

## U.S. Veteran's Administration: *Providing Real-Time Virtual Medicine*



When the Department of Veterans Affairs (VA) Medical Center in Iron Mountain, Michigan lost its pathologist to retirement, it was left with a critical shortage of expertise in Michigan's Upper Peninsula and northeastern Wisconsin. Seven medical facilities comprise the Veterans Integrated Service Network area 12 (VISN 12), and at 220 miles north of Milwaukee, Iron Mountain is the most remote facility, as well as the smallest. Radiology and pathology expertise is required for each VISN clinic, yet attracting this critical expertise to rural Iron Mountain proved to be almost impossible.

The VA needed a way to provide its patient population with access to clinical specialists, as well as ensure high-quality care. Not only did it solve the immediate shortage of clinical staff in Iron Mountain, it has created one of the most exciting advances in healthcare delivery today. VISN 12 implemented a virtual medicine program that relies on the IGX™ 8400 series wide-area switching platform from Cisco Systems, Inc. This five-state virtual medicine network integrates data, voice, video, and diagnostic imaging systems and is one of the largest tertiary care telemedicine networks in the nation. The VISN 12 IGX 8440 network enables real-time telefluoroscopy, teleradiology, and diagnosis, setting a new standard of health care.

### Quality of Care Depends upon Available Expertise

"Quality of care for our patients is the bottom line to all we're doing," says Craig Davis, associate chief information officer for VISN 12. Radiology and pathology are critical to the operation of each VISN medical center. With a large number of radiologists in Chicago, the expertise

is available—it just isn't easily transportable to the medical centers in remote rural areas. From a clinical standpoint, VISN 12 needed to increase access to specialists. At the

same time, the VISN's administrative needs required access to information from all of its sites. Under the direction of Dr. Joan Cummings, VISN 12 Network Director, the office of the CIO, headed by George Welton, was charged with developing a team and implementing a comprehensive wide-area network to support all of the VISN's business needs.

"Our original wide-area network was not optimal for carrying data, voice, and video traffic," says Ken Vander Waal, senior telecommunications specialist, "yet that was essential if we were going to be able to realize our vision for virtual medicine. We had separate

networks for teleradiology, telepathology, and telefluoroscopy applications, but individual nonintegrated circuits are expensive and hard to manage when migrating them to the other VISN hospitals. We needed a network that would enable us to share technology, as well as support a robust administrative infrastructure."

### Highlights at a Glance

Business:	<ul style="list-style-type: none"> <li>Healthcare—U.S. Veteran's Medical Centers</li> </ul>
Challenge:	<ul style="list-style-type: none"> <li>Providing access to medical specialists and ensuring high-quality care for patients in remote clinics.</li> </ul>
Solution:	<ul style="list-style-type: none"> <li>Virtual medicine ATM network based on Cisco IGX 8400 Series wide-area switches</li> </ul>
Benefits:	<ul style="list-style-type: none"> <li>Enabled real-time consultation, diagnostic, and pathology procedures by specialists in major metropolitan hospitals over the ATM network</li> <li>Improved access to in-depth expertise for three million patients</li> <li>Delivered critical, high-quality image transmission</li> </ul>

### Business Efficiency Required Integration

While increasing clinical efficacy was a top priority, the VISN also needed to integrate its business functions for higher efficiency and enhanced buying leverage. The original network structure was costly. The VISN uses approximately 1000 hours—\$70,000—of videoconferencing per month, which is expected to increase 50 percent each year. Its use of the VA's Frame Relay network, cost \$90,000 per month. With demand for bandwidth on the rise, VISN 12 needed a network that could scale *and* reduce costs as much as possible. By integrating laboratory services, human resources, and purchasing functions across a wide-area backbone, the VA could save hundreds of thousands of dollars.

VISN 12 evaluated several technologies, including IP, ISDN, and ATM networks. They chose the Cisco IGX 8400 series wide-area switch as their ATM platform for several key reasons.

“The IGX 8400 protected our investment in Frame Relay, X.25, HDLC, channelized T1, and ISDN technologies and gives us the ability to add new technologies, bandwidth, and sites to our network,” says Davis. At the same time, ATM's quality and class-of-service (CoS) features were also critical for the VISN's clinical applications. Davis notes that a network can be technically feasible, but performance has to be clinically acceptable. For example, if a clinic is treating a patient with a bleeding aneurysm, waiting 25 minutes for the image to be transmitted is clinically unacceptable. The ability to prioritize clinical traffic over administrative traffic when necessary was a key concern, and that's why VISN 12 chose the IGX 8400 series switches with their advanced traffic management and intelligent quality of service capabilities.

Eight IGX 8400 switches are deployed in facilities located in the Chicago area at North Chicago, the VA Chicago Health Care System (VACHCS) Lakeside and West Side Divisions, and Hines, Illinois; Tomah, Milwaukee, and Madison, Wisconsin; and Iron Mountain, Michigan. The four Chicago-area switches are connected via DS-3 connections to an OC-12/STM-4 SONET ring. T1 trunks extend to Milwaukee, Madison, Tomah, and Iron Mountain.

VISN 12 centralized data switching at its North Chicago facility, where a Cisco 7500 series router routes data traffic to the IGX 8400 network backbone. Video switching occurs at the VACHCS - Lakeside campus where several T1 interfaces connect the ISDN-based video unit to the IGX 8400 backbone. A coordinated dialing plan between all VISN 12 video units simplifies usage and eliminated the need to re-train staff. Now, data, voice, and video are integrated over a single wide-area backbone for the eight main hospital sites, and network capabilities will soon be extended to approximately 25 outpatient clinics using Cisco 3800 series multiservice concentrators.

### Real-Time Virtual Medicine

Today via the network, patients at the Iron Mountain facility can be examined by medical experts located in the Milwaukee or Chicago clinics. Robotically controlled microscopes allow pathologists to render diagnoses with the same accuracy they would have if they were actually sitting at the microscope in Iron Mountain. Digital filmless systems transmit X-ray, computer tomography (CT), and ultrasound images over the IGX 8400 network, enabling specialists to capture images and consult in real time. Invasive procedures, such as fluoroscopies, are conducted live—with the patient on the table and the images being sent as they are generated from Iron Mountain to an expert physician in Milwaukee for diagnosis.

“We're performing real-time consultation,” says Davis, “not just sending static images over a network. Using the remote control microscope, a pathologist in Chicago can manipulate tissue sample under the microscope in Iron Mountain and look for basal cell carcinoma in real time. Our turnaround time for pathology reports has been reduced from four days to one day.”

Pathology and telefluoroscopy procedures are conducted live, and the images viewed over the network are live. Using wireless headsets, technicians can talk privately to the doctor during telefluoroscopy procedures and the patient can also talk to the doctor. During these procedures, communications cannot fail and image quality is paramount. With the high-speed network, image transmission has been highly successful.

VISN 12 also conducts primary care consultation over the network. In St. Sault Marie, Michigan, using a telemedicine unit with built-in digital sound and EKG capability, a nurse can put a digital stethoscope on the patient's chest, and the doctor in Milwaukee can hear the heartbeat and simultaneously read the EKG. VISN 12's virtual medicine capabilities eliminate the need for highly paid physicians to reside at rural hospitals where only a handful of specialized exams are performed each month. At the same time, it gives three million patients access to in-depth expertise that would otherwise be available only in large metropolitan hospitals.

Just as importantly, the IGX 8400 network has also enabled VISN 12 to integrate its back-office applications and reduce costs while processing tens of millions of dollars of business orders a year. VISN 12 will also save \$68,000 per month in Frame Relay networking costs, thanks to its IGX 8400 wide-area network. An additional \$132,000 per month in projected savings is expected by eliminating multiple T1 lines and providing "in-house" ISDN services. With high-speed transport in the Chicago area and plenty of bandwidth at every site, VISN 12 is saving enough in video transport alone to pay for the wide-area network.

#### [A Pipe Dream Come True](#)

Iron Mountain's telepathology project has already won a Hammer Award from Vice President Gore for making a significant contribution in support of reinventing government principles. However, VISN 12 is just getting started. Plans include remote patient glucose monitoring where the patient's at-home monitor will automatically download information to a patient database and be available to clinicians via the Web.

All of VISN 12's outpatient clinics will soon be added to the network, and there are plans for VISN 12 to use its SONET bandwidth to provide gigapop points of presence for affiliated universities in the area. With 622-Mbps pipes for sharing data, VISN 12's IGX 8400-based wide-area network is leading a charge to take patient care to the next level.

"Pipe dream seems like an appropriate term for a network," laughs Davis, "and this wide-area network is a pipe dream come true. It's a very, very exciting thing."



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