Pelco Sells! France's Schneider Electric Buys CCTV Giant for $1.5B ... See Page 8

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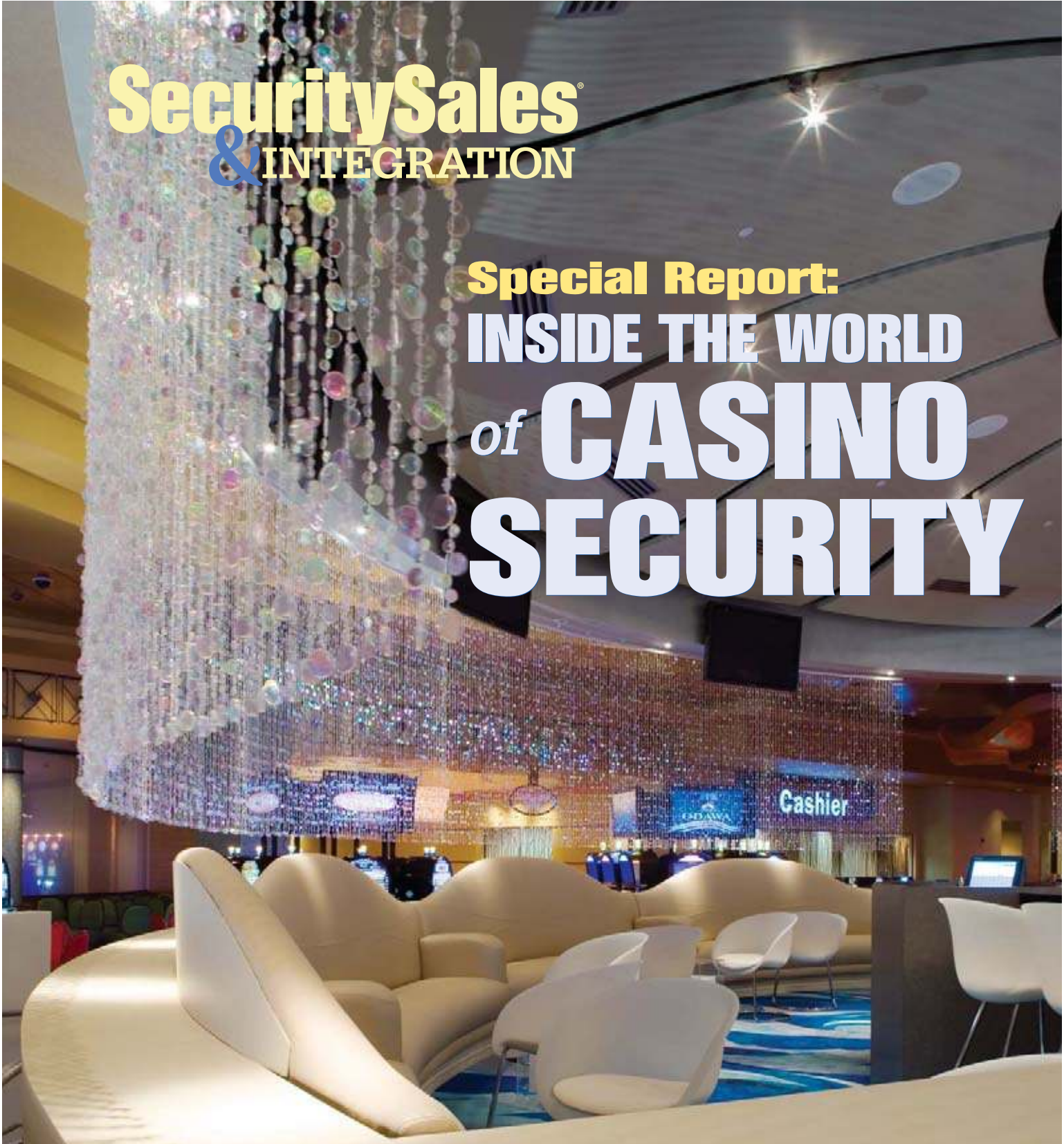


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# CASINO Leaves No

**By Robert D. Grossman**
President
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## CASE STUDY IN BRIEF

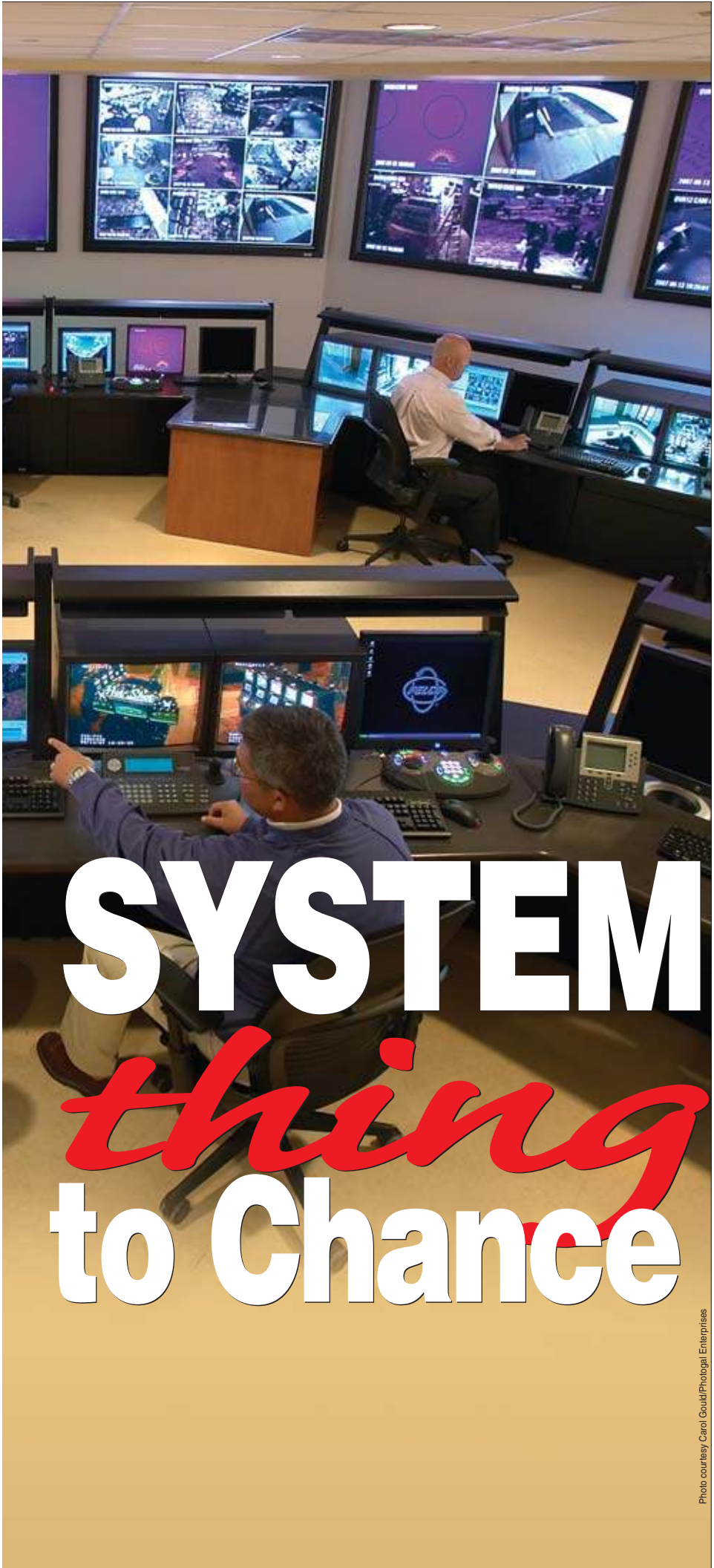
**Subject:** Video security system installation, with integrated access control that also provides for communication between a variety of subsystems, at Odawa Casino Resort in Petoskey, Mich.

**System:** Pelco Endura digital video management system and 9780 matrix switch for 800 cameras; RAID-5 server-based redundancy and off-site data backup; Lenel OnGuard® access control system; full integration between video surveillance and access control

**Installing Companies:** CCTV, American Video and Security of Black Creek, Wis.; access control, SecurAlarm Systems Inc. of Grand Rapids, Mich.

**Years in business:** 4 and 14 years, respectively

**When the Little Traverse Bay Bands of Odawa Indians erected its new gaming facility in northern Michigan, the tribe meticulously planned for a state-of-the-art video system that integrated access control and other security features. Get an insider's look at how the tribe's success was destined from the beginning.**



# SYSTEM *thing* to Chance

Photo courtesy Carol Gould/Photogal Enterprises

***Editor's Note:*** *While we prefer to bring you installation profiles as a passive participant, the Odawa Casino is a unique opportunity to give you an exclusive behind-the-scenes vantage point. The author was intimately involved in planning and executing the sophisticated video solution at the recently opened gaming resort in northern Michigan and is able to provide our readers with a true "insider" perspective. He is describing events that he helped shape, and the only way to do that is by telling the story in the first person.*

Most consultants, integrators and other professionals involved with large-scale security projects tend to develop a sixth sense. We learn to pinpoint problems in the early going and then formulate the necessary adjustments to be successful.

This added sensitivity is important to us, as it occasionally helps us identify those projects that are doomed from the start. Since the survival of your business is often dependent on the success of your projects, it is important to recognize and embrace your "gut instinct."

Far more uncommon is the project that incites a gut feeling from the get-go that success is inevitable. Indeed, it is rare to find a job that has the necessary backing from upper management, openness to new technology, and a well-defined process for project planning, procurement and rapid problem resolution.

The video surveillance installation at Odawa Casino, located near the waters of Lake Michigan in Petoskey, Mich., was such a project. The design included two control rooms and auxiliary monitoring locations, encompassing a new casino, parking structure, special events area and a remote waste water treatment plant. All of it secured with full integration between video, access control and other gaming systems.

While I'd like to say I was pleasantly surprised, all of us involved with this project genuinely knew it would succeed from the start.

### Success Begins With Adoption of 'Qualifications Selection' Process

In large part, the project's expected triumph was due to the tribe's embracement of the Qualifications-Based Selection (QBS) process, according to Kevin Kane, an owner's representative for the Little Traverse Bay Bands of Odawa Indians (LTBB), which operates the gaming resort.

"This is a nationwide program that is based on prequalifying vendors, interviewing where necessary and then negotiating fees," Kane says. "This allowed us to select vendors with a proven track record and the skills needed for us to succeed, while still meeting our cost and budgetary objectives. In fact, the entire project finished not only on time, which is not uncommon for casino projects, but under budget, which is certainly the exception."

Prior to designing the solution, and even before the project got off the ground, the surveillance focus group was tasked with crafting system requirements to a rough order of magnitude and setting the budget. This group — consisting of the tribe's CFO, general manager, regulatory director, surveillance manager, surveillance lead technician and owners' representatives — had a general idea of what they needed the system to perform. They desired a wall of video monitors that would display numerous cameras simultaneously, plus operator stations free of distractions and enough room to work effectively and comfortably.

"We are thankful to be working for a tribe that has vision and wanted to make sure that our part of the puzzle fit into their picture," says Vince Cook, regulatory director for LTBB.

### Tribe Prepares for Gaming Future Informed by Past Experiences

The members of LTBB were no strangers to analog and digital video. Prior to the Odawa Casino project they owned and operated the nearby Victories Casino with its 16 gaming tables and 1,100 slot machines, plus restaurants, a bar and other amenities. The tribe had already upgraded its analog recording solution to a NiceVision Pro 200 Series DVR system. The old facility also had a Pelco matrix switch and more than 300 cameras from various manufacturers, both fixed and pan/tilt/zoom (p/t/z) models.

Photo courtesy R. Grossman and Associates Inc.

**Rochester, N.Y.-based Lenel was selected as the access control manufacturer, in part because of its willingness to support all levels of integration. The system was expected to integrate with the Pelco video system, along with databases such as time and attendance, and hybrid cards with both proximity functionality and printed bar codes to support legacy systems. Above, a technician from integrator SecurAlarm Systems Inc. of Grand Rapids, Mich., works on the Lenel hardware.**

"Our system had grown through evolution," explains LTBB's surveillance manager Tom Gould. "We knew that the new facility would allow us to make a fresh start, both from a technical and an operational perspective, and we were looking forward to applying what we have learned over the years."

One of the things they had learned was they did not want to go it alone; a consultant would be essential to the new project. The new facility — with about 50,000–square feet of gaming floor space — would be much bigger, including 1,500 slots, 30 tables, a special events area, more amenities and considerable room for growth. The camera coverage would also be greatly enhanced, with roughly 800 cameras, more operators and a great deal more technology to manage the operation. As part of the product and vendor selection process, the tribe first needed to find the right consultant to guide them.

"We wanted someone who could look at our needs and expectations and guide us in making choices," explains Kane. One example: the existing system had a video wall, consisting of a bank of monitors, all individually controlled through the matrix switching system. While this allowed for real-time video refresh on each screen, it would not provide much operational flexibility, was expensive to implement (a much larger matrix switch would have been required), and would have consumed substantial space in the room.

The final design included front projection of video images fed through the digital side of the system, thereby reducing cost and adding the ability to dynamically resize images as needed, depending on what transpired in the facility at the time. "The decision to put video quality on the desk rather than on the wall was the right one for our application, but we probably wouldn't have come up with that on our own," Kane says.

### Potential Consultants Solicited by 'Request for Qualifications'

Once the project had received all of the necessary approvals, a "Request for Qualifications" document was sent out to a number of prospective vendors. To save time and maximize participation, the document was sent to consultants, manufacturers and

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System design by Shakopee Mdewakanton Sioux Community (SMSC) Gaming Enterprise and R. Grossman and Associates, Inc.
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Photo courtesy R. Grossman and Associates Inc.

**The Odawa Casino surveillance solution utilizes a Pelco Endura digital video system and 9780 matrix switch. As cameras were brought online, each was titled on the matrix and adjusted for frame rate, resolution and storage time on the digital system. The matrix switch inputs utilize yellow cable; outputs, green. The gray cables are interconnects between the BNC termination panels and the switching cards in the matrix cages.**

integrators. It clearly stated the needed qualifications for each group. As a consulting firm, for example, we had to certify we did not "manufacture, furnish or install such systems and 'our firm does not' have any affiliation with any surveillance equipment manufacturers or surveillance integrators."

Similar restrictions were placed on other trades, while questions were designed to reveal as much as possible without requiring respondents to jump through hoops, as can often be the case (*see side bar on page 80*).

I was impressed with the initial interview, as were many of the other consultants and vendors selected for different areas of the project. The focus was on building a team based on capabilities and experience, not the strength of a PowerPoint™ presentation. Kane instructed me (and other vendors) to keep it short and to the point, and to "leave the marketing folks at home."

### Installation Begins to Take Shape; Integration Capability an Emphasis

Once I was on board, we reviewed the design process to date. In the head-end area, we left raised computer flooring in the rack room and extended it to the adjacent technician's shop. This would allow us to move the technician to another location in the future, if needed, and expand the rack room. We eliminated the raised floor in the surveillance room, and instead opted for two-foot-wide trenches running from the rack room to the operator and supervisor consoles. The Winsted console we selected features an integral cable management system that we used for console wiring, which also offered some cost savings.

Expansion was a critical factor as well. It is not uncommon for casinos to grow and expand far beyond their initial footprint and we wanted to be prepared. The initial system design called for roughly 800 inputs, so we sized the racking and infrastructure to support more than three times that number, or 2,500 cameras.

Our firm calculates HVAC and power requirements as part of the design process, so we provided this in two phases — initial system size and expanded size. It was decided to size the UPS system for the expanded capacity, but only purchase batteries for the first phase. This eliminated the high cost of purchasing more battery capacity than was initially required, since batteries are a consumable.

We also provided two areas for video review outside of the command center. Access to the monitor room was to be extremely restricted, so functions that would normally be done in the room at a supervisor console were moved to remote monitoring consoles. One was located in a common area of the surveillance suite, while the second was placed in a conference room. This allowed both semi-private and private viewing, as access to the surveillance suite is limited as well.

Most casinos divide video monitoring into two areas: the heavily regulated surveillance department tasked with monitoring the gaming floor and any money handling areas (including the passage of money into and out of the facility). The security department monitors all other areas including roadways and parking lots. A second command center was designed for security, but it was considerably different from the surveillance console in that it could accommodate more rack mounted security equipment as needed for future growth.

The two monitoring consoles and third security console served a dual role. If there was ever a system failure or condition that made the surveillance room uninhabitable, the operators could simply move to one of the other consoles to resume their duties.

To accomplish this, we designed the system as a single large system that was partitioned in such a way to limit access based on passwords and job functionality. In this manner, the security operator would not have access to call-up or control a gaming camera, but a surveillance operator, with access to all cameras, could send a gaming camera to a monitor in security. This allows a person with more restrictive system access to view an important image they wouldn't normally be able to see.

On the software side, we focused on integration capabilities. We provided for full integration between access

Photo courtesy Carol Gould/Photogal Enterprises

**In the head-end area, raised computer flooring in the rack room was extended to the adjacent technician's shop. This allows the ability for technicians to move to another location in the future, if needed, and expand the rack room.**

Photo courtesy Leo A. Daly Architects

**The casino offers 1,500 slots, 30 tables, a special events area and other amenities. About 800 cameras provide coverage for 50,000 square feet of gaming floor space.**

control and CCTV (fairly standard in high-end installations), but also provided for communication between a variety of subsystems such as slot data systems, cash registers, casino marketing cards and slot cash voucher systems. Also included was audio recording from a variety of sources and in selected areas as required by tribal and National Indian Gaming Commission (NIGC) regulations.

"Working with a consultant [throughout the design process] really opened our eyes to the different technologies available to us," says Cook. "We had previously focused primarily on coverage and video quality, and there were things like automatic camera call up on alarms that we just hadn't thought of. Adding these features and capabilities has put us light years ahead of where we were before, and our being a part of the design process, from start to finish, has been a huge help."

### Video, Access Control Vendors Ease Expansion, Offer Flexibility

Once the design parameters were fleshed out, it became important to select a manufacturer. Doing so would simplify the bidding process by allowing us to work with a manufacturer to fine-tune the system design, and make it easier to compare bids since all integrators would be bidding the same functionality and essentially the same equipment. LTBB chose to go with a single manufacturer for as much of the CCTV system as possible. This would allow the tribe to focus on integration with other systems without worrying about integration between the various CCTV sub-systems.

After careful consideration of a number of full-line suppliers, Clovis-Calif.-based Pelco was awarded the contract. The tribe's experiences with Pelco equipment had been extremely positive. The decision offered the advantage to reuse some of the Pelco equipment (such as matrix switch cages, keyboards and p/t/z domes) for expansion of the system at Odawa when the Victories Casino closed. Other equipment, including fixed cameras and the NiceVision recording system, was broken up into a series of smaller systems and utilized in other tribal properties where compatibility with the Odawa Casino system would not be a requirement.

The selection of an access control system was given careful consideration as well. That it had to integrate well with the Pelco system was a given, but there were other opportunities for blended operation. Access to other databases such as time and attendance, and even cafeteria meal purchases, were added to the specification wish list, as were hybrid cards with both proximity functionality and printed bar codes to support legacy systems. Ultimately, Rochester, N.Y.-based Lenel was chosen as the access control manufacturer because of its flexibility and willingness to support all levels of integration.

### Integrators Selected on Familiarity With Equipment, Customer Service

Two separate integrators were selected for the project, in part because

Photo courtesy R. Grossman and Associates Inc.

**Unshielded twisted pair (UTP) signals are fed to Nitek active hubs to be converted back into unbalanced signals and transmitted to both the matrix switch and digital video encoders. Each hub provides two individual outputs per camera, allowing the systems to be fed separately (via color-coded cabling) and preventing a problem with one system impacting the other.**

of the timing of the system purchases. First up was the CCTV integrator, American Video and Security (AVS). Based in Black Creek, Wis., AVS focuses on gaming and has done a lot of work with other Native American casinos. The company is very familiar with Pelco systems and had recently finished a gaming project for the Northern Lights Casino in Carter, Wis.

One aspect that impressed LTBB about AVS was its long-term plan for customer satisfaction. As part of its proposal, AVS agreed to hire and train a local technician who would work on the project through the installation and remain on duty at AVS expense for a full year. "We're a small company with big customers, and we feel that going the extra mile on service and support makes us stand out in a competitive bid situation," comments Rick Verbsky, president of AVS.

Access control was to be handled by Grand Rapids, Mich.-based SecurAlarm Systems Inc. Gloria Lubben, executive vice president of SecurAlarm, worked closely with us through the design process and provided many enhancements to the system design based on their past experiences. "We are used to customers who require a great deal of flexibility," Lubben says. "This project allowed us to present a variety of different options and truly customize the system around the specific project requirements."


Photo courtesy Carol Gould/Photogal Enterprises

**A Winsted console was selected for the control room, featuring the ability to mix and match both CRT and LCD monitors. In a gaming environment, CRT monitors provide better tonal balance for critical viewing, while LCDs are used for digital playback. Ultimately, LCDs are expected to be used in all places as quality improves. Video projection on wall screens allows multiscreen playback and live monitoring of digital video images.**

## Point-to-Point System Requires More Cable, But Advantages Rule

One requirement of the system design was the recognition of the fact that expansion was a given. While the headend was appropriately sized for growth, we felt it important to allow for the addition of more field devices without the need to constantly pull more cable. Casinos typically use analog video for live camera call-up to avoid latency, with an integrated encoder/server-based digital recording system for storage and retrieval of events. Since this required point-to-point wiring of cameras (instead of a networked configuration), we designed a UTP-based system utilizing equipment provided by Nitek of Rolling Meadows, Ill.

This was one of a few exceptions to the "one manufacturer" rule, and was largely due to the DIP switch-based distance compensation design used on the Nitek hubs. With DIP switches, a failed hub or module can be quickly swapped out for another one by simply matching up the switches. Units that use potentiometers tend to require more extensive setup and drift over time, while self-calibrating units never stop calibrating and can degrade the image as they compensate for changes in the image that fool

## Odawa Casino Equipment Overview

| Manufacturer | Description |
|---|---|
| **Da-Lite Screen Co.** | Cinema Contour projection screens |
| **Fargo** | Badge printer |
| **GE Security** | Door contacts |
| **HID Global** | Proximity readers |
| **HP** | ProCurve networking products |
| **Lenel** | OnGuard® access control system, including panels, controllers and power supplies |
| **Middle Atlantic** | Vertical racks |
| **Nitek** | UTP video transmission, surge suppression |
| **Panasonic Security Systems** | DLP video projection |
| **Pelco** | 9780 Matrix switch, Endura digital recording, Spectra IV and Spectra mini domes, fixed cameras, fiber-optic modules and power supplies |
| **Samsung** | Large format LCD monitors |
| **Winsted** | Consoles |

them into thinking the cable distance has changed. We also selected hubs with dual outputs, allowing us to route the video signal to both the matrix switch and the digital video encoder without the use of a separate distribution amplifier.

While a point-to-point system requires more cable than a networked system, it has other advantages that, in some applications, make it more cost-effective and flexible. For one, we did not have to worry about the cable distance limits inherent in Internet protocol (IP)-based video systems, and the use of 4-pair Cat-5e cable to each camera location allows three additional cameras to be added per cable (two if the camera is a p/t/z model, which use a pair of wire for data).

Cameras were routed to one of two rack rooms on the casino level or directly back to the rack room, whichever was closer. An extensive patching system based on "66 block" style interconnection terminals and 25-pair Cat-5 cables allows for reconfiguration of cameras in much the same manner a telephone system uses.

Separate power cables were used instead of conductors on the Cat-5e cables to preserve the spare pairs for video expansion and allow the possibility that future cameras might draw more current than the Cat-5e cable could support. While this flies in the face of convention — electronics equipment tends to get more efficient, not less — we had some concerns that future cameras might incorporate features such as higher resolution imagers, internal hard drives and video analytics. Therefore, we wanted to be prepared.

Camera selection is also a challenge in casinos. We were helped somewhat by the fact that Pelco carries essentially two different lines of p/t/z dome cameras. The Spectra IV Se-

## Redundancy Relied on for Fail-Safe Protection

The critical nature of the video surveillance solution at the Odawa Casino in Petoskey, Mich., made safeguards essential. As much redundancy as possible was built into the system. In addition to the items mentioned in the case study article beginning on page 70, such as dual output UTP hubs that feed digital and analog systems separately, there were many areas where redundancy ruled. These include:

**Camera power supplies** — No two adjacent cameras are fed from the same multidrop power supply. This ensures that a power supply failure, however unlikely, will not shut down an entire area, and is a design requirement we adopted for all of our projects based on work we do for the USPS.

**Digital data redundancy** — In addition to the server-based redundancy offered by redundant arrays of independent disks (RAID)-5 hard drive con-

Photo courtesy R. Grossman and Associates Inc.

**Among the many layers of redundancy safeguarding the Odawa Casino surveillance system, no two adjacent cameras are fed from the same multidrop power supply.**

ries is well suited to lower light areas of the casino floor, where the wide dynamic range feature compensates for huge differences in lighting, be it flashing slot machine to shadows around the base of each machine. The wide range of optical magnification (35x) allows cameras to track people throughout the casino and image stabilization is a big help in certain areas as well.

At the other end of the spectrum was the Spectra Mini. These cameras are not much bigger than fixed domes and feature 10x zoom lenses. Our firm had used them successfully in the close quarters of a cruise ship casino and we specified them here in areas with lower ceilings where high magnification and low light response were not a factor. This allowed us to minimize the aesthetic impact of the domes in certain areas without compromising performance.

### Changing Nature of Industry Evidenced During Installation

Throughout the installation process, the challenge of adjusting, moving and modifying cameras to accommodate varying lighting issues and other décor concerns was ongoing. While Dave Lucas of AVS experimented with different positions, angles and lenses, his brother, Jim, handled the software configuration and adjustments to the Pelco Endura digital video system and 9780 matrix switch.

As cameras were brought online, each was titled on the matrix and adjusted for frame rate, resolution and storage time on the digital system. Operators training on the system prior to opening saw the camera count grow and were amazed at how good the video quality was, compared to what had been state-of-the-art just a few years ago. →

figuration, we provided a spare set of Pelco Endura encoders and servers. If a server or encoder fails, the analog matrix switch will automatically switch the cameras to a spare encoder, server and RAID. This also allows for server maintenance without the loss of data.

**Hardware redundancy** — All servers have dual redundant power supplies, and each power supply is fed from a different circuit breaker. A spare CPU is included with the Pelco 9780 matrix switch to take over in case of failure.

**Master evidence server** — All video clips that are pulled out of the overwrite rotation are saved on a master evidence server located in the rack room. A second master evidence server, also featuring RAID-5 redundancy, is located in a separate building and backs up clips stored on the master evidence server every 15 minutes.

**Dual response to alarm events** — Door alarms are handled by the access control panels through the access control server, which is connected to the matrix switch through a high level data interface. A second alarm path is provided through alarm contact closures that are fed through an alarm interface on the matrix. In this manner, if communications ever fail between the access control panels and the central CPU, alarms will still go through.

## Detailed Program Used to Select Vendors for Casino Project

An integral component to selecting vendors for the Odawa Casino project was the submitting of prequalification data in compliance with the nationwide Qualifications-Based Selection (QBS) program.

Some of the questions were generic in nature, while others drilled down into design philosophies and experience with other gaming and Native American projects. Questions included:

- Type of firm (surveillance equipment manufacturer, surveillance consultant or surveillance integrator)
- Background information about your firm and any other partners that would be involved
- Biographical information on the principals of the firm and those individuals with your firm with whom we would be working with directly
- List the gaming licenses currently or previously held by your firm and the reason, if any, of those licenses are not current
- Verify if your firm is a Little Traverse Bay Bands of Odawa Indians (LTBB) licensed contractor or if there is any issue in being a LTBB licensed contractor
- State the level of experience your firm has in working with all tribes and the current and past relationships with any Michigan tribe
- References of tribal organizations that you have provided services; include the contact information for the appropriate individuals
- List the digital surveillance systems your firm has in place, including the size, location and contact information
- Address your firm's approach and schedule by answering how you: develop cutting-edge technologies and virtual matrix systems; integrate existing digital surveillance systems to your digital surveillance systems; offer service and support during installation, startup and over the life of the system
- Other information you feel is pertinent to our selection process

A confidentiality agreement was also required for the Odawa project, and the format to be used in the response was not specified. This allowed LTBB to evaluate the care each prospective vendor took in preparing its answers, proving that no matter how old you get, spelling still counts!



**To be considered for the Odawa Casino project, manufacturers drafted answers to a list of prequalification questions using the Qualifications-Based Selection (QBS) program. While some questions were generic in nature, others probed vendors' design and installation experience and acumen.**

As the casino construction progressed, no tradesman or construction worker could so much as adjust their clothing without the watchful eye of surveillance upon them. While this was supplemented by formal training sessions, the real-time experience gained during construction was a tremendous help in acclimating people to the system.

One unforeseen problem with the cameras speaks to the changing nature of our industry.

At one time, cameras were all synchronized to the 60Hz power line frequency. By utilizing a camera's vertical phasing (or "V-Phase") feature, integrators were able to match up all cameras in the system, eliminating the picture "roll" when switching from camera to camera. In practice, cameras were rarely V-Phased, and customers rarely noticed a roll, but there was no harm in continuing this proud tradition. However, projects that fully utilize online UPS power systems sometimes have slight timing problems and do not deliver precisely 60Hz power. This causes the video images on certain cameras to orbit the screen, moving in a barely noticeable clockwise rotation.

The operators at Odawa noticed it immediately, however, proving that the quality of the tools we were providing for them was well deserved. While we were able to have the UPS calibrated to eliminate the problem, we went to internal sync on all the cameras to prevent this problem from recurring if the UPS ever drifts. Based on our experiences, we will be calling for internal sync on future projects as a precaution and have recommended to manufacturers that they reconsider their default setting.

### Team Approach and a Keen Eye for Problem-Solving Ensure Success

As the casino progressed through construction and a flawless opening, there were the usual number of challenges, but none jumped out as opportunities for "lessons learned." With a decision process in place that allows for rapid, informed decisions, a manufacturer that is ready to jump in and help as needed, and two experienced integrators on the job, this project was a testament to the success of the team approach.

But the final measure of performance is ultimately customer satisfaction. "In this case," explains Kane, "we had a client who had suffered from unfulfilled expectations on previous projects. Through our planning, processes, and attention to detail, we were able to exceed their expectations. We created a showcase and raised the bar for future projects."

I'm sure I speak for the entire team when I say I'm looking forward to the next one. ■

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TECHNICAL & IT MANAGEMENT

# Hybrid SYSTEMS ARE A SAFE BET FOR CASINOS

All photos courtesy R. Grossman and Associates

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## AT A GLANCE

- VHS tape is being replaced by DVRs; while many customers are urged by manufacturers to go 100-percent digital, casino surveillance directors are pushing back
- IP-based camera packages prove to be too slow for most casinos, while analog systems have less latency, giving surveillance operators better control over the casino floor
- The best solution is to mix analog and digital technologies, thus creating a "hybrid" system that provides advantages from both types of systems
- Using a hybrid of two separate systems provides fail-safe redundancies that equal less downtime during equipment failure

**Even though DVRs are replacing VHS tape, there is more to a casino surveillance system than just straight IP-based camera packages. Find out what is the best option for casino security while providing fail-safe redundancies.**

While the odds at table games and chances of winning at a slot machine are frequent topics for debate in the gaming industry, one thing is certain: Casinos around the world, both corporate and Native American, are in the midst of performing the biggest upgrade since one-way glass was replaced with CCTV cameras. That upgrade is the move to digital recording.

At the center of this upgrade lies another debate. While it is clear that VHS tape is going away and DVRs are its replacement, many manufacturers (often without analog product lines) see the industry as a digital-only solution. "Virtual matrix switch" is a frequently used phrase, and their prospective customers are urged to go 100-percent digital.

Casino surveillance directors, however, are pushing back. They like the idea of digital and are buying into all of

the advantages. They are frequently heavily invested in, or are in the process of, converting their recording side to digital, but most are not sold on replacing their analog cameras. This article will explore whether the replacement of analog makes sense, where analog can clearly outshine digital with today's available technology and how "hybrid" systems are frequently the appropriate choice for gaming venues.

### Necessary Building Blocks for Any Video System

In order to better compare the various options, it's important to understand the building blocks of a digital video system — whether it be analog, digital or somewhere in between. This is easier than ever, since the various types of systems have more in common than they have differences. In fact, the basic system architecture is identical regardless of the type of system you select — once you've made the decision to eliminate VHS and incorporate digital recording as part of your system. *(If you're still considering VHS as an alternative, see the sidebar "5 Myths of VHS Debunked" on page 85.)*

**Analog matrix switching systems provide real-time switching and control with very little latency. Applications that do not require time-intensive camera control can utilize the virtual matrix.**

There are five functional areas to any video system. For the purpose of illustration, we'll compare these five areas to Lego® building blocks. You first must acquire a video image, usually with a camera. The image must then be encoded into a digital format and stored on a hard drive. There must be a means to retrieve the video image for playback or live viewing, and finally a means to display, or view, the image on a monitor. These functions are universal regardless of the type of system used; the only difference, believe it or not, is in the packaging.

Systems that incorporate IP-based cameras package the first two Legos in the camera, using it to acquire and encode the image. A server connected to the camera via an Ethernet network provides the storage, while a client computer allows retrieval and viewing of a video image. These systems often incorporate an additional "black box" that can be sent a video stream through a controller and display it on a monitor, completing the picture.

When all of the pieces are assembled, this type of system is a complete recording solution that is also called a "virtual matrix." It is called this because it incorporates the functionality of an analog matrix switch but does not require the cabling or hardware that is usually associated with such systems.

While this type of system generates the most "buzz" on the market, most gaming professionals who have carefully examined such systems agree they are totally inappropriate for gaming. The video switching from camera to camera is slow, often as long as a second or two, while analog systems switch between cameras in a few thousandths of a second. Likewise, the control of cameras is difficult because there is a lag, called latency, between when the operator moves the joystick and when the camera moves. All systems have some latency — it takes time for a signal to get from your joystick to a camera that can be thousands of feet away — but, again, it is much greater with IP-based systems.

**While most casino surveillance directors are not sold on replacing their analog cameras, many are investing in converting their recording methods to digital.**

It is unlikely to find an analog system with more than 40 milliseconds (thousandths of a second) of latency, while the best IP-based system is around 150 milliseconds. This translates to overshooting your target when panning a camera around the casino or across a gaming table, and a surveillance operator is unlikely to be comfortable with that amount of lag time.

This is, for the most part, a casino industry-specific problem. Clients in other industries are perfectly happy with IP-based systems and virtual matrixes. The delay is a function of the processing required to convert digital data into "packets," transport it across an Ethernet network and reassemble it at the other end.

Other side effects can include dropped frames, stuttering image and an inexplicable loss of quality because of network traffic. Virtual matrixes may have the functionality of real analog matrix switches, but they do not currently enjoy the level of performance inherent in their real-world counterparts.

### The Hybrid Solution: Splitting Video Between 2 Systems

Many gaming clients are finding the answer to the performance issues inherent with pure IP-based systems by utilizing a mix of analog and digital technologies, in essence creating a hybrid system. While this essentially involves splitting the video signal between two systems, there are inherent advantages to doing this and few (if any) disadvantages.

First, let's look at the signal flow. We'll still use the same Lego blocks, only now the camera will be a standalone unit that outputs analog video. That signal can be run back to a central point or sent to several "nodes" around a facility, but it will remain analog until it reaches its destination. Before we move to the next link in the signal chain, let's look at the advantages to doing this.

An IP camera with a built-in encoder outputs an Ethernet signal that can only be run 100 meters, or about 340 feet. Distances greater than this require a network switch or other means of regenerating the signal, or a fiber-optic connection. Coupled with the higher cost of IP cameras (they cost more because of the built-in encoder), you are starting out with a tremendous cost disadvantage. There must be closets or junction points throughout a facility, and there is a lot more equipment to break, degrade the signal, or add noise or latency between the camera and the control room.

An analog camera is less expensive, smaller and available in a wider variety of configurations. You can mix and match brands without worrying about software problems, and you can still use inexpensive and ubiquitous Cat-5e cable to connect the camera to the control room. With analog cameras and unshielded twisted-pair (UTP) adaptors, you can run the signal as far as 6,000 feet, or roughly 20 times the distance of an IP camera, without passing it through any additional boxes.

Once the camera reaches its destination, it is fed to both an encoder and an analog matrix switch. While the signal may go to one system and loop out to the second system, an appealing design option, for reasons described a little later, is to split it using a video distribution amplifier. This distribution amplifier can be either a standalone unit or a part of the UTP hub that converts the signal back from twisted pair to coaxial cable.

Each camera now feeds two systems, one for high performance viewing and the other that provides recording and lower performance viewing, due to the latency described earlier. Since the high performance viewing is only required on a small number of monitors, it is relatively inexpensive. Those familiar with analog matrix switches know that inputs are relatively inexpensive, while outputs are costly in terms of price and physical rack space.

A large casino with a half-dozen operators can often get by with a 16-output matrix switch, while the largest casinos may only require 32 outputs — more if some of the fail-safe redundancies that are described in the next section are required. Either way, this less expensive matrix is not significant in overall system cost, and the savings promised by a virtual matrix simply aren't there unless you are talking about eliminating a giant matrix switch used to control banks of monitors in a video wall.

What about those banks of monitors? We've all seen casino control rooms and we know that keeping an eye on a number of areas is critical. Here's where the system truly becomes a hybrid.

That digital virtual matrix system we just finished tearing apart is perfect for

## 5 Myths of VHS Debunked

Here are the top five reasons an end user may want to keep VHS, and the responses you will need to explode these myths.

1 **There are too many incompatible digital standards. VHS is universal.** DVD is the universal digital standard. Get an inexpensive DVD burner or authoring software and burn your video clips to the consumer DVD playback format. They'll look great and will play back on a DVD player that can now be purchased at your local supermarket for under $30.

2 **Digital costs too much.** True, the digital return on investment (ROI) is tough to justify. Timesavings can be a factor and searches that take days on VHS can take seconds on digital. Tape changes are a thing of the past. There are no recurring tape costs — you did replenish your VHS tape stock periodically, didn't you? In addition, there are features available on digital systems (random access, integration with other systems and ease of copying) that simply are not available on VHS. If you're looking strictly at acquisition cost, tape may be cheaper, but sooner or later you'll be forced to go digital. VHS is going away.

3 **Tape is more reliable.** This may have been true at one time, but digital systems have come a long way. RAID-5s (random array of independent drives) are commonplace, preventing data loss and providing a means for swapping out hard drives while the system continues to run. A jammed or overused VHS tape is often unrecoverable, while digital data can often be revived in even the worst scenarios.

4 **Tape looks better.** Again, this may have been true at one time, but not today. While it is true that you can degrade the performance of a digital system to make it look worse than tape — high compression, low resolution, low frame rate — it can also look crystal-clear and is no longer the weakest link in the signal chain. If you have not seen terrific digital image quality, you have not looked at enough systems.

5 **Courts don't accept digital recordings as evidence.** Again, not true. While we're not lawyers, talk to one before reciting this opinion. They'll likely tell you that it is chain of custody that matters when considering evidence, not the type of media. Defense lawyers can argue otherwise, but that is what they are hired to do.

video walls, offices and other areas that do not perform critical, time-intensive camera control or switching. Workstations or decoders can be used to drive projection screens, LCD displays or other video walls, and can do so far more cost effectively than a matrix switch. This design is appropriate for projects other than casinos.

### Hybrid Systems Provide Inherent Fail-Safe Redundancies

The two separate systems also provide several fail-safe redundancies that can make the difference between closing a casino during an equipment failure and keeping the money flowing. First and foremost, they can back each other up. If the analog matrix fails, the virtual matrix will be good enough to get by until things can be repaired.

Likewise, a failure of the digital system, resulting in even downtime for maintenance, will not affect live viewing of images. In fact, one system design incorporates additional matrix outputs that can shunt video signals to a backup encoder/server/storage combination automatically in the event of a server failure. Monitor outputs can also be recorded, ensuring that anything important enough to be viewed live is recorded in two separate places.



**Slowly but surely, casinos are finding digital recording to be more reliable than VHS tapes. Digital systems have come a long way, and digital recording is turning into the new universal standard.**

While these are two separate and distinct systems, they don't have to act that way. Manufacturers such as Honeywell and Pelco offer systems that incorporate keyboards capable of seamlessly controlling both systems, making the analog/digital divide seamless. Other manufacturers offer this functionality as well, and the combination of both technologies is truly greater than the sum of their parts.

### A Balanced System Is the Best Alternative

When looking at all of the advantages of hybrid systems for gaming specific applications, it is difficult to envision why a casino would opt to select a pure IP-based solution. While that technology is perfect for some applications, gaming surveillance has unique performance requirements.

Manufacturers or integrators that push or recommend inappropriate technologies for the gaming market do so at their own peril. And casinos that fall victim to these sales pitches can easily pay a lot more for lower performance. This is a case where the right system design costs less and works better than the alternative — a "win-win" situation on or off the gaming floor. ■

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## How Evolution of Video Has Affected the Gaming Industry

The gaming industry has really gone full circle when it comes to adding cameras. When many of you first started working with CCTV, cameras were very pricey. Some of you go back as far as $1,000 fixed cameras, but many more probably remember $3,000 pan/tilt/zoom (p/t/z) cameras and expensive lenses, mounting hardware and the cost of maintaining the equipment. Coverage was costly, and a good VCR was an investment to be weighed carefully. Each camera required its own VCR — a quad could be used to allow four cameras to be connected to a VCR, but that was a poor second choice for gaming applications that were reserved for back-of-house or other nongaming areas.







**While camera costs remain low, the cost for recording each camera in a digital system has skyrocketed. In gaming applications, the cost to record a camera has grown from less than $300 in the VCR days to more than $3,000 per camera in many cases.**

With the passage of time, costs have come down dramatically. A good midrange p/t/z can be purchased for less than $1,000 — sometimes much less — and while there are different varieties of fixed cameras, there are a lot to choose from starting below $100. During the VHS heyday, recording was relatively inexpensive as well. Add a multiplexer to allow up to 16 nongaming cameras to a VCR, or go with a VCR per camera if you'd like.

Consumer units worked well for many casinos and the cost per VCR dropped below $300, making the hardware cost for a gaming p/t/z camera less than $2,000 in many cases, often including installation (half of what many were paying several years earlier).

Unfortunately, digital has changed that for the worse. While camera costs remain low, the cost for recording each camera has skyrocketed. In gaming applications, the cost to record a camera has grown from less than $300 in the VCR days to more than $3,000 per camera in many cases. While cheaper alternatives exist, casinos that are using encoders, servers, RAIDs (random array of independent disks) and the associated cooling and UPS (uninterrupted power supply) subsystems are paying dearly for the coverage.

Moreover, while hard drive prices continue to decline, customers are not really pocketing the savings. Instead, they are opting for higher resolution — 4CIF in gaming applications — longer storage time and improving system performance.