From VCR to IP Surveillance

The more end-users become familiar with DVR technology, the more they realize that DVR represents just one more step in the ongoing digital evolution of CCTV systems. Innovation continues beyond the DVR, and a viable, cost-effective alternative has emerged: IP Surveillance or Networked Video – video transferred over IP infrastructure.

The VCR Era. For quite a while, TLVs (VHS) have been used for recording CCTV images. Digitization in the CCTV arena was first introduced around 1990 when digital cameras (based on CCD sensors) replaced analogue tube cameras. These CCD cameras were partly digital, but they still used analogue connections and recording was still done on analogue VCR tapes.

The DVR Era. This era can be roughly divided in two. In the first half, around 1996, the DVR's recording function was to become digitized (stage 1). This next step into digitization gave the end-user the benefits of no longer having to change tapes; consistent recording quality, and recorded event searches became more efficient. Nevertheless, the DVR still had analogue coaxial inputs and an analogue output for the monitor.

The second half of the DVR Era saw a network connection established for the DVR through digitizing the monitoring station by employing a PC. In the last two years, DVRs increasingly are being delivered equipped complete with a network or modem interface so that the recorded images can be monitored remotely, via monitoring software, using a standard PC (stage 2). Newer, more advanced DVRs can use their IP connection not only to communicate with the PC, but also to communicate with other networked cameras.

The IP Surveillance Era. The last stage to complete CCTV digitization is the link from the cameras to the DVR (stage 3). For many of today's CCTV systems, this is the last bastion of analogue technology: the coax cable. Network cameras and Video Servers have hammered the final nail into the analogue coffin by making the link from the camera to the recorder digitized, using standard computer networks, Internet, or even wireless technologies. Furthermore, digital imaging combined with networking enables a whole new range of system-level functionality and cost-efficiency.

Towards Total Digital Functionality

As we've seen, the DVR is actually a hybrid technology - part digital, part analogue. Going one step further to a totally digital system makes perfect sense since the CCD (via an A/D converter) already generates a digital image, and the recording on the hard drive in the DVR is also digital.

Why perform a digital-to-analogue conversion in the cameras, just to make an analogue-to-digital conversion on the DVR? These multiple conversions slow down performance and increase the cost of the system.

At the most basic level, how do the DVR and IP Surveillance concepts compare?

Let's examine a single video channel:

With a DVR, the processes of digitization and compression occur in the recorder unit. But with IP Surveillance most of the "action" moves to the camera, including "intelligent" functions like motion detection and others that are managed by software. Gradually, this more intelligent solution is creating "smart" cameras. IP Surveillance sacrifices no functionality; it simply moves it from the DVR to the camera. This explains why the network camera is more expensive initially.

Comparing DVR and IP Surveillance concepts

The DVR and IP Surveillance share a number of beneficial features and functions: recording to digital hard disk; no tape maintenance; consistent high image quality; fast, easy image retrieval, access to recorded video over IP networks, etc. However, a more comprehensive comparison of the two technologies reveals how IP Surveillance technology offers a number of significant advantages over a standard DVR:

- **Scalability.** IP Surveillance scales from one to thousands of cameras in increments of a single camera. No 16-channel jumps like in the DVR world. Increase frame rate and storage by adding hard drives and PC servers to the network. Any frame rate for any camera at any time is available.

- **A more cost efficient infrastructure.** Most facilities are already wired with twisted pair infrastructure so no additional wiring, an expensive part of the CCTV installation, is required. Where there is no infrastructure, installation of twisted pair is cheaper than with coax wiring. In addition, wireless networking can be used where cabling is unpractical.

- **Systems integration and network convergence.** IP Surveillance technology provides an open, easily integrated platform. As system integration becomes increasingly critical, ensure that access control, heating and ventilation, process control, and other systems and applications can be effectively integrated. A single network connects and manages the enterprise for data, video, voice, etc., making management more effective and cost efficient.

- **Remote accessibility.** Any video stream, live or recorded, can be accessed and controlled from any location in the world over wired or wireless networks.
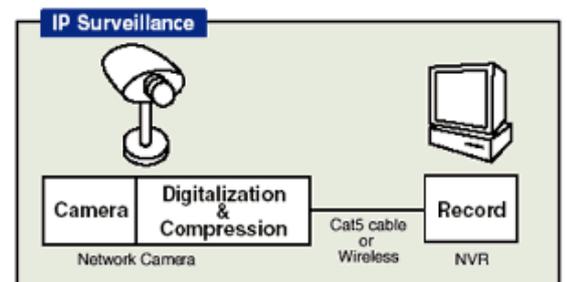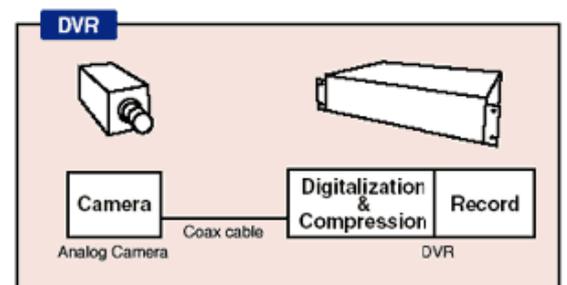
- **Intelligence at camera level.** Motion detection, event handling, sensor input, relay output, time and date, and other built-in capabilities allow the camera to make intelligent decisions on when to send alarms, video and at which frame rate, improving information access and decision-making.

- **Increased reliability.** IP-based data transports enable off-site storage and the ability to use redundant infrastructure, server and storage architecture. By using standard server and network equipment, replacement time if any equipment should go down is considerably less than when using proprietary DVR solutions. Management software provides real-time system operation status and information on preventive measures.

IP Surveillance matures

Just as the progressive evolution of CCTV digitization has yielded improved system performance over time, IP Surveillance promises to continue to deliver a host of attractive, future end user benefits:

- Increased intelligence located at the camera level, such as advanced Video Motion Detection (VMD), license plate recognition, event triggers, object tracking, etc.

- A higher resolution than the limits of the analogue NTSC and PAL formats, up to 0.5 Mpixel. Mega-pixel Network Cameras are already available, and soon they will become multi-megapixel.

- Power via Ethernet – eliminating the need to have power outlets at the camera locations and enabling easier application of uninterrupted power supplies to ensure operation 24 hours a day, 7 days a week.

- Wireless transmission of video using cost-efficient standard technologies such as IEEE 802.11b, and wireless access to any video via PDAs, Tablet PCs, and cellular phones.

- Encryption, watermarking and connection authentication at camera level, offering a considerably more secure solution than with any analogue camera.

Conclusion

In contrast to common opinion, we have seen that the DVR is just a step in the continuing development of the CCTV technology and not an end point solution. Security started with analogue cameras, switchers and tape recorders; today's recording is digital and since the cameras are also turning digital it is natural to go for a complete digital solution with IP Surveillance.

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