WHITE PAPER

The easy path to network video

Video encoders bring immediate benefits of IP-Surveillance

AXIS COMMUNICATIONS

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1. The easy path to network video

The introduction of network video has revolutionized video surveillance in many ways. IP-based video surveillance systems bring many important benefits, such as vastly improved image quality, better scalability, event management, intelligent video and – in many cases – lower cost of ownership. Nevertheless, it is too early to claim that this development has rendered all analog CCTV surveillance systems obsolete and useless.

The technology shift does not force security managers to immediately choose between either an IP-Surveillance system or an analog video surveillance system. It is in fact possible to combine the two, thereby not only making it possible to maintain existing investments, but also reap many advantages of IP-based technology and create a future-proof platform. The solution is video encoders.

1.1 Technology shift

Video encoders, sometimes referred to as video servers, contain a compression chip and an operating system so that incoming analog video can be converted into digital video, transmitted and recorded over the computer network for easier accessibility and viewing. However, to ensure all the benefits of IP the demands on video encoders are – or should be – very high. If chosen with care, a video encoder can allow a system with analog CCTV cameras to provide many of the features and functionalities otherwise reserved for IP-based systems.

The industrial rationale for video encoders is strong. Approximately 95 percent of the estimated 40 million surveillance cameras installed in the world are analog. Considering that the average lifetime of an analog surveillance camera is five to seven years, many of them will serve for quite a while yet. But more important to some operators is the investment they have put in coaxial cable installations. In buildings with no Ethernet infrastructure, adding a modern network can be an investment that the user wants to avoid – or at least postpone.

Figure 1. *A network video solution at hand: the AXIS Q7401 Video Encoder*

Video encoders are a key component in the market conversion from analog to network video surveillance systems. The market saw a similar, albeit more limited, technology shift when the digital video recorder (DVR) replaced the video cassette recorder (VCR). With DVRs, the need to change tapes was removed, image quality became more consistent, and finding exact video sequences in stored material became less laborious.

The scope and functionalities of DVRs have evolved over the years. Nonetheless, they have never been able to deliver more than a handful of the benefits that can be provided by full-fledged network video systems. With DVRs, video is still stored on proprietary equipment, which makes integration with the fast-growing market of software applications for network and video management a challenge. DVRs also offer limited scalability.

1.2 Gaining advanced and important functionalities

A video encoder converts and compresses analog video signals into a video stream that is identical to that coming from a network camera, enabling it to be fully integrated into a network video system. This enables users to view live images on any local or remote computer on a network. A video encoder can also provide a multitude of advanced functionalities, such as distributed video motion detection, tampering alarm, event management, and integrated audio support. Furthermore, it provides a foundation for more intelligent video functionalities such as number plate recognition and people counting, etc.

Many video encoders offer pan/tilt/zoom (PTZ) control that allows analog PTZ cameras to be controlled over the network using a computer mouse or joystick. And if the video encoder supports Power over Ethernet (PoE), it may be possible for both the encoder and the analog camera that is connected to it to receive power through the same cable used for data transmission. This can provide substantial savings because power cables can be excluded from an installation.

Figure 2. *Analog camera with a one-channel video encoder in a camera housing.*

In terms of image quality, some video encoders provide image fine-tuning, as well as aspect ratio correction that ensures that images do not appear distorted when viewed on a PC screen. High-performance video encoders provide full frame rate (30 fps in NTSC, 25 fps in PAL) in all resolutions for all video channels. Furthermore, unlike their analog counterparts, digital images retain their quality regardless of the distance travelled.

The most common video encoder is a standalone version with single or multi-channel connections to analog cameras. Standalone video encoders are best positioned close to the analog cameras. They are typically used in situations where there are a few analog cameras located in a remote facility, or where the setup is some distance from the central monitoring room.

For larger centralized systems, high-density rack solutions with blade versions of the encoders are usually preferred. The blades can support one, four or six channels. Racks can be outfitted with a mix of video encoder blades and can accommodate from one up to 84 analog channels, providing a flexible and expandable solution for migrating large-scale analog installations to network video. With hot swapping, there is no need to power down the entire system when installing or removing the video encoder blades.

1.3 Scalable and flexible

The introduction of video encoders improves scalability and flexibility. In an IP system it is very straightforward to add new cameras and move them around in. This makes installation easier and facilitates an expansion of the system. Since recording and management is based on standardized computer hardware, the operator has a multitude of vendors and providers to pick from whenever more storage is needed or if other parts of the infrastructure must be upgraded.

Unlike analog CCTV/DVR systems, network video surveillance is built on open and interoperable standards; video encoders use universally accepted compression standards such as Motion JPEG, MPEG-4 or H.264, enabling great savings in bandwidth and storage. Using standards also means that operators avoid the risk of being stuck with a proprietary technique. It also allows for integration with other systems, for instance IP-based building management systems or industrial and logistical solutions. The possibility to combine and integrate different systems gives great leverage to a surveillance investment based on network video.

Figure 3. *A video encoder rack can support up to 84 analog channels.*

1.4 Creating a future-proof system

Video encoders offer a valuable solution to the challenge of migrating analog CCTV video to IP-Surveillance. This is particularly true when it comes to enterprise installations where there may be a great number of analog cameras that represents a large investment that must be protected. By using video encoders in an analog video surveillance system, a security manager can obtain many useful features of a network video system while still maintaining the earlier analog investments.

Furthermore, it creates a more future-proof video surveillance system that allows users to add network cameras and experience all the benefits of a network video system, including high-resolution video with progressive scan, megapixel and HDTV image quality.

2. A closer look: the evolution of video surveillance systems

2.1 VCR-based analog CCTV systems

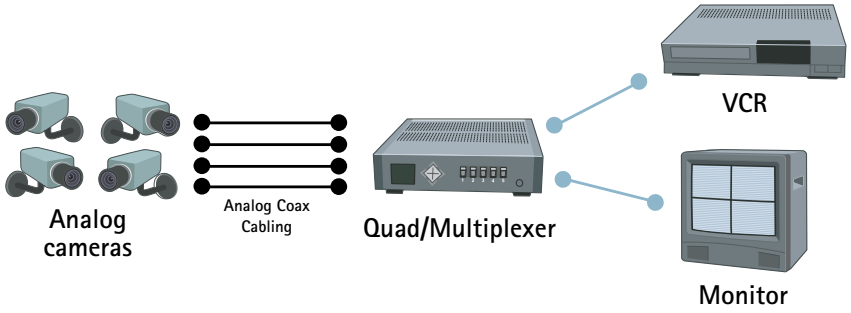

Figure 4 *Diagram showing a classical analog video surveillance system.*

2.2 DVR-based analog CCTV system

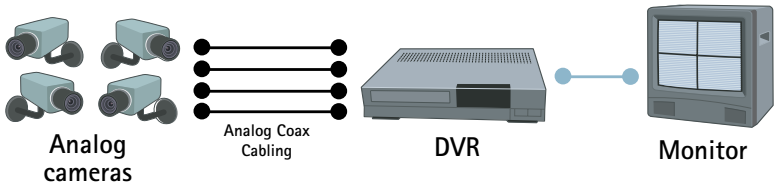

Figure 5 *A surveillance system with analog cameras that are connected to a DVR, which includes the quad or multiplexer functionality and provides digital recording.*

The introduction of the DVR system provided the following major advantages:

> No tapes and tape changes
> Consistent recording quality
> Ability to quickly search through recorded video

2.3 Network DVR-based analog CCTV systems

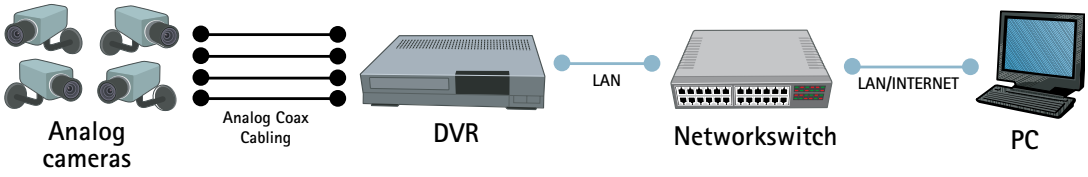

Figure 6 *This is a system that shows how analog cameras can be networked using a network DVR for remote monitoring of live and recorded video.*

The network DVR system provides the following advantages:

> Remote monitoring of video via a PC
> Remote operation of the system

2.4 Video encoder-based network video systems

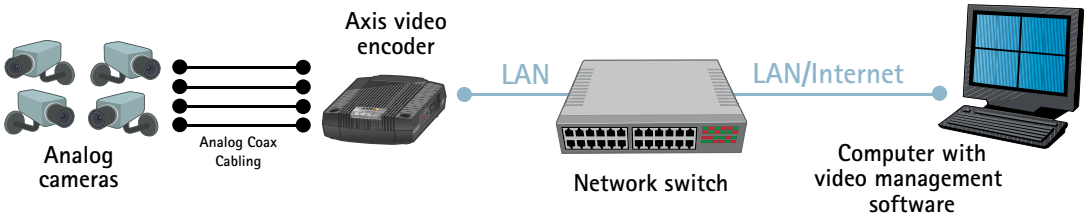

Figure 7 *This diagram shows a true network video system, where video is continuously transported over an IP network. It uses a video encoder as the cornerstone to migrate the analog security system into an open IP-based video solution.*

A video encoder-based network video system has the following advantages:

> Use of standard network and PC server hardware for video recording and management
> The system is scalable in steps of one camera at a time
> Possibility to record off-site
> Possibilities for distributed intelligence
> Easier to integrate with other systems such as Point of Sales and building management
> Ability to use Power over Ethernet
> Future-proof since the system can be easily expanded by incorporating network cameras

2.5 Network camera-based network video systems

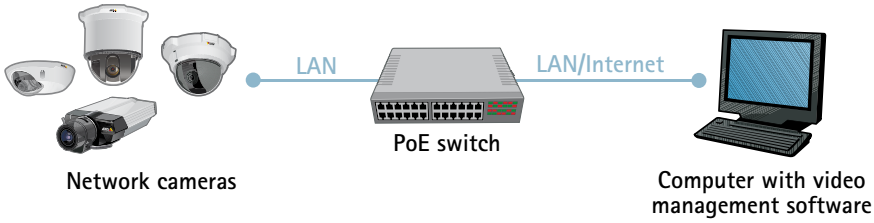

Figure 8 *This diagram shows a true network video system where video from network cameras are continuously transported over an IP network. This system takes full advantage of digital technology, and provides consistent image quality from the cameras to the viewer at whatever location.*

A network camera-based network video system provides the following advantages:

> Ability to use high resolution (megapixel) cameras
> Consistent image quality, regardless of distance
> Ability to use Power over Ethernet and wireless functionality
> Full access to functionalities such as pan/tilt/zoom, audio and digital inputs and outputs over IP, together with video
> Camera settings and system adjustments over IP
> Full flexibility and scalability

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About Axis Communications

Axis is an IT company offering network video solutions for professional installations. The company is the global market leader in network video, driving the ongoing shift from analog to digital video surveillance. Axis products and solutions focus on security surveillance and remote monitoring, and are based on innovative, open technology platforms.

Axis is a Swedish-based company, operating worldwide with offices in more than 20 countries and cooperating with partners in more than 70 countries. Founded in 1984, Axis is listed on the NASDAQ OMX Stockholm under the ticker AXIS. For more information about Axis, please visit our website at www.axis.com.

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