload&name=News&file=article&sid=721)

What K-Net is, and what it means to the remote communities it services, can best be explained through examples and stories about how it has affected people's lives. The Wawatay News has profiled several such stories about K-Net on their website, http://knews.knet.ca

BASIC INGREDIENTS: COMMUNITY PROCESS DIRECTS THE TECHNOLOGY

One of the important lessons from the K-Net experience has been to pay close attention to the community process that directs technological development. The network itself is a reflection of the people who create it; therefore, it is essential to become familiar with the people who built K-Net, understand their vision and appreciate the close, dynamic relationship they have developed with the KO communities.

The "people" involved in building a network include those who have a vision, those who can talk common sense, and the technical partners. No single individual generally has these three skills. The TEAM that delivers this set of skills works together to deliver the vision that the community leaders direct. The technical team needs to work from the vision, not from the latest fad in a computer magazine. The common sense team members (often also the visionaries) needs to write proposals and have input from the technical side. And finally, the technical people need to learn and adapt, working as part of a team rather than as the driver. All members of the team need to learn to work as a team, something that is often easier said than done.

K-Net began operating in 1994 with an electronic bulletin board system (BBS). This was a direct response to the local education directors who saw the need to provide children in the KO communities with computers and links to information resources. The Chiefs agreed and supported the initiative. This is how K-Net started, by bringing in staff who were already involved in related projects to respond to a perceived need.

K-Net assembled a team of champions and began working on behalf of the KO communities. It negotiated with policy makers, telecommunication carriers, equipment vendors, and other governmental departments with a stake in rural telecommunications and service delivery to First Nations. In a study done by the University of Guelph, the role of K-Net was described as a "mediating organization", one that works on behalf of communities and ensures that the services they receive are appropriate, technologically sound, and sustainable[1].

EXPERIMENT, LEARN, ADAPT

One of the key accomplishments of K-Net has been to harness any funding opportunity offered by government agencies and put this to work to meet the needs of the communities. By 1997-98, K-Net was installing links using DirecPC[2] units through Industry Canada's SchoolNet initiative. The basic phone infrastructure at the time quickly became a limitation, so they decided to use MSAT[3] technology to create an outbound channel. As this was happening, they also trained community technicians and started to use a Wingate proxy server to create school networks. When they found limitations with the Wingate/Win95 system, they decided to go with Linux. The K-Net technicians quickly learned how to set up networks, and in a very short time, were stringing blue cable to connect other buildings and residences. People acquired computers and modems and began communicating by email from their homes before they had a residential phone.

1   Ramírez, R. and Richardson, D. 2000. "PACTS for rural and remote Ontario: Research Report Year 1 and Case Studies." *Partnerships, Accessibility, Connectivity Transformation Strategies*. School of Rural Extension Studies, University of Guelph. http://www.uoguelph.ca/~res/pacts

2   **DirecPC** - the first one-way satellite Internet access developed in 1996. The subscriber connects upstream to the Internet via dial-up modem and an Internet Service Provider (ISP) and receives the downstream

3   **M-SAT** - mobile satellite services that use geo-stationary satellites that have been optimized to serve fixed or portable terminals.

The first years of experimenting with different technical options gave K-Net a sense of what was possible; it also gave the team a foundation for their vision. By 1999, they knew they wanted to get broadband service in the communities. They started with a simple plan: to aggregate the needs of each community by finding the main community users and their immediate bandwidth requirements.

Blue Ethernet cable in the snow

Community User	Bandwidth required (Kbps)
Band Office	56
Community School	56
NAPS Office (Police)	128
Community video	384
Nursing station	128
Aggregate bandwidth	768 Kbps

Having determined their broadband needs and planned applications, K-Net drafted a proposal in 1999 with which to approach potential funders. Their proposal stated:

"The model we are suggesting will have an expanded community integrated network that will tie into the community wide area network. Depending upon the traffic generated from the community, the inter-community connections can be designed up to T1 capacity."[4]
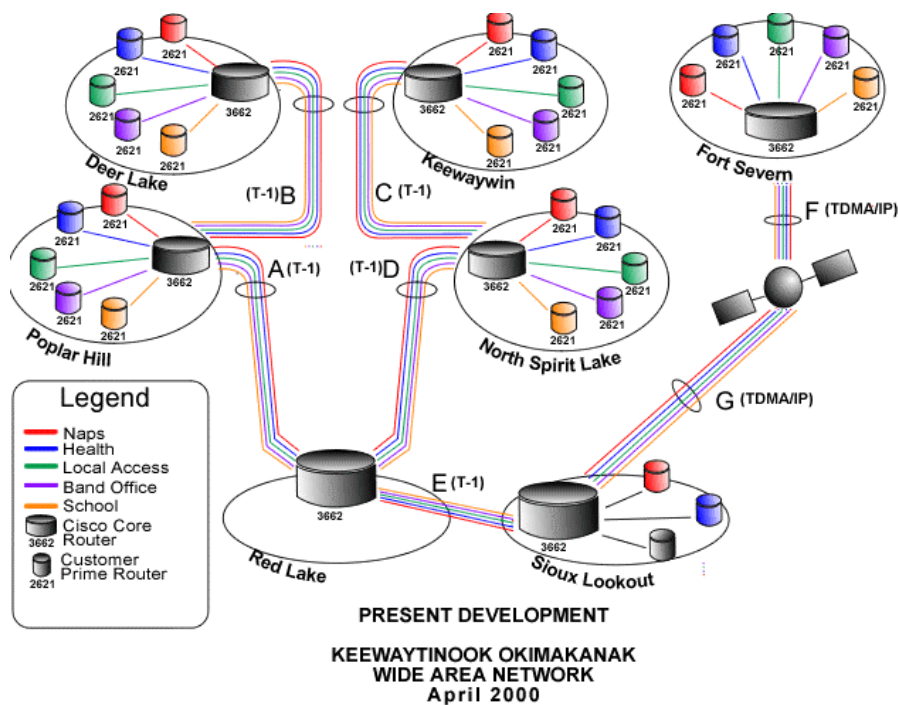
The KO communities began approaching potential partners of all sorts with their proposal, and in discussing options, they learned more about the technology and its suitability to their geography, as well as the key partners who would be able to make broadband happen.
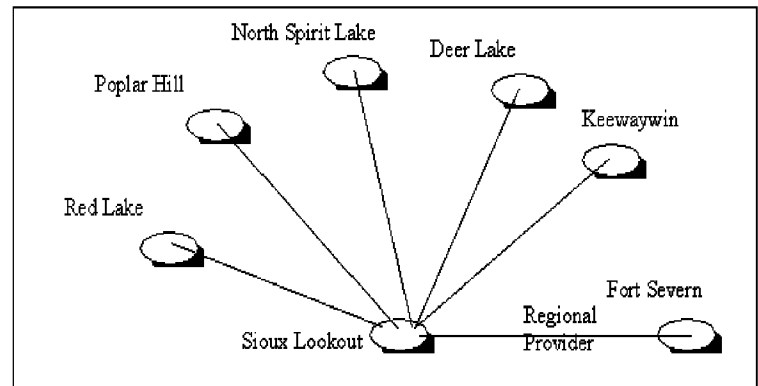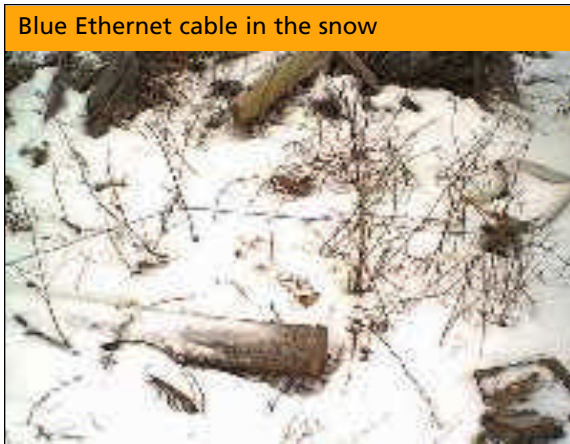
EMAIL BEFORE PHONES: USING THE TECHNOLOGY TO JUMP AHEAD

The technological pole-vaulting experience of the KO communities is impressive: as described above, some people ended up using email in their homes before they had a telephone. It is likely that this process will also happen elsewhere, considering the current lack of telecommunications services in many rural and remote communities around the world. The table below summarizes the major developments of the Internet over the past 30+ years [5] – generations that K-Net bypassed in less than a year.

Internet Generation	Period	Characterized
1st	Late 1960s to early 1990s	A network of social engineering prototypes of interest to military and research organizations
2nd	1990s to today	Mass adoption and commercialization of narrowband access; Dial-up modems providing intermittent low-bandwidth connections; Took advantage of telephone network and universal access policies (some countries)
3rd	Today (in some places)	Always on, high-speed; Impossible to predict what applications will emerge

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4   **T1** is 1.5 Mbps. Source for this quote and diagram: *Keewaytinook Okimakanak Broadband Network. Summary of Applications, users, traffic and preliminary network design*. November 1999. http://smart.knet.ca/archive/documents/NETWORK%20SUMMAR.html

5   Bar et al., 2000. "Access and Innovation Policy for the Third-Generation Internet." *Telecommunication Policy* 24: 489-518.

By April 2000, the K-Net network had grown significantly and was proposing to provide T1 connectivity to Keewaywin, Deer Lake, North Spirit Lake and Poplar Hill through Bell Canada's infrastructure, configured with Cisco routers; and to Fort Severn via satellite. The diagram below is from the Keewaytinook Okimakanak January 2000 Smart Communities business plan.[6]

PRESENT DEVELOPMENT

KEEWAYTINOOK OKIMAKANAK
WIDE AREA NETWORK
April 2000

The knowledge and expertise gained by K-Net are being employed to assist other First Nations communities. For example, the Kativik Regional Government in Quebec's Nunavik arctic region is working closely with K-Net staff to plan and implement network and traffic management systems for 14 C-Band satellite sites. In the health sector, K-Net and Health Canada are planning to extend tele-health services to all 28 First Nations communities in the Sioux Lookout Zone of north-western Ontario. Industry Canada has engaged K-Net to deploy Telesat C-Band satellite capacity to some 30 remote communities across Canada. Industry Canada also has agreements with K-Net to deliver the SchoolNet program and provide help-desk services to over 100 First Nations schools in Ontario.

K-Net's commitment to assist-ing other First Nations, rural and remote communities across Canada is evidenced by its work in helping cat-alyze and facilitate discussion among members of the Nation-al C-Band Public Benefit Work-ing Group. The objectives of this Group include sharing regional satellite information concerning communities (existing infrastructure, plans, proposals, etc.), examining network management mod-els that make the best use of C-Band services for public benefit, and developing a consortium of partners of regional networks to support the goal of delivering broadband connectivity to every First Nations, rural and remote community in Canada by 2005.

Since April 2000, the network has expanded further (for more details, see http://services.knet.ca/network_overview.html. K-Net emphasizes the importance of community investment and ownership over the local network, com-bined with a collective aggregation across the different communities. Each community owns their own infrastruc-ture, paying for their "pipes" and a portion of the shared pipe. Although each has had the option of operating their network alone, they soon discovered that individual com-munities are too small to make the situation economical-ly viable. Sharing the network among all the K-Net com-munities has given everyone more leverage to negotiate preferential prices for bandwidth.

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6   Source: http://smart.knet.ca/archive/graphics/konetwork5.gif

![Keewaytinook Okimakanak Kuh-ke-nah Smart First Nations Demonstration Project](logo)

MAKING IT HAPPEN: GOVERNMENT AND PRIVATE SECTOR INPUT

In 1999 K-Net assembled a bid to become one of Industry Canada's Smart Demonstration Projects.[7] K-Net's Kuh-ke-nah proposal won the national competition for the Aboriginal category.

K-Net's winning proposal emphasized the following themes:

▲ Community engagement efforts in all communities to ensure the network is developed on the basis of people's visions and needs.

▲ A portfolio of 'Smart Services' including: a data warehouse, an Internet portal, electronic centres in each community open to the public, a broadband network, an internet-based high school and a number of telemedicine applications.

▲ Training for staff in all of the above services on how to use the technology, how to maintain the network and equipment on-site, and how to help others learn to use the new services.

▲ An evaluation process to track how the technology changes livelihoods in the First Nation communities.

The Smart Demonstration Program provided a competitive grant worth CAD$4.65 million and required the same amount to be sourced from other partners. K-Net was able to bring on board a large number of partners, including the private sector, to come up with the additional funding bases. K-Net has learned to bring these different partners to the table; they have created alliances that did not exist before. These alliances have built a network of trust that is K-Net's most valuable social capital.

K-Net has been implementing the Smart Demonstration project since 2000 and will continue until 2004 – but the services and infrastructure will continue to operate after the project is complete. The investment and documented accomplishments have allowed K-Net to leverage additional resources. For example, K-Net has recently been selected as one of the Regional Managing Organizations for Industry Canada's First Nations' SchoolNet initiative, serving as a help-desk for aboriginal schools all across Ontario.

BUSINESS CONCERNS: FINANCIAL SUSTAINABILITY OF THE NETWORK

Among other things, K-Net is a network provider that pays for transport services using Bell Canada's existing network, and satellite services from Telesat. As of October 2003, each community was paying CAD$2,675 per month to K-Net. From this amount, K-Net pays Bell Canada a monthly fee per community of $2,075 for bandwidth. The balance of $600 is made up of $300/month for the T1 (1.5Mbps) Internet access which K-Net buys in bulk, $200 for the shared portion of the Toronto linkup, and $100 for service support that includes service support/ programming routes/ maintenance. The community monthly fee is paid for by a variety of community customers including the Keewaytinook Okimakanak Internet High School (KiHS), Telehealth, the Band Office, cable fees, and other programs. Those private residences with cable TV and cable modems pay a monthly fee to the local cable operator.

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7   For full proposal, see http://smartcommunities.ic.gc.ca/demoprojects/demoprojects_e.asp

In November 2002, K-Net prepared a Network Sustainability Strategy. The business case was prepared with financial projections over five years using three different scenarios. These scenarios range from servicing 21 communities and 20 agencies, to 55 communities across Canada and 20 agencies. The strategy addresses issues of scalability where it established that the current network could accommodate four times the current bandwidth without further capital investment. It highlights technical components where additional investments could lead to increased efficiencies, and it also signals other dimensions such as competition, maintenance, staff turnover and community network insolvency scenarios. This document is a testament to the sophistication of the K-Net network and the planning that is taking place to insure its sustainability.

The pricing that K-Net offers is possible because of its current size – but it started small. Dan Pellerin, K-Net's Network Manager, draws an analogy of the first rope that is thrown across a river before building a bridge; this provides the anchor. After that first rope, more "lines and then beams" can be added as the need for applications becomes evident and as needs demand more bandwidth. The K-Net network has had significant dollar amounts invested in it, but the network did not start with those dollars in mind – it started with a vision of improving the communities' livelihoods.

The K-Net vision literally began with drawings on paper napkins. Today, they still draw, but the tools are different and they can share the drawings with communities using videoconferencing.

GOVERNMENT SERVICES: A KEY CUSTOMER

For government agencies, K-Net is an attractive network provider because it reaches a remote and high-risk population that has difficulty accessing essential government services, particularly health and education services. K-Net's website is also an important content provider – its portal includes templates to create websites, as well as a number of other tools such as open-source platforms for online learning. This range of services makes K-Net quite unique in that it combines content with transport, as well as being a non-profit organization that works on behalf of First Nations' interests.
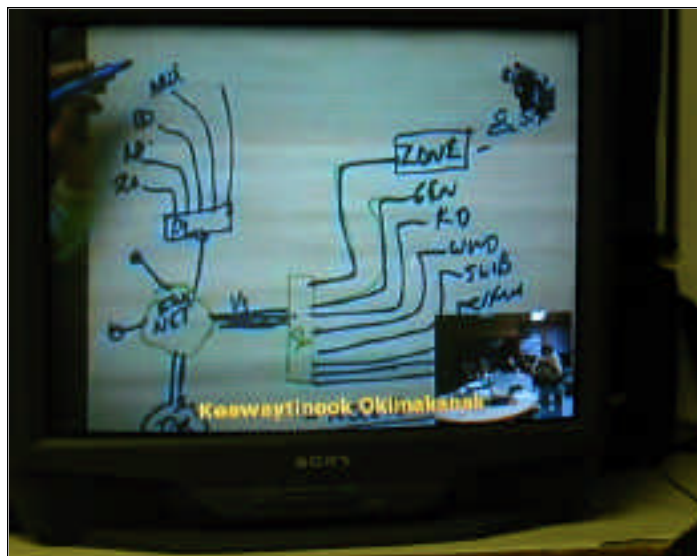
Dan Pellerin explains how the network works – from Sioux Lookout – live, during a community engagement workshop in Deer Lake, 2001.

K-Net provides a wide-reaching, cost-effective platform for the delivery of government services. For example, Health Canada (HC), the federal agency that provides medical services to Canadian aboriginal communities, has access to the network and services for CAD$1,600 per month per community. HC can channel a variety of their programs through this network, rather than each program individually establishing a separate arrangement for connectivity. K-Net already has 24 nursing stations connected across the region, so it makes sense for Health Canada to use the existing network to deliver their programs. No other service provider can offer the government a more comprehensive deal. The same applies to schools: K-Net works with the community networks to offer SchoolNet-supported schools access to a shared T1 broadband at $300 per month per school. There are 140 schools all across Ontario that are working to access similar services.

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8   K-Net. 2002. *Kuh-ke-nah Network Sustainability Strategy*. Available on request.

K-Net's philosophy is to make the technology as easy and as affordable to these government service agencies as it has to the communities themselves. Coverage is therefore growing: there are 13 communities accessing the Internet high school program, 8 communities using the C-band satellite link-up in northern Ontario (with 4 more to be added), and 8 communities in Nunavik in northern Quebec (with 6 more soon to be added).

In 2002, K-Net brokered a partnership with Industry Canada and Telesat to deliver affordable access to the most remote communities using C-Band transponder space that Industry Canada has available.

"As part of its commitment to enhance communication services to rural and remote communities, Telesat made two channels on its new Anik F3 satellite available for the federal government to use to serve public institutions in remote areas of Canada. The two channels, or transponders, are able to provide enhanced multimedia connections for remote communities. In advance of the launch of Anik F3, Telesat has made one C-band channel available today on the existing Anik E2 satellite." [9]

SHARING LESSONS

The K-Net managers have shared some key lessons for other communities wishing to establish their own network:

▲ There is no bad point in time to start – just do it.

▲ Learn about the technology – if you don't learn it yourself, you will become dependent on consultants and vendors.

▲ Start by linking those who share a need; use the technology that is available, and build from that.

▲ Train people in the community and give them a profile.

▲ Establish two-way communication to mentor the community technician as you become more knowledgeable.

▲ Listen to the community – find out how they have communicated in the past. Did they use HF radio? Is there a tower you can still use? Can you send them an antenna and a laptop and get them connected – even through a narrow bandwidth? That first connection is the key; from then on, the challenge (to bring more bandwidth) has to do with dollars, skills and management.

Kuh-ke-nah Network
August 2003

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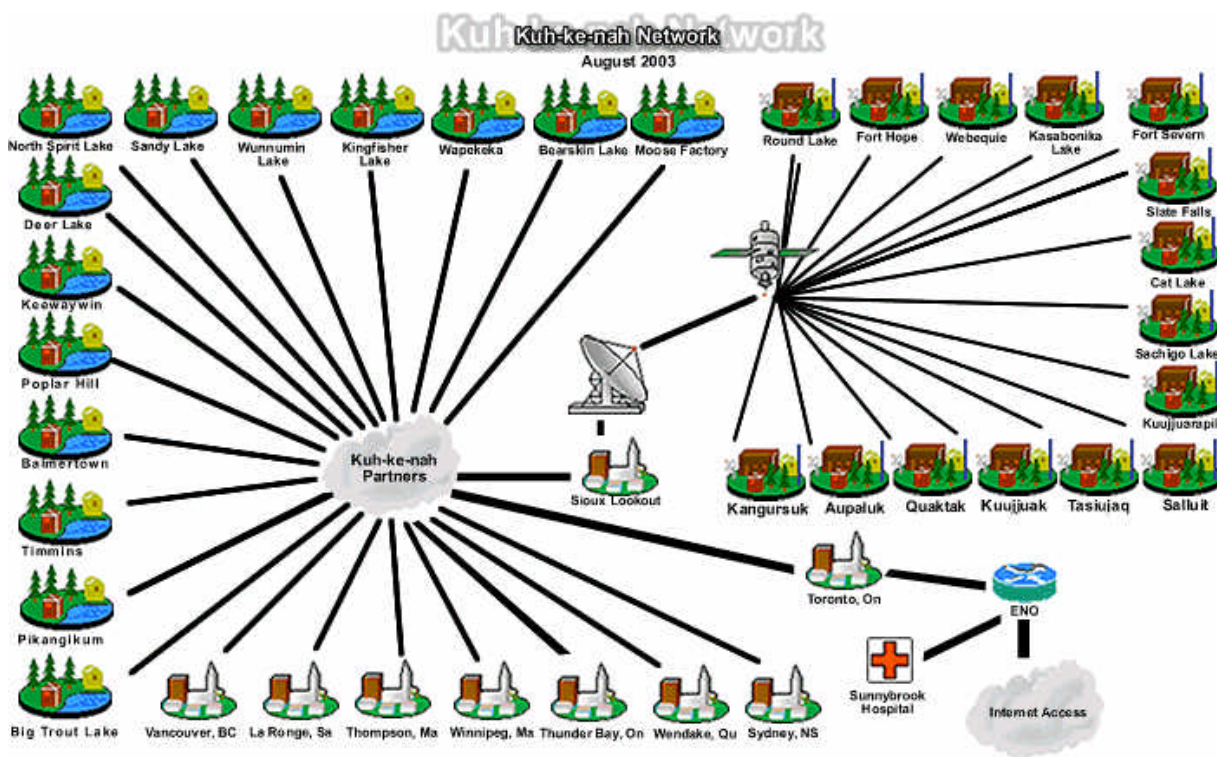
9   Source: http://smart.knet.ca/satellite/information. Also see http://smart.knet.ca/satellite for more information about this resource and the press release making K-Net an IC agent for supporting the use of this resource.

K-NET AS A MODEL FOR ICT DEVELOPMENT

The K-Net network is an impressive achievement, but as Dan Pellerin reflects, "It is easy after a few successes to let it get to your head and then you try to do too much, bite more than you can chew, lose sight of the vision and concept." This is why there is always the need to maintain community participation and stay focused, especially as the network develops and needs to be sustained with paying customers.

Recent efforts by the Food and Agriculture Organization of the United Nations and the UK Department for International Development (DFID) to integrate Communication and Information dimensions into the context of the sustainable livelihoods framework suggest that:

"*Communication and information are critical components of the livelihoods framework, essential for linking and informing decision-making processes at every level: 1) to facilitate the acquisition and exchange of information by the poor necessary for developing livelihood strategies; 2) to improve communication within and between the institutions responsible for making decisions that affect livelihood options; and 3) to empower communities to participate in the decision-making processes.*"[10]

The following is an integration of principles proposed by FAO/DFID and by the International Development Research Centre (IDRC): [11]

▲   Offer concrete solutions and use realistic technologies

▲   Move forward at the pace of the community

▲   Learn from mistakes

▲   Localize globalized communication

▲   Work with a gender perspective

▲   Let people speak with their own voice

▲   Generate new knowledge and promote local content

▲   Address info costs: who pays?

▲   Ensure equitable access

▲   Strengthen existing policies and systems

▲   Build capacity

▲   Build knowledge partnerships

It is noteworthy that K-Net has followed these principles rather closely while establishing its network and technological applications. K-Net provides a real-life case study to examine how these principles have been put into practice in remote communities in Canada.

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10   Source: http://www.fao.org/waicent/portal/outreach/livelihoods/model-en.html
11   Gómez, R. and Casadiego, B. 2002. Letter to Aunt Ofelia: Seven proposals for human development using new information and communications technologies. IDRC/PAN Américas, Raíces Mágicas and ITDG: Ottawa. http://www.idrc.ca

Artists:

The six First Nation artists kindly agreed to support the use of their copyrighted art work to be included in this publication. They include Kevin Belmore, Derek Harper, Abe Kakepetum, Tim Tait, Alice Williams and Saul Williams. Their contact information is included at the end of each section of the document.