

## **Cubic Video Technologies Inc.**

### **San Diego, California**

**Business:** Digital Video Technologies

**Number of Employees:** 30

From Indiana high schools to U.S. ships sailing through potentially precarious waters, the millennial version of “candid camera” is keeping an eye on many Americans. This is no old-fashioned videotaped or broadcast entertainment, but rather live digital surveillance carried out for very serious security purposes, using cutting edge technologies like the Internet.

It's the product of a small California company, Cubic Video Technologies, Inc., which has a secret weapon in the security war – technology for sending live, high-quality images over data networks, as opposed to conventional broadcast (television) networks. The technology, developed with co-funding from NIST's Advanced Technology Program (ATP), has provided the basis for three commercial systems and is having a substantial national impact:

- Video compression and decompression (codec) technology overcomes the problem of lost or misplaced data.
- Video electronic mail system has sold 70,000 units; surveillance system is used at thousands of public and private sites.
- Customers say digital surveillance saves time and money, averts trouble and improves confidence.

The cutting-edge nature of the technology is evidenced by the imprimatur offered by Genuity, the present-day form of Bolt, Baranek, and Newman – the company that, some 30 years ago, won the government contract to design the network that became the Internet. Now an Internet service company in Burlington, Mass., Genuity chose the Cubic system to watch over the electronic commerce infrastructure it provides for clients such as large banks. Using a laptop computer hooked up to the Internet, “I can sit in a hotel room anywhere and pan, tilt, and zoom in on a location in, say, Tampa, Florida,” says Craig McQuate, director of corporate security and safety.

McQuate and other users can see the images in near real time (the actual delay ranges from a half second to a few seconds, depending on the speed of the network and its connections) because of the unique codec, which condenses the large amounts of data in images, making transmission practical and reconstitutes the image at the receiver. In the past, codec research focused on transmission over switched-circuit and broadcast networks with a time delay, which was used to enhance image quality. Cubic won the ATP award to develop a codec that could operate in real time on networks used by personal computers (PCs). The company had a concept, but needed ATP to see if it could really work.

In the two-year ATP project, which ended in 1997, the company came up with a new concept and wrote and tested algorithms and network-management techniques to implement it. The concept is based on wavelets, a basic research result that promised superior compression capabilities. In an advance that proved critical for security applications, the algorithms were written to withstand common network anomalies, such as “packets” of data (the mode of transmission in the Internet) being lost or misplaced, thereby ensuring that image frames would not be missing or out of order.

Although Cubic's technology is not the only one to use wavelets, the compression algorithm is three times faster than any other, which reduces costs, and the image quality is the best available through software, says Bill Guetz, chief technical officer. The codec also is highly flexible, able to adapt from slow telephone modem speeds to fast fiber-optic cable links. The technology would not have been developed at all without ATP funding, he says.

The first product based on the codec was a Web video streaming software package, later withdrawn from the market when a large software company offered a similar product free of charge. The second product makes it practical to send video clips as email attachments; some 70,000 units have been sold. But the company's emphasis now has turned to the security system, which records, compresses, and transmits live color video from up to 1 video cameras preserver to one or more authorized PCs over a private or public network, while simultaneously allowing playback of recorded video.

Compared to analog videotape, the digital system offers many advantages, Guetz says, including a better image, the option of much longer storage (on a hard drive instead of tape), location and playback of selected sequences in seconds instead of hours, and no need for special hardware. The technology was successfully demonstrated in the New York City subways and is now being sold by about 100 dealers nationally. The system is the best available for users such as school districts with distributed campuses, convenience stores with large numbers of far-flung locations, and utility and telephone companies with unguarded equipment rooms, Guetz says. Parent company Cubic Corp., a longtime defense and transportation fare-systems contractor is exploring military applications of the technology.

For Genuity, the digital system eliminates the hassle of analog video security, which entailed frequent changing of tapes as well as time delays and personnel costs associated with locating and shipping the appropriate tapes when incidents occurred that had to be reviewed by headquarters. Genuity currently uses the Cubic technology at 12 sites nationwide, from New York to Chicago to Palo Alto, California, and that number is growing rapidly, McQuate says. Although the Genuity setup costs more than video security, he says, "The benefits far outweigh the costs."

The cubic technology is used at dozens of K-12 schools in Indiana to monitor student vandalism, fighting, smoking, and other misbehavior in hallways and parking lots, according to system dealer Dave Conley of Conzer Inc. in Carmel. Some of the schools previously had videotaped surveillance, whereas others had no security systems at all. "It's a big jump over video cassette recorder technology in terms of quality of image, ease of access to images, and archiving," Conley says. "It's as much a deterrent as a tool for actually catching students in the act."

Among transportation applications, the Cubic system is used to monitor vessels passing through the Panama Canal. The digital technology is installed at six locations, including one that can be accessed by the Internet so that military and other customers can watch the transit of their ships from remote locations, says Fermín Caballero, a security specialist with the Division de Protección del Canal. "With this kind of service, our select customers are more confident with their high-value assets transiting the canal," he says.

The division still relies primarily on analog video because officials must be able to view any of 50 cameras from any monitor (the cubic system is restricted to 16 cameras per server); the digital technology is used as backup and for rapid deployment in installations lacking capabilities for broadcast-quality analog video. "I like its versatility for small applications," Caballero says. Use of digital video may be expanded in the future, he says, because of the possibility of having mobile security control centers that cost less than full installations at remote sites.