



US CELLULAR HELPS UNIVERSITY OF WISCONSIN HOSPITAL IMPROVE COMMUNICATIONS AND PATIENT SAFETY

CASE STUDY

THE SITUATION

Several years ago, University of Wisconsin Hospital and Clinics in Madison, Wisconsin faced a problem—doctors and staff were frustrated with poor wireless communications in and around the two million square foot complex. As a Level One trauma center, clear and always available communications between doctors, maintenance staff, patients’ families, and other emergency medical personnel was critical for quality care of patients.

The hospital complex itself was designed with patient safety in mind, a concrete structure with towers between each wing for easy defense against fire. However, this design proved difficult for wireless communications as doctors lost calls as they walked through any door in the hospital complex.

As the same time, US Cellular, one of several wireless carriers in Madison, faced its own problem. On the University of Wisconsin - Madison campus, cellular coverage was weak. The UW campus is located between downtown Madison, to the East, and the Hospital, to the West. While the business case warranted a new cell site, there were no locations available for constructing a new tower, and the University would not permit wireless carriers to locate antennas on any of their properties. In fact, UW Hospital was one of the few landowners in the search area not directly controlled by the University system.



THE SOLUTION

US Cellular won the contract to improve wireless communications throughout UW Hospital and Clinics in what has turned out to be a win-win partnership. The project included the following:

- US Cellular earned permission to install a macro site on top of the UW Hospital complex to improve coverage along the western edge of downtown Madison. In return, US Cellular was responsible for designing, purchasing, installing, and maintaining a system to cover the UW Hospital complex.
- The new macro site provided coverage for the top five floors of the hospital complex. However, the macro site could only penetrate so many feet of concrete, leaving the bottom three floors—including the emergency room, operating rooms, and many public areas—without coverage.
- To cover the bottom three floors of the building, US Cellular installed ADC's Digivance, RF Transport System to redistribute RF signals within the complex. ADC designed and installed a system of 27 remote antennas and Digital Remote Units throughout the bottom three floors of the complex, all linked through Digital Expansion Units (DEU) to the Host Unit with optical fiber cables.
- With the exception of a small amount of cabling within the complex, the entire project was funded by US Cellular.

THE BENEFITS

"Our number one objective for this project was patient safety," said Ruth Fankhauser, Assistant Director of Information Systems at UW Hospital. "Our doctors felt strongly that poor wireless communications within the complex posed a potential threat to patient safety. In addition, we needed to balance availability of wireless communications within the building against possible RF signal interference with hospital electronics and monitoring equipment," she said.

With the macro site covering the top five floors and the Digivance in-building system covering the bottom three floors, cell phones could operate at lower power, reducing the risk of cellular interference with hospital equipment. While testing organizations had recommended to UW Hospital that cell phones should be kept three inches from hospital equipment, the UW Hospital staff imposed a three-foot restriction so people would be more conscious of cell phone use around medical equipment.

US Cellular chose ADC's Digivance RF Transport System for several reasons, according to Ken Drake, Senior RF Engineer, and Al Remondini, RF Design Engineer, both of US Cellular. First, the size of the project demanded an RF transport system that used fiber cables. "Within the building there were so many floors and special areas to cover, including stairwells and hallways, that we needed the longer reach of a fiber system," said Drake. RF transport systems that rely on copper cables have distance limitations that make copper impractical for large projects, he said. The distance limitation of a coax feeder cable was also an issue for the macro site.



Second, design flexibility made Digivance a clear choice for the project, according to Remondini. “Digivance is one of the few indoor systems that does not require a home run to a central location for each digital remote unit and antenna,” said Remondini. Digivance affords design flexibility through use of Digital Expansion Units. Instead of a home run topology, DEUs are installed throughout the complex, each of which serve up to six Digital Remote Units and antennas. ADC designed the UW Hospital in-building system so that each DEU had one open port, allowing easy addition of another antenna or DEU, for multiple antennas. This daisy chain topology works because Digivance—the only all-digital RF transport system on the market today—is able to perfectly replicate the digitized RF signal over each port on each DEU and Digital Remote Unit throughout the system.

This flexibility continues to prove useful for both US Cellular and UW Hospital. “No matter how much you test, you always find coverage issues after turn-up because of the unique construction characteristics of each building. It is a lot easier to add coverage with Digivance, both in terms of cabling and man hours, than with other systems,” said Drake.

On top of the hospital, a three-sector macro site was placed to improve wireless service to the west end of the downtown Madison area. While one sector could be easily located just outside the equipment room, the other two sectors needed to be placed on the other side of the building, approximately 2000 feet away. This distance could not be accommodated with a traditional coax feed, so US Cellular again turned to ADC for its Digivance RF Transport System. The Digivance macro solution can transport RF over a fiber optic cable up to 12 miles without the attenuation issues incurred over coax. This provides even more flexibility in optimizing site location.

Finally, US Cellular found that ADC offered one of the few turnkey solutions on the market. ADC provided design and installation of both fibers and equipment for the Digivance in-building and macro system. “The installation went very smoothly. There were no complaints, which says a lot when you consider that they (ADC) had to work in sensitive areas in a 24x7 environment,” said Remondini.

THE PARTNERSHIP CONTINUES

Since the system went live, US Cellular has added two more Digivance macro systems to accommodate the carrier’s addition of a CDMA network to its existing TDMA and analog network. While Digivance accommodates any modulation standard, US Cellular was unable to combine the systems because of limitations on their antennas.

The expansion of the in-building RF transport system to accommodate new construction for such projects as new surgical wards promise to be easy and cost-effective for US Cellular as a result of the Digivance topology. In addition, UW Hospital has created an in-building rate plan with US Cellular to provide doctors, maintenance personnel, and other staff with a high in-building minutes plan for a small, set monthly fee—a plan that will continue to increase the number of subscribers on the US Cellular wireless system. Even with incremental investment required to cover new areas of the hospital complex, the return on investment remains compelling for US Cellular.

CASE STUDY



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