

A Fully Broadband-Enabled Rural Alberta

The following hypothetical but entirely plausible scenario is intended to illustrate the relevance of broadband telecommunication to the future of Alberta's rural communities. The setting is east-central Alberta in the year 2020.

Eight years earlier, the region's municipal governments partnered with provincial government in building a water distribution system to bring a safe and secure supply of potable water to farms, towns and villages throughout the region. During the build, a spare conduit was simultaneously plowed in alongside the water conduit. Later that year, in partnership with government and private interests, the region's municipalities used the spare conduit to deploy an optical fibre-to-the-premise network. This highly capable and future-proof network now supports state-of-the-art broadband telecommunication services for homes, businesses and industries throughout the region.

The water and fibre utilities are managed and operated through a joint venture controlled by the partnering municipalities. The fibre is used to monitor and manage the water utility, and is operated on an open access model that enables any legitimate service provider to lease wholesale capacity on the network and deliver services over it. By 2020, over a dozen tenants are leasing capacity to support services within the region. They include commercial Internet, telephony and television service providers, energy utility operators, oil and gas producers, and the provincial government.

Energy utility operators use the fibre network to support real-time monitoring and management of their utility infrastructure, and to support energy retailers and their customers in better anticipating and managing energy demand. This has eased and stabilized demand while reducing costs for operators and their customers. It has also enabled energy retailers to reduce risk and realize greater profits from arbitrage of spot and contract markets, and has also allowed power producers to increase deployment of generating capacity that uses wind and other transient sources of renewable energy.

Oil and gas producers use the network to support remote monitoring and management of their field operations including video monitoring of pipelines, well sites and other infrastructure. They also support their exploration and development programs with high-definition video and data conferencing services using closed, mobile point-to-point wireless networks supported by their leased fibre capacity. These services enable geophysicists, geologists and engineers to monitor and manage seismic programs, drilling programs and enhanced recovery programs from distant offices in Calgary and Houston, helping them to optimize program effectiveness while reducing financial, social and environmental costs.

The provincial government uses the network to support delivery of health, education and other services to homes and businesses, including a new generation of in-home monitoring services that support 'aging in place' for Alberta's growing cohort of senior citizens. The network has also enabled more effective and efficient deployment of health care professionals, who now provide diagnostic and other services directly into private homes from their clinics, offices and residences. These professionals include specialists in larger cities and semi-retired specialists and GPs working from their home offices. Regional residents and business operators now have access to an immense range of public and private resources and services for elementary, secondary and post-secondary education, as well as services for vocational training and professional development. These on-line services have significantly reduced the need for new bricks-and-mortar infrastructure, saving the provincial government billions of dollars.

Most homes, businesses and industrial facilities are now connected to the network. Operating revenues are nearly optimized, and the costs of building the network will be recovered in less than a decade. A portion of the excess revenue is distributed to local governments partnering in the initiative, enabling them to maintain and improve municipal facilities and services. The region's economic development alliance actively promotes these regional utilities throughout the world, and several small technology enterprises and a call centre have moved into the region to capitalize on lower costs of operation.

Meet the Taysums

The fictional Taysum family own and operate a fourth-generation mixed farm in a part of the region known for its bird hunting and scenic vistas. Cliff (55) runs the feeder operation and a seasonal guiding and outfitting business, and serves on local and regional economic development committees. Cliff's wife Diane (57) manages the household and operates a two-suite B&B out of the home's converted walkout basement, which offers an expansive view to the west across a small lake to gently rolling hills.

Older son Ryan (33) has a degree in agribusiness, manages the crop operation, and consults in the production, certification and marketing of organic grains, forage and livestock. He spends the summer operating the farm and provides consulting services as time allows. Over winter he helps Cliff with the feeder operation, researches best practices in local and regional organic production, monitors global markets for organic products, and delivers seminars and consultations, usually via the Internet.

Since spending a summer break during university on an organic farm in northeastern France, Ryan has stayed in regular contact with the family that hosted him. He has steadily improved his French, which has enabled him to expand the scope of his consulting services for western Canadian producers to include marketing into Quebec and the European Union. He has also been helping a small regional alliance of French and Belgian producers to market specialty organic products into western Canada.

Ryan's wife Marie (31) has a certificate in medical transcription, looks after children Wendy (8), Finn (4) and Emily (1), and works part-time from the couple's small acreage beside the farm. Her steady clients are two medical clinics in Edmonton, and she occasionally does work for a clinic in Yellowknife. Wendy and two of her school friends have developed a keen interest in Highland dance, and Marie has arranged a weekly hour-long lesson from a professional dance instructor in the Maritimes. The girls will use the same high-definition videoconferencing system that Ryan uses for much of his consulting work, and which the family uses to stay in touch with family and friends. On Sunday evenings and holidays, Ryan and Marie gather the children for a video chat with Marie's parents, who have retired to Vancouver Island. On weekday evenings, Wendy uses the system to work on homework assignments and school projects with her classmates. Her class will stage a play as part of an upcoming community festival, and she and her classmates hold nightly half-hour rehearsals by videoconference.

Three mornings a week for half an hour, Ryan, Marie and Finn videoconference with a speech therapist in Lethbridge, who is working to help Finn overcome a congenital speech impairment. Every second Wednesday, the videoconference includes a researcher and their graduate student from the Department of Speech-Language Pathology at the University of Toronto. The student's thesis will compare the effectiveness of different therapeutic techniques for treating children with Finn's condition. Finn looks forward to all of the attention, and is happy to oblige his audience with stories of his day-to-day activities. He has become a star subject, and everyone is pleased with his progress.

Cliff and Diane's younger son Cody (25) still lives on the farm, and has been confined to a wheelchair since a vehicle accident in his mid teens. He is close to completing a Master's degree in information systems through Athabasca University's distance learning program, and works part-time for a large feedlot operation several kilometers from the farm. The feedlot operator has installed a bio-digester to produce natural gas and electricity from the feedlot's steady supply of animal waste, and the 'green' electricity is powering a self-contained and very profitable data centre remotely managed by Cody.

Cody's Master's thesis will focus on the security, logistics and economics of the data center's operating model, and his goal is to make a business of supporting other larger feedlot operators in developing and operating similar facilities and marketing their 'green' data services. He envisions a network of facilities scattered across the Canadian prairies, owned by feedlots and marketed and operated under his CowFlops brand. He is also exploring the feasibility of developing such facilities in Brazil, where an exploding IT industry has become the country's fastest-growing source of greenhouse gas emissions. He has already established several contacts in Brazil's agriculture and IT industries, and has begun learning Portuguese with the assistance of a bilingual language instructor in rural Brazil.

Cliff and Diane's daughter Sarah (30) has a degree in hospitality management, lives in the nearby town of around 3,500 people, and operates The Slough, a thriving gallery-café that has become a social hub for the region's creative community. Sarah's live-in boyfriend Anil (27) has a degree in digital arts and produces computer-generated video content for advertising and media clients in Calgary, Vancouver, New York and Bangalore, India. He is also working with two local entrepreneurs to build a small media production company focused on the regional market.

Sarah hosts an event every Thursday night at The Slough for local artists and artisans to debut their latest works. An upcoming event will feature a new half-hour episode in a documentary series that Anil and his partners have been producing over the last year, which focuses on the natural, cultural and economic history of the region and its people. Each premiere can be enjoyed free at The Slough or for \$5.99 via live webcast from The Slough, which entitles the remote viewer to download a copy of the new episode and participate in a live post-screening review hosted by Sarah and Anil. Everyone else can download the new episode for \$2.99 from the company's web server, which is hosted at Cody's prototype CowFlops data centre. The series has already grossed over \$5,000 per episode, and sales continue to climb as the region's residents and even larger diaspora learn about the series.

On nights when regional content is not available, Sarah uses other sources of live content to draw customers to The Slough. This includes music, theatre, stand-up comedy, movie screenings and other live productions from venues across western Canada and around the globe, which she is able to pipe into The Slough by way of the high-capacity optical fibre network that serves her premises. During Ontario's famous Stratford Festival, she usually pays for a direct live feed of at least two major stage productions. Festival events are now produced and broadcast in 3D, which Sarah is fully equipped for.

Sarah also follows the exploits of high-profile people who hail from the region, especially athletes and entertainers. For the benefit of her clientele and the broader regional audience, Sarah occasionally conducts a live interview with one or more of these high-profile personalities, who usually welcome the opportunity to catch up on the latest news and gossip from home and connect with old friends who still live in the region. She has also interviewed the region's political representatives, who all encouraged her to make these interviews a regular affair.

Sarah has webcast all of her live interviews via Cody's servers at the prototype CowFlops data centre. She promotes Cody's enterprise alongside her own during these interviews, and several local business operators have approached her to enquire about promoting their own enterprises in exchange for cash or services in kind. This has inspired Sarah, Anil and his partners to develop a dedicated web channel for regional audio, video and other content. The channel will include news and interviews as well as feature content from the production company operated by Anil and his local partners, which also does live webcasting of regional sporting, cultural and civic events.

Diane became a strong advocate for the regional fibre network after Cody's accident eight years earlier, when Ryan explained to her what a difference it would make to all of their lives and especially Cody's. She now uses the network every day, and can hardly remember how she got along without it. Diane enjoys daily video chats with family and friends, and also confers by video with most of the vendors who supply goods and services for her household and her B&B enterprise. This enables her to show the vendors exactly what she needs, and also to see exactly what the vendors have. This has spared her countless trips into town and longer trips into Edmonton, saving her thousands of dollars and leaving her with more time to spend on other things including marketing and operating her B&B.

Live video has been a boon for the B&B as well, which now operates almost year-round. Diane gets an average of two calls a day from people all over the world who are interested in visiting the region and have learned about her business via the Web. Callers tend to be interested in either the view or the hunting, depending on the time of year. If it's the view, Diane takes her high-definition web camera out on to the west porch to show them the vista, then tours the surrounding premises and the bedroom suites. If it's the hunting, she tours the suites and then connects the caller with Cliff to discuss hunting conditions. Since she began using live video for marketing the B&B, business has more than doubled.

Diane's father Blake (82) also lives on the farm, in a comfortable mobile home that was moved on to the property after Diane's mother passed away five years earlier. Blake ran his own farm in an adjacent district up until seven years ago, when Diane's mother was diagnosed with inoperable cancer. He initially wanted nothing to do with the broadband network, adamantly declaring that he had no use for it. He was also prone to declaring that he would only leave his farm "feet-first, in a pine box".

Cliff had always gotten on well with Diane's father, and bringing Blake to the farm was his idea. He knew that if they could persuade Blake to move, he would have better access to social opportunities and health care services by way of their broadband connection, and generally a better quality of life. To the amazement of everyone except Cliff, Blake embraced the opportunity to spend his remaining years more closely connected to his family. Blake soon learned that this would include all of his children, grandchildren and great-grandchildren who lived elsewhere in the world.

Blake now uses the network to socialize with family, friends and acquaintances around the globe, including his only surviving sibling, a younger sister who runs a mission in Ecuador with her husband; Diane's older brother, who manages a farm equipment dealership in BC's lower mainland; and Diane's younger sister and her husband, who operate a restaurant in Perth, Australia. Blake also spends a lot of time with Cody, who helps Blake to navigate the Web and locate people and businesses with an interest in vintage tractors. Blake has been collecting and restoring vintage tractors for decades, and is on the hunt for a small handful of replacement parts needed for restoring two of his machines to operating condition. He has long since mastered Cliff and Diane's videoconferencing system, but still seeks Cody's help when making purchases over the Internet. He worries about the security of online commerce, and wants to ensure that he is not putting himself at risk.

Cody has recently begun helping his grandfather to catalogue and market an extensive collection of vintage farm implements and related parts and accessories that he accumulated by way of his tractor hobby. Blake now has his own website, which Cody is developing and managing on his behalf. Blake plans to donate his tractors to a handful of heritage farms and museums around Alberta, but will sell the implements and other equipment for as much as he can and invest most of the proceeds in Cody's business. He doesn't really understand what the CowFlops facility actually does, but he knows that it's making good money for Cody and that's good enough for him. Blake's website has only been up for a few months, but he is already receiving around a dozen calls a week from prospective customers across the continent and has made several thousand dollars in sales. He has also bartered with a vintage parts dealer in West Virginia, trading some equipment for several parts for one of his tractors.

Blake has a deteriorating heart condition, and rarely leaves the farm except to shuttle Cody to and from the CowFlops facility at the nearby feedlot when nobody else is available. Cliff, Ryan and Cody have installed a wireless local area network (LAN) at the farm that connects a host of personal, household and mobile devices, including a sophisticated vital sign monitor that Blake wears around his wrist. The wristband is wirelessly connected to the GPS-enabled smart phone that Blake carries with him, which connects to the farm LAN or to a cellular network if Blake is away from the farm. The smart phone is equipped with software that analyzes the data streaming from the wristband in real time.

When the data indicate something out of the ordinary, the smart phone issues audible and mechanical alarms to notify Blake. If he fails to respond within a set time, the smart phone issues voice and email alerts to Diane, Cliff, Ryan, Marie and Cody. If specific conditions are met, Blake's doctor and the regional health clinic are notified as well. The emails summarize the anomalous data and provide a detailed map showing names and GPS locations for Blake and all people receiving the alert. With Blake's consent, the software also activates his phone's microphone and camera and streams the audio and video to all recipients' phones, enabling them to potentially see and hear what is happening.

The farm's high-capacity broadband connection has improved health services for all who live there. Blake, Cody and Finn have better access to specialists for their respective conditions, and everyone has better access to their GP. This has reduced the need to build and operate more bricks-and-mortar infrastructure for health services, which has saved the provincial government many millions of dollars.

Aside from Blake's vital sign monitor and smart phone, the farm's LAN connects several other devices that have improved the efficiency and profitability of the farm's crop and livestock operations. These include video cameras in the feeding pens, calving barns and other facilities, which allow Cliff and Ryan to monitor the stock from wherever they happen to be – even when they are away from the farm. Cliff uses his laptop to videoconference with veterinarians directly from barns, pens and fields, which has saved thousands of dollars in mobilization costs and enabled him to better manage the health of his stock. This has reduced the livestock mortality rate and led to better returns on the feeder operation.

To better support the crop operation, Ryan has built a wireless wide area network (WAN) that enables broadband connectivity from most points within the confines of the farm. The network employs three 120° sector antennae atop a 40-foot tower situated on a high point of land near the middle of the farm, roughly a kilometer and a half from the farmstead. The three antennae are connected to the fibre gateway by means of a point-to-point wireless backhaul, which employs a high-gain directional antenna on the tower and another at the farmstead. The networking equipment was purchased at a bargain from one of the region's former wireless ISPs, who now serves their customers by way of the fibre network.

Ryan has equipped each of the farm's vehicles with a compact steerable antenna, including the tractor, swather, combine, pickups and quads. This enables broadband connectivity to the Internet from any vehicle, as long as the steerable antenna is pointed towards the tower and has a clear line of sight. To expand the broadband access footprint beyond the vehicle, Ryan has also equipped each vehicle with a WiFi router. Using a laptop equipped with a high-definition web camera, Ryan has high-definition videoconferencing capability from anywhere within a 50 meter radius of each vehicle.

Ryan has found this to be invaluable, especially during harvest season. For example, if he has an equipment failure and needs technical services, he uses the video capability to access these services remotely. During last year's harvest, the combine developed a troubling mechanical vibration that Ryan was unable to diagnose. He conferred by video with a service technician at his regional equipment dealer, who also couldn't diagnose the problem. The technician immediately contacted a technical service rep at the manufacturer's regional office, and within thirty minutes the problem had been diagnosed. A worn-out component in the machine's hydraulic drive system would need to be replaced under warranty, and the regional dealer happened to have the part in stock. The dealer immediately dispatched a mechanic with the required part, and Ryan was back in operation less than half a day after calling the dealer. He estimated the network had saved him over a day and half of down time.

Epilogue

Cliff was slow to buy into the Broadband Revolution, initially regarding it as a threat to the rural identity and way of life he had always known. Over time, after numerous animated conversations with Ryan, he came to recognize that competitive broadband enablement would be essential to addressing the most serious economic and social challenges facing their rural community and countless others across Canada. He also came to understand what it could mean for Cody, and this inspired him to take action.

With help from Ryan and Diane, Cliff leveraged his standing throughout the region to rally support for a capable broadband network, aggressively promoting the concept to neighbours, politicians, municipal councils and the local and regional economic development committees. At the time, everyone was focused on building a water utility to serve the region's farms, towns and villages. The Taysums realized this would be an ideal opportunity to deploy conduit for a buried fibre-to-the-premise network, and lobbied hard. With the help of other supporters including their MLA, they persuaded the region's municipal councils to deploy an extra conduit when building the water utility, at marginal additional cost.

The rest is history... or at least it could be. Much will depend on the emergence and effectiveness of leadership at the community level, and the effectiveness of government in supporting this leadership.

The SuperNet was an important first step towards competitive broadband enablement in rural Alberta. Now it's time for Alberta's rural communities to finish the job, with a little help from senior governments.