



# The History of Video Surveillance

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## 1970s-1980s

Technology-aided surveillance began in the 1970s with closed-circuit television (CCTV) systems that were analog based. These systems were built from cameras, multiplexers, time-lapse video camera recorders (VCR) and monitors. They required a lot of coaxial cable wiring to send and store the video onto video tapes. These analog systems were based on the original TV standards from the mid 1900s that are becoming obsolete in the new century due to HD (High Definition) TV.

To maintain a VCR system, operators had to manually change the tapes on a regular basis as they became full, sometimes several times a day - a labor-intensive routine. In addition, the VCR required frequent service checks and typically had to be replaced every two years. In the event that evidence had to be found in the tapes, a very time-consuming review of rewinding the tapes was required.

Over time, CCTV installations resulted in high operational costs, even though they were made with relatively affordable components. Compared with the systems that evolved later, the cost-effectiveness of traditional CCTV was reduced by this need for frequent manual operation and repetitive replacement of mechanical components. Users often failed to change tapes, to replace worn out ones, or to service the VCR equipment properly so they ended up with poor quality, useless recordings - or none at all.

## 1990s

Due to the problems experienced with the VCR, people began installing digital video recorders (DVRs) as that technology became available. In a DVR, a digital storage media such as a computer hard drive is used for storing the video recordings. The most recent recording overwrites the oldest, allowing uninterrupted and continuous recording. Recordings could be transferred to a tape for archiving if needed.

With digital video recording the storage of surveillance images no longer had quality loss over time (as opposed to traditional videotapes) and manual intervention was greatly reduced, resulting in a lower cost overall.

A DVR is usually a local solution where at least one DVR unit is required per location, although some began to offer some capabilities for remote surveillance.

Axis Communications and IQinVision both came out in the early 1990s with the first network cameras in the market: Axis launched the first network camera ever and IQinVision produced the first megapixel model. Milestone Systems launched the first globally-offered open platform IP video management software that supported these network devices, in the late 1990s.

## Millennium 2000 and beyond:

### Convergence with the Information Technology (IT) industry

By 2003 there were more sophisticated computer-based DVRs on the market that could handle multi-camera inputs (thus eliminating the need for a multiplexer) and provide additional functionality such as alarm handling, scheduled activation of cameras, control of pan/tilt/zoom cameras, activity detection, alarm notification (e.g., through a sound, an e-mail, a mobile phone message) and remote access. Video evidence could be located instantly by specifying a date and time or through an activity search.



Simultaneously, the more flexible software management approach from Milestone provided an open platform where partners and customers could design best-of-breed solutions: Milestone has an independent business model with no single manufacturer alliance. Milestone software supports the widest choice in network cameras, so users could select exactly the right models for individual needs.

This open platform IP video approach represents a 'milestone' in the evolution of the industry: it decouples the hardware from the software, allowing a free choice of both surveillance and IT equipment using standard common off-the-shelf (COTS) hardware offerings that have more competitive pricing.

This is very different from DVRs that are one-stop-shop combined hardware and software 'appliances' limiting customers to the development pace of single vendors. The flexibility with an open platform software solution means replacing only those components necessary and that the entire system does not go down upon an equipment failure. With the IP network approach, archiving and storage are more efficient and compression standards also improved for optimized system use.

With the surveillance controlled through a computer, the installation could also be used in brand new ways. For example, faster retrieval of video evidence meant that more incidents could be alerted, averted, investigated, and resolved or prosecuted. Active notification combined with remote access also meant that guards could be replaced, cut back in number due to the virtual eyes, or freed up to do other security tasks.

### **Dying or 'sunset' technologies replaced by the new**

The phonograph gave way to stereos, followed by CD players and record albums; music tapes gave way to CDs, Walkmans and iPods; land-line phones are replaced by wireless; typewriters by computers; old fashioned cameras by digital – likewise, in the surveillance world analog is becoming obsolete and network camera technology is the new way to go - just like HD TV.

As already experienced in the business world with other technologies like Microsoft Office and Enterprise Resource Planning software or mobile phones, there is no doubt that the influence of IT networks, the web and IP-protocols are continuing to dramatically change surveillance technology.

### **Video Cameras with Network Interfaces**

In the new millennium video cameras with network interfaces (Ethernet) have become widely available from an increasing number of manufacturers, with image quality and camera functionality so sophisticated that you get much more for your money than with analog cameras. Even big traditional analog equipment vendors like Pelco have launched IP camera models – and Milestone was their first choice of software partner for supporting them.

Network cameras are directly attached to a data network, such as a local-area network (LAN) or a wide-area network (WAN). The camera is then directly accessed and viewed from a computer on the network (with no more need to be connected via the traditional coax cable). Network video servers – increasingly now called video encoders - convert traditional analog video camera output to digital data for connecting to the network. This allows easier migration from existing analog or basic DVR systems to network-based digital solutions, preserving previous security investments.

The IP network technology allows individual cameras to be viewed and managed using software like Milestone XProtect installed on a standard computer, even though the operators may be located far away.

In 2004 Axis released the first network camera with Power Over Ethernet (POE) that significantly improved ease of hardware installations and the flexibility to add, move or change cameras on the network at any time.

By 2006 more megapixel cameras were being offered in the market, as well. As these only work in IP network installations, their popularity for extremely clear images and powerful range have increased demand for IP video management software.



## **Network-based video systems**

Computer software for network video surveillance management has also become more widely offered in the industry from not just pure software developers like Milestone, but also from some of the network camera manufacturers (although these are only for use with their own hardware and for limited numbers of cameras). This software, along with network camera technology or traditional analog cameras connected through video encoders, provides fully network-based surveillance that efficiently reuses IT equipment, infrastructures and resources for easy system operation and maintenance.

The benefits of IP solutions are many. Beyond all the advantages of the computer-based DVR, the need for coax cables is eliminated, and CAT-5 network cabling or wireless networking technology is used (especially for sites with widespread, outdoor physical requirements). CAT-5 and fiber network cabling is much less expensive to install and multiple cameras can share the same cable. At most sites this cabling is already in place for networking purposes, like large universities or corporate campuses. The result is a very flexible and affordable surveillance implementation.

Since standard components from the IT industry are being used, a good price/performance ratio is achieved. Components can be upgraded regularly to stay on top of new innovations, or replaced individually as planned maintenance that increases uptime. If the system performance needs to be increased (to handle higher image frame rates, for example, or to manage more cameras), customers can simply replace the server with a newer, more powerful one and reuse the old one for other purposes.

Today, the possibilities are limitless for the scalability and performance of a network-based surveillance system. Video management software like Milestone XProtect that could only handle one camera's input in its first generation during the late 1990s today can handle thousands of cameras from multiple sites.

## **Endless integrations with other systems and devices**

Another illustration of increased efficiency is seen in the Milestone XProtect Analytics framework where a single user interface aggregates multiple analytics tools from different vendors into one easy-to-manage solution. This gives a future-proof framework for implementing and managing different video analytics applications that addresses some of the key industry issues such as the end user's need to easily correlate alerts between various analytics tools. Using Milestone, they can rapidly search across alerts and events to quickly find relevant video evidence about security incidents from multiple sources.

Open platform IP video management software also provides the capability for integration with other security or business systems like access control, Point-of-Sale retail transaction systems, ATMs at banks, Heating/Ventilation/Air Conditioning (HVAC) systems, lighting, alarms, patient care, employee databases, product data, shipping and logistics information, and much more. Some hallmarks of true open platform software include published documentation of a Software Development Kit (SDK) for third parties to integrate such systems using common external Application Programming Interfaces (APIs), training in the use of an SDK, and project consulting expertise to help companies who do not have in-house expertise to do integrations – all offered by Milestone.

Such integrations are raising the market to new levels of performance and evolving surveillance beyond the scope of security alone to actually 'video enable' business across a multitude of industries. Partners and customers are able to future-proof their surveillance investments and keep up with the speed of innovation for better response to the increasing challenges of security and business in today's complex world.