

# Hybrid

## SYSTEMS ARE A SAFE BET FOR

# CASINOS



All photos courtesy F. 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.**

**W**hile 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

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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 under-



**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.**

stand 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.)*

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



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

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.

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 matrices. 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 matrices 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 de-

scribed 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-out-

put 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.

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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



**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.**

a server failure. Monitor outputs can also be recorded, ensuring that anything important enough to be viewed live is recorded in two separate places.

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 com-

bination 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

**T**he gaming industry has really gone full circle when it

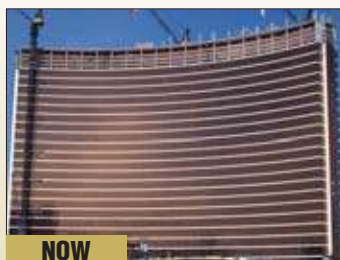
comes to adding cameras. When many of you first started working with CCTV, cameras were very pricey. Some of you go back as far as \$1,000 fixed cameras, but many more probably remember \$3,000 pan/tilt/zoom (p/t/z) cam-

eras 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.

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



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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.