

Xittel Combines Fiber and Motorola WiMAX to Serve as Few as 25 Customers

This Canadian firm's public-private model, with some up-front government subsidy, works broadband magic

By François D. Ménard ■ *Xittel Telecommunications*

Xittel Telecommunications, in operation since 1997, has become well known in Canada for pioneering customer-empowered fiber optic networks deployed using a public-private partnership model – more European-style than North American. The company builds and operates community systems in Canada, and does engineering work in the US, Middle East, Europe and Africa. Revenues in 2005 were about \$5 million (Canadian).

Xittel shares its history and credentials with a sister company, Xit Telecom, an ISO 9001 telecommunications-engineering firm. Because of its intimate relationship with Xit, Xittel approaches telecommunications opportunities differently than most CLECs, as it has experience with all stages of telecommunications projects from feasibility studies, to establishment of partnerships and seed funding acquisition, to detailed engineering, per-

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mitting and construction. Its community projects show it can manage commercial networks as well.

Xittel has, to its knowledge, become the first company in Canada to deploy an IEEE 802.3ah Gigabit Ethernet PON 1x32 FTTH system. This system currently provides a bundle of primary line VoIP

and Internet access to Xittel subscribers in Cantley, QC.

Xittel was almost certainly the first company in Canada to prove that non-incumbent carriers could make use of the public right of way and incumbent telephone company support structures to cut the cost of outside plant construction.

Use of incumbent telephone company and power utility support structures by non-dominant carriers has allowed them to drive down construction costs for new fiber optic networks to levels now substantially below the \$15,000 per mile (US dollars) threshold.

Xittel did it mainly by overlashing incumbent telephone company strands with new fiber optic cables. This substantially reduced the capital and the ongoing costs of new outside plant and established new business cases, especially in rural areas where broadband service was previously financially out of reach.

This construction methodology involves more engineering and attention to the permitting process. Nevertheless, this way of building outside plant has become the most popular in Canada, because of its affordability and because it has been

Background

Xittel Telecommunications, Inc. is a facilities-based rural and regional broadband developer and provider. It sells high-speed Internet access and Voice over IP using fixed wireless technology and optical fiber links.

Xittel also offers a portfolio of engineering and network management services through its sister company, Xit Telecom, Inc., supporting the development of its core telecom services, providing a recurring revenue stream.

Xittel owns 250 km (150 miles) of fiber optic routes, and manages close to 1000 km (600 miles) for public and private customers. Among its partners and customers, Xittel counts about 100 public and private organizations, such as school boards, municipalities, and natural resources companies.

Xittel also owns 45 fixed wireless sites serving over 1,200 homes and small businesses and is in the process of adding another 90 sites to its network. It is quickly expanding the rollout of its fiber and wireless infrastructure, both in Québec and in the rest of Canada. The company is also investing in the migration of some of its densest subscriber bases to FTTH and is the process of redefining the economics of providing FTTH in rural areas.

Management Team

Xittel Telecommunications employs 40 people at its headquarters in Trois-Rivières, Québec. The management team is heavy on engineering, and long on experience.

Robert Proulx, President, is a registered professional engineer in Canada and has more than 25 years of management and engineering experience in computer sciences, industrial controls and telecoms. An innovator and entrepreneur, he was Vice President of Genitec Telecommunications (now Dessau-Soprin), and was Vice President, Operations and Technical Services at Cogeco Cable. From 1997 to 2002, he was Vice-President in charge of the telecoms division of IMS Experts-Conseils, which became Xit Telecom. In 2001, he received the prestigious Canarie Iway Award for Xit's contribution to the deployment of large broadband networks in Canada.

Jean-Pierre Beaumier, Vice President, Operations, is also an engineer. He has 25 years of management experience in the telecom industry. He was Vice President, Operations at Réseau d'Informations Scientifiques du Québec (RISQ), and then Vice President, Engineering and Network Management for Videotron Telecom Ltd. He also served as Director, New Market Development for Telebec Ltd, as well as other technical and management positions at Telebec.

Sylvain Juteau, Vice President, Business Development, has nearly 20 years of business experience as a hands-on manager and entrepreneur. He is a founder of LINO, an ISP in Val-d'Or, QC. Its success led it to be acquired by Telebec, a Bell Canada subsidiary. Juteau also managed the operations of Infoteck Internet until its merger with Xittel.

Patrick Poirier, Vice-president R&D, has nearly 20 years of business experience as a manager of an Internet Service Provider and an IS/IT Consulting firm. He founded Intermonde, an ISP in the Lanaudi Ère region of Quebec.

used successfully in the engineering of over 10,000 kilometers of outside plant over the last seven years by Xit Telecom.

Xittel manages and maintains over 1000 route kilometers of sheathed fiber optic cable in the province of Quebec on behalf of itself or for customers such as school boards, regional municipalities, Provincial Optical Research Area Networks such as RISQ and various private sector customers.

The success of Xit in Quebec was taken to a new level in 2001 when the provincial government under advice from Xit, launched the Connected Villages (Villages Branchés) program. The program was

initially funded with \$75 million (Canadian), doubled to \$150 million in 2004. The particularity of this subsidy program is that it is focused on subsidizing the long-term (minimum of 20 years) acquisition of access to existing or new dark fiber with two-thirds of the amounts to be paid in full by the Government of Quebec at the beginning of the project.

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Several of the Villages Branchés projects resulted in some of the fiber optic capacity being made available in an open access fashion. For hundreds of rural and regional communities, this represented the deployment of the most important infrastructural assets since railways, roads and electrification. The investment is now making it possible for them to achieve economic sustainability in a global knowledge economy.

Starting in 2003, as a participant in several of Quebec's Villages Branchés projects, Xittel was repeatedly asked by its clients to provide not only the fiber optic infrastructure, but also services on top of the infrastructure.

In 2006, after acquiring a large Internet

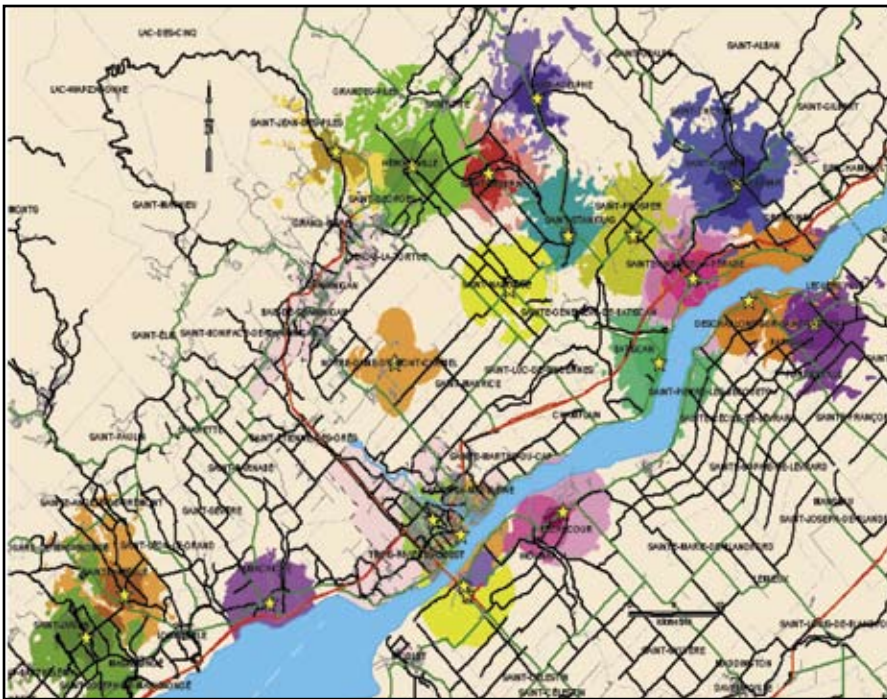


Figure 1. A typical Xittel coverage area. The illustration shows overlapping coverage of Quebec's Mauricie region with Xittel antenna sites.

At least 1 million Canadian households are in rural and regional areas where broadband Internet access is not available. If these households had broadband available and subscribed to broadband service at the same rate other Canadian households, about 500,000 more households would be served. At \$40 per month (Canadian), this represents a pent-up demand and a potential annual market of about \$250 million.

Service Provider, Xittel successfully evolved into a full service Internet Service and Voice over IP Provider. Xittel also started to leverage newly deployed fiber optic capacity to provide inexpensive 4 Mbps wireless (using the pre-WiMax standard) broadband to communities where broadband had not been made available. The demand for the service has been extremely strong and the number of subscribers grew to several hundred within a few months its availability.

Rural and Regional Internet Access

In its 2005 Report to the Governor in Council on the Status of Competition

in Canadian Telecommunications Markets, the CRTC (Canada's equivalent of the FCC) determined from mandatory industry reports that approximately 89 percent of Canadian households have access to broadband services, and 48 percent actually subscribe.

Dialup subscriptions continue to decrease. The number of Canadian dialup subscriptions declined 20 percent in 2004. As a percent of total subscriptions, dialup subscriptions declined from 36 percent of total subscriptions in 2003 to 27 percent in 2004.

Broadband service was available to 98 percent of households in urban centers

and approximately 68 percent of households in rural and regional centers. As in the US, the CRTC estimates that the methodology used to identify broadband availability in rural and regional areas overstates availability of broadband service, because communities are taken to be served if service is reported anywhere within them. The FCC uses the same methodology; if service is available anywhere in a postal ZIP code, the entire ZIP is said to have it.

Despite this progress, at least 1 million Canadian households are in rural and regional areas where broadband Internet access is not available. If these households had broadband available and subscribed to broadband service at the same rate as other Canadian households, about 500,000 more households would be served. At \$40 per month, this represents a pent-up demand and a potential annual market of about \$250 million in Canada (about \$60 million in Quebec alone).

Rural Broadband Access Opportunity

According to the CRTC report, it "is well recognized that, among other benefits, access to broadband networks and services in rural and regional and northern communities supports quality education and health care, job creation and, more generally, helps sustain the vitality of those communities. Consequently, closing the 'digital divide' between urban and rural and regional and remote areas of Canada by ensuring that broadband access is available in every Canadian community is a key priority for the federal government as well as other levels of government."

Similarly, Industry Canada lists a number of benefits for businesses, schools, municipal governments, communities, and agriculture.

Bringing broadband access to rural and regional communities represents a significant opportunity. For example, in Figure 2, white dots are communities with broadband connectivity in Quebec's Mauricie region. Red dots are communities without broadband connectivity – and thus are opportunities for Xittel.



Figure 2. Broadband availability in Mauricie-Bois-Franc. White dots represent communities with broadband, red without.

Wireless versus Traditional Broadband Solutions

Wireless broadband is seen today by several telephone and cable carriers as the logical compliment to their wireline deployments in the center of villages. Telephone and cable infrastructures are less suitable for deployment where low-cost solutions are necessary to make rural and regional broadband Internet access economical. This is due to the fact that the costs to run wireline outside plant outside of the center of the village are far too often prohibitive.

Telephone companies generally use Asynchronous Digital Subscriber Line (ADSL) technology to provide services. ADSL can generally provide speed of 3 Mbps at a distance less than 4.3 km from a point of service, generally a telephone central office.

This has forced telephone companies to deploy remote cabinets fed via fiber optics. These street cabinets cost tens of thousands of dollars, but may be able to serve only a handful of rural and regional customers. This results in costs that are not very attractive and thus represent a barrier to deployment for telephone companies.

Cable companies built their infrastructure by installing coaxial cables and amplifiers on poles, distributing off-air signals from community antennas and satellite dishes. They have generally not deployed cable TV infrastructure outside the immediate perimeters of towns and villages because the small number of customers do not warrant the cost of deploy-

ing cable and amplifiers, and they had no regulatory obligation to do so.

Furthermore, existing rural and regional cable TV systems need significant upgrades to carry two-way and digital signals. These issues make it difficult for cable companies to extend coverage outside of the center of villages.

Other Broadband Technologies

Broadband Internet access is also offered by satellites in geosynchronous orbit, such as Telesat's Anik F2 satellite. However, due to the high cost of satellite service, it is mostly used in Canada to serve public institutions in isolated far-north communities, or as wholesale service to Internet Service providers in these communities. Furthermore, geosynchronous satellite communications has an inherent half-second round-trip delay, which makes telephone service, including VoIP, awkward. Overall, for cost and performance reasons, satellite broadband access is not competitive when a terrestrial alternative is available.

Broadband over Power Lines (BPL) has been touted as an attractive solution for rural and regional areas because of the ubiquity of the electrical power grid. BPL is a technology that allows medium and low voltage power lines to carry digital signals. However, because power lines were not designed to carry such digital signals, repeaters are required every few hundred meters, resulting in high cost per subscriber in low-density areas. Trials and many studies have shown that BPL is not economical in rural and regional environments.

Fixed Wireless Broadband Technology

Cost and performance of fixed wireless systems has improved remarkably over the last five years, especially with the recent

standardization of WiMAX technology. WiMAX, IEEE 802.16, provides up to 50 km of service-area range and allows connectivity between users without a direct line of sight.

At the moment, Xittel is using Motorola Canopy technology, which is "WiMAX-ready," pending final certification and possible software upgrades. In real-life, commercial use, Xittel has found that 4 Mbps line-of-sight service can be achieved up to 15 km from a base station in the license-free 2.4 and 5.8 GHz frequency bands.

Today's carrier-grade license-exempt wireless technologies such as the Motorola Canopy technology used by Xittel are much more resilient than WiFi and thus provide excellent quality of service and reliability, despite the fact that the spectrum is shared, not licensed.

Furthermore, with the availability of recently improved Motorola Canopy technology in the 900 MHz band, there are more options for connecting homes that are not in line of sight of antennas, albeit at lower speed than available with 2.4 and 5.8 GHz.

License-exempt solutions provide several key advantages over licensed solutions, including:

- Lower initial costs, because electromagnetic spectrum does not need to be purchased.
- Faster rollout, without a requirement to file or obtain approval for use of the spectrum.
- A common band that can be used in much of the world, resulting in high-volume production runs and lower unit costs from manufacturers.

Of course, the number and location of users and the limited control of the spectrum offered by a license-exempt solution

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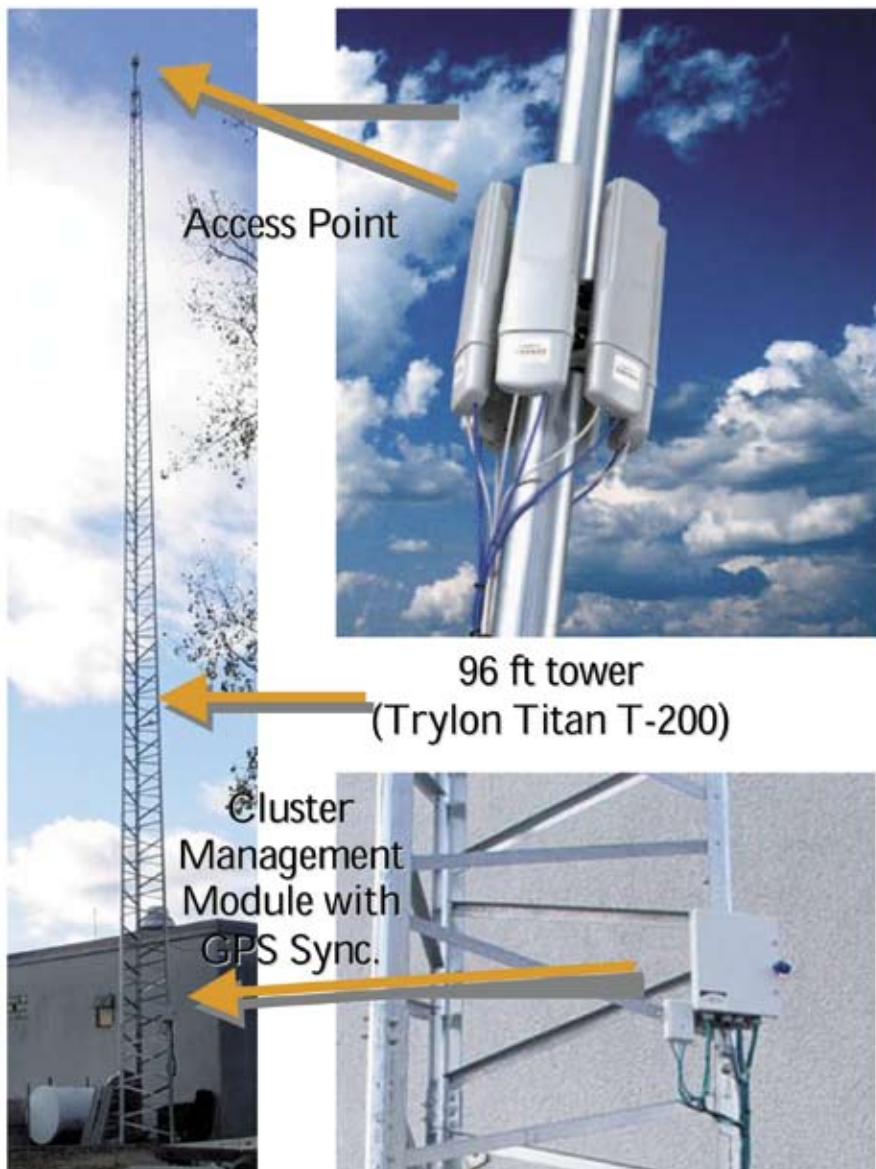


Figure 3. Fixed wireless antenna site.

may result in more interference. A service provider, like Xittel, needs good network design expertise, site surveys and specialized antenna solutions to serve an under-developed market with a business-class service using a license-exempt solution.

For instance, Xittel has concluded that use of the 2.4 GHz band in remote areas is preferable because of the better propagation characteristics of the lower frequency compared to the 5.8 GHz band. In more populated areas, Xittel has concluded that use of the 5.8 GHz band is preferable because this portion of the spectrum is less crowded than is the 2.4 GHz band, despite its shortcomings in terms of propagation

when compared to the 2.4 GHz band.

Motorola Canopy and WiMAX allows for better near line of sight operation (NLOS) and better resiliency to multipath interference than previous solutions. This enables Xittel to deploy antenna sites farther away from subscribers and within areas that have obstructed views to the subscriber, such as houses with light tree coverage or among buildings in more densely populated areas, although deploying WiMAX in more favorable conditions can improve performance.

The benefit of a license-exempt WiMAX solution includes cost-effectiveness and easier market entry for service providers like

Xittel. Easier market and lower costs entice service providers like Xittel to deploy solutions to more customers.

RF interference and the physical placement of the infrastructure are the primary challenges associated with deploying a license-exempt solution. Xittel is an early mover in this field, with known reference customers, a structured go-to-market approach and an integrated offering. Xittel is thus in an advantageous position to benefit from the desire of remote communities to have broadband connectivity.

Canopy System Overview

Xittel provides VoIP with guaranteed Quality of Service using Ethernet traffic prioritization over its hybrid fiber-Motorola Canopy platform. This replaces traditional primary line service.

Xittel currently uses Motorola's Canopy system for fixed wireless access. The main components of the Canopy system are:

Antenna sites. The antenna site system (Figure 3) is typically a 96 ft tower with associated digital and radio frequency electronics. It is located strategically within an area, ideally on city ground near a city building already served by optical fibers, without high surrounding structures, and within sight of most customers to be served. Total capital expenditures for an antenna site are approximately \$18,000. Synchronization via GPS ensures that Canopy radios at overlapping antenna sites do not interfere with one another.

Subscriber module. The subscriber module (Figure 4) is installed on customer premises. Beyond a certain distance from the base station (about 8 km), a dish, similar in size to a satellite TV dish, is installed to focus the signal strength (Figure 5). The subscriber module needs to be aligned to face the base station and in line of sight, or near line of sight, of the base station. As part of the base service, Xittel includes the cost of the subscriber module (worth approximately \$325 Canadian) and charges a nominal fee for the installation at the customer premise (around \$200).

Backhaul module. The backhaul module, similar to the base station, allows for a long-range point-to-point link between base stations, avoiding the need to have optical fibers installed to each base station,



Figure 4. Subscriber module, if the home is not farther than about 5 miles from a WiMAX base station.



Figure 5. A small dish can be added to the subscriber module for locations more than 5 miles from a WiMAX base station.

reducing overall capital expenditures.

As a rule of thumb, Xittel considers that the smallest viable business case can be derived from as few as 25 subscribers, although many more eventually subscribe. Xittel will typically assist in rallying potential subscribers by participating in information sessions.

Fiber makes all of this easier. An antenna site is typically connected to Xittel's fiber backbone, and then to dual redundant 100 Mbps Internet trunks in Trois-Rivières. For systems where Xittel does not have fibers all the way from the area served to Trois-Rivières, backhaul to Trois-Rivières is through a Virtual Private Network (VPN) leased from another Tier 1 carrier.

Some access points are also linked to the backbone through wireless backhaul links. Xittel may obtain Internet bandwidth from multiple suppliers. Depending on traffic volume and location, Internet bandwidth costs \$100 to \$450 per Mbps per month.

Back Office Systems

Xittel operates with a customer care and billing system it developed. This system is

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able to support Internet access and VoIP customers, as well as a number of packages, promotion and billing features.

Xittel also owns and manages two data centers, which include servers for its operational platform including CC&B, RADIUS, PPPoE servers, provisioning, email, web hosting, and so forth. These servers are located in a computer room with redundant access to telecommunications facilities, Uninterruptible Power System (UPS), backup generator, and fire and water alarm systems.

Xittel operates a Network Operation Center, which includes a call center staff, to monitor its network infrastructure.

Xittel markets its services at two levels. It partners with rural and regional communities. Business development activities include lobbying, visiting, attending conferences, and other face-to-face approaches. Its reputation, built following years of working with towns and villages, greatly helps in these matters.

The partnership extends to end-user sales. Towns are more than willing to promote Xittel Internet access in order to

achieve a critical mass and established an economic case for broadband deployment. Furthermore, rural and regional communities are tightly knit, so reaching a good portion of a target market is feasible.

Partnerships with the communities reduce the sales and marketing expenses normally incurred by Internet access providers. Helped by strong partnerships with the local communities, Xittel has been able to maintain an end-user pricing strategy that is competitive with wireline DSL and cable-modem services. Xittel views its strong wireless broadband subscriber base as an enabler to the deployment of FTTH wherever it is possible and is thus in an excellent position to establish long term relationships that will see its subscriber needs being met over the long term, even for those who choose to live in rural areas. **BBP**

About the Author

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