



Connecting to Education with WiMAX* Technology



Northern Michigan University becomes first U.S. university to provide high-speed 4G to every student

One of the largest notebook computer campuses in the U.S., Northern Michigan University (NMU) equips all full-time students with an Intel®-powered Lenovo ThinkPad* laptop as part of their tuition. For this program and other innovative efforts to integrate technology into higher education, NMU has received an array of national and international awards.

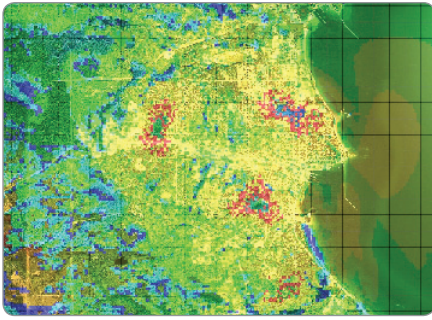
The university recently built on that commitment by taking another trailblazing step toward exploiting the benefits of technology by adopting WiMAX community-wide wireless connectivity. It is a move sure to build on their reputation and enhance their role as an education leader.

Extending Connectivity Community-Wide

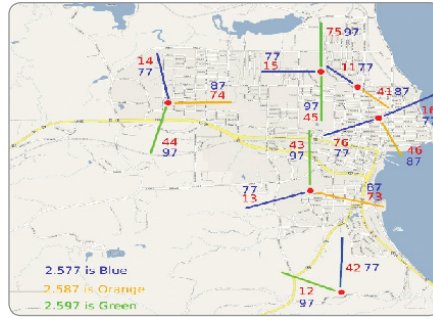
The move to WiMAX began with an understanding that connectivity is a critical part of any campus laptop program. NMU already had 100 percent 802.11abgn WiFi* coverage on campus. Seeking to extend network reach, the university deployed 802.11abg WiFi hotspots in the surrounding city of Marquette to support off-campus network access. While helpful, the limitations of WiFi meant that a trip to campus remained the best way to directly access the NMU network.

Seeking a better solution, NMU Chief Technology Officer David Maki began looking at 802.16e mobile WiMAX in late 2008 as a solution that could more effectively extend the campus network to off-campus users. The intention was to augment the notebook computing initiative by enabling students, faculty, and staff equal, affordable access to broadband when away from campus.

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NMU computer simulated coverage map



Antenna placement showing sectors and frequencies



Fire department hose drying tower for base station

Making It Happen

A critical hurdle in any WiMAX implementation is RF spectrum, and unfortunately NMU did not have a spectrum license. NMU leaders and Rep. Bart Stupak (D-Mich.) built the case for a spectrum request and presented it to the Federal Communications Commission (FCC) in Washington D.C. In October 2008, the FCC granted NMU an Educational Broadband Service (EBS) license.

RF Coverage

Next, the boundaries of RF coverage needed to be determined and an RF coverage map created—a critical step in any wireless implementation. With sufficient spectrum, the best geography for WiMAX is flat with few trees, which can absorb the RF signal. The city of Marquette, approximately four-by-five miles in area, has a few hills, but fortunately proved to be a good fit overall for a WiMAX implementation.

WiMAX Towers

Identifying towers and their arrangement followed. NMU, working with Intel engineers, used network design software to determine the number and placement of towers and accommodate all users at a lowest cost. This task is often complicated by the need for access to the antenna locations, and sites may need to be leased at additional cost and time.

Fortunately, NMU and the city of Marquette found they had enough locations within their control. NMU was also pleased to learn they would be able to use a city-owned water tower and a tower used by the fire department as part of their tower complement.

Base Stations

For its base stations, NMU selected the Motorola WAP 450P*, which supports multiple antenna technologies that provide superior capacity and coverage in rural, suburban, and urban environments.

By late August 2009, Maki and his staff, with help from Intel engineers, completed the physical implementation of the network. In 2010, NMU entered an agreement to expand the coverage to the towns of Negaunee and Ishpeming, located 14 miles and 19 miles, respectively, outside of Marquette. Both towns are home to many students and faculty.

Intel WiMAX Cards

Once the system was in place, NMU began to install Intel® WiMAX* cards in all the laptops distributed to students in the fall of 2009. Existing students were offered the option of purchasing a WiMAX USB adapter to allow their laptop to take advantage of the expanded coverage.

NMU and the Future of Education

The introduction of WiMAX at NMU led to a new wireless network with dramatically greater reach. The result has been a change in the way students, faculty, and staff connect to the Internet off-campus, communicate, and get their work done.

Wireless 4G broadband networks fill a critical need in education by enabling the full transition to digital media. Many schools will follow the path of NMU in the future. For more information, visit www.k12blueprint.com.

What Is WiMAX*?

WiMAX belongs to the 4G class of networks. Like current cellular 3G data networks, WiMAX provides a high-speed wireless data connection to any device within range of a WiMAX-enabled tower. The advantages of WiMAX and 4G networks over 3G networks are speed (up to 2X faster) and reduced latency.

Although WiMAX is broadly installed in over 100 countries with millions of subscribers, it has been slow to enter the U.S. market. In 2008, there were only a few commercial WiMAX implementations in the U.S. and no university-implemented programs.

