Community-driven Broadband Installations -

Lessons Learned and Initial Benefits Derived

Case Study #1: Rat River Communications Co-op
Case Study #2: Niverville-Ritchot-Tache Broadband Inc.

PART II: THE NETWORK POST-BUILD STAGE

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Kyle Halford, Director
The Broadband Development Centre
456 – 435 Ellice Avenue
Winnipeg, MB. R3B 1Y6
204.943.3386 **khalford@thebdc.ca**

THE BROADBAND DEVELOPMENT CENTRE
www.thebdc.ca

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EXECUTIVE SUMMARY

This document represents Part II of the report, *Community-driven Broadband Installations - Lessons Learned and Initial Benefits Derived*. The Rat River Communications Co-op Inc. (RRCC) and Niverville-Ritchot-Tache Broadband Inc. (NRT) Case Studies describe two distinctive community-driven broadband network builds within Manitoba.

The Pre-deployment Stage, in Part I of the study, described the up-front, pre-build work that is instrumental to the success of any community-driven broadband initiative. The community engagement and education process, the partnership building, the market demand analyses, the initial design & engineering configurations and the repeated re-running of the financials were the foundation on which RRCC and NRT developed their broadband networks.

Part I - *The Network Build Stage*, went on to detail how the communities were able to establish a network access link, a suitable backbone trunk infrastructure and the means for scalable local distribution.

Part II of the study now focuses on *The Network Post-build Stage*. It gives examples of practical rural applications, describes early network usage patterns and notes some initial benefits derived from the project process itself.

The opportunities that broadband services enable do not come from the technology itself but from the practical applications of that technology. Fundamental needs can be easily recognized in such areas as effective schools and thriving local business environments. *The Network Post-build Stage* explores how various users are applying the technology within their local environments.

Part II also integrates lessons learned from the RRCC and NRT experiences into a *Best Practices Reference*. It has been the principal intent of these case studies to make their lessons available to those community champions who are planning or in the process of executing their own local broadband initiatives.

We thank Industry Canada for its contribution to these case studies.

SECTION A: RURAL BROADBAND APPLICATIONS

The objective of 'extending access' to broadband networks is not in itself very meaningful. Access must be accompanied by the desire to achieve tangible and meaningful improvements in the standard of living of families and an increase in the competitiveness of the businesses that make up rural and remote communities. Quality health care, effective schools, safe streets and thriving local business environments are fundamental needs in all communities.

Broadband networks are the new medium for social and economic activity. The services offered over these networks affect and improve the lives of individuals of all ages, their educational and health systems, the local business environment and the very fabric of community life. It is crucial that the wider community understands these potential benefits and is familiar with specific applications that can enhance their everyday living.

Some noteworthy applications enabled through the delivery of broadband services to the RRCC and NRT regions include:

- **Manure Management & Farm Property Security**
  To streamline his land fertilization process, a local farmer has had radio transmitters and cameras installed around his property and added a wireless broadband connection to the laptop in his tractor. Eyeing his laptop, the farmer is able to monitor the manure applicator he is pulling and, at the same time, the manure pump that is stationed several thousand feet away at a manure storage pond. A camera, sitting on a bank encircling the storage pond, as well as other cameras situated around the farm, send signals to an antenna on a tower high above this farmer's home. If there's a problem with the pump it can be controlled remotely (off/on) from his laptop utilizing his FM transmitter. He is able to monitor his **manure management system, barn temperature, water pressure and initiate security scans** because of the broadband service now available in the area.

  [excerpted from an article by Allan Dawson, Farmers' Independent Weekly, Sept. 25, 2003, p. 10]

- **Environmental Monitoring & Control Package / Security Monitoring**
  A farm business is in the process of implementing an environmental monitoring & control package that will handle all of its local barn locations. This package will enable the management of **temperature, humidity, electricity and alarm functions** from remote locations. The typical environmental systems in use today rely on telephone lines. The development of wireless broadband networks in rural areas, however, has enabled an extension of this application **to locations** (in this case the barns) that do not have phone lines. The wireless broadband access also facilitates remote control of the system **from any position** on the business property.

Some similar applications being utilized by cottage owners in the Whiteshell region include: **monitoring water pipes** for potential freeze-ups; monitoring and controlling the **temperature of hot water tanks**; remote call-ins to **turn on furnaces or adjust the thermostat setting**; and monitoring **security alarms**, particularly during the non-resident winter break-in season.

Additionally, Rural Municipalities are looking to monitor their pumping stations (for enhanced water / flood control) and their sewage lift stations.

- **Equipment Monitoring**
  The largest dairy barn in Manitoba (600+ dairy cows) makes use of a very sophisticated dairy parlour. If one envisions a rotating restaurant, 50 stalls rotate in a similar fashion every 10 minutes, each having completed the milking of a cow. The company that manufactures this equipment and consults on its operations is based in Ireland. Wherever possible, this company wants to be in a position to **update, control and monitor the equipment from its Head Office**. This oversight function may involve 'tweaking' the system to accommodate local variations on the equipment set-up or, a worse case, may entail the timely response to an equipment failure scenario. A broadband network link is critical in performing these tasks.

- **Product / Service Monitoring**
  A trucking broker sells 'delivery loads' to trucking companies. He needs to constantly know **where his trucks are located and what carrying capacities** they have available. This business owner is located in a very rural area that is unlikely to ever be offered DSL or cable modem services. He is determined to maintain a rural location but would not have been able to run this business without access to broadband services.

  Another trucking firm in the area **monitors its vehicles and their respective loads**. It uses GPS coordinates and a web browser to track where the trucks are located.

- **Commodity / Currency Trading**
  The delays and service interruptions typical of dial-up Internet service make commodity and currency trading virtually impossible.

  A company based in Ste. Anne, Manitoba is an active commodity trader. Before the NRT wireless broadband installation, they would book office space in Winnipeg from which to execute their trades. Now, not only are they able to perform this operation from their rural location, they are providing commodity trading **training services** for a number of urban clients.

  A couple of commodity seed companies in the RRCC region sell their seeds to a worldwide marketplace. They had previously been paying exorbitant rates for dedicated T1 service (where it was even available) to execute their sales transactions. Their cost of sales has declined significantly with the wireless broadband services brought in by RRCC.

- **Voice over IP (VoIP) or IP Telephony**
  Voice over IP (voice delivered using the Internet Protocol) is a term used in Internet telephony for a set of facilities for managing the delivery of voice information using the Internet Protocol (IP). In general, this means sending voice information in digital form in discrete packets rather than in the traditional circuit-committed protocols of Private Branch eXchanges (PBXs). The major advantages of VoIP / Internet telephony are that it avoids the tolls charged by ordinary telephone service and it extends traditional phone services to locations that do not have installed phone lines.

  A hog barn operator in the eastern portion of RRCC's coverage footprint had no phone service out to their barns. VoIP is allowing the farm manager to communicate, on a local basis, with workers stationed out at the barns. It is also enabling the barns to link into the traditional telephone office switch (PBX) and **extend those traditional services** (ex. long distance) via the IP telephones.

  A rural trucking company had insufficient access to the number of phone lines it required at their operations site. The incumbent telco could have pulled in more lines but it would have been quite expensive due to the rural nature of the location. They are now, however, in a position to make use of existing lines situated in a neighbouring community and **extend that telephone service out to their site via IP telephony**.

  Remote office workers are now extending their headquarter-based voice services out to the road. Calls placed to their direct office numbers are picked up and forwarded to remote locations. This is allowing all services subscribed to at the office (e.g. call answer, call display, etc.) to become available remotely. These workers are essentially taking their office numbers and telephone services with them.

- **Video Security Surveillance**
  A grouping of 5 gas stations is now being **monitored from a central Head Office location**.

  A hog operation consisting of 7 barns is in the implementation stage of setting up a 'Wireless Agricultural Remote Surveillance' system.

- **Large Data Transfers**
  A local insurance broker needs to update his policy quotations overnight. It was taking 3 to 4 hours each night because his dial-up connection would bump him off up to 10 times during the course of the regular business day. He is now completing this task within 15 minutes.

  A local accountant "couldn't afford to be without high-speed services". He **uploads** Revenue Canada submissions for his clients electronically (**e-filing of tax returns**). This calls for particularly heavy use during the tax season. He is also **downloading** large files from clients and from the Revenue Canada website. Previously, this had been an exercise in "burning valuable time".

Co-op gas stations in Grunthal and Mitchell need to **upload their daily sales figures to Head Office**. They also need to download an entire database for the next sales day. The time commitment on these efforts has gone from 2 - 4 hours (overnight) to 5 - 10 minutes at the end of the business day.

A local pig barn would **send in its bi-weekly statistics to Head Office** by burning a CD and sending it through the regular post. This generally took 2 - 3 days to arrive. Those same statistics are now being e-mailed in a matter of seconds or entered online in real-time.

- **e-Commerce**

  A custom-home builder constructs his houses locally and exports the majority of them to the US. He builds hundreds of homes and then has them trucked down south. This is an example of a businessperson that wants to maintain his rural location. Aside from the lifestyle choice, it is the tax situation and the ease in which he can get his homes onto the highway (does not have to deal with the magnitude of overhead wires found in the city or even in a rural town) that factor into location selection. Access to broadband services now allows him to **show his design concepts and finished homes in a distant marketplace**.

  A home-based business that can best be described as offering a full-fledged "weather station in a box" operates from a very isolated rural location. The weather station capabilities of this product – gauging wind speed, temperature, humidity, barometric pressure, etc – are 'boxed' and operated using battery or solar power. This box can then be plugged into a website to distribute the information globally. This business does not have a market in Canada but has an enormous presence in Africa. His **marketing and e-commerce applications are being supported through broadband service availability**.

  A musician north of St-Pierre-Joly cuts and mixes compact discs. He is **connected to a production studio in Winnipeg through RRCC's wireless broadband network**.

- **Economic Development - Community Initiated Call Centre**

  The Village of St-Pierre-Jolys has made application to become Virtual Incubation Manitoba's fifth project. The have submitted a letter of intent to the funding program in order to start either a virtual call centre or a small conventional call centre within the Village. The objective is to demonstrate to local constituents the benefits of this industry and, hopefully, to attract a large operation to the area.

  The concept of having a call centre where all of the customer service agents are housed in a central structure is changing. Virtual or distributed call centres farm out the calls to different locations. One advantage of this set up is that various locations may each host a different set of language skills. Also, the extension of traditional phone services (required by call centres) out to remote locations (via VoIP) allows a call centre to tap into an expanded (rural) labour force.

- **Distance Education**
  Red River College is exploring the potential of offering 'Wireless Communication Network Training' through its rural St-Pierre-Jolys campus. This would require local **capacity to support a video-streaming application** – something now possible through RRCC's broadband network.

- **Government Services**
  Chaboillé Community Development Corporation has initiated a CIM-Net project through the Government of Manitoba's Energy, Science & Technology department. This project has enabled the RM of De Salaberry to post their municipal by-laws, council meeting minutes and current events on their website. They have also constructed an area for regional businesses and organizations to promote and advertise their goods and services.

  The provincial court system is looking into the possibility of maximizing 'case hearing time' and reducing travelling costs for their rural judges. This would involve **holding some of their judicial sessions remotely through video-conferencing facilities**.

- **Health Services**
  Midwives from the RRCC region are travelling significant distances for initial consultations with their patients. They are looking to do **advance consultations via video-conferencing facilities**. Over 90% of these visits are to relatively distant locations (over 1 hour travel time).

  A speech therapy patient in St-Pierre-Joly (stroke victim) would, previously, have had to go to Steinbach (~ 25 km) to access services. While this patient is not presently strong enough to travel, it is very important to initiate this type of rehabilitation work as soon as possible after the stroke occurrence. Further complicating the situation is that the patient's mother tongue is French. Even if she were strong enough to travel, Steinbach does not offer bilingual services. **Local broadband services have now enabled video-based therapy in a bilingual context**.

Mediplan-specific Broadband Application Examples:

- **Virtual Private Network**
  Virtual tunnelling with its associated overhead uses significant bandwidth. Mediplan currently requires 3 Mbps with its encryption overhead.

- **Sequel Data Replication**
  Mediplan's central servers are housed in Minnedosa, as is their master call centre database. A queuing system is in place to accommodate change requests for any given record. The updated data is replicated back and forth between Minnedosa and Niverville to ensure records at multiple locations are consistent.

- **VoIP**
  The equipment currently used in IP telephony is particularly good for bridging office-to-office communications. In Minnedosa, IP telephony connects Mediplan's dispensary facility with their customer service centre. A similar set up has now been implemented between the customer service centre in Minnedosa and the new dispensary in Niverville.

  Mediplan's 'dispensing pharmacists' are housed in a dispensary facility while their 'consulting pharmacists' are housed in a separate call centre building. These groups communicate with each other and Mediplan's clients communicate with both pharmacist groups using IP telephony.

- **Large Data Transfers**
  A digital document system **handles all documents** from within Mediplan's customer service systems. This is entirely browser-based.

  Customers place orders with Mediplan in the form of a mailed or faxed document. If it is faxed, Optical Character Recognition (OCR) software converts the information into digital form. This is then modified into a 'text format'. If the original order is mailed, it must be digitized with a scanner and OCR software and then undergoes the same 'text format' modification.

  In the Mediplan business operation, a pharmacist first reviews the order and then a customer service representative confirms that order with the customer. Next, a Canadian doctor signs off on the prescription. This involves a secure PDF document with an encrypted password. It is sent to the doctor and then back to the dispensary using Canada Post's "Postecs Service" (secure, encrypted and handled through e-mail). Finally, the dispensing pharmacist reviews the prescription and signs off on its release to the patient. Bandwidth is essential for the volume of traffic in this process.

- **Remote Video Security Monitoring**
  With the appropriate security clearance, one can view all Mediplan facilities (in Minnedosa and Niverville) through a browser-based camera system.

  A card access system tracks the opening and closing of all doors. A time tracking system is also in place. Alarm systems are enabled / disabled and monitored from a central location in Minnedosa. These functions are all facilitated through the same broadband data link.

- **Video Conferencing Consultations with Pharmacists (Future Application)**
  Within the next 6 months, Mediplan intends on implementing video-based consultation services for customers that have access to video conferencing equipment. The objective is to help to meet pharmaceutical service needs in under-served rural and remote communities. This service can be offered with reasonable performance using a 3 Mbps (bi-directional) connection. This capacity may not eliminate all jitter but will be adequate for communication purposes. It's hoped that this can be facilitated at the client-end through local health offices equipped with video-conferencing gear and access to broadband services.

SECTION B: NETWORK USAGE PATTERNS

The RRCC network is currently supporting 15 medium and/or large enterprises and approximately 55 residential and/or small business subscribers. The medium / large enterprises have generally been early adopters to broadband service offerings in the area and had been signed up early on by the Co-op. The residential / small business subscriber segment has shown a 150% growth rate over the past four months. An ongoing marketing campaign, word-of-mouth endorsements and an enlarged coverage footprint have all factored in to RRCC's new business development figures.

The network itself retains significant excess capacity from which to support future subscriber and usage growth. Currently, network traffic is topping out only two or three times per day for one to five second intervals. It's estimated that RRCC is operating at under 50% of its network capacity.

The average throughput speed is approximately 1 Mbps. Specific user speeds are contingent on the service package to which they subscribe. Burstable speeds achieve 1 Mbps or 2 Mbps service and throttled residential packages are achieving 512 Kbps, bi-directionally. This is very comparable to standard DSL or cable modem offerings. Higher speeds are consistent with the higher-end service packages.

RRCC subscribers experience virtually no network congestion (as noted above, network peaks occur only 2 to 3 times per day, for 1 to 5 seconds). The key 'limiting factors' on speed are the server capacities of websites being visited and the broadband service package to which the user is subscribed.

The NRT network is currently servicing about 50 combined business and residential subscribers. This is expected to double in the next 60 days, with over 60 prospects signed onto a waiting list, and then to double again within a 6-month timeframe.

The network has been designed to allow Mediplan to scale up from its existing 3 Mbps requirement to 50 Mbps. As such, the overall network is operating at only a fraction of its total capacity – estimated to be about 10% at this time.

There is virtually no congestion on the network. Subscribers are realizing the throughput speeds specified in their selected service package with higher-end service package subscribers hitting 10 Mbps burstable throughput speeds.

SECTION C: INITIAL LOCAL BENEFITS DERIVED

Although each is still at an early stage, community stakeholders within the RRCC and NRT broadband installation deployments are deriving benefits from having simply been involved in the project process itself.

- **Regional Cooperation**

  An excellent example of increased regional cooperation stemming from municipal involvement in the broadband installation case studies can be found within the NRT service area.

  '911' emergency service calls within the RMs of Ritchot and Tache are routed through Brandon. While the fire hall in Ile des Chenes (RM of Ritchot) is located only ½ km from the RM of Tache border, calls requiring fire response on **Tache's side of the border** are directed to the nearest **Tache fire hall**. A fire just outside of Ile des Chenes will therefore be responded to from the fire hall in Lorette, approximately 11 km away, rather than from the fire hall in Ile des Chenes, ½ km away.

  The regional partnerships developed for NRT's broadband implementation are now being leveraged to address fire protection as well as municipal library service issues.

An example of increased regional cooperation within the RRCC service area has the Village of St-Pierre-Joly working more closely together with the RM of Hanover. In this case, St-Pierre-Joly initially pulled together the **local expertise to design & engineer a wireless broadband network**. They don't, however, possess the economic muscle to ensure its future operational sustainability. They need to continue to expand their market cachement area. The RM of Hanover comes to the table with a **significant business marketplace**.

While it remains a work in process, RRCC is moving from a 'founding board' governance structure to a 'regionally representative elected board'. It is anticipated that as more communities are represented by a 'local broadband champion' that the degree of regional cooperation will continue to evolve.

> ***"Rural communities are all about relationships. In the old days, we had a good agricultural representative tying all the surrounding communities together. After some time apart, initiatives such as this [RRCC broadband project] are pulling our communities back together. We really do need each other to achieve many of our objectives."***
>
> Murielle Bugera, Economic Development Officer
> Chaboillé Community Development Corp.

SECTION D: BEST PRACTICES REFERENCE

This section summarizes ***'Key Lessons Learned'*** in the RRCC and NRT community-driven broadband installation case studies.

Lessons Learned from the Pre-deployment Stage

Community Leadership & Vision

- Patience and determination may prove to be your most vital attributes
  - be ready for surprises!
- Establish concrete goals in order to 'rally the community' together
  - know what it is you are trying to accomplish (e.g. business retention / new business / industry attraction, other economic development objectives)
- Broadband is 'municipal infrastructure'
  - work under the assumption that broadband services are just as important as roads, water or electrical services; this is fast becoming a 'make or break' factor in choice of business location or relocation

Parnership Building / Community Engagement

- Pull together strategic and cooperative partnerships
  - key local stakeholders and targeted major users (e.g. education, health, business, municipal governments) need to know what each other is doing and they need to be pulling in same direction
    - understand specific needs of potential major users
    - involve potential major users throughout the project pre-deployment process
    - initiate community / town hall meetings to energize constituents and to keep everyone's focus on the end goals
  - key external partners must be brought into the fold
    - most communities will not be as fortunate as St-Pierre-Jolys, whereby much of the necessary broadband wireless design & engineering expertise happened to live within the community and these experts were willing to contribute significant in-kind time and effort towards the project. More often than not, communities will need to be prepared to hire third-party consultants who have the necessary expertise to work at the design & engineering, community education and demand aggregation until a financially viable business plan has been developed.
- Regionalize the project
  - adjacent communities provide economies of scale through shared backbone infrastructure and an enhanced revenue base; also, post-deployment, rural communities often cannot support multiple ISPs
  - each community has different strengths (e.g. administrative and technical resources vs. breadth of marketplace) that should be capitalized upon

Community Education

- Facilitate community information exchanges to:
  - establish local network performance expectations, price point sensitivities and potential local applications
  - clarify how broadband services are relevant to particular local needs
  - sell constituents on the local feasibility of the concept
  - identify and aggregate likely business and residential subscribers
- Education is an ongoing process (ending up a part of the marketing function)

The Business Plan

- Prepare a thorough market demand analysis
  - gather hard data on potential user demand through questionnaires, telephone surveys, town hall meetings, and in-person major user interviews
    - pricing options (service packages) have to be customized to suit the local market environment
    - it is critical to understand price point sensitivities with respect to monthly service charges and up-front customer premise equipment (CPE) fees
  - local stakeholders are often in a better position than service providers when it comes to collecting and verifying local marketplace intelligence and aggregating the underlying demand for broadband services
  - be aware that solid expressions of interest do not necessarily translate on a one-to-one basis into signed subscriptions; there may be close to a 50% erosion in the ultimate uptake
- Leverage existing resources & infrastructure
  - understand your local skill set
    - conduct a community human resource inventory (noting both skills and interest regarding the project)
    - utilize all relevant resources available (e.g. financial, administration, communications, education, negotiations, market research, project management, engineering)
  - identify and investigate existing infrastructure
    - land, towers or other structures to support possible wireless equipment (e.g. barns, feed mills, water towers, schools), locations for equipment shelters (e.g. fire halls, community centres, schools)
  - recognize municipal contributions that may be available to the project
    - access to rights-of-way, facilities & infrastructure (e.g. towers, fiber / conduit, wireless equipment)
    - act as an anchor tenant or become the aggregator of major users (e.g. government, schools, health care, business and industry)

- Evaluate and resolve the network ownership structure
  - the business model must take into consideration local goals and objectives, consider:
    - the degree of municipal control desired (e.g. compare RRCC's 'Co-op Business Model' vs. NRT's 'Utility Business Model')
    - the likely operational involvement from municipal stakeholders (e.g. volunteer support, staffing resources available)
    - a return on investment / cost recovery strategy (e.g. royalties based on a % of gross revenues or profits, tower access fees)
    - potential ISP partners' marketing, customer service and overall business acumen (which are firmly attached to long-term sustainability of the network)
- Re-work the **financial numbers** and **re-engineer the solution** until it makes long-term sense
  - perform the due diligence of a comprehensive technical and financial analysis and then be prepared to make multiple adjustments
    - consider the capital cost component – resources available vs. researched community needs; evaluate how to fill any 'gaps'
    - consider the sustainability component – perform cash flow projections based on substantiated take-rate forecasts
  - explore financing alternatives re:
    - backbone trunking system
    - regional trunking system
    - local distribution system

Lessons Learned from the Deployment Stage

- Design & engineering configurations must reflect business plan parameters
  - the business case is intimately coupled to engineering design and operational cost considerations
    - fully understand what type of bandwidth customers will require and integrate this into the design work
    - ensure the network is scalable to meet future demand projections (i.e. what appears cheaper now may not be twelve months down the road)
    - plan for segregated service level offerings in the local marketplace
- Consider hybrid solutions during the technology decision making process
  - do not to get married to one technology; find the best fit for the local marketplace
  - the technology decision making process should weigh anticipated local applications, aggregate demand volumes and segregated service level requirements against existing infrastructure and local environmental conditions
- Conduct comprehensive equipment assessments
  - take into account local considerations (e.g. terrain, tree heights / foliage, rainfall intensity, etc.) to obtain the best possible price-performance measure
  - keep current with a rapidly changing equipment market

- consider the tradeoffs on a hybrid equipment selection in the price / performance evaluation

➢ Field-test equipment before making final purchase decisions
- make use of other community experiences when direct field-testing is not possible (e.g. observe a live network, preferably one operating over a similar terrain)
- site visits, link analyses, spectrum analysis and field-testing of potential equipment are all part of the assessment process