

CASE STUDY

METROPOLITAN AREA NETWORKS

OTTAWA WIRELESS, INC.

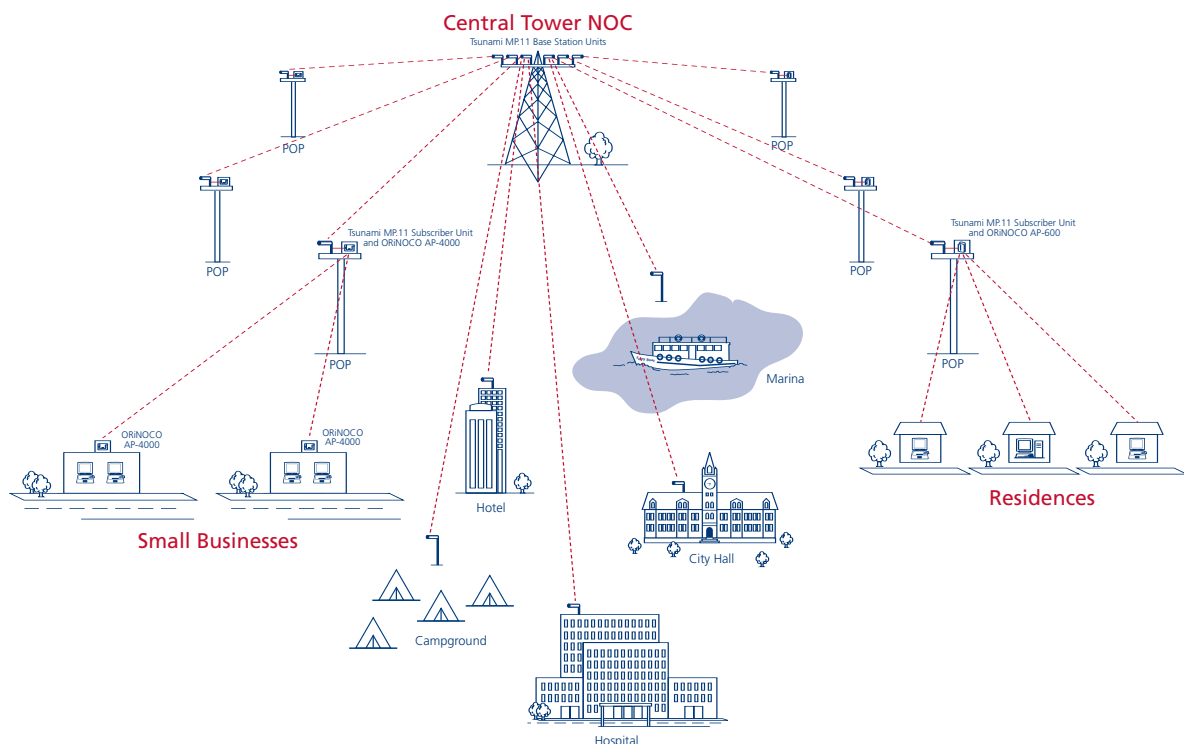
Grand Haven Uses Proxim in First Wi-Fi Network to Provide End-to-End City Coverage



In July 2004, Grand Haven, Michigan became the first city in the USA to be completely covered end-to-end with Wi-Fi Internet access. Using Proxim's wireless solutions, the Wi-Fi network significantly improves quality of life in the city by allowing subscribers to cost-effectively connect to the Internet or place mobile Voice over IP telephone calls nearly everywhere within the 6 square mile city.

The first-of-its-kind city-wide network is the final result of a public/private venture between the city of Grand Haven and Ottawa Wireless, Inc., a leading provider of wireless Internet access and services. Proxim delivered all the radios for the deployment, which includes Proxim's ORiNOCO AP-4000 tri-mode access points and the Proxim Tsunami MP.11a point to multipoint wireless backhaul system. The Ottawa Wireless network is an excellent example of how last mile broadband access can be effectively provided to a community. Broadband wireless and Wi-Fi access can be offered less expensively than DSL and cable, are fully mobile and can be rolled out with extreme speed.

This city-wide network replaces the need for all existing telephone and Internet services and has brought the price of high-speed Internet to under \$20. Demand for service, which has been operating commercially since fall 2003, has been vigorous with more than 300 customers and 150 homes/businesses permanently connected to the network in its first 6 months of operation. Current customers of the service include the city administration, hospital, large and small area businesses, hotels, campgrounds, marinas and hundreds of residential and tourist customers.



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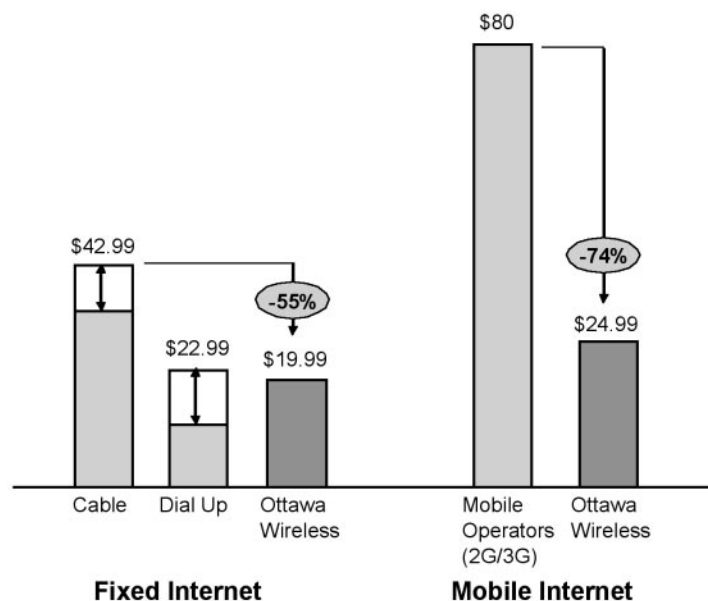
While hundreds of cities in the USA and abroad have announced or begun similar projects, Grand Haven is the first with coverage end-to-end. Grand Haven mayor Roger Bergman says, "City-wide Wi-Fi offers many immediate benefits for the community and we are very proud to be the first city to offer this service end-to-end. The network has and will continue to improve the quality of life of residents, augment safety, attract businesses, boost tourism and assist with education. We look forward to it being available through out the county and eventually the state. We have created a true 21st century telecommunications platform and a model for its rollout everywhere."

In addition to fixed/mobile high speed Internet access, the network supports more advanced services such as point-to-point dedicated VPN connections, wireless video surveillance and high speed access for cars up to 55mph and boaters up to 15 miles offshore. City-wide mobile Wi-Fi VoIP telephone calling is currently in beta testing with full launch expected before the end of summer. Pricing for always-on broadband Internet starts at \$19.95 for 256kbps and unlimited city-wide mobile VoIP calling has been set at \$29.95/month.

BENEFITS FOR THE ENTIRE COMMUNITY

The Grand Haven network is a fully operational showcase of both the capabilities of city-wide Wi-Fi as well as the profound benefits these networks have across many facets of the community. Some of the benefits already demonstrated in Grand Haven include:

OTTAWA WIRELESS IS DRAMATICALLY DIFFERENT BROADBAND



- **Bridging the digital divide.** The starting price of broadband access has dropped from \$30-45/month to under \$20 and the price of unlimited telephony has dropped from over \$40/month to under \$30. Mobile data access has taken the largest drop with prices moving from \$80 for standard high speed nationwide cellular-based data access to under \$25.

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- **Increased quality of life for residents and businesses.** Corporate users and residents can now use the Internet from the boat, city parks, coffee shops, hotels, the beach, their home, office or nearly anywhere they choose instead of at a desk. A few local professionals have taken advantage of the 15mile range on the lake and set up offices on their boats. A few businesses have already expressed interest in moving to Grand Haven for use of the network.
- **Reduced city operational costs and increased city revenue.** The city government of Grand Haven has already achieved thousands of dollars in savings by linking disperse administration buildings using dedicated wireless VPN links. The city plans to introduce many additional uses of the network including city-wide VPN laptop access for city administration. The city receives a franchise fee from transactions conducted over the network in return for the operating license granted to Ottawa Wireless.
- **Improved public safety and health.** Tests are being setup for connectivity to and from Police cruisers as a replacement to the old 800Mhz system. The local hospital is in the process of interlinking 5 area medical buildings using wireless VPN connections and many doctors and nurses connect using the network. Wireless video security cameras are being considered for installation along the dangerous pier heads and city beach areas. The video will be fed directly to the 911 response team.
- **Improved education.** Wi-Fi Internet access is available for students in the local schools and library, and provides the ability to freely roam across the city. Classrooms can be located anywhere in the city without losing the ability for students to connect to the Internet or the school network.
- **Increased attraction for tourism.** Internet access is immediately available for any tourist that visits the area. Area campgrounds, hotels and marinas offer Wi-Fi access in every slip and room; many of these locations subsidize access for their guests in order to increase attractiveness. Wi-Fi video tourist cameras have been placed at attractive locations across the city to highlight the city of Grand Haven; these can be accessed through a website.

GRAND HAVEN NETWORK TECHNOLOGY BREAKTHROUGHS

Ottawa Wireless had to overcome dozens of technology and regulatory challenges to create a reliable service that outpaces all existing broadband offerings in terms of performance, pricing and value. As Wi-Fi was not developed initially to be used across a metropolitan area, significant engineering, network design and systems development was required to enable a seamless, high performance and reliable city network. Experienced in designing and deploying metropolitan area networks around the world, Proxim was able to provide the technical assistance required for the overall success of the project.



There are several technology highlights of the Grand Haven network, including:

- Fully city-wide seamless mobility across the city at roaming speeds up to 55mph. (e.g. no IP renew required, no dropped VoIP telephone calls)
- Nearly all services are self-provisioned and do not require human interaction. Signups can occur on the spot.

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- The network can support thousands of clients and operates at a 99.9% reliability, even in extreme harsh environments (e.g. rain, fog, snow, wind, trees)
- The network uses 100% wireless backhaul across the city. There is only a single Internet connection spread out using some 250 Wi-Fi (802.11a, b, g) radios located entirely upon only existing city infrastructure.
- The network is monitored at every point on a 24x7 basis, achieves exceptional broadband performance. Top speeds of 5Mbps bidirectional are sustained with an average downstream data rate of 3Mbps. Very low latency of 10ms is achieved end-to-end with access up to 15 miles into Lake Michigan.
- End-to-end network security is provided via support for all VPNs, WPA, RADIUS, VLANs and the recently ratified 802.11i standard. WEP encryption, the failed wireless security standard, is not used on the network. All services are auto provisioned, including speed upgrades.
- The Wi-Fi network can be operated as either a retail or wholesale network supporting multiple service providers.

PARTNER PROFILE:

Ottawa Wireless, Inc.

Ottawa Wireless, based in Grand Haven, Mich., is a leading provider of wireless Internet access and services to consumers, businesses and local government agencies. With the most public Wi-Fi locations deployed throughout the Midwest, Ottawa Wireless uses open spectrum wireless Internet for data, voice and video applications. The firm is recognized as a pioneer in the public deployment of Wi-Fi and WiMAX technologies. Additional information about Ottawa Wireless is available



Proxim Corporation
2115 O'Nel Drive
San Jose, CA 95131
tel: 800.229.1630
tel: 408.731.2700
www.proxim.com