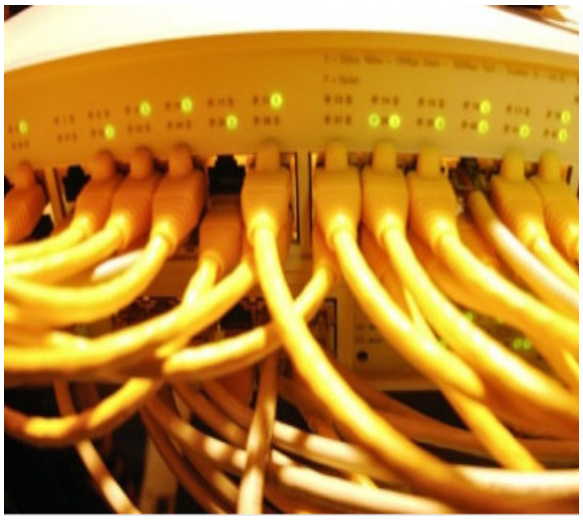

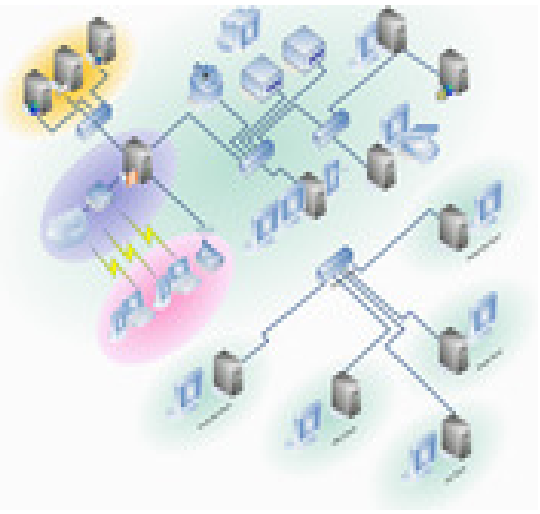

The First Nations ISP Guide

Providing Internet Services

Managing Network Operations

CONTENTS

ACKNOWLEDGEMENTS:

This guide was prepared with input from BC First Nations that have set up their own ISP operation and managed their own networks, and with help from the supporting agencies. Without their collective experience and knowledge, this guide would not have been possible. Thanks to:

Cliff Casper	Seton Lake First Nation
Dan Mundall	Lyttonnet
Don Maki	Ktunaxa Nation Council
Kerry Mehaffey	Lil'wat First Nation
Jamie Sterritt	Pathways to Technology
Stephen MacKinnon	Seabird Island First Nation
Sue Hanley	FNTC
Norm Leech	FNTC

Version 1.2 **Hans DeBruyn** **March, 2012**

INTRODUCTION

Broadband connectivity is being introduced to many BC First Nations, and along with the opportunities this provides to communities for improved education, health care, and social and economic development comes the challenge of managing this technology. For some communities, this may involve negotiating a contract with an Internet Service Provider (ISP) to be the vendor and manager of the network resources, but other locations may not have an ISP available or may wish to take on the responsibilities for managing the network themselves - as an economic development opportunity or to keep control and autonomy of this resource within the Nation. For those communities, this guide will describe what is involved in establishing an ISP operation and will outline some of the key issues and questions to be addressed in making this decision and in operating a broadband network for the benefit of the community.

The guide will look at three aspects of the ISP operation: the business decisions, the operational issues, and the technology questions.

THE BUSINESS DECISION

A community that is looking at the option of becoming an ISP and network operator can approach the decision in two ways. First, you may view the services provided by the network and by Internet connectivity to be a basic utility, like water or electricity; or you may not have any option but to be your own ISP, and therefore the business decision is made by default and the business issues come down to questions of how to set up the operation in the most affordable and cost effective way. Alternatively, you may wish to look at the option of becoming an ISP as an economic development opportunity, to be evaluated on the basis of revenues available vs. costs incurred and profit earned. In either scenario, you will need to estimate the flow of money coming in from network users and to understand the costs involved from all aspects of operating and maintaining the network

A FINANCIAL SPREADSHEET

To assist with these estimates, we have included an Excel spreadsheet with this guide to collect the needed information. This spreadsheet has three tabs – one for assumptions and community data, one for financial detail such as costs, and a financial summary tab to show the results of the analysis. We will run through an example to explain the entries and to show you how the calculations work.

It is important to note that the example shown does not include any capital costs – it assumes the network has been built and the decision now is whether to operate the network as an independent ISP.

REVENUES

The first step is to estimate the number of users for the network and the revenue that this will bring in. To calculate this we first need to know the number of homes in the community and the number of business and community facility users.

We then estimate the "take rate" – the percentage of the homes and businesses that we believe will pay for a subscription to the network. With the use of internet becoming common among all age groups, that number might vary from 30% - 70% of homes in the first year to 50% - 90% after a few years of operation, depending on the economic circumstances in your community and the number of very low income families[1]. Using an average community as a starting point typical take rates would be about 50% for the first year, 60% for the second, and 70% for the third. Similarly, you would enter a take rate for businesses, likely a high percentage rate as most business uses Internet.

5				
6	**Total Population**	550	575	600
7				
8	**Average #People per Home**	4.00	4.00	4.00
9				
10	**Estimated # Homes for the Population**	138	144	150
11				
12	**Number of Businesses**	5	5	5
13				
14	**Take Rate**			
15	Residential Starting Take Rate	25.0%		
16	Residential Increase in Monthly Take Rate	2.0%		
17	Residential Yr Ending Take Rate	49%		
18	Residential Av Take Rate for the Year		60%	70%
19				
20	Business Starting Take Rate	100.0%		
21	Business Increase in Monthly Take Rate	0.0%		
22	Business Yr Ending Take Rate	100%		
23	Business Av Take Rate for the Year		100%	100%

You will then be asked for an estimate for "churn rate" – the percentage of customers that decide after a few months that they do not want the service or cannot afford it. There may be a cost associated with removing subscribers from the network (clerical or technical costs) and that cost would also be entered in this section.

We then input the proposed monthly charges for the various types of customer. The price charged by ISP's for service in smaller communities ranges from about $30 - $60 per month for home users. Large

[1] The CRTC reports that in 2010, 70% of Canadians subscribed for broadband Internet

ISP's such as Telus and Shaw Cable charge about $35 per month for basic Internet service, so this may represent a reasonable and competitive price.

If you plan to have an installation charge to hook up each new customer, enter that charge and also the cost of performing the installation.

To complete the revenue calculation, we need to estimate the percentage of bad debt – subscribers that order the service but do not pay their bill.

25	**Churn**			
26	Churn Rate (6 month cycle)-Residential	5%	5%	5%
27	Churn Rate (6 month cycle)-Business	0%	0%	0%
28	Cost of Churn	$25	$25	$25
29				
30	**Pricing per Subscriber**			
31				
32	Residential Monthly Recurring Charge	$35.00	$35.00	$35.00
33	Residential One Time Installation Fee	$0.00	$0.00	$0.00
34	Business Monthly Recurring Charge	$200.00	$200.00	$200.00
35	Business One Time Installation Fee	$0.00	$0.00	$0.00
36				
37				
38	**Cost of Sales**			
39				
40	Install Cost	$0.00	$0.00	$0.00
41				
42	**Operating Costs**			
43				
44	Bad Debt as a % of Revenues	5.0%	5.0%	5.0%

With these inputs complete, the spreadsheet will now calculate the revenue per month for three years on the Financial Details Tab:

1	**ISP Operating Budget**						
2							
3							
4		**Month 1**	**Month 2**	**Month 3**	**Month 4**	**Month 5**	**Month 6**
5	Residential Churn						
6	# of New Residential Subscribers	**34**	**3**	**3**	**3**	**3**	**3**
7	# Accumulated Residential Subscribe	**34**	**37**	**40**	**43**	**45**	**48**
8	Business Churn						
9	# of New Business Subscribers	**5**	**0**	**0**	**0**	**0**	**0**
10	# of Accumulated Business Subscrib	**5**	**5**	**5**	**5**	**5**	**5**
11							
12	**Revenue**						
13							
14	Residential						
15	Monthly Recurring	602	1,251	1,348	1,444	1,540	1,636
16	Installation	0	0	0	0	0	0
17		602	1,251	1,348	1,444	1,540	1,636
18	Business						
19	Monthly Recurring	500	1,000	1,000	1,000	1,000	1,000
20	Installation	0	0	0	0	0	0
21		500	1,000	1,000	1,000	1,000	1,000
22							
23	**Gross Revenue**	**1,102**	**2,251**	**2,348**	**2,444**	**2,540**	**2,636**
24							
25	**Cost of Service**						
26	Residential Installation Cost	0	0	0	0	0	0
27	Business Installation Cost	0	0	0	0	0	0
28	**Total COS**	**0**	**0**	**0**	**0**	**0**	**0**
29							

OPERATING EXPENSES

The next step will be to estimate the expenses to operate the network. The first group of expenses are those incurred to start up the ISP operation and network. This would include the costs of training the technical and administration people and any specialized tools and supplies:

30	**Implementation Operating Expenses**				
31	Training	500	250	250	
32	Tools and supplies	200	200	100	
33	Other				
34	**Total Implementation Opexp**	**700**	**450**	**350**	**0**

The next group of expenses are the recurring monthly costs of operating the network.

Advertising: Depending on your community and whether you are offering service to subscribers outside your community, you may need to advertise the availability of broadband service, particularly when launching the network.

Bad Debt: This is a spreadsheet calculation based on your input for the percentage of users that do not pay their bill.

Bank Fees: Account charges for bank account(s) for the broadband service.

Billing Costs: The cost to prepare and mail a monthly bill for each subscriber. The default calculation in the spreadsheet is for $1/mo./subscriber, but you may change this if you have alternate means of billing, such as making internet charges part of standard utility bills such as hydro, water, garbage collection, etc.; using prepaid subscription cards; including this in housing charges; or using annual fees.

Business Insurance: Your community will own the local network, and therefore will assume responsibility and liability for any damage caused by the network. This could be liability for things such as property damage from a tower collapsing, or it could be the business liability for a lawsuit associated with the network. You will need to obtain a quote from your insurance supplier for this coverage, or you may be able to include the network infrastructure and business coverage under an existing insurance coverage for the Nation.

Business License: If your community is subject to business licensing, add a budget for the license costs

Churn Costs: Calculated from your assumptions about the number of subscribers who will discontinue service

Contractor Fees: The costs associated with supporting and maintaining the network. If you set up a contract with an individual or a supplier to provide Help Desk services for your users; technical support, maintenance, and network monitoring for the network, enter all the costs associated with that support on this line. If you have not yet defined the costs to provide this support, the spreadsheet will provide a "rule of thumb" estimate for this cost, based on one full time person supporting about 500 users at a cost of about $50K per year – this translates to about $15 per month per user. You may be able to lower the cost for this item if your network support can be handled by existing IT technicians in your community (at the school, band office, or health center for example) if they take on the added work. If your community has a maintenance person for other utilities (power generation, water plant, etc.) they may be able to add these responsibilities to their job. You may also want to look at volunteer labour to handle support, such as using young people with IT skills to provide Help Desk support. Some communities pay a "per call" fee for every support call handled – say $10.

If your last mile network uses Cable TV connections to supply internet you have the option of using third party support suppliers to handle Help Desk and subscriber support. Companies such as IBBS (http://www.ibbs.com/services/customer-care/residential-technical-support) will provide this service for about $7.50 per user per month. This would still require someone local to your community to handle the network maintenance.

Courier Costs: Estimate the cost of shipping parts and equipment needed for maintenance.

Customer Care: If you contract separately for Help Desk support services (see Contractor Fees above) you may wish to enter that cost here, and show only the maintenance costs in the contractor fee line.

Equipment Leases: If you require additional equipment beyond that provided at installation of your network, and you lease that equipment, enter that cost here. An example might be leasing a server computer to handle your user billing.

Equipment Purchases: An estimate of the replacement equipment costs associated with maintaining the network. The spreadsheet will calculate a rough estimate based on a 2% replacement rate for subscriber equipment at $200 per unit.

Facility Rental: If you have to pay office rent for your ISP operation, or workshop or warehouse space, enter that cost here. Also, if your last mile solution involves cable or fibre running on utility poles in your community, you may have to pay pole rental fees to the utility company that owns those poles.

Loan Interest: If you have to borrow money for start-up costs or equipment, enter any financing costs here.

Misc: miscellaneous costs

Network Charges at Gateway: The monthly charges you will incur for the Internet connection for your community at the gateway or PoP. This is the cost of your Telus or Shaw service, and may have two components – the cost of the connection, based on the speed of the service; and the cost of Internet traffic, based on the amount of usage. These costs may be combined into a flat rate for both components. The speed needed for your community will depend on the number of users for the connection. As a rough rule of thumb, you should try to budget the gateway cost at around $10 per user per month, or less, so if you have 100 users you would try to keep gateway costs at around $1000 /mo. There are a number of programs underway to provide gateway facilities at reduced cost for First Nations communities through BC's Connecting Citizens program and the Pathways to Technology project.

Office Supplies: expenses associated with the ISP office, such as pens and copy paper

Telecommunications: If your ISP operation will require its own phone line(s) or fax line, enter those costs here

Professional Fees: fees for legal and accounting services for the ISP operation.

Salaries and Benefits: If you have estimated the cost of technical support in the Contractor Costs above, this line will contain the costs of administration for the ISP operation. This may also be a part time person(s) or a contract position(s). The administration costs include handling new subscribers, setting up user accounts, billing and collection, book keeping, filing and record keeping, and managing the ISP business. Also included in administration costs are compliance costs – the effort associated with keeping up with government regulations and reporting. (see Regulatory Requirements in this Guide).

Utilities: the cost of electricity for the network. If you have network equipment with their own metered hydro supply enter that cost here, if you are allocated charges for heat, water, and electricity for your office enter those here as well.

Other: any other expenses associated with the network operation

Note:

The expenses listed here do not include any allowance for network upgrades over time. In practice, advances in network technology will make it desirable to upgrade the core technologies in your network every 5-10 years. The capital planning for costs associated with network upgrades should be incorporated into your community's capital plan. A budget of 10%-20% of the capital cost of electronic equipment in your local distribution network is therefore recommended.

36	**Operating Expenses**	Shaded Cells are Precalculated				
37						
38	Advertising	200	50	50	50	
39	Bad Debt	55	113	117	122	127
40	Bank Fees	20	20	20	20	20
41	Billing Costs	34	37	40	43	45
42	Business Insurance	400	400	400	400	400
43	Business License					
44	Churn cost	0	0	0	0	0
45	Contractor Costs	591	632	673	714	756
46	Courier Costs	20			20	
47	Customer Care					
48	Equipment Leases					
49	Equipment Purchases	11	12	13	14	15
50	Facility Rental					
51	Loan Interest					
52	Misc					
53	Network Charges at Gateway	750	750	750	750	750
54	Office Supplies	20	20	20	20	20
55	Telecommunications	50	50	50	50	50
56	Professional Fees	1,000				
57	Salaries & Benefits	1,000	1,000	1,000	1,000	1,000
58	Utilities	50	50	50	50	50
59	Other					
60		4,201	3,133	3,183	3,253	3,233
61	**Total Operating Expenses**					

The last group of costs are the capital costs associated with starting up and operating the network. Use this section to enter any "one-time" capital purchases required to buy equipment or software required for the network that is not included in the installation costs for the network. If you are purchasing subscriber equipment that will be rented to the users on the network, the cost of buying this equipment would also be entered here. If you have a grant or subsidy that is being provided to offset some or all of these capital costs, enter that amount as a negative number. In our example, the assumption is that the network build is already complete without the need for funding from the Nation.

63	**Capital - One Time**		
64	**Capital - Equipment to Rent**		
65		0	0
66			
67	**Capital Grants Rec'd (negative)**		
68			

FINANCIAL SUMMARY

Having entered all the revenue estimates and costs, the next step is a financial summary that shows the annual cash flow and a three year total.

	Year 1	Year 2	Year 3	Total
Revenue				
Residential	19,268	35,374	43,202	97,843
Business	11,500	12,000	12,000	35,500
	30,768	47,374	55,202	133,343
Cost of Sales	0	0	0	0
Gross Margin	30,768	47,374	55,202	133,343
Gross Margin %	100%	100%	100%	100%
Implementation Expenses	1,500	250	250	2,000
Ongoing Operating Expenses	41,901	51,597	56,644	150,142
Operating Profit (Loss)	(12,633)	(4,473)	(1,693)	(18,799)
Opearting Margin	-41%	-9%	-3%	-14%
Capital Expenditures	0	0	0	0
Capital Grant Received	0	0	0	0
Net Capital Expenditures	0	0	0	0
Notional Cash Flow	(12,633)	(4,473)	(1,693)	(18,799)

This shows that in the first year, we estimate revenue of $30,768 and costs of $1500 + $41,901 for an operating loss of $12,633. The total loss for the three year period is $18,799, so if we want to fund the ISP operation we would need to secure funding for that amount to subsidize the operation. Alternatively, we would need to look for additional sources of revenue, or to reduce costs.

For example, if we raise the monthly residential subscriber fee from $35 to $40 in our example and we could maintain the same number of subscribers, we would reduce our annual loss in year 1 to $10,018 and we would make a small profit starting in year 2 and year 3. In this scenario if we could secure startup funding of about $10,000 we have a sustainable operation. The spreadsheet allows you to look at the effect of changing any of your assumptions or estimates.

As the spreadsheet shows, the major items to consider when you are looking at an ISP operation as a business are:

- The number of subscribers and the rate you will charge. It is very difficult to run a small ISP business, so if you can bring in outside subscribers or sell services to local business that will help your operation

- The costs of providing maintenance and support will depend on the skill you have in your own community or the availability of contract help. You should also consider that the people who will help users in the community with broadband could be the same people that would help the users with computer problems. The technical resources available to facilities like schools and health offices and band offices can perhaps be used to help administer and support broadband in the community.

- The cost of administering the network is the other major labour cost, and if you can combine this with other functions in your community such as utility billing or housing administration it may help bring down the cost for the network

- The cost of your Internet gateway will depend on the amount of bandwidth you contract for. It is always nice to have more capacity, but higher capacity may be unsustainable.

- The example shown assumes no capital costs, if you have to provide funds to build or upgrade the network those costs will need to be added to the business case

The final consideration in looking at the business case for an ISP operation is to look at what would happen if you choose not to set up your own network operation. If you bring in an outside ISP to operate the network for you, he will need to recover his costs and make a profit also, so you will need to understand what that scenario would cost your home and business users. You should also consider that all the money paid for Internet service in that case flows out of your community to the supplier, whereas some of the funds would stay in the community if you could do it yourself. A community owned ISP helps build technical skills and helps the users to feel the network is a community resource rather than an outside entity.

RISKS

The financial analysis will show you the sustainability of an ISP operation using your best estimates of revenues and costs. You may want to try a few different scenarios for subscriber revenue and operating costs to get a better idea of the range of results that you would see to understand the financial liabilities your community would face. As the owner and operator of the network you will be expected to sign contracts that run for several years for items such as your gateway costs, and if your operation is not successful you will still be liable for those payments.

The long term viability of your operation can also be affected by competitors. Once the capital costs of establishing a gateway in your community have been covered and the subscribers in your community are used to paying market rates for Internet services, there is the risk that another ISP, cable TV operator, or perhaps Telus itself would now see the community as a business opportunity and could start service in your area in competition with your network.

You are also dependent on your gateway supplier for ongoing connectivity at an affordable rate. Many communities are using Telus PoP's under CCA agreements or Pathways to Technology pricing, and you will need to satisfy yourself that contract renewals or upgrades will not result in unaffordable costs.

ISP OPERATIONS

Having evaluated the business case for an ISP operation, your next step is to consider the responsibilities associated with managing and operating a network. You will need to understand the services you will be expected to provide your users and the key skills that will be needed. There are also legal requirements and governance issues that you will have to address.

ISP SERVICES

The basic service delivered by an ISP is to provide a connection from the user to the Internet, but along with this the ISP must provide administration and support services to the end user and maintain the network. It is beyond the scope of this introductory guide to explain each of these in detail here but this will serve as a basic checklist.

There are a number of core technical requirements that are needed to allow a user to access the network and to use basic Internet functions. These include:

- Authentication / Access Control
  - determine and control who is allowed to use this network
  - user id / password or
  - hardware address control
- DHCP (Dynamic Host Configuration Protocol)
  - Provide each user an address on the network
  - Set up Internet Protocol (IP) addresses
  - assign name server addresses
- DNS (Domain Name Service)
  - translate internet names to an IP address
  - name lookup / IP address servers
- Firewall
  - block unauthorized access from the Internet to local network and users

Some ISP services are optional - they are not required for basic Internet use but provide additional services that add convenience or ease of use. Some ISPs charge extra for these services. Although optional, providing SPAM / VIRUS filters is highly recommended because it greatly reduces the number of problem calls for the technical support service. Optional ISP services could include:

- Email
- POP3 server - receives email (Post Office Protocol)
- SMTP – send email (Simple Mail Transfer Protocol)
- SPAM and VIRUS filters
- WebMail – browser access to email when away from home
- FTP – file transfer / server uploads
- NTTP – USENET newsgroups

To provide these services you will require local server hardware and software, and the skills to set up the service, perform the configuration and to train the technical support staff. You may want to contract some technical assistance from a local ISP or another community that has experience with these systems for the initial setup. Much of the software needed is available as "Open Source" programs, which are available at little or no cost to the ISP community.

It's worth noting that if you do set up the skills and equipment necessary to provide these ISP services that you will have an excellent base for future Information Technology projects in your community. With the server hardware and network in place and local knowledge of how to use these technologies you will be well positioned to add other applications for your community.

ADMINISTRATION

The network administrator will handle the setup for new users, the billing and payment, and the tracking of usage and traffic for the network. A checklist of key activities would include:

- New account setup
- Email address setup
- Usage / Traffic Statistics / administration
- Billing
- Payment processing
- Collections
- Equipment configuration (permissions / bandwidth)
- IP address registration / administration / tracking

As for the core ISP services, you may find that the tools to handle these administrative tasks are available as Open Source software at minimal cost.

USER SUPPORT AND MAINTENANCE

Technical support for the network will include assistance for the end user when problems are encountered and diagnosing equipment and connection failures and performing repairs.

The first level of support for end users is commonly called a "Help Desk". It is usually a phone number that a user can call when his Internet service is not working properly. A technician responding to a call would attempt to diagnose the problem by asking the user to describe the symptoms of his problem, or by running some basic tests. If the technician determines the problem is with the network he would go on to perform the necessary maintenance, or if the problem is with the user's computer or software he may suggest some steps the user should take to correct the issue. In practice, many of the support calls for network issues are related to user problems such as loose connections or a virus in the user's computer, and in a small community it may therefore make sense to combine the network technician role with the IT technician role.

The network technician is also responsible for maintaining the local distribution network. The connection between the community gateway and the end user is owned by the community / ISP and any repairs, equipment configuration or replacement, or software setup is the responsibility of the ISP. As outlined in

the following section, a large part of this role is handled through network monitoring. These tools will help identify if a piece of equipment needs to be replaced, or if a wireless connection is acting up, or if there are network problems at the Internet supplier.

NETWORK MONITORING

If a user has problems accessing an internet service, the ISP must be able to isolate the source of the problem - the customer's computer, the subscriber equipment, the access point equipment, the gateway connection, or the links in between. Typically, an ISP sets up a continuous monitoring system that constantly looks at the traffic on the network and recognizes if there is an interruption in the flow or a slowdown in services. If a fault is detected the ISP can take corrective action by notifying upstream suppliers or dispatching maintenance services at the community network site.

Network management includes

- SNMP monitoring (System Network Management Protocol)
  - allows access to network equipment to check operation and performance
- RMS monitor / alarms (Remote Monitor System)
  - allows monitoring of electrical power, temperature, alarms
- Bandwidth monitor / shaping / accounting
  - measure and control usage for each subscriber
- Maintenance Dispatch

As for the common ISP services, there are many Open Source (free) software packages available to handle network monitoring. It would be worthwhile to talk with other local ISP's to see what they are using and to contract some assistance for setting up these tools

BANDWIDTH MANAGEMENT

Network management also includes measurement and control of user traffic volumes. Internet usage involves a number of users sharing a limited amount of bandwidth, and it is possible for some users to "hog" the connection - a user trying to download an entire DVD can slow down users trying to look at a web site or read their email. In some networks the amount of bandwidth available to any individual user can be controlled dynamically, in others, users may have established limits for the amount of data they can download or upload in a given period. In some cases, usage is controlled by charging extra fees for usage above a pre-set amount of data.

In addition to bandwidth controls for individual users, the ISP may also want to prioritize certain portions of the total available gateway bandwidth capacity to certain customers such as the school, health center, band office, or business customers; and may adjust the balance between home users and these institutional users depending on the time of day – perhaps allowing home users greater capacity overnight.

Certain types of Internet use, such as peer-to-peer file transfers, typically used to download large movie and audio files, can place a heavy load on the network and therefore degrade the overall network response for the average user. Some ISP's therefore block or forbid these types of applications if the network capacity is limited. Other ISP's choose to place limits on the amount of traffic any one user can consume in a given period and charge additional fees if these limits are exceeded. The Canadian Radio and Television Commission (CRTC) has recently ruled that these techniques are permitted only if the ISP very clearly states in their terms and conditions what techniques are being used to manage bandwidth. (ITMP – Internet Traffic Management Policy)

The ITMP policy requires ISPs to disclose the following information about their ITMPs to their retail customers:

- pricing information about their economic ITMPs; and
- whether or not technical ITMPs are being used and, if so, what effect they have on the ISP's retail Internet services;

the following information about their technical ITMPs clearly and prominently on their websites, and in customer contracts and terms of service:

- why the ITMP is being introduced;
- who is affected by the ITMP;
- when the ISP will apply the ITMP;
- what type of Internet traffic is subject to management – for example, upstream peer-to-peer file sharing applications; and
- how the ITMP will affect a user's Internet experience, including the specific effect on speeds

The equipment used to measure and allocate bandwidth per user is specialized and expensive, and should therefore be included in your network build budget and capital plan.

SKILLS

An IT champion. Perhaps the most important role, particularly in the planning stages is the "Community Champion". This individual has the mission of promoting and encouraging the use of IT, connectivity, and the Internet in the community, both in homes and in administrative facilities. As part of this role, this individual would help define the training needed in the community. The community champion role requires leadership and passion to "sell" the ideas to the community and its leadership, and the perseverance to keep projects moving when they hot roadblocks.

A Community Support Technician. This individual provides the first layer of support to home and office computer users in the community. This support may include assisting users with basic hardware issues (cabling, power, loose connections), connectivity problems (Internet outages, browser configuration), basic security settings (anti-virus tools) and basic applications setup (browser, email, OS updates, etc.). It is important to have someone local to fill this role even if you choose to contract out some of your

support because of the advantages to having users deal with someone they know and trust, and where they do not feel embarrassed by their lack of knowledge when they ask a question.

ISP RESPONSIBILITIES

Security and Privacy: One of the key roles in managing network and IT resources is to maintain data security and user privacy. This will include physical security of network and IT equipment and facilities to ensure that only authorized staff has access, and data security to ensure that information transmitted on the network or stored on local computers cannot be accessed by unauthorized people.

The requirement for security and privacy of data becomes even more important when dealing with data such as health records, personnel data at the band office, and financial information such as credit card or banking information. As an ISP you will be responsible for controlling access and to provide tools to secure data, such as data encryption and file locking tools. You will also need to consider secure backup strategies are in place for archives of important data.

As manager of the staff that will maintain the network you will also need to ensure that IT and network staff do not abuse their role, given the access they have to equipment and network infrastructure. It is beyond the scope of this guide to list all the tools and techniques you would need to manage security for your network, but be aware of the need to prioritize security and privacy controls into all your network and IT plans.

Acceptable Use Policy: As a network manager you will be responsible for setting the rules and policies for how your users will access the Internet. Providing access to the Internet opens up access to a world of useful and helpful information, but it also open up access to undesirable content such as pornography and hate literature, or the theft of copyrighted material. It is therefore necessary to have all network users agree to and sign a code of conduct for all network use, and a clear set of rules for unacceptable content or use. An acceptable Use Policy (AUP) is generally a written contract that each user must sign as part of the subscriber agreement.

An acceptable use policy may also outline the steps that a user should take to protect youth from online predators and to protect privacy.

The **Resources** section of this guide includes links to sample Acceptable Use Policy documents.

REGULATORY REQUIREMENTS

The role and responsibilities of ISP's is something of a grey area in government regulation at this time, and a number of legislative changes are being debated currently. If you choose to set up an ISP operation you will need to clarify the law in the following areas:

Registration: Under the Telecommunications Act an ISP who owns and operates local distribution facilities must register with the Canadian Radio and Television Commission (CRTC) as a non-dominant carrier. An ISP who operates a network using distribution facilities owned by another carrier may need to register as a reseller. Registration with the CRTC also requires ISP's to file an annual ownership report. The **Resources**

section of this guide includes pointers to the appropriate section of the CRTC website and to sample registration letters and annual information reports.

Responsibility for Content: Due to the high rate of digital piracy and unauthorized copyright infringement of material on the Internet new legislation is being considered for Internet suppliers. In general, the current approach is to consider ISP's that only provide the connection from users to the Internet are not responsible for copyright infringement or illegal or defamatory content. If an ISP provides hosting and storage capability for users, the ISP may take on additional responsibility for the content that is stored, and may be required to take down infringing or illegal content.

There may also be instances where users on your network have access to illegal activity or content even if you are only the connecting link to another site on the Internet. In such cases you may be required to provide information about your users' Internet address and any logs that show which user was assigned a given Internet address at a specific time, as well the contact information for your user. This creates a requirement that you must be able to identify the user associated with any Internet address at any time.

A more detailed analysis of the legal liability of an ISP is available from **The Canadian Journal of Law and Technology** at http://cjlt.dal.ca/vol1_no2/pdfarticles/bernstein.pdf

GOVERNANCE

First Nations ISP ownership is one part of the larger picture of self-determination, territorial rights, and control over resources. The importance of Information technology and connectivity in the health and growth of your community means that many of the decisions outlined here should be considered in light of overall Nation policy and direction, rather than on strictly financial or technical terms. Information Technology and Internet access are important tools for education and traditional knowledge, language, health care, treaty negotiations, economic development, and for social and entertainment value. As such, you may want to maintain control over the quality of the infrastructure and the cost to your people.

You may also encounter governance issues in dealing with telecom suppliers on infrastructure. If, for example, a telecom requires right of way through your territory, there may be opportunities to trade off ROW rights for connectivity for your Nation. If you require access to the utility poles in your community, there may be opportunities for bargaining with the utility company for other permissions you control.

TECHNOLOGY

An Internet Service Provider is first and foremost a network manager. If you choose to become the ISP for your community, you will become responsible for operating and maintaining the broadband network for your location, either with your own resources or with assistance from outside suppliers, and this will require a basic understanding of the technology and equipment involved.

There are three main technologies involved with Internet connectivity for your community. First, the link from the World Wide Web to your location will provide the gateway or central connecting point at your community, commonly called the Point of Presence (PoP). Second, from this connection point, the internet connection is distributed to the facilities, homes, and businesses through a "last mile"[2] distribution network using telephone cable, cable TV connections, or wireless technology to deliver the signal. Third, your network will require equipment and software to manage the network services, maintain the network, and provide administration for the users on the network.

THE COMMUNITY GATEWAY

In most cases, the link from your community to the Internet will be provided by Telus. These connections are generally being provided through a joint provincial – federal government program to bring a PoP to BC's First Nations. Generally, you will not need to be involved in the design and construction of this connection – usually a fibre link to nearby communities that currently have broadband, but you will need to ensure it will be adequate to meet the needs of your community, and you will need to be involved in the connection of the rest of your network to this connection.

The capacity needed at the community gateway will depend on the number of homes, businesses, and community facilities that will be connected, and by what the community can afford to pay in monthly fees for the connection. If you will be receiving a PoP connection through the Pathways program, you will choose between a 3 mbps and a 10 mbps Telus connection. As the ISP, you will be asked to sign a contract with Telus committing to pay the monthly charges for this connection for the term of the contract.

LOCAL DISTRIBUTION NETWORK - "THE LAST MILE"

The main challenge for an ISP in providing connectivity to local homes and businesses is the local distribution network, linking the PoP to individual buildings and homes. This portion of the network will be the full responsibility of the Nation as the ISP, with the management, maintenance, and subscriber

[2] The connection to the home has traditionally been called "the last mile" in the communications network. But many are now calling it "the first mile" to recognize that the network should start from the end user.

support that goes with that responsibility. The design and construction of the local network may be a part of your initial setup, but it will be very important to be involved and training from the early stages.

There are a number of commonly used technologies for local distribution networks, including wireless, cable TV wiring, telephone copper wire, and fibre optic cable.

In a **wireless** network, a radio frequency signal from an antenna in a central location is broadcast to and from individual subscriber radio units at each home or business. (For more detail on wireless networks, please refer to the FNTC Guide to Wireless, on the FNTC website.) This technology allows for quick deployment within a community and relatively easy addition of new subscribers because it is not necessary to add new wiring in the community, but it has some limitations if the community is spread out over a large area, lacks clear line of sight to a central location, or has many trees that block visibility to an antenna location. From an ISP perspective, a wireless network can be somewhat more complicated to maintain, because the intricacies of radio signals can be more difficult to set up than a wired connection, but many small communities have successfully set up and operated wireless networks in BC.

A **Cable TV** based network uses the coax cable used to deliver cable TV to each home to also carry the internet signal. Each home requires a modem box to translate the cable frequencies to the internet signal. This solution is well suited for a community that already operates (or wishes to operate) a community cable system, but will require more difficult civil works to wire up the community if there is no existing cable. Access to the poles needed to carry the cable, and the installation of wiring to each home can also make the initial installation more complex, but once installed the systems tend to be stable and easy to maintain. If the community is spread out over long distances, the cost of running cable can be a limiting factor.

Digital Subscriber Line (DSL) (sometimes called ADSL (for Asynchronous Digital Subscriber Line) uses the existing copper wiring that connects your home telephone to the telephone company switching station to carry the Internet signal at the same time as it carries your telephone connection. DSL technology requires a central piece of equipment called a DSLAM at the central telephone switch, and a small box in each home (called a DSL router – about $50). The distance from the central office may limit the technology. The existing copper wire to your phone can only carry the Internet signal for about 4km before the signal starts to degrade, so telephone customers further than 4km from the telephone office may not be able to subscribe – this makes it a poor technology to use in some rural areas.

Optical fibre can carry an enormous amount of Internet traffic (more than 1000 mbps), and therefore fibre has become the technology that the telephone companies and Internet providers use to link their facilities, and those of large business and institutional users. Fibre to the home (FTH) will one day be common in larger cities, but with today's technology it is not yet cost effective for small rural areas. If you have a fibre gateway available in the community the next step requires the fibre to be run throughout the community (which often requires license payments to the hydro or phone company for the use of their poles), and then at each home the fibre needs to be terminated and converted from an optical signal to a cable that can be connected to a computer. Each of these terminations can cost between $1000-3000. Installing and splicing fibre requires skilled installers and specialized equipment. Although the bandwidth of the fibre itself is much higher than that of DSL or Cable, the actual capacity of the connection to the Internet will be limited by the capacity of the gateway.

The final choice as to the best local distribution network for your community will involve many tradeoffs between setup and maintenance costs, time to implement, access to poles, distances within the community, and technical skills. Given the complexity of this decision, you may want to get advice from other communities, regional ISP's, and other professionals in making this decision. One important consideration is to design the network for ease of maintenance and support. As noted in the Network Management section, tools are available to help evaluate the health of the network on an ongoing basis and to diagnose possible network failures, and many tools support the use of remote access so that technical experts outside the community can see and test the network functions and assist local technicians. The planning and capital for these tools should be included in the last mile implementation budget.

EXAMPLES

There are a number of First Nations in BC that are operating their own network and providing ISP services to their community. Their stories will give you some examples of how they made their decision to take on this role, and some of the lessons they have learned.

SETON LAKE FIRST NATION

The Seton Lake First Nation (SLFN) is a community of about 115 homes located between Lillooet and Pemberton on the north shore of Seton Lake. The broadband network in the community came about as a result of a request from Telus to run a fibre cable through the SLFN territory. The nation agreed to grant the right-of-way for the connection but requested Telus in turn to provide a connection in the community from that fibre run. Telus then made the nation aware of the provincial government Connecting Communities Agreement (CCA) which could provide a gateway in the community at a favourable cost, and the Connecting Citizens Grant Program (CCGP) program which could help with last mile network costs. Using this opportunity as a starting point, Cliff Casper, the Economic Development manager for the nation developed a proposal for a wireless network in the community. The network was funded jointly by the CCGP grant and the SLFN, and was built in a partnership with a regional vendor that designed the network, trained SLIB staff in installation and maintenance skills, and constructed three tower sites used to provide the wireless signal. SLFN staff performed the installations at the subscriber locations.

The SLFN contracted with a regional ISP to set up the CCA PoP in the community, and to provide telephone support to the users. In practice, however, the local technician has been able to handle all the support in the community, and all the maintenance required for the network. The local technician had previously been trained on microwave networks by BC Hydro and has been able to build on this knowledge to handle all of the technical tasks in operating the network. The technician is paid on an hourly basis for any support calls, and he has also found additional work assisting members of the community with computer problems. The network administration, billing, and collection is handled by Cliff on a part time basis. Credit card customers are handled through the regional ISP because the nation does not have a payment system for credit cards.

The network currently has about 80 subscribers, in addition to connections at the Band Office, Health Center, School, and Gas Station / Store. The network also provides service to non-native homes in the area, and also supplies Internet to BC Hydro work camps in the area. The network is operating at break-even or better because of the “outside” revenue and because the nation is able to fit the maintenance and administration roles into part time positions with existing people in the community.

The network had strong support from Chief and Council in the planning stages because they recognized the value of the Internet service in a smaller, some isolated community. The SLFN was willing to invest capital to build the network, along with the CCGP, and the community has been very happy with the service. The initial financial plan was difficult but the community felt the benefits outweighed the risks. The largest issue for the network currently is with the billing and collections – an automated system

would be welcome, and a payment system that avoids substantial manual work and follow up calls is needed.

KTUNAXA NATION COUNCIL

The Ktunaxa Nation Council (KNC) is a group of four nations in the East Kootenay region of BC. The Ktunaxa network is somewhat unique in that it covers a very large geographic area including many non-native communities. The network was originally planned as a regional project with a partnership of regional governments, a non-profit community networking organization, and the KNC. The KNC sponsored a multimillion dollar funding proposal for the network in 2003 with the objective of obtaining connectivity for the nation as well as supporting the regional initiative. As the network was built, however, the partnership fell apart and the KNC as owner of the majority of the infrastructure was left the responsibility for completing the project and managing the network, a role they had not intended to take on. This involved substantial financial contributions to finish the build, upgrade substandard infrastructure, and to pay the operating costs while the network was being built. It also required taking on the leadership role for the project for technical progress as well as administration and management.

The KNC network consists of fibre-to-the-home technology in two of the KNC communities, and a wireless network with 14 tower locations over 200 km. The network has three gateway locations, with one 100 mbps PoP, one 32 mbps PoP, and one 10 mbps PoP. The network requires about 500 customers to break even.

The KNC has made the investments and accepted the challenges it encountered with the network because it had few other options. The nation had certainly not anticipated the role it ended up playing, but the end objective of having broadband connectivity for the nation trumped the concerns with the project, because no one else was able or willing to take on the completion and operation of the network. The KNC contracted for technical services with local suppliers in order to obtain the needed skills, and has established a separate operating company to run the network, with a contract network management and support staff. The KNC has been able to leverage the network investment with a progressive IT group that is developing tools and applications for the nation, and the end results have been rewarding.

Two lessons that the KNC has learned are to pick your partners carefully and not to underestimate the complexity and costs of managing a network. A nation that brings in partners to build and operate a network must carefully assess not only the skills and capabilities of the partner, but also the motives and political environment, and the potential for the partner to work at cross purposes to the nation, to hold the nation ransom for critical services, or to compete with the nation at some future time. When setting up a network as a business a nation has to carefully examine all areas of operating costs – in the case of the KNC network the original design required helicopter delivery of propane tanks to mountain top tower locations at several times throughout the years, at a cost of thousands of dollars each trip. The network also required a customized billing system to keep track of customer usage and differing plans, and this also required a significant cost to develop. Having made that investment, perhaps there is an opportunity now for the KNC to share that work with other nations that are considering an ISP operation.

SEABIRD ISLAND BAND

The Seabird Island Band is located about 3km from Agassiz in the Fraser Valley. The reserve consists of about 1500 hectare and has about 200 homes. The community started to build a wireless network to provide Internet service to homes about 4 years ago, and currently has a Wi-Fi mesh network with about 50 nodes serving about 90 homes. The nation also has a high speed network linking all of its facilities – a K-6 school, high school, college, health center, community center, band office, and a variety of businesses – in total almost 500 desktop systems and 50 servers. The Gateway for the community is a Telus fibre 100 mbps service to the band office.

The Band's IT staff also acts as the community ISP and network operator. The broadband service was considered a necessary element of the band's economic development strategy and the costs to maintain the service are considered a core cost of doing business rather than an optional expense. Householders currently pay $30 / mo. for broadband, but the band is considering offering the service at no cost – they see broadband as a utility like water and electricity that should be provided as part of the infrastructure in a community. The wireless network was designed with "quality of service (QOS)" specifications so that it can support Voice over IP (VOIP) applications that provide low cost telephone service for the community. They have also provided a community server that allows the community to share information about events and important bulletins, so the network has become an important part of the social fabric for the community.

The band has developed significant expertise in wireless technology within their IT staff, and is currently helping neighbouring communities in evaluating wireless solutions, and they are willing to provide advice and services to other First Nations that may need technical assistance. They believe that the most difficult part of setting up a network is in the early learning and deployment stage, and they made significant investments in training and certification for their technicians.

OTHER COMMUNITIES WITH ISP OPERATIONS

A number of communities that are introducing broadband to their Nation under the Pathways to Technology project will also be operating their own networks and ISP operations. The Doig River First Nation in the Peace River area, a community with about 50 homes has constructed a wireless network and currently provides Internet service to about 20 homes. No local ISP was available to manage the network so the community has taken on the administrative and support responsibility.

The Homalco First Nation in the Campbell River area of Vancouver Island is planning a broadband network using their existing Cable TV wiring in the community. The technology used in cable broadband lends itself to remote user support and administration, and this will allow the community to contract some of this work to outside suppliers with skill and experience in this area

RESOURCES

THE ROLE OF THE FNTC

The First Nations Technology Council (FNTC) was created by a First Nations Summit Resolution to develop a First Nations Technology Plan to ensure that all 203 BC First Nations:

- Are connected with high speed broadband;
- Have access to affordable, qualified technical support; and,
- Have the skills needed to access technologies that can improve their lives.

Subsequent Resolutions passed by the First Nations Summit, the Union of BC Indian Chiefs and the BC Assembly of First Nations Chiefs have given FNTC the further mandate to:

- Develop an Integrated Information Management Strategy;
- Establish a Common Services Organization to support the development of technologies and applications in First Nations communities; and,
- Develop the Fully Integrated Technologies (FIT) Community Model.

As BC's First Nations become connected the FNTC is actively addressing some of the roadblocks that communities face in taking on responsibility for their own network and setting up an ISP operation. As we have seen in our business discussion, an ISP operation is difficult to justify for many communities because a relatively small subscriber base limits the amount of revenue an ISP operation could generate, and therefore the community cannot afford to hire the technical and administrative staff required to support the operation. The FNTC believes that the best way to address this issue is to combine the support and administrative needs of multiple communities into a common services model. In this model a support technician would take calls and provide assistance for several communities, and a centralized administration facility could handle subscriber care and billing and payments for many communities so that the skills and equipment do not need to be duplicated in each community.

These plans are at a very early stage; the FNTC is currently soliciting requests for qualifications from potential suppliers to understand the capabilities and costs of such an organization. If you are planning an ISP function for your community, please contact the FNTC to see how they can help.

The FNTC has also commissioned a number of community guides for technology planning and connectivity options, many of these documents will be helpful if you investigating network options.

FNTC LINKS

Community Technology Plan: Broadband Internet Access

FNTC ISP Checklist

Community Wireless Handbook

Building an ICT Network [a guide for Small and Remote FN Communities] - Jess Gordon - FNTC

OTHER LINKS

Digital Divides and the 'First Mile': Framing First Nations Broadband Development in Canada

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

Independent ISP Regulatory Requirements

Sample Annual Ownership Report for ISP to CRTC

Sample CRTC Registration for Independent ISP

CRTC Internet Traffic Management Policy