Modernizing a Hospital Network with Air-Blown Fiber

Sharp Memorial Hospital upgrades its enterprise network with fiber optic cabling

By Kurt Templeman ■ *Sumitomo Electric Lightwave*

Sharp Healthcare of San Diego is no stranger to innovation. The organization has been listed on Hospitals & Health Networks' 100 Most Wired list for nine years, a feat equaled by only four other health care systems in the US. But Sharp executives know that staying on the list – and being able to take advantage of advanced medical equipment – requires constant attention to the network infrastructure.

Several years ago, Sharp made a commitment to transform one of its seven hospitals, the 50-year-old Sharp Memorial campus, into the most technologically advanced hospital in California. "It's necessary for us to adapt to the current healthcare environment," says Mike Murphy, Sharp HealthCare's president and CEO. "Put simply, 50-year-old hospitals cannot accommodate 21st-century technology." Among the challenges that Sharp Memorial had to confront were an aging national population with increasing health service needs; threats of bioterrorism and public health crises; and new generations of clinical tools, equipment and technology.

To support the technology transformation, Sharp executives decided to install a new campuswide network, based on an advanced fiber optic infrastructure. Henry Garcia, the hospital's project support manager responsible for information system issues, enlisted National Electric Works (www.nationalelectricworks.com), a San Diego-based electrical and telecommunications design and installation firm, to help recommend an approach and design a new infrastructure that would meet the hospital's needs.

Guarding Against Obsolescence

Garcia gave National Electric Works three criteria for the new infrastructure: First, it had to be future-proof, or capable of accommodating upgrades easily and quickly so the hospital could take advantage of new medical technologies and continue expanding its campus. Second, it had to be unobtrusive, and not risk disrupting the hospital's activities and operations. Finally, it needed to be cost effective, with a promise of positive return on investment for any future network upgrade projects.

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National Electric Works evaluated several fiber optic backbone solutions and determined that the FutureFLEX air-blown fiber infrastructure, pioneered by North Carolina-based Sumitomo Electric Lightwave, met Sharp's criteria. In addition, FutureFLEX allowed fiber to be blown into clean rooms and other infection isolation areas without construction. This capability eliminated 90 percent of environmental infection control measures, which ordinarily account for about 40 percent of the cost of hospital fiber optic cabling upgrade projects.

"Unlike conventional fiber optic cabling infrastructures, air-blown systems promote patient safety, which is Sharp Hospital's number one priority," says Clint Morgan, vice president of National Electric Works.

At the same time that it was installing the new fiber optic network, Sharp was also constructing new buildings on its campus, including a center for outpatient imaging and surgery and an additional 315,000-square-foot hospital. To prepare for connecting the new and old buildings, Sharp Memorial constructed a special network control building just to house a state-of-the-art switch room and main network data hub. Direct fiber runs connect this hub with data communication rooms in each building on the Sharp Memorial campus, so that IT managers can reconfigure the network quickly and easily by blowing fiber when and where it is needed.

Planning for the Future

Because medical technology is changing so rapidly, it is difficult to forecast network requirements. But Sharp Memorial wanted to avoid building a

The gateway to Sharp's medical campus in San Diego.

network with too little or too much capacity. With a conventional fiber optic network, the hospital would have had to guess how many fibers to run. Too few fibers could have required later retrenching, which would be costly and disruptive. Running too much fiber would also have been costly – and the excess fiber might have become obsolete before it was ever used.

Instead, following National Electric Works' network design, Sharp installed a highway of compact air-blown fiber tube cable to interconnect the main data frames in all six buildings. Empty 19-cell tube cable (each cable contains 19 small tubes or cells) installed in place of traditional "innerduct" lead from a fiber termination unit in the new data hub to fiber distribution units across the campus. These in turn ultimately lead to the main data communication centers in each building. Nitrogen was used to blow 2-, 6-, 12-, or 18-strand fiber bundles, for a maximum capacity of 342 fibers per tube, through the cable at speeds up to 150 feet per minute. To join the campuswide network between and within the buildings, push-fit couplings connected outdoor tube cable to indoor plenum or riser-rated tube cable.

To accommodate future network changes, tubes through which fiber bundles could later be blown were left vacant. For example, the tube cable leading to the new hospital remained empty until the needs of the facility could be accurately determined. "With air-blown fiber technology, we've been able to eliminate the time-consuming and fallible process of forecasting future fiber requirements," explains Garcia. "If I decide to switch from 62.5/125-µm multimode to single-mode or 10-Gbit Ethernet fiber, depending upon the changing bandwidth needs of the various hospital departments, it's a simple process of blowing in the new fiber bundles and blowing out the old, which typically can be done in a matter of minutes."

Garcia says the air-blown system eliminated at least four or five steps of a labor-intensive process that would otherwise have been necessary. Even though Sharp's conduit and underground duct systems are highly complex, the tube cable was easily installed inside of them. Garcia strongly doubts that it would have been economically or logistically possible to do a point-to-point direct fiber optic cable pull using conventional methods; the pathway would have had at least eight pulling points through challenging transitions

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between cable trays, manholes and direct buried conduit in a tunnel leading to Sharp's central plant, dietary buildings and the new outpatient pavilions. The air-blown fiber solution eliminated those challenges by allowing fiber to be blown rather than pulled. It also eliminated the need to acquire enclosed space permits and meet stringent OSHA regulations.

Because fiber bundles can now be blown in reconfigured through the termination and fiber distribution units, the FutureFLEX tube cables have eliminated the need to ever again re-enter Sharp Memorial's complex conduit system. Nor will Sharp outgrow its conduit space. In a typical 4-inch conduit, two 1.7-inch 19-tube cables provide 38 individual reuseable pathways (the obsolete fiber can be blown out and the tubes reused). Conventional cabling can only provide a maximum of four 1-inch pathways in the same conduit space.

With conventional cabling, the old fiber optic cable in the conduit or duct would have had to be pulled out and new cables pulled in, a time-consuming, disruptive and costly process. "The hospital is fortunate to have found a new and better system," comments Garcia. "One that doesn't disrupt the network, the hospital's physical facility and daily operations, or our infectious control environment."

Fighting Hospital-Borne Infections

Disruption can be annoying in any facility, but in a healthcare facility it can be life-threatening. Hospital personnel can't be asked to clear hallways and move patients for a network upgrade when they are delivering critical and time-sensitive care. Healthcare IT managers view even minor network upgrades as a serious task requiring risk management planning, internal coordination and infection-control measures, in addition to construction permits and approvals from the Office of Statewide Health Planning and **Development (OSHPD).**

"Before the FutureFLEX system, we had to apply for OSHPD permits that could be obtained only by licensed professionals. The infection control and safety officer of the hospital also had to meet with the fiber installation crews for special training," explains Garcia. "We've eliminated those processes, because blowing in the fiber bundles through a termination unit for an upgrade, or rerouting the fiber pathway through a fiber distribution unit requires no construction work."

More important than the permitting process, Garcia says, is the fact that FutureFLEX preserves the hospital's sterile environment. With a conventional cabling infrastructure, the hospital must go to great lengths to protect patients from pathogens that may result in lethal infections. Any debris or dust from removing tiles and flooring, breaking through ceilings and walls or installing ductwork represents a direct threat to immune deficient patients and to areas such as clean rooms, clinical laboratories and intensive care units. Crews must often relocate patients and hospital staff, construct plastic enclosures or noncombustible walls, utilize special HEPA filter units, wear special protective clothing, clean the construction zone daily, and monitor and report on daily compliance with the infection-control plan.

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Because Sharp Memorial was able to eliminate the preparation process normally required for fiber installation, along with the regulatory and special construction permits, it was able to save weeks or months of time and up to 40 percent of overall project costs. Blowing fiber bundles into secure and sanitized areas is as easy as blowing fiber bundles into any other area of the campuswide network. Typically, it takes two installers a few minutes to a couple of hours to complete even the most complex fiber installation upgrades or network changes.

"We now have time to devote to other IT projects for the hospital, which has made our IT department more efficient," explains Garcia. Once the tube cable was installed, Sharp Memorial could expect to upgrade its fiber optic network at one-tenth the time and cost that conventional methods would have required. "As a nonprofit healthcare facility, it's personally satisfying to report to the community that Sharp Memorial is able to provide not only the latest in technology, but that our IT department can also contribute to the sound fiscal operations of the hospital," says Garcia.

Sharp Healthcare has since incorporated FutureFLEX air-blown fiber technology into its Grossmont facility and plans to integrate air-blown fiber further into the centralized data center that links 61 Sharp Healthcare sites. "With our new air-blown fiber network infrastructure, we can evolve simultaneously with the evolution of healthcare," says Garcia. "We're ready for anything that can provide better technology and healthcare to our community." **BBP**

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