

## **Video encoders -**

brings the benefits of IP surveillance to analog systems



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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 and 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

A video encoder is the bridge between an analog CCTV system and a network video system, thereby prolonging the operability of legacy systems. Simply put, encoders contain a compression chip and an operating system that converts incoming analog video into digital video. The digitized signal can then be transmitted and recorded over the network for easier accessibility and viewing. Furthermore, encoders provide analog CCTV camera systems with many features and functionalities otherwise only associated with IP-based systems, such as tampering alarm and audio detection.

The industrial rationale for video encoders is strong. There are an estimated 100 million or more analog surveillance cameras installed in the world today (2013). Considering that the average lifetime of many of these cameras is approximately six to eight 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 without network 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. If the video encoder supports Power over Ethernet (PoE), it can receive power through the same cable used for data transmission, providing substantial savings by the exclusion of power cables.



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

In terms of image quality, 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 often positioned close to the analog cameras and typically used in situations where a few analog cameras are located in a remote facility, or where the setup is at some distance from the central monitoring room.

For larger, centralized systems, high-density racks with encoder blades offer the most flexible solutions. The blades typically support four or six channels. Video encoder chassis can be fitted with a mix of video encoder blades and can accommodate 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 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 chassis can support up to 84 analog channels.

#### 1.4 Creating a future-proof system

Video encoders are a highly valuable solution when 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 functioning analog cameras. By using video encoders in an analog video surveillance system, a security manager can obtain the useful features of a network video system while maintaining the earlier analog investments.

The possibility of edge storage brings yet another advantage. Edge storage allows network video products, such as encoders, to store recordings locally on an SD (Secure Digital) memory card, or similar. This can be used as a complement to central storage or as a backup when the central system is not available. The system even allows missing video clips during network disruptions or central system maintenance to later be retrieved from the camera/encoder and merged with the central storage, ensuring uninterrupted and complete video recordings.

Furthermore, video encoders create a more future-proof video surveillance system that allows users to also 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

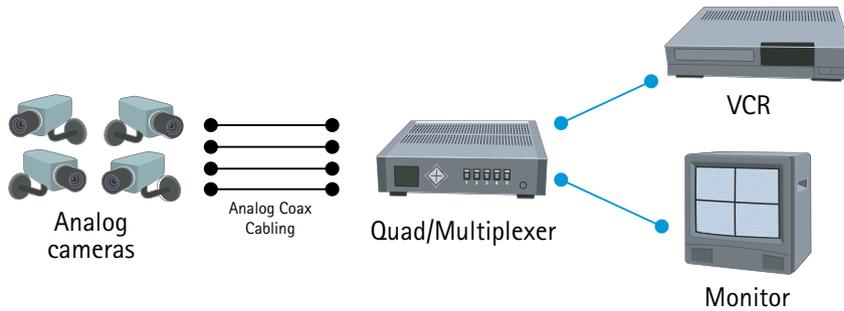


Figure 4. Diagram showing a classical analog video surveillance system.

### 2.2 DVR-based analog CCTV system

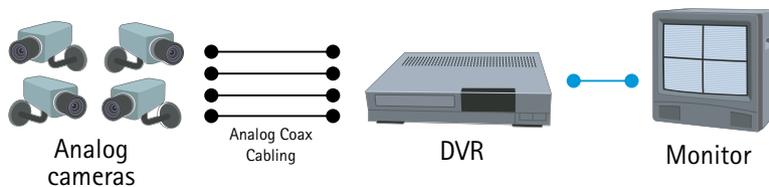


Figure 5. A surveillance system with analog cameras that are connected to a DVR, which includes the quad or multiplexer functionality and provides digital recording.

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

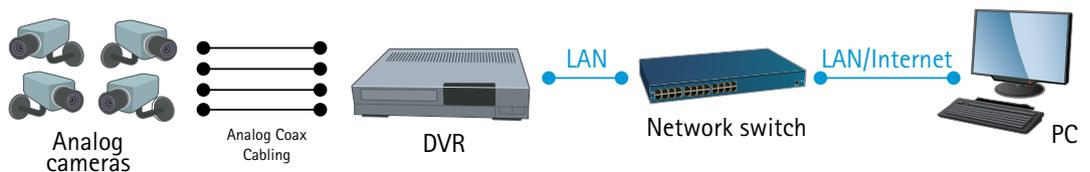
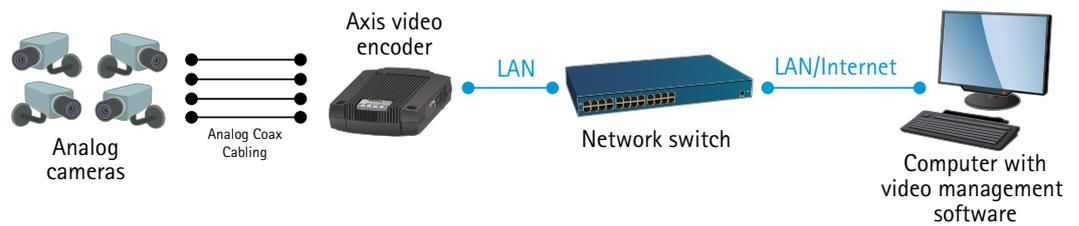


Figure 6. This is a system that shows how analog cameras can be networked using a network DVR for remote monitoring of live and recorded video.

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

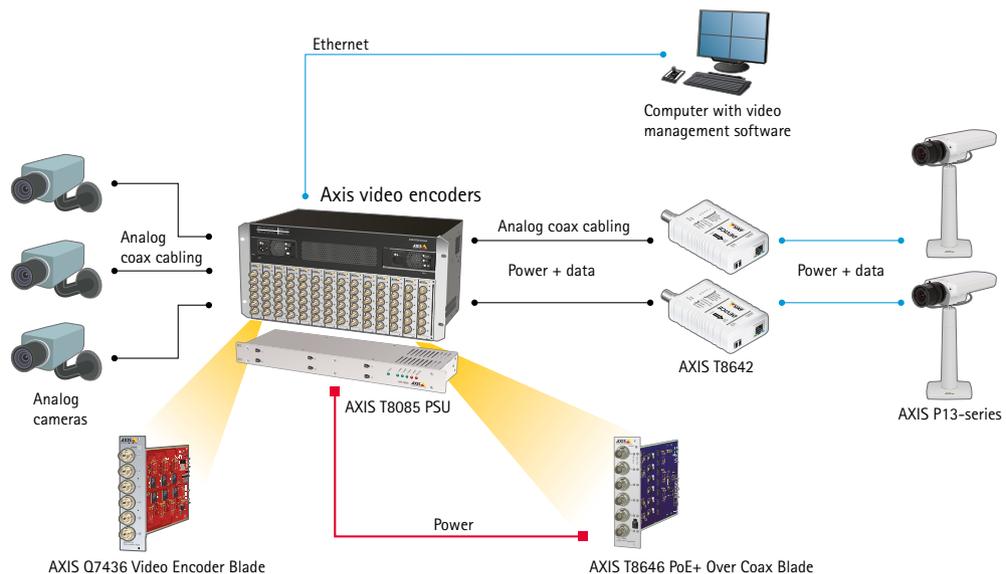


**Figure 7.** This diagram shows a true network video system, where video is continuously transported over an IP network. It uses a video encoder as the cornerstone to migrate the analog security system into an open IP-based video solution.

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 video system using coax cables



**Figure 8.** The diagram shows a network video system that utilizes existing coax cables and a video encoder chassis. A mix of video encoders and Ethernet over coax adaptors is used in the chassis, providing flexibility to seamlessly migrate from analog cameras to network cameras with video encoders.

In some instances it is neither practically nor economically justifiable to replace all existing coax cabling with Ethernet cabling. However, the coax cable can be used for IP cameras by utilizing Ethernet over coax adaptors, which convert an analog system to digital. These adaptors are available as single channel units as well as multi-channel blades and can be used in video encoder chassis. The multi-channel blades are typically used in larger installations where coax cabling is installed to a central location. A video encoder chassis can be used with video encoder blades and Ethernet over coax blades simultaneously, enabling a seamless migration to network cameras. A network camera-based network video system provides the following advantages:

- > No need for re-cabling, keep the coax
- > Re-use of existing video encoder chassis
- > Carries PoE and PoE+ over the coax cable
- > Easy to install
- > Reliable configuration
- > Seamless migration

## 2.6 Network camera-based network video systems



**Figure 9.** 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

# About Axis Communications

Axis offers intelligent security solutions that enable a smarter, safer world. As the global market leader in network video, Axis is driving the industry by continually launching innovative network products based on an open platform – delivering high value to its customers and carried through a global partner network. Axis has long-term relationships with partners and provides them with knowledge and ground-breaking network products in existing and new markets.

Axis has more than 1,600 dedicated employees in more than 40 countries around the world, supported by a network of over 65,000 partners across 179 countries. Founded in 1984, Axis is a Sweden-based company listed on NASDAQ OMX Stockholm under the ticker AXIS.

For more information about Axis, please visit our website [www.axis.com](http://www.axis.com).