

ATM Network Opens New Access for Healthcare and Business in Hawaii

Like their counterparts elsewhere in the U.S., healthcare providers in Hawaii are seeking to expand their delivery capabilities and markets through telemedicine services. High-speed, broadband telecommunications exist in the islands, with the U.S. mainland, and with other countries in the Pacific and Asia. Now, the statewide Hawaii Telemedicine Access Network (TAN) is helping to create new opportunities for delivering medical services within Hawaii and in new markets in the Asia/Pacific region. TAN is part of a larger statewide voice and data network -- the Hawaii Telecommunications and Information Resource Center (HTIRC) Network -- that was created to support business development. The HTIRC network is based on Asynchronous Transfer Mode (ATM) technology, with user access provided by ADC Kentrox AAC-3, AAC-2 and AAC-1 Multi-Service Access Concentrators. TAN interconnects rural hospitals, public health facilities, medical centers, clinics and physician offices on the six major Hawaii Islands. This network is significantly improving access to basic and comprehensive healthcare for state residents. It will also facilitate development of advanced medical services and enable export of healthcare services to patients on other Pacific Islands and in Asia.

A Network Built Through Collaboration. The telemedicine network is initially implemented as a pilot project of the High Technology Development Corporation (HTDC), a state economic development agency. The network is supported by a variety of collaborative partnerships with state and federal agencies, local telecommunications and Internet service providers, and higher education institutions. Partners provide resources such as network planning, circuits on existing fiber and satellite networks, network equipment, and other infrastructure components and services. Funding for the costs of network infrastructure and equipment was provided by federal and private foundation grants, state budget allocations, revenues from network users, and in-kind contributions from HTIRC partners.

HTIRC network links encompass a variety of facilities, including existing capacity on a state-operated microwave network for inter-island communications, as well as fiber and private lines contributed by local carriers and other agencies. The objective of the partners which are providing this capacity is to "seed" companies and markets that will expand in the near future.

Access Concentrators Simplify Network Access. The ADC Kentrox ATM Access Concentrators give network managers the ability to integrate voice, video and data traffic from each site for transmission over the ATM backbone. The largest sites use AAC-3 units with single or multiple T1 connections; smaller hospitals, clinics and business sites use AAC-1 units and ISDN or T1 circuits. For sites that need bandwidth higher than the 1.5 Mbps of a single T1 line, network managers use the Inverse Multiplexing over ATM (IMA) feature in the AAC-3 and AAC-2 units to combine multiple T1 circuits into a single, high-bandwidth link. All users connect to a hub site on each island, which accesses the HTIRC network via AAC-3 units and multiple T1/E1 circuits. On the user side, the AAC units connect to data routers, PBXs and video codecs.

"The real value of the telemedicine network gives healthcare providers the ability to connect to any other provider on the network," explains Frank Fukunaga, Acting Executive Director and CEO for HTDC. "They can realize significant cost efficiencies by avoiding the time and effort required to implement these connections themselves on a direct, one-to-one basis." Network administrators at each provider site can dynamically allocate ATM circuit bandwidth for different applications. For example, circuit allocation enables a two-way, live videoconference to receive greater bandwidth for its duration, while less bandwidth is given to lower-priority data traffic such as file transfers.

Network costs are also decreased by the need to purchase only an ATM switch and an access concentrator instead of multiple devices for separate voice, data and video services. In addition, TAN providers need to install only one ATM access circuit to the network, because the AAC integrates all the different traffic types for transmission.

Healthcare providers also realize savings in voice and fax toll charges.

Because inter-island calls are long-distance, hospitals and clinics save money when these calls (voice, fax or data) are sent over the ATM network instead of a public carrier's network.

New Opportunities for Healthcare Delivery. Hawaii TAN will eventually connect more than 100 hospitals, clinics, physician offices, and other healthcare centers across all six major Hawaii Islands. As of mid-1998, 15 hospitals were connected to the TAN network. Applications for TAN include transfer of medical images (x-rays, CT scans, MRI, etc.), consultations with specialists via videoconference, exchange of patient records, and data archiving. The TAN network will also enable innovative applications such as in-home telehealth services, valuable for an aging population. Communications for

health and medical services with providers in other countries will be made via links that connect TAN to the Internet and other international networks.

"In addition to better servicing Hawaii residents, our expectation is that TAN will enable our local hospitals and clinics to expand their services to out-of-state markets, which will help them avoid being acquired by larger mainland companies," says Fukunaga. "The fear is if that happens, primary specialty-care service will come from the U.S. mainland, draining money out from Hawaii."

One of the most unique applications for TAN is a "proof-of-concept" project to securely archive angiogram images at a federal supercomputer center for diagnosis, analysis and research by cardiologists. Images are transmitted over an OC-3 link from the HTIRC network to the computing center. The large storage capacity and supercomputer capabilities provided by the center are essential for this project because of the volume and size of image data. For example, one angiogram file can require up to 1.5 gigabytes of storage, and a hospital can perform more than 500 angiograms per year. If the project proves the validity of networked storage and retrieval for angiograms, the concept could be extended to cover other medical images. The ultimate vision of project managers is to create a commercial archive center in Hawaii that would enhance patient care for state residents and offer a new healthcare service for patients in other countries via international networks.

Supporting Business Growth. The primary mission of the High Technology Development Corporation is to foster economic development through programs such as the implementation of advanced networks and communications services. HTDC has developed a science park and currently operates business "incubators" that support more than 60 technology start-up companies.

The HTIRC network arose from the need to provide lower-cost communications services to HTDC client companies for testing, piloting, and demonstrating information-based products and services. A typical network application for HTDC companies is to transfer large files, such as images downloaded from satellites or the Internet, for distribution to users.

One HTDC business success story is a company that used the network to develop an Internet relational database. "Internet access for developing and localizing information-based products is very efficient and cost-effective," said Fukunaga. "And the Internet overcomes the geographic barriers that would otherwise face businesses that wanted to locate in the islands." HTDC's users benefit from the high-performance (45 Mbps) of the T3 link that connects the HTIRC network to the Internet.

ATM technology was selected because it is an international standard, an important consideration for Hawaii businesses and healthcare providers that want to communicate with and sell products and services to Asia-Pacific customers. "We have some unique assets, like our bilingual, multi-cultural population and our closeness to Asia-Pacific," notes Fukunaga. "We want to help businesses leverage these assets to provide localized products and services throughout our region. We can do this through the advanced ATM technology in the HTIRC network and its links to the Internet and other regional networks."

Also important was the ability of ATM equipment to support multiple speeds and access technologies from ISDN to OC-3. "Protocols such as ISDN aren't always available or affordable in all areas of the state," says Fukunaga. "We wanted a network that could support multiple protocols based on what our users need, then scale to provide additional capacity in the future."

Fukunaga notes an initial concern was the ability for HTDC to reduce the learning curve for engineers to maintain, manage, and enhance the network. ATM makes network servicing and management simpler because engineers need to learn the operation and maintenance of fewer devices at user sites and in the backbone.

HTDC manages the network through partnership with other project participants. "Good service for answering questions and responding to needs is very important for us, being so far from the mainland," says Fukunaga. "Our network requires a very responsive vendor and ADC Kentrox has delivered."

An Expanding Resource. The HTIRC network will continue to grow in the future, for example, by connecting to satellite networks to reach Pacific areas where wired networks links are not feasible. These connections will be used for a variety of communications needs related to health, education and disaster management. Other planned uses for the HTIRC network include advanced research and distance learning with full-motion video.

Hawaii's businesses, healthcare providers and residents all benefit from the flexibility and high performance of the HTIRC and TAN networks. And by extending these communications to international networks, HTDC will not only reduce the geographic barriers but open new markets as well.

