

# Opportunity Knocks: US Universities Look to Capitalize on Mobile WiMAX

With access to spectrum and other valuable resources, universities and other educational institutions are looking at new models to leverage WiMAX networks beyond providing internet connectivity to students and faculty.

## Wireless Broadband Perspectives - WiMAX.com Weekly Series

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*For the next several months, WiMAX.com and Cisco will be featuring weekly topics and perspectives from the WiMAX & wireless broadband industries. This week, we visited with Ball State University, a cutting-edge wireless research university, to better understand their WiMAX developments and opportunities they see for innovation and growth.*

While much of the focus on WiMAX in the US is often viewed purely from a service provider's perspective, the availability of WiMAX equipment and FCC spectrum mandates are creating unique opportunities for colleges, universities and other educational institutions. Under FCC rules, holders of EBS (Educational Broadband Services) spectrum must show "substantive usage" by May 2011 or risk forfeiting the spectrum.

EBS spectrum was provided to local colleges, universities, school boards, churches and other non profits in the 1960s to as a means to provide educational and distant learning content via television. With the development of mobile WiMAX, this spectrum became much more valuable and could be utilized to deliver high-speed wireless broadband services or leased to other service providers.

But most of these institutions lack the expertise needed to develop their spectrum assets. Enter Ball State University (BSU), a state-run research university in Muncie, Indiana that was identified as a "top wireless" university by Intel in 2005. BSU has been at the forefront of wireless research and innovation and has worked with a number of different networking and wireless technologies. Partnering with Alvarion and Digital Bridge Communications, BSU was one of the first operators in the US to conduct field tests of WiMAX equipment in 2006.

Leveraging its early involvement in WiMAX, BSU created its own campus-wide mobile WiMAX network in 2008 with a single WiMAX base station and a single 120 degree sector antenna. Since then, it has expanded its network to include six Cisco base stations and now features a complete Cisco end-to-end solution comprising AAA servers and ASN gateways.



*Ball State University Students Installing Outdoor WiMAX Antenna*

BSU's WiMAX program has been so popular that it has attracted interest from other schools including the University of Wisconsin in Madison. Under an arrangement with that school, BSU helped build a mobile WiMAX network on the Madison campus and provides on-going consulting and hosting services, a model it sees possible with other schools.

"Based on the work done with the University of Wisconsin, we have developed a WiMAX services model along with a suite of services that we can offer to other institutions," says Vernon Draper, Assistant Director Networking and Communications Integration for Ball State University. "This provides a revenue model for the university as well as helping other states meet their EBS spectrum requirements."

BSU is in a unique position to evaluate many different technologies, given its experience working both with both Wi-Fi as well as a variety of WiMAX profiles - from fixed WiMAX networks to the latest mobile WiMAX beam-forming networks. It also operates a complete Cisco environment including a 10Gbps fiber network on campus as well as a campus-wide Wi-Fi network with nearly 1,200 access points. So exactly how well did its mobile WiMAX network compare with some of the other technologies such as Wi-Fi?

"Initially we aligned all of our WiMAX antennas to face out from the campus," says Draper. "We then realized that the in-building penetration (with WiMAX) was really good with beamforming and that we could penetrate the buildings by re-aligning our antennas. We have a hospital near campus and were surprised at the penetration that was achieved, even in the

basement, and ended up partnering with the hospital to track usage and provide a map of coverage."

### **WiMAX Program Objectives**

BSU's WiMAX network provides an important learning environment for BSU students, both from an engineering perspective as well as the business aspects of operating a network. "What we were able to do is not only evaluate the technical performance of WiMAX, but also build the business case," says Dr. Robert Yadon, Professor of Information and Communication Sciences & Director of Applied Research Institute at Ball State. "The GIS mapping software allowed us to bring in things like disposable income, population on house-hold basis and identify the demarcation points where truck rolls were required/not required."

The current program is based on invitation only and students in the program are required to keep track of their experiences while on the network, which provides valuable information to BSU's network administrators.

The availability of an all IP, mobile, high-speed network has also generated some innovative applications. To better help students track the location of shuttle buses, the university installed notebook computers equipped with WiMAX and GPS USB dongles in the front panels of the busses. The information is then reported back to a fleet management server, providing real-time location based information that can be accessed by the students.



*Ball State University Shuttle Bus with WiMAX enabled GPS & Video Camera*

### **Commercialization Opportunities**

BSU has also had a long, established relationship with Cisco and has been a Cisco Network Academy for the past twelve years. In that role, the university provides Cisco certified training for wireless engineers and is one of the leading training partners for the region. While much BSU maintains a strong relationship with Cisco, it is also working with other infrastructure vendors such as Alvarion, Airspan, as well as Taiwanese device manufacturers to make sure it has a diverse testing environment for its WiMAX network.

Cisco certainly reaps the rewards from its relationship with BSU by offering potential customers the opportunity to visit a state-of-the-art commercial WiMAX network with Cisco's latest equipment. Cisco officially entered the WiMAX market in October 2007 through its acquisition of Richardson, Texas-based Navini Networks.

"The combination of WiMAX-available equipment, the availability of federal broadband stimulus funds, and the looming 2011 FCC deadline for usage of EBS spectrum, has created a 'perfect storm' of opportunity in the marketplace," says Michael Shepherd with Cisco's Wireline & Emerging Providers group. The group is tasked with working with Tier 2&3 operators on building out their wireless assets. Shepherd considers himself somewhat of a matchmaker, pairing EBS spectrum holders with operators to help them build-out networks and fulfill their EBS obligations.

"Shortly after we acquired Navini Networks, we saw a unique opportunity to position our radios in the unserved markets of this country," says Shepherd. "There are literally hundreds of EBS spectrum holders that must build-out their networks by 2011, or risk forfeiting their spectrum. The opportunity is huge."

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