Sticking the Quantum Leap

Modernizing older networks poses formidable IT challenges. Fifty year-old Sharp Memorial hospital needed an ultramodern solution to stave off impending obsolescence.

By Kurt Templeman

Ranked in the top 100 "Most Wired" hospital systems in the country for seven consecutive years—an IT technology honor bestowed on just eight other hospitals in the country—Sharp Healthcare of San Diego is on a mission to revamp its Sharp Memorial campus into the most technologically advanced hospital in California, and quite possibly one of the most advanced in the nation.

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Sharp Memorial, which is more than 50 years old, is one of seven hospitals and part of the vast medical service offerings of the Sharp Healthcare system. Confronted with the new era in healthcare, which is marked by an aging national population with increasing health service needs, a possible threat of bioterrorism and potential public health crises, and a new generation of clinical tools, equipment and technology, Sharp executives launched a modernization program intent on bridging the time gap.

"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."

Sharp executives decided to introduce what they considered to be the most technologically advanced fiber optic infrastructure

available, to support a new and expanded campuswide network. IT management, headed by Henry Garcia, the hospital's project support manager responsible for information system issues, set three initial criteria for the evaluation of competing fiber optic cabling infrastructures. Garcia enlisted the expertise of National Electric Works, a San Diego-based electrical and telecommunications design and installation firm, to assist in the recommendation and overall design of a new infrastructure that would meet the set criteria.

Predicting Future Needs

To guard against potentially rapid network obsolescence, the new infrastructure needed to be capable of future proofing Sharp's local area network by accommodating quick and easy network upgrades, moves, adds and changes in order to respond immediately to emerging medical technologies, ongoing campus expansions and the future evolution of healthcare. Sharp's fiber optic backbone had to be continuously unobtrusive and nondisruptive to the daily activities and operations of the hospital. In addition, it needed to be cost effective with a promise of positive return on investment for any future network upgrade projects.
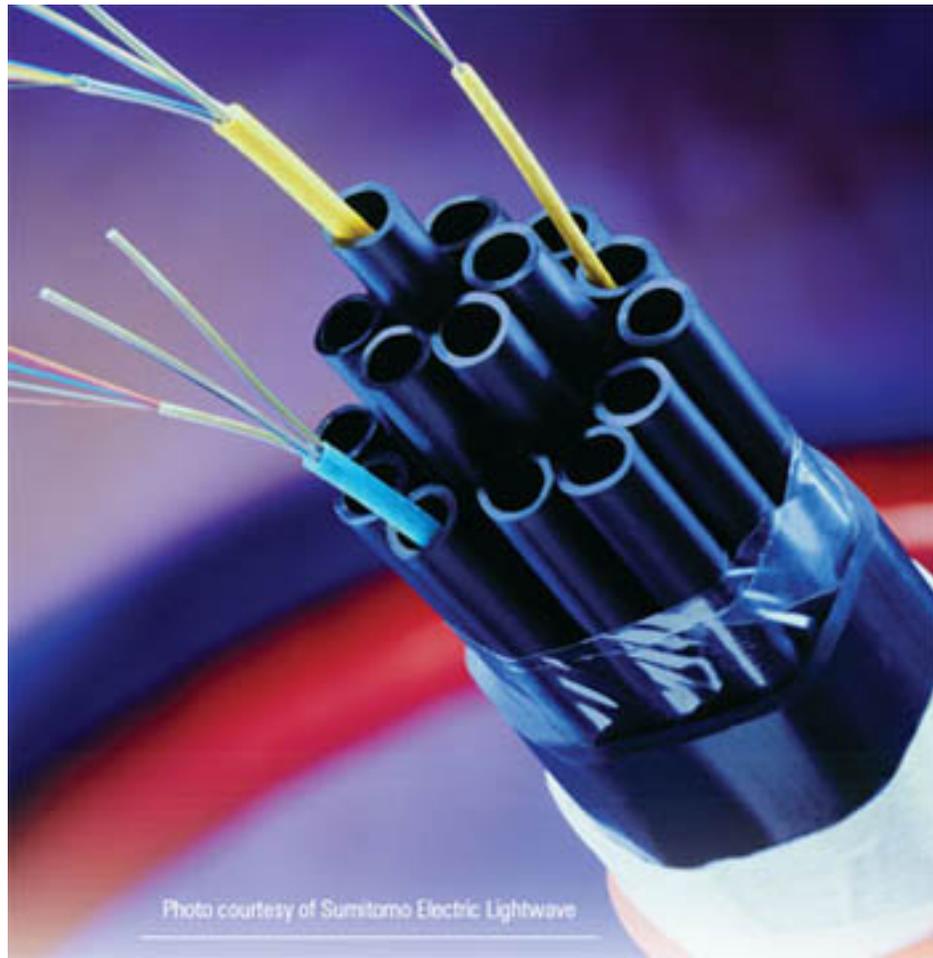
Clint Morgan, a registered communications distribution designer and vice president of National Electric Works, reviewed and evaluated various fiber optic backbone solutions

Photo courtesy of Sumitomo Electric Lightwave

and determined that the FutureFLEX air-blown fiber infrastructure, pioneered by North Carolina-based Sumitomo Electric Lightwave, met all three of Sharp's initial criteria and offered some additional unexpected benefits. With the FutureFLEX system, fiber is blown quickly and easily into clean rooms and other infection isolation areas without the need for construction, thereby eliminating 90 percent of environmental infection control measures, which comprise approximately 40 percent of the cost of a conventional fiber optic cabling upgrade project.

"Unlike conventional fiber optic cabling infrastructures," says Morgan, "Air-blown systems promote patient safety, which is Sharp Hospital's number one priority."

Advanced Modernization
Sharp's multiphased modernization strategy included newly constructed seismic compliant buildings, such as the already completed Outpatient Pavillion that houses, among other services, the new MRI, cancer, endoscopy, wellness and surgical centers.

From 16 slice computerized tomography scanners to digital radiology image storage, each center is complete with the latest in technological advances. On November 10, 2004, the most ambitious endeavor in the modernization plan broke ground—a new hospital, scheduled for completion in 2008. The new 315,000 square-foot, seven-story facility will adjoin the first two floors of the existing hospital for a net expansion of 271,516 square-feet.

To prepare for seamless network connectivity for its current and ongoing expansions, Sharp Memorial constructed a new building between the existing hospital and the recently built Outpatient Pavilion that houses its new state-of-the-art switch room and main network data hub. From this hub, the air-blown fiber system interconnects the multiple data communication rooms of each building on the Sharp Memorial campus with direct fiber runs, enabling IT managers to reconfigure fiber needs quickly and easily by blowing the exact amount of fiber when and where it is needed.

Future-Proofing the Data Hub
Even the best engineers and IT/IS professionals can find it challenging to accurately predict future changes in patient growth, individual medical departmental needs, data traffic and emerging technology in healthcare. Equally difficult was Sharp Memorial's desire to foresee the resultant changes that would ultimately be forced upon their fiber optic infrastructure. If they had chosen to install a conventional fiber optic structured cabling system, too few fibers might have been run, which inevitably could have led to costly retrenching and continuous disruption of hospital activities. Conversely, too much dark fiber could have been laid, resulting in a costly overbuild. Even worse, the hospital could have laid soon-to-be-obsolete fiber types that would fail to support new medical technologies and the bandwidth requirements of a data-rich, progressive healthcare facility.

Instead, Sharp's IT management followed the network design submitted by National Electric Works to install a highway of compact air-blown fiber tube cable on the hospital's campus to interconnect, through continuous fiber blows, the main data frames in all six buildings. From a fiber termination unit located in the new data hub, empty 19-cell tube cable (each cable contains 19 small tubes or cells), installed in place of traditional innerduct, lead to various fiber distribution units within the campus that ultimately lead to and terminate at multiple main data communication centers within 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 19-cell tube cable at speeds up to 150 feet per minute. The point-to-point infrastructure also included the use of 2-, 4- and 7-cell tube cable in some branching locations. To join the campuswide network between and within the various
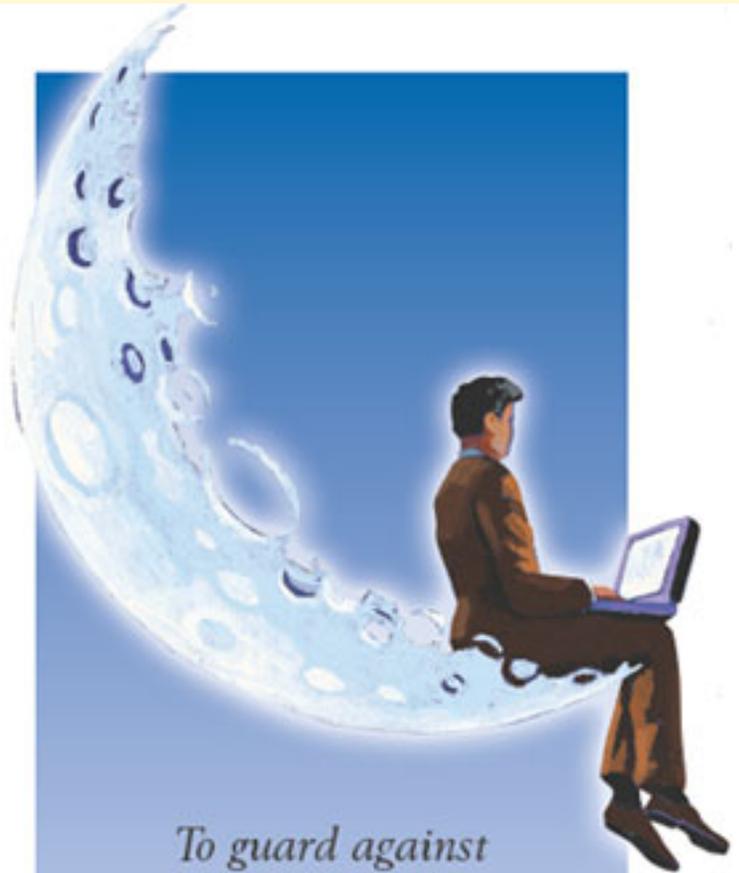
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buildings, push-fit couplings connected outdoor tube cable to indoor plenum or riser-rated tube cable.

To accommodate future network changes, a number of tubes were left vacant through which fiber bundles could later be blown. The tube cable leading to the yet-to-be-constructed new hospital remains empty until the needs of the facility can be fully and accurately determined. Similarly, by utilizing only two of the seven tubes within the cable leading to the MRI and central plant facilities, Sharp Memorial knows with certainty that it has used only one-third of its air-blown fiber system capacity with two-thirds capacity left for future expansion. "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-•m 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."

According to Garcia, choosing the air-blown system also eliminated at least four to five steps of a labor-intensive process that otherwise would have been necessary, had a conventional backbone infrastructure been adopted. Though Sharp's existing conduit and underground duct systems are highly complex, the tube cable was easily installed inside of it. However, Garcia strongly doubts that a point-to-point direct fiber optic cable pull using conventional methods would have been possible, economically or logistically. The existing pathway would have had at least eight pulling points through challenging transitions between cable trays, manholes and direct buried conduit within a tunnel that leads to Sharp's central plant, dietary buildings and the new outpatient pavilions. The air-blown fiber solution eliminated those challenges by "blowing" fiber rather than "pulling" fiber optic cable and further eliminated the need for enclosed space permits and having to meet stringent OSHA regulations.

Room to Grow
Installing FutureFLEX tube cables eliminated the need to ever again re-enter Sharp's complex conduit system, since the fiber bundles

would be blown in and reconfigured through the termination and fiber distribution units for any future network moves, adds and upgrades. Moreover, the air-blown system preserves network capacity, ensuring that Sharp Memorial will not outgrow its conduit space. Within 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.

Had Sharp Memorial chosen conventional cabling, the old fiber optic cable that permanently occupied 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."

Preserving a Sterile Environment
Disruption due to construction and work crews in any facility can be annoying, However, in a hospital or healthcare facility it can be life threatening. Doctors, nurses and other hospital personnel have neither the time nor the inclination to clear hallways and move patients for a network upgrade, particularly when delivering critical and time-sensitive care. Healthcare IT managers view even minor network upgrades involving a conventional cabling infrastructure as a serious task that requires 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).

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Additional FutureFLEX Advantages

The air-blown fiber system eliminates the costly investment of dark fiber installation. Hospitals can blow only the most appropriate optical fiber types, whenever necessary, one project at a time, facilitating pay-as-you-go budgetary benefits. FutureFLEX also enables hospitals to blow out fiber bundles from one area and reuse it in another application or location, providing fiber and bandwidth on demand, and helping the hospital preserve its initial fiber investment. To facilitate optimal network efficiency, FutureFLEX's point-to-point, direct fiber run connectivity reduces attenuation for better transmission and signal integrity, thereby reducing potential network failure. And, since fiber bundles can be blown in and blown out in a matter of minutes without having to enter repeatedly into conduit, as would be required by conventional fiber installations, the system facilitates quicker emergency network restoration.

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 importantly, according to Garcia, FutureFLEX provides a clean installation of fiber and preserves the hospital's sterile environment. During network upgrades and fiber installations of a conventional cabling infrastructure, much effort goes into protecting immunocompromised areas and patients from opportunistic pathogens, such as Aspergillus, or airborne pathogens that may result in lethal infections. Any kind of debris or dust associated with

the construction in hospitals—removal of tiles and flooring, breaking through ceilings and walls, installing ductwork—represents a direct threat to immune deficient patients and to the highly sanitized areas, such as clean rooms, clinical laboratories and intensive care units. To guard against hazards associated with conventional cabling installation, 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.

Sharp Memorial also was able to eliminate the entire preparation process that normally is needed for a conventional fiber installation, along with the regulatory and special construction permits required with a conventional fiber optic infrastructure. Typically, the entire preparatory process for a conventional fiber installation takes weeks or months and can comprise up to 40 percent of the overall project costs. In contrast, 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 typically expect to upgrade its fiber optic network at one-tenth the time and cost associated with conventional methods. "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 with the intent 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."

For more information on **FutureFLEX air-blown fiber systems,** www.rsleads.com/703ht-206

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