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Gigabit wireless package handles strain of medical imaging, tough environment

By [John Cox](#), Network World, 03/08/07

In Sioux Falls, S.D., your options for giving remote users access to 500MB files are limited. And they're expensive.

The files are X-ray, MRI and CT images taken usually at Sioux Falls' Avera Cancer Institute, part of Avera McKennan Hospital. But they're studied by referring doctors at other locations in and around the city. File movement and access was made possible by an aging wireless 100Mbps Ethernet connection that was bogging down on ever larger files and increasing unreliable.

The solution, after considering the limitations of carrier options, was to upgrade the existing link to one gigabit, using full-duplex, point to point radios from [BridgeWave Communications](#).

The imaging service is part of a battery of technical, diagnostic and treatment services from Medical X-Ray Center, a private, for-profit radiology group serving South Dakota, Minnesota and Iowa. As imaging gear has improved, the files have gotten a lot bigger, straining the wireless bridge that linked the center's headquarters in Sioux Falls with McKennan Hospital, two miles away, where most of the imaging is actually done. Files can reach 500MB, though 100MB is the average size, says Rod Sevening, IS manager for Medical X-Ray.

The Center also hosts a server and database with treatment plans for radiation patients, and that data is downloaded over the link to be reviewed by doctors, therapists, and technicians programming the radiation equipment.

Typically, remote physicians, therapists and others connect from their outlying facilities over LANs and then T-1 connections to the center's headquarters. The 5.8 GHz wireless bridge then carried them to data and images stored at McKennan Hospital. For its picture archiving system, the center uses the open source Conquest software, which supports a medical imaging standard called Digital Imaging and Communications in Medicine standard. The IS department concluded that any replacement connection had to have at least 700Mbps bandwidth, and it had to meet federal Health Insurance Portability and Accountability Act requirements to protect patient information.

Carrier options, from Qwest, SBN and Midcontinent Communications and several others, were limited, or pricey, or both. At the time, only SBN seemed to be able to deliver gigabit capacity. "If you're leasing from a telco company and paying for gigabit bandwidth over fiber, that's over \$10,000 a month," Sevening says. Another option was leasing multiple lower-speed lines, and load balancing the traffic between them. "But that would have been a very expensive alternative," Sevening says.

There was another wireless option: satellite radio. "But we thought that was kind of overkill, to go to outer space

to reach a mile away,” says Jerry Hendricksen, network computer technician with Medical X-Ray.

Hendricksen researched and evaluated a pack of wireless bridge companies, and narrowed the choice to BridgeWave and one other. Both had radios that could meet the requirements. BridgeWave got the nod in part because of the vendor’s detailed focus on calculating the exact distances between the sites, and the heights at which the radios would be mounted in order to optimize both throughput and reliability.

The connection actually has two wireless legs, each enabled by a different pair of BridgeWave radios. The center’s headquarters links with a water tower 0.8 miles away via two BridgeWave AR60 60GHz radios. The connection is then carried to the hospital campus 1.2 miles away by two AR80 80GHz radios. The spectrum was an important consideration for the center for several reasons.

“The frequency range is outside that used by off-the-shelf [wireless] products that you could buy around town. We wanted that to avoid interference,” Hendricksen says. One band is unlicensed, the other “lightly licensed” meaning that it’s a straightforward process to get FCC clearance. But in both cases, that meant clean, clear spectrum, and less danger of interference. Finally, BridgeWave uses narrow, tightly focused radio beams, which also makes both interference and radio snooping more difficult.

Both links are full-duplex, a big difference from Wi-Fi radios which are half-duplex. “Full-duplex is very important for us, because we have multiple things going on” over the net, Hendricksen says. “With half-duplex, if we’re sending a large image, you have to send a packet, wait for an acknowledgement, then send another packet, wait for another acknowledgement, and so on. You’re taking turns communicating. With full duplex, we can be sending that image, and someone at the other end can be sending something back at the same time.”

One other critical consideration was the climate in which the outdoor radios would have to operate, something that would never occur to indoor wireless LAN users. “We’re in a climate, where temperatures fluctuate from 20 degrees below zero to 120 degrees above outside,” Hendricksen says. “You need equipment that can handle that, as well as rain and snow.” With previous vendors, radios would expand and contract with the wide temperature changes, sometimes causing the seams of the radio’s case to open up to moisture. BridgeWave has, in effect, a double casing, he says, with openings for just electricity and the fiber cable.

The gigabit wireless link was installed in July 2006. All four radios were mounted and aligned, and plugged directly into routers at the center and the hospital, in just one day, by a local wireless solutions vendor, Sioux Falls Two Way Radio Service. Project cost, including the four radios, was \$60,000. Sevening says they pay for themselves in six months. The project has a life expectancy of at least three and possibly five years, although BridgeWave guaranteed the gear for 25 years. By that time, Sevening says, one or more carriers may finally have a competitive data service.

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