

No Cost Enhanced Wireless Coverage

Stephen K. Stearns

Information Technology and Communication, University of Virginia

Michael N. Warlick

Procurement Services Department, University of Virginia

Abstract

The University of Virginia, in support of its mission and in an effort to maintain the highest quality of services for its students, faculty, staff, and visitors, has long desired to enhance the signal strength coverage of cell phone service providers throughout key facilities on the University Grounds.

The Goal: Deploy a Wireless Neutral Host System (“System”) to allow any wireless carrier that wishes to access the System the ability to enhance their network coverage and capacity in key facilities on University Grounds, especially in all residence halls and sporting venues, to include the 60,000 capacity football stadium (Scott Stadium) and the 15,000 indoor arena (John Paul Jones Arena), home to the University’s indoor sporting teams and numerous other spectator events, including concerts and Broadway shows.

The Problem: How to build the \$4.5 million carrier neutral System at no cost to the University without adding multiple unsightly antennas for each carrier on University Grounds.

The Solution: Hire a firm (“System Integrator”) to design and build the carrier neutral System and then allow wireless carriers to pay a fee to access the System. The fees generated would cover the entire cost to design and build the System, including all of the cost associated with the System Integrator, equipment, installation, and maintenance. Any expansion of the System would be paid by the carriers or by the University through revenue generated from rent payments.

The Result: A \$4.5 million consolidated wireless System that cost the University \$0 to build while at the same time meeting the University’s goal of providing excellent wireless coverage with limited exterior antennas in all residence halls and sporting venues.

Introduction of the Organization

When Thomas Jefferson founded the University in 1819, he intended it to be nothing less than a world-class institution of higher learning. Jefferson's spirit lives on — not only in the Rotunda and Academical Village he designed, and which remain treasures of American architecture, but in the University's standing as a leader in education, research, and community service.

The 21,000 plus students attending the University work within a true meritocracy and live by an Honor Code unique among American universities. Each student is exposed to the widest spectrum of disciplines — from arts and athletics to humanities and technology. Our students also enjoy a unique connection to the world beyond college through the University's outstanding professional training, exemplified by its nationally ranked schools of Law, Business, and Medicine. The University offers 48 bachelor's degrees in 46 fields, 94 master's degrees in 64 fields, six educational specialist degrees, two first-professional degrees (law and medicine), and 55 doctoral degrees in 54 fields. The University as a whole has had a consistently high ranking, not only among public schools, where it often heads the list, but among all American universities, public and private.

Over 12,000 permanent University faculty and staff are committed to serving both the local and national community. The University makes a real difference in the world, through its invaluable research, a hospital ranked among the nation's finest, and graduates who have consistently forged our nation's policies and discoveries.

The University remains public, supported by the Commonwealth of Virginia, while also nourished by the strong support of its alumni. The operating budgets for July 1, 2008, through June 30, 2009, for all divisions of the University of Virginia total \$2.2 billion. Of the total budget, \$1.2 billion relates to the Academic Division, \$980.1 million to the Medical Center, and \$34.1 million to the University of Virginia's College at Wise.

Statement of the Problem/Initiative

Like many institutions throughout the country, the use of cellular telephone technology by University students, faculty, staff, and guests continues to expand, but its reliability is hampered within many buildings, and at some outdoor locations, by poor Radio Frequency (RF) signal strength. While a problem in many buildings, the signal strength issue is particularly troubling in key facilities such as student residence halls. Safety issues related to signal strength in the residence halls was a significant concern. Students literally hanging out of dorm windows in effort to get a strong cell phone signal needed to be addressed. Capacity issues at sporting venues during large concerts or sporting events was a problem. The University community and guests expect their cellular device to operate, without problems, regardless of the size of the crowd. Finally, the University did not want multiple antennas for each carrier peppering the landscape of its historic grounds. These problems led to the University's initiative of deploying a System that:

- was carrier neutral so the University community and the general public could use the wireless carrier of their choosing;
- provided excellent wireless coverage and capacity;
- limited the number of unsightly antenna locations across grounds;
- was cost neutral to the University; and
- allowed for future expansion of the System at no cost to the University.

Design

The first step the University took to meet its goal of enhancing wireless coverage in key facilities was to issue a Request for Proposal (RFP) seeking an experienced firm to assist in the planning, design, deployment, operation, and maintenance of a wireless system (also known as a Distributed Antenna System—DAS) that would connect with multiple wireless carriers.

Through this RFP process, the University selected Longent LLC to act as the University's System Integrator to extend wireless cellular communication services to the interior of University buildings and, where needed, augment signals for outdoor coverage. As System Integrator, Longent was involved in all phases of developing and implementing the wireless system — from providing a project plan and design, identifying buildings needing RF signal remediation, specifying and supplying equipment needed, and providing maintenance and training to participating in negotiations with the wireless carriers.

This latter task led to the second and most crucial step — that of getting the wireless carriers to participate in the system. The goal was to make the System carrier neutral and allow carriers to have access to the System for a fee. The fee charged to the carriers to access the System had to pay all costs associated with deploying the System, including the costs associated with the System Integrator. The primary benefit to carriers is marketing the enhanced coverage to parents and students. Carriers don't want to lose students on their parent's plan due to limited coverage in a residence hall. In addition to providing enhanced signal strength, the System greatly increases capacity of the carriers' existing networks, which is very beneficial at the sporting venues. For example, during football games prior to the System being built, carriers needed to

bring in Cells on Wheels (COWs) to handle the capacity generated by 60,000 fans. With the System built, they no longer need to do this.

We first contacted all the local wireless carriers that might be interested in joining the System. These included AT&T, Alltel, Verizon, T-Mobile, NTELOS, US Cellular, Sprint and Nextel. We sent each carrier a sample agreement and information about the design of the System.

Highlights of the agreement include:

- Carriers are responsible for a portion of the actual cost to deploy the System, up to a maximum of \$1.5 million; this figure is based on an estimated total system cost of \$4.5 million.
- The University reserved the right not to proceed with the project until an agreement was signed with a minimum of three carriers.
- If more than three carriers join the System, refunds are issued to the initial carriers, resulting in all carriers paying an equal amount to access the System.
- Carriers have to provide the necessary equipment necessary to connect to the System.
- The University charges carriers rent for the space needed for the equipment.
- Carriers have to pay for the costs of electricity and cooling for the equipment.
- If the University decides to expand the System to cover additional locations on Grounds, the University may fund such expansion from rent received.
- The carriers can decide to expand the System to cover areas not initially covered, at their cost.
- Upgrades and maintenance of the System equipment is shared among the carriers.

- The University and its System Integrator are responsible for the design, installation, and maintenance of the System.

Implementation

The RFP for a System Integrator was issued in August 2006 and an award was made to Longent in June 2007. We started contacting the wireless carriers in August 2007 while at the same time deploying the system at the two main sporting venues — Scott Stadium and the John Paul Jones Arena. This showed the University's commitment and allowed enhanced coverage immediately after signing a carrier. The goal was to have at least one wireless carrier on contract and operational during the football season. However, due to the length of negotiations and the lead time for the carrier to order equipment, this did not happen. Throughout this phase, though, we continued to engage carriers in discussion on accessing the System and kept them apprised of deployment progress. We reached an agreement with the first carrier (Alltel—subsequently acquired by Verizon) in April 2008. At this point the System was fully operational in the sporting venues. We subsequently reached an agreement with the second carrier, AT&T, in September 2008 and the third carrier, T-Mobile, in April 2009. Once we had three carriers on board the funds were available to finally complete the project. This summer we started deployment of the System throughout the student residence halls. This portion of the deployment is ongoing as of today with a completion date scheduled for December 2009. At that point, the System as initially envisioned will be fully operational with service provided by three wireless carriers. We continue to engage other carriers in the hope that they will also join the System at some point in the future.

Benefits

The goal of deploying a \$4.5 million wireless system in key facilities, at no cost to the University while remaining carrier neutral, was met. In addition, any future expansion of the System will be done at no cost to the University by either 1) the carriers paying for the expansion and/or 2) the University paying for the expansion through funds generated from carrier rental fees. We are currently collecting over \$44,000 each year for rent. Also, any upgrade/replacement of the System's equipment will be shared among the wireless carriers, not by the University.

Other benefits include:

- Improved safety since 911 emergencies can be reported using cell phones.
- \$400,000 yearly savings in telecom costs by removing wireline telephones from residence halls.
- Additional revenue for the University and its athletic department from game day promotion contests involving cell phone texting. Before the System was deployed, this wouldn't have been possible because of the carrier's network capacity issues in the sporting venues.
- Provisions for adding enhanced next level data services ("3G" and "4G") to the System.
- Carriers offering special pricing to students, faculty and staff.
- A minimum number of exterior antennas installed inconspicuously in locations of our choosing.

In summary, the University is meeting its mission of providing quality services for its students, faculty, staff, and guests. It has done so at no cost to the students, parents or the University. This \$4.5 million project was truly no cost.

Retrospect

Even though our goal of deploying a System at no cost to the University was met, there were some anxious moments before signing the three carriers necessary to support the system. Had we been unable to sign three carriers paying \$1.5 million each, the project may not have been completed. Researching the local wireless market and determining the viability of the carriers and their willingness to support the project were important parts of the planning. Knowing the local carriers were interested in enhanced coverage on Grounds provided the confidence that we could “build it and they would come”. Negotiations with the carriers took longer than we anticipated because of the downturn in the economy and mergers. There were times when we doubted continuance of the project without the University having to absorb the cost. Our research showed that signing the first carrier would cause the others to sign-up. Fortunately, this proved to be true. We know in today’s economy that adding new carriers in the short term may not be possible, but we remain confident that other carriers will access the System in the long term.