

WiMAX Enables New Business Model at Indiana School

Ball State University enhances student experience and provides services to other universities.

EXECUTIVE SUMMARY
BALL STATE UNIVERSITY, INDIANA <ul style="list-style-type: none"> Academia Muncie, Indiana
CHALLENGE <ul style="list-style-type: none"> Use 2.5 GHz wireless spectrum actively before FCC deadline of 2011 Provide advanced learning environment, and boost university's competitiveness Offset costs and create commercial opportunities in wireless
SOLUTION <ul style="list-style-type: none"> Create advanced WiMAX network in collaboration with Cisco Use this as technology test site and to support advanced internal services Provide consulting and hosting services to other schools with 2.5 GHz licenses
RESULTS <ul style="list-style-type: none"> First site in the world to take delivery of Cisco BWX 8415 WiMAX base station, enhancing the test system First customer is University of Wisconsin – Madison, testing hosted services Students and faculties now using applications from remote study to immersive learning

Challenge

Academic institutions are frequently technology innovators, but one U.S. university, Ball State University (BSU) in Muncie, Indiana, is looking well beyond the usual hi-tech roles. With its groundbreaking work with the broadband wireless technology, Mobile WiMAX, Ball State is meeting four key challenges.

The first challenge is to develop a highly advanced learning environment for its students, which will help it to be more competitive in attracting top-class applicants and staff. Universities need to support a rapidly expanding range of sophisticated web services. Examples include online teaching and course materials, efficient administrative processes, new communications methods such as social networking, and web-based collaboration for research projects. All these services require a high-capacity wireless network, which is optimized for open and mobile web usage.

The second challenge is to be at the forefront of technology, to enhance BSU's reputation and its industry partnerships. This has involved creating one of the country's most sophisticated testbeds for Mobile WiMAX, in cooperation with Cisco.

The third challenge involves BSU's aim to create an innovative business around its early adoption of the technology. Achieving this goal could offset the technology's costs and make BSU a wireless center of excellence for the region. This could even provide a template for other academic institutions around the United States and in other countries.

All three of these challenges can be met using 2.5 GHz wireless spectrum help by BSU (and many universities). But this brings an additional fourth challenge of its own: the Federal Communications Commission has imposed a deadline of 2011 on 2.5 GHz holders, which must demonstrate active use or risk forfeiting their license rights.

Solution

To address all these issues, Ball State has created a state-of-the-art Mobile WiMAX network in its 2.5 GHz spectrum, using Cisco® BWX 8305 and new BWX 8415 WiMAX base stations and surrounding systems. The university has found the technology a good fit for its requirements, because the technology supports fast data rates, is highly spectrally efficient, and is developing a robust device ecosystem. As an all-IP technology, it is optimized for web services, and there has been significant WiMAX R&D into the open web usage model.

The BWX 8305 and BWX 8415 WiMAX base stations form the powerhouse of BSU's advanced wireless and broadband set-up. As well as an advanced testbed, it is being used for a range of internal and external purposes. Two BSU departments (the Office of Information Technology and the Center for Information and Communication Sciences [CICS]) are using it to test 802.16e applications for on-campus and off-campus use and to provide services to partner organizations.

Phase one of the WiMAX project, now complete, covers a half-mile radius. Phase two, for spring 2010, will expand this to two miles, a larger sample base of students, and a broader variety of devices, including notebooks, GPS devices and so on. It will also include use of the BWX 8415 running in 10 MHz channels.

Ball State's testing process has also involved other departments, notably landscape architecture and geography. Students from these faculties have been assigned dongles or PC cards, and are using and evaluating new learning approaches enabled by wireless broadband. In particular, they are focusing on immersive learning environments harnessing advanced multimedia techniques. While the students assess and feed into the end user experience, the technology departments are studying the most efficient ways to deliver these new applications to mobile units.

This multilayered project has brought expertise and benefits on both the academic and administrative fronts. Professor Robert Yadon, director of the CICS Applied Research Institute at Ball State, says: "From an academic standpoint, our graduate students in the CICS program have been involved in the early evaluation of a state-of-the-art broadband mobile wireless technology."

Bradley McCoy, network integration manager and one of the certified WiMAX engineers at the heart of the activity at Ball State, says: "Our critical use for WiMAX is to provide an additional engagement with our students. We do foresee we will also use it for unique applications such as data services on our campus buses, locator services for our buses, remote feeds for student-run radio and television stations, connectivity for our public safety officers."

The early results of the deployment have been sufficiently impressive to catch the eye of other universities in the region. This has led in turn to an agreement with the University of Wisconsin, under which Ball State has helped the larger school build its WiMAX network, and now runs the system on its behalf. Such a partnership could be replicated with other colleges, making Ball State into a regional center of excellence. And it is this pattern that is sure to be of interest to other groups of universities in other parts of the United States, many of which have 2.5 GHz spectrum, but little or no expertise in WiMAX. As with the University of Wisconsin deal, a partnership allows a school to preserve its 2.5 GHz spectrum without investing the large amounts of time and upfront finance required to deploy and manage its own WiMAX network and ecosystem. But the school still gains the administrative and learning advantages enabled by a mobile broadband, web-optimized network.

Yadon says: "We were one of the first to explore the remote interoperability of WiMAX using the AAA/ASN Cisco Profile C back end. Our demonstrated ability to remotely configure and operate the University of Wisconsin base stations suggests opportunities for economies of scale as institutional networks seek cost-effective ways to preserve the Educational Broadband Service (EBS) spectrum throughout a region or entire state."

Results

This project brings advantages that go far beyond short-term efficiencies and applications. A network as powerful and open as the Cisco WiMAX system opens up what McCoy calls "unforeseeable possible applications."

A longer term impact will be felt in two specific areas. One is a profound shift over time in the university's learning environment, which will be a reference site for other colleges. "Having WiMAX makes Ball State unique, it provides a competitive edge to demonstrate to prospective students that we are progressive in developing new technologies and also provide students with immersive learning opportunities," says McCoy.

The other is in BSU's role among the broader academic community of the Midwest region. Here, it is now seen as a role model for harnessing advanced wireless technology, and many other institutions will seek to tap into its experience. Yadon says: "We're on the cutting edge of new technology, the first university to gain exposure to broadband wireless. What we've learned extends and applies to every campus environment and broadband wireless network." This could improve the college's financial position and prestige in future.

Nor is this only a one-way process of Ball State offering its services and expertise to other colleges. Increasingly, Yadon expects a web of cooperation to develop between various academic institutions. Such an approach could

become the norm in many parts of the United States, stimulated by the need to make “substantial use” of the 2.5 GHz spectrum by 2011. Rather than each institution repeating the same efforts, it is likely that clusters will develop around certain regional universities with particularly strong reputations for telecoms and technological expertise, such as Ball State.

Technical Implementation

The origins of Ball State’s new network and model go back before Mobile WiMAX was even an option. The school had experience of providing hosted services for other colleges, in telephony reselling. It also had a strong existing relationship with Cisco. Ball State has a full Cisco environment in wired and wireless networking, including a 10 Gbps fiber network on-campus, which connects almost 20,000 locations. It also boasts campuswide Wi-Fi with nearly 1,200 access points.

The collaboration on these various projects meant Cisco considered BSU a trusted partner and an ideal “friendly site to test the latest and greatest technology,” says Michael Shepherd, business development manager at Cisco. This made it a natural step for the two organizations to work together once more when both became interested in Mobile WiMAX. Ball State was looking for a technology for its 2.5 GHz spectrum; Cisco, having acquired Navini Networks, was looking for an advanced testing partner. The synergy was obvious.

One of the key objectives of the Ball State cooperation has been to evaluate the performance of smart beamforming, one of the key competitive features of the Cisco system. This technology improves the range and robustness of wireless signals by focusing them on their specific targets, while rejecting other interfering signals. Cisco systems offer the most advanced implementation of this technology in the sector, boosting range, reliability, and data rates in combination with MIMO.

The first project at Ball State was to document the baseline performance of the Cisco beamforming technology and provide a platform for continuous testing of subsequent performance enhancements. Pre-test benchmarking took place at the end of 2008, with a single BWX 8305 WiMAX base station and single 120-degree sector antenna on top of the college hall. During this period, Ball State was named the first domestic Cisco Early Field Trial location for Mobile WiMAX which brought benefits such as early equipment availability, testing and pricing. Testing then extended throughout 2009 to multiple BWX 8305 base stations and antennas. In mid-2009 Ball State, which has had access to the most advanced products in the Cisco portfolio, became the first site in the world to take delivery of the new BWX 8415 WiMAX base station. This began testing in November.

The advanced nature of the testbed makes Ball State a valuable reference site for potential Cisco customers. Many of these come to view the university’s system, and Shepherd says: “Almost every provider or municipality that touches Ball State becomes a customer.”

For More Information

To find out more about Cisco WiMAX solutions, go to: <http://www.cisco.com/go/wimax>

PRODUCT LIST

Wireless

- Cisco BWX 8305 Broadband Wireless Access System
- Cisco BWX 8415 Broadband Wireless Access System
- Cisco BWX 350 USB Modem
- Cisco Broadband Wireless Gateway
- Cisco Intelligent Services Gateway
- Cisco Service Control Engine (DPI)
- Cisco Mobile Wireless Home Agent
- Cisco 7600 Service Provider Edge Router



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