TROPOS networks



Anytime, Anywhere Broadband
GoMoorhead!, Moorhead, Minnesota

A Tropos Networks Case Study
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Scenario

- A Moorhead, Minnesota teenager is working on a project for one of her classes at Moorhead High School. She settles into the family room couch with her laptop and uses the family's new high speed wireless broadband connection to download research at a rate 20 times faster than the dial-up link it replaced.

- Over at Minnesota State University's Moorhead campus, a freshman sits on a bench outside his dorm instant messaging high school buddies at colleges throughout the Midwest.

- At the Moorhead Business Park, a six-person work team drifts into a conference room for a brainstorming session. They all carry laptops. During the meeting, they will use the company's wireless broadband service to e-mail questions to people who are not in attendance and to swap presentations, documents, and Intranet data with each other.

For a decade, Moorhead, Minnesota has been aggressive about offering its 32,000 citizens advanced telecommunications and information services. A substantial fiber optic network rings the community. A 2002 survey showed that 68 percent of residents had Internet access. In 2005, the city took the next step, equipping residents and businesses with high-speed wireless broadband links via a metro-scale WiFi MetroMesh network from Tropos Networks. "Go Moorhead!" the public service utility's broadband service, went live in September.

History

Moorhead sits at a natural Red River crossing point where Minnesota meets the Dakotas. Settled in the 1870s, the wild and wooly frontier town served as a transportation hub for goods and passengers heading north and west. Today's Moorhead still is a transcontinental crossing. Interstates 94 and 29 intersect just west of the city limits. Distribution and transfer continue to be vital businesses.



Nearly as long as it has been a town, Moorhead has had a public service utility. Moorhead Public Service has provided residents with electric and water services in 1896. After the 1996 passage of the federal Telecommunications Act, a city-

GoMoorhead! Anytime, Anywhere Broadband





wide referendum authorized Moorhead Public Service to provide infrastructure for high-speed cable, non-switch telephone and Internet service. Today, a high-speed fiber-optic network rings the city.

In 2002, the city considered adding broadband WiFi to its menu of services. The goal was to provide lower cost Internet access to more residents and to aid economic development.

"The city Public Service Commission recommended against WiFi service at that time because they felt that the technology was still too new," said Bill Schwandt, general manager of Moorhead Public Service.

Moorhead took another look at WiFi in 2004. Across the state, the Minneapolis suburb of Chaska had successfully completed installation of a metro-scale broadband WiFi network from Tropos Networks. The network delivers low-cost, high-speed Internet connections to Chaska's more than 7,500 homes and 18,000 residents.

After city officials visited Chaska, Moorhead decided to move ahead with the WiFi project. However, city officials wanted to gain community buy-in and implement the project carefully.

As the first step, Moorhead Public Service prepared a business plan, which a city-appointed WiFi task force and a technical advisory committee scrutinized. The task force included local telephone providers, representatives from Moorhead's two universities, community members, and business people. The advisory committee drew from Moorhead's large cadre of technical professionals. The committees suggested several business-plan alterations:

- The plan proposed a host of WiFi network uses, including public safety and medical communications. The task force recommended that the project focus first on basic service, and add functions later.

- To keep costs low, the planners had decided not to include a help desk hotline. The technical committee urged that a hotline was essential for good customer service.

Finally, the city held a public hearing on the proposed WiFi network.

Deployment

Moorhead approved the broadband WiFi network project in March 2005. Moorhead Public Service hired First Mile Wireless of Blaine, Minnesota, the Tropos business partner that put in Chaska's network, to design and install the network, which will be fully operational in October 2005, just six months later.

First Mile Wireless used Tropos® 5210 MetroMesh® routers for the network. The 5210 combines the most sophisticated mesh routing intelligence, designed to optimize throughput in a dynamic metro-scale WiFi mesh environment, with a carrier-grade hardware platform. MetroMesh routers can be deployed in the industry's lowest node density, which provides the most economical way to implement a high-performance metro-scale WiFi network. Each router provides wireless connectivity to standard 802.11b/g clients and extends the coverage area of the WiFi network.

The Tropos 5210 is ruggedized, weatherized and certified for outdoor installation. A trade-level worker can mount it on a building or lamppost in under 15 minutes with a single tool. In Moorhead, city workers and First Mile Wireless workers installed the Tropos 5210 routers on utility-owned streetlights.

WiFi signals travel via direct line of sight. In treeless, flat environments like those found in the Western United States, Tropos 5210 routers can exchange signals with other routers up to a mile away. In hilly, heavily treed Chaska, First Mile Wireless positioned routers closer together for the optimum signal clarity. Although it is much less hilly than Chaska, Moorhead's tree canopy is also dense. First Mile Wireless mounted the routers about 1100 feet apart. To assure that signals overlapped, the installation plan divided Moorhead into grids with the routers placed in a circular pattern inside each grid.



The Tropos 5210 Outdoor MetroMesh Router

"An overlapping circular pattern eliminates dead zones because it guarantees that any client router is only 400 to 500 feet from a network node," explained Jay Gustafson, the project manager for First Mile Wireless.

The Go Moorhead WiFi network, which delivers broadband coverage throughout the city's entire 13.4 square miles, features:

- 247 Tropos 5210 routers,
- 13 Tropos 5210s that serve as gateways into the city's fiber optic network.
- Fixed wireless point-to-multipoint systems located on the city water tower and dispatch tower that assure subscribers anywhere in Moorhead, indoors or out, can connect to the Internet.

"Because the extensive fiber network rings the city, we were able to build in added redundancy by dividing the network into three segments," Gustafson said. If one part of the network fails for any reason, routing intelligence built into the Tropos Predictive Wireless Routing Protocol (PWRP) can reroute traffic back along the most optimal path to the wired gateway. Routing intelligence also makes it easy for Moorhead to add nodes and increase capacity as the network grows.

Financials

Moorhead Public Service projected the cost of building the network at $2.3 million. A capital lease provides $1.7 million of the funding. Another $600,000 comes from internal sources. The utility expects to pay off the debt in five years, projecting $525 in revenues from 2,200 subscribers the first year and by year five, $1.3 million from 4,500 subscribers.

Go Moorhead's basic residential service costs $19.95 a month – about half the price of a comparable commercial service. Subscribers get 1Mbs Internet access, two wireless access points and three e-mail accounts. The $29.95 deluxe service, which offers three access points, 10 e-mail accounts and a static IP address, is designed for small businesses and heavy Internet users. Visitors and sporadic users pay $5.95 a day to access the service.

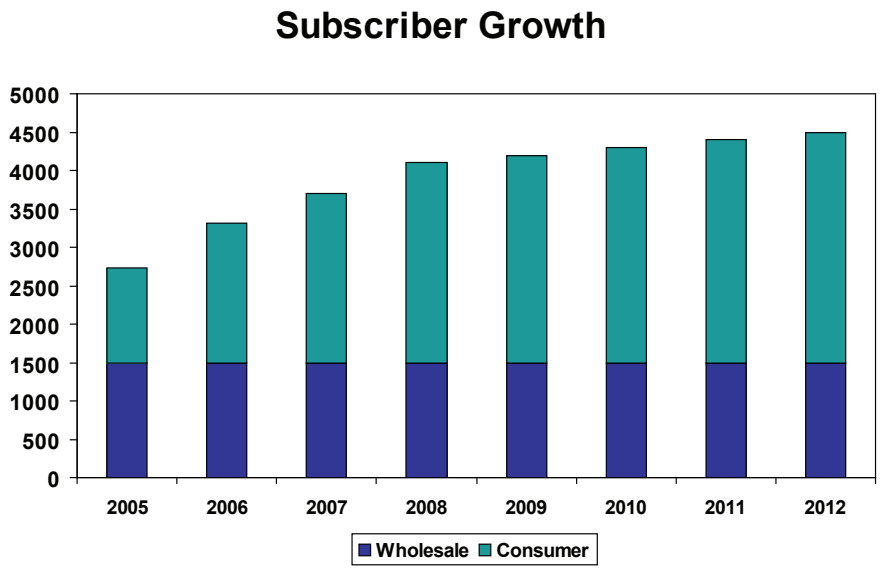
In the future, Subscribers also need hardware that links their homes or laptops to the WiFi network. Subscribers can buy a wireless bridge for desktop computers for a $150 purchase from Go Moorhead or $5 a month rent. A laptop PCMCIA card costs $100 to purchase or $5 a month rent.

Marketing

Over the past century, Moorhead Public Service has built a reputation for reliability and dependability. The utility wants Go Moorhead to carry on that tradition.

"Because this is a newer technology, we needed to let people know what it was," explained Jennifer Walz, director of communications. "The more orderly the rollout, the happier our customers will be, and the easier it will be on us."

While the WiFi network was built, ads for the service were placed in utility bills, and spokespersons talked about the new service on local radio. About 2,200 people pre-registered and Moorhead State University contracted for WiFi access for students in its residence halls.


Subscriber Growth
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2005
2006
2007
2008
2009
2010
2011
2012
Wholesale
Consumer

Beginning in August, 300 beta testers put Go Moorhead through its paces in exchange for free WiFi service, reported Dave Kahley, electric division manager for Moorhead Public Service. Throughout September, 500 pre-registrants a week received "playbill"-style invitations to preview of the WiFi system. At month's end "Now Showing"-themed mass mailings to all Moorhead Public Service customers promoted Go Moorhead's availability.

Management

As it did with telecommunications and television services, Moorhead Public Service outsourced some WiFi network operations, Kahley said. The utility has no IT staff of its own, so it contracted to use the city IT director's half-time. Local consultant Jason Petty provides subscribers with PC support and Multiband, an Internet Services Provider with offices in Fargo, authenticates users, runs the help desk, and is billing subscribers until the utility takes over the task in 2006.

Many Moorhead Public Service subscribers like to come downtown and pay their utility bills in person, so Go Moorhead has opened a store on the first floor of the Moorhead Center Mall where people can sign up for the service and pick up the wireless bridge. Subscribers also can sign up online.

Summary

Moorhead, Minnesota, teamed with Tropos Networks partner First Mile Wireless to design and install Go Moorhead, a city-wide broadband WiFi network in just six months. Traditional wireline broadband networks and incumbent wireless networks can take years, and substantial capital outlay, to deliver similar coverage.

Moorhead Public Service, the city's 100-year old public utility, runs the network, which delivers 1 Mbs broadband service, far faster than dial-up connections, at half the cost of traditional broadband service.

Go Moorhead has achieved the city's twin goals of providing advanced telecommunications services to residents, businesses and students and of enhancing economic development. Residents now have access to low-cost broadband Internet service and people have broadband wireless access anywhere in the city.

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