CASE STUDY

Revitalized city has an eye for public safety

Pivot3 High-Definition Storage Helps the City of Long Beach Grow Its Video Surveillance as Valuable Police Tool

Since 1961, the City of Long Beach, California has been undergoing a major revitalization campaign. The Long Beach Redevelopment Agency is leading the effort to transform the historic urban area located some twenty miles south of Los Angeles. Over the course of the past 45 years, the once blighted industrial city has re-emerged as a thriving modern center with new retail and residential developments, a reinvigorated downtown business district, a world-class harbor and numerous tourist attractions.

Such a massive redevelopment effort has many elements, not the least of which is public safety. All the new restaurants, shops and hotels won't attract a single customer if people don't feel safe living and working in the revitalized environment. Recently, the City of Long Beach police department turned to high tech "eyes in the sky" to monitor public access areas and help keep them safe. Video surveillance cameras have been installed in various downtown locations that are popular commerce and entertainment destinations drawing tens of thousands of visitors each day.

Challenge

- Delivering scalable storage capacity at a reasonable cost for a municipal video surveillance system with large input requirements
- Providing the highest reliability for storing and preserving video images in the event it is needed as evidence in criminal cases
- Integrating seamlessly into the Wi4Net FlexiVideo solution that includes components from multiple providers

CelPlan Wireless Global Technologies

Solution

- The Pivot3 High-Definition Storage Cluster, which enables the municipality to store hundreds of terabytes of data on a system with unmatched affordability and high reliability
  - Break-through RAIGE technology provides distributed RAID for always-on availability, scalable performance through workload distribution, parallel throughput for fast data transfers, and simple installation and administration of the RAIGE controller

Results

- The Pivot3 High-Definition Storage Cluster is an integral component to the Wi4Net FlexiVideo system for collecting, managing and preserving video footage
- The affordable, scalable storage system allows the public safety department to save money by only buying the storage capacity it needs, when it is needed

Citywide video surveillance adds virtual patrol officers on the streets

In 2006, the Redevelopment Agency allocated funds to create the infrastructure for the video system. The Wi4Net division of CelPlan Technologies of Reston, Virginia was chosen to implement and maintain the system. Since then, Wi4Net has begun to install the video surveillance system in phases, beginning with Pine Avenue, an historic downtown entertainment, dining and shopping district. Phase II takes the system to the sports arena, convention center, world trade center, and various other facilities and high traffic areas. Phase III will venture into further reaches of the city.

City planners chose Wi4Net as the surveillance solution provider for several reasons. For one, Wi4Net has a unique wireless broadband communications platform called FlexiRadio™ that is perfectly suited to applications such as public safety, video surveillance and Intelligent Transportation Systems (ITS). Second, Wi4Net has a proven solution called FlexiVideo™ that integrates all the hardware, software and communication components necessary to capture, transmit, store and protect video images that can be used to help prevent and solve criminal activity.

Phase I of the project involved installing nine video nodes and 17 cameras in the Pine Avenue entertainment district. A node contains the radios used to transmit live video to a monitoring hub; the power supplies, including battery backup; and local video storage that can store about two weeks worth of video from two cameras.

The cameras capture the video and store it locally on computer hard disks at 30 frames per second. The video also is transmitted at six to eight frames per second to the police department's central monitoring hub via the FlexiRadio communications network. Software from Wi4Net partner Insight Video Net, LLC (IVN) catalogs the video and carefully preserves it for use as indisputable evidence that is admissible in court if the need arises. Ultimately, the video is stored on a highly scalable storage area network from Pivot3, Inc.

"Having the video surveillance system is like having additional patrol officers on the street. From our monitoring hub, we can see what's happening in a public area and direct officers to a hot spot if needed," says Lieutenant Steve Ditmars with the Long Beach Police Department. "The system has been embraced by patrol officers in the area and has been used in several cases."

IVN is the leading provider of surveillance video management software used by municipalities and law enforcement agencies all across the country. IVN's Central Management System™ was developed through consultation with police departments, district attorneys and other members of the judicial system to understand how video needs to be handled in order to become valid evidence in a trial. This is known as the evidence chain of custody, and it cannot be compromised if it is to be effective in prosecuting crimes. "Evidence is irreplaceable," says David Carreon, IVN's Vice President of Sales. "Preserving it and making it available when needed is critical to the clients we serve."

Grow-as-you-go storage is a perfect fit in the FlexiVideo solution

The last element of the surveillance system and a vital link in the evidence chain of custody is the video storage system from Pivot3, a storage company with headquarters in Houston, Texas. Pivot3 brings its unique new high-definition storage architecture for video surveillance to the FlexiVideo solution.

"IVN introduced us to Pivot3," says Jasper Bruinzeel, Vice President of Marketing & Sales with CelPlan Technologies. "Those two companies have very complementary technologies that capture, catalog and store video images. We like how they work together, and as it turns out, the Pivot3 storage system fits perfectly into the total solution Wi4Net is building for Long Beach."

Easily expandable storage is critically important as the City of Long Beach extends its video surveillance network throughout multiple parts of town. Phase II of the project is adding six more nodes and 12 more cameras, and after that, another 15 nodes and 30 cameras are planned for deployment in Phase III. The ultimate goal is citywide security coverage, and the video from all those cameras will need to be effectively managed and stored.

"In the early stages of implementation, when we only had a handful of cameras, we could get by with direct-attached storage servers," says Bruinzeel. "However, this gave us limited storage capacity and no growth path. The Pivot3 storage area network gives us the capacity we need to accommodate the current and future growth of the surveillance network. We estimate we'll need six terabytes of storage space in the near future, but we expect to grow far beyond this and the Pivot3 system will let us grow capacity as we need it, whenever we need it."

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A unique approach to high-definition video storage delivers affordable yet boundless growth

Flexible expandability is a hallmark characteristic of the Pivot3 High-Definition Storage Cluster, built on Pivot3 RAIGE™ technology, and a primary reason why this storage solution was chosen for the Long Beach surveillance system. Compared to traditional video storage systems, Pivot3 has a fundamentally different way to ingest and store vast amounts of video data streams.

RAID (Redundant Array of Independent Disks) data protection has been at the heart of storage systems for more than two decades. The lead engineers at Pivot3 are intimately familiar with the benefits as well as limitations of RAID, as they are among the inventors of the original RAID architecture. Now they have designed a more flexible, highly scalable and fault-tolerant architecture using inexpensive networked nodes. This can reduce infrastructure costs by 50 percent or more, while still providing all the critically important characteristics of RAID. The Pivot3 RAIGE architecture is the result of years of research and development.

The patent-pending RAIGE (RAID Across Independent Gigabit Ethernet) operating system drives a series of inexpensive networked nodes, called Databanks, which are virtually clustered. This creates a high-performance storage cluster where the video data is distributed, protected and accessed in parallel across multiple Databanks connected via common gigabit Ethernet. This unique configuration breaks the limit of physical RAID devices by using a totally virtualized environment.

This virtual architecture allows performance and capacity scaling along with flexible and dynamically changeable data protection levels and volume definitions. There are no hardware limits; Databanks are added linearly when needed to grow capacity to hundreds of terabytes, allowing enterprise scaling with affordable industry-standard drives.

Each Databank adds processing power, cache and network ports contributing to an overall increase in performance and bandwidth. So, contrary to most storage systems whose performance degrades as capacity is added, the performance of a Pivot3 High-Definition Storage Cluster actually improves with the addition of each new Databank.

For the City of Long Beach, the Pivot3 storage system can start small and grow incrementally with ease as more surveillance capacity is brought online through the phased implementations. The city doesn't have to pay for

excess storage capacity that sits idle long before it is needed. Instead, the network administrator can simply plug in another inexpensive self-configuring Databank at any time. What's more, the architecture supports dissimilar Databank nodes, preserving the city's investment in existing technology while making the introduction of newer technology painless.

Another important feature of the RAIGE architecture is the inherent redundancy at every level. Because the video images are distributed and replicated across multiple Databanks, no data is ever lost if a Databank fails. The system dynamically rebuilds itself without missing a beat. This feature provides pure peace of mind for the police department, as it can be assured that the stored video images will always be available if and when needed.

Pivot3's architecture uniquely addresses the high throughput demands of video data. Most storage systems have one "thread" through which to transfer data into and out of the system. This single input/output thread can become a real bottleneck that slows system performance. The High-Definition Storage Cluster has a multi-threaded capability that enables concurrent "reads" and "writes" so there is no bottleneck to hold up the rapid transfer of data to and from the Central Management System software. As a result, writing data to or retrieving data from storage is extremely fast.

Be cost-conscious without compromising capability

"We really like the approach to storage that Pivot3 takes," says CelPlan's Bruinzeel. "We get superior performance and growth potential from a storage area network at an affordable price. Even though we're cost-conscious with the city's money, we aren't compromising a thing to get a great back-end storage solution for all our video."

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"We've built one of the nation's first and largest wireless camera system infrastructures, using the 4.9 GHz spectrum for all of the cameras," remarks Lieutenant Ditmars. "Although our camera and wireless system were designed with expansion in mind, we realized only later the large scaling required from a storage perspective. That's why we chose Pivot3. We now have a storage system that can meet our current and future needs at a lower cost. The system was implemented quickly, and because of its 'pay-as-you-grow' model, it costs us only a fraction of traditional SAN solutions."

As the City of Long Beach enters the final stages of its decades-long revitalization, the city's visitors and inhabitants can feel safe as the video "eyes in the sky" add a strong police presence to the newly remade and vastly popular public areas of the historic Southern California city.

Contact Pivot3:
Pivot3, Inc.
6605 Cypresswood Drive
Spring, TX 77379
www.pivot3.com
Tel: 1.877.5PIVOT3 (574.8683)
Fax: 281.516.6099

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