

A Guide to Network Surveillance

Xtreme Surveillance

1.0 IP Surveillance

1.1 Advantages of IP Surveillance

IP surveillance has revolutionized the world of security and has thrown a light of importance on the invention of this century; the Internet. With everything being digitized in the world, from military weapons technology to common kitchen appliances, the new era in security and surveillance continues to expand its horizons. Here are some of the benefits that IP surveillance has to offer.

1.11 Remote Accessibility

Access live video at anytime, from anywhere

You can access real-time video at any time from any computer anywhere. Axis network video products provide an easy way to capture and distribute high quality video over any kind of IP network or the Internet. The video can be stored at remote locations for convenience and security, and the information can be transported over the LAN or Internet. This means that even companies with several offices across the world can make effective use of a network video solution for security surveillance and remote monitoring purposes.

1.12 Easy, future-proof integration

Put the cameras wherever you want, integrate applications, and leverage your investments

There are almost no limitations as to where you can place Axis network video products. They are not tied to physical inputs or frame grabbers and you can connect the product to a LAN, xDSL, modem, wireless adapter or cell phone. Basically wherever you can receive a phone call on your cell phone, you can receive images from an Axis network video solution.

In addition, Axis network video has the capacity to provide a high level of integration with other equipment and functions, making it a continually developing system:

- **Migrating your analog CCTV system into a network video solution**
With an Axis network video solution, you can integrate your existing analog system with products that bring it up to speed with the latest IP technology. The solution enables you to take advantage of numerous functionalities such as remote pan/tilt/zoom, Power over Ethernet, wireless, mega pixel, audio, motion detection and many more, while meeting your requirements for image quality, recording capabilities and reliability.
- **Integrating applications**
A fully integrated Axis network video system can be used for a multitude of applications simultaneously: for instance, access control, building management, point-of-sales systems, ATMs, as well as fire, intruder and visitor management, and so forth.

1.13 Scalability and flexibility

A system that grows with your needs

An Axis network video system can be expanded by adding more network cameras. This is just as easily done regardless of whether the new cameras are to be placed at the same site, or at a new location communicating over the Internet. You can choose exactly what you need today, and scale the system at any time to meet your growing needs. New technologies, additional cameras, and extra storage capacity are all easily added as required, thanks to strict adherence to industry standards.

1.14 Cost-effectiveness

Save money and lower total cost of ownership thanks to strict adherence to industry standards

Based on open standards, Axis' professional network video products run on Ethernet networking. Using standard PC server hardware for video recording and storage rather than proprietary equipment such as DVRs radically reduces management and equipment costs, particularly for larger systems where storage and servers are a significant portion of the total solution cost. Additional cost savings come from the infrastructure used. IP-based networks such as the Internet, LANs and various connection methods such as wireless can be leveraged for other applications across the organization.

Axis network video products also support a number of advanced technologies such as Power over Ethernet, which provides power to the network camera using the same cable as that used for network connection.

1.15 Distributed intelligence

Put the system's intelligence wherever you need it

In today's network video systems, intelligence has been brought into the camera itself. Advanced network cameras can have built-in motion detection and alarm management so the camera decides when to send video, at what frame rate and resolution, and when to alert a specific operator for monitoring and/or response. More intelligent algorithms - number plate recognition, people counting, face recognition - are also being integrated into network cameras. You obtain data in more manageable forms and with higher levels of accuracy. Intelligence at the camera level implies a far more effective means of surveillance than is possible with a DVR or other centralized system.

1.16 Proven technology

Safe investments that last well into the future

Network video started at Axis. We invented and launched the first network camera back in 1996, and we continue to lead this market. Working with an extensive network of CCTV and IT industry partners, we can fit the ideal video solution around your needs now and in the future.

Whatever your requirements we have the expertise and the right partners to match them:

- More than 20 years experience in network connectivity
- More than 10 years experience in network video

- Recognized market leadership with over 400,000 professional network video installations worldwide.

1.3 Video Servers

Axis video servers integrate easily into your existing analog CCTV (closed circuit television) system. You can acquire all the benefits that digital technology offers without scrapping your investment in an analog system.

1.31 What is a video server?

A video server digitizes analog video signals and sends digital images directly over an IP network, such as a LAN, intranet or Internet. It essentially turns an analog video system into a network video system and enables users to view live images using a Web browser or a video management software on any local or remote computer on a network. It allows authorized viewers from different locations to simultaneously access images from the same analog camera, as well as network cameras if they are added to the system.

1.32 Remote accessibility

An IP-based surveillance system will give you the ability to secure people and property, or monitor equipment and facilities; remotely from anywhere there is a networked computer. In addition, by utilizing the serial ports of a video server, you can remotely control existing equipment such as pan/tilt/zoom devices or time-lapse tape recorders. A video server can be connected to a wide variety of specialized cameras such as a miniature or microscope camera.

1.33 Migrate an analog CCTV system into a digital, networked solution

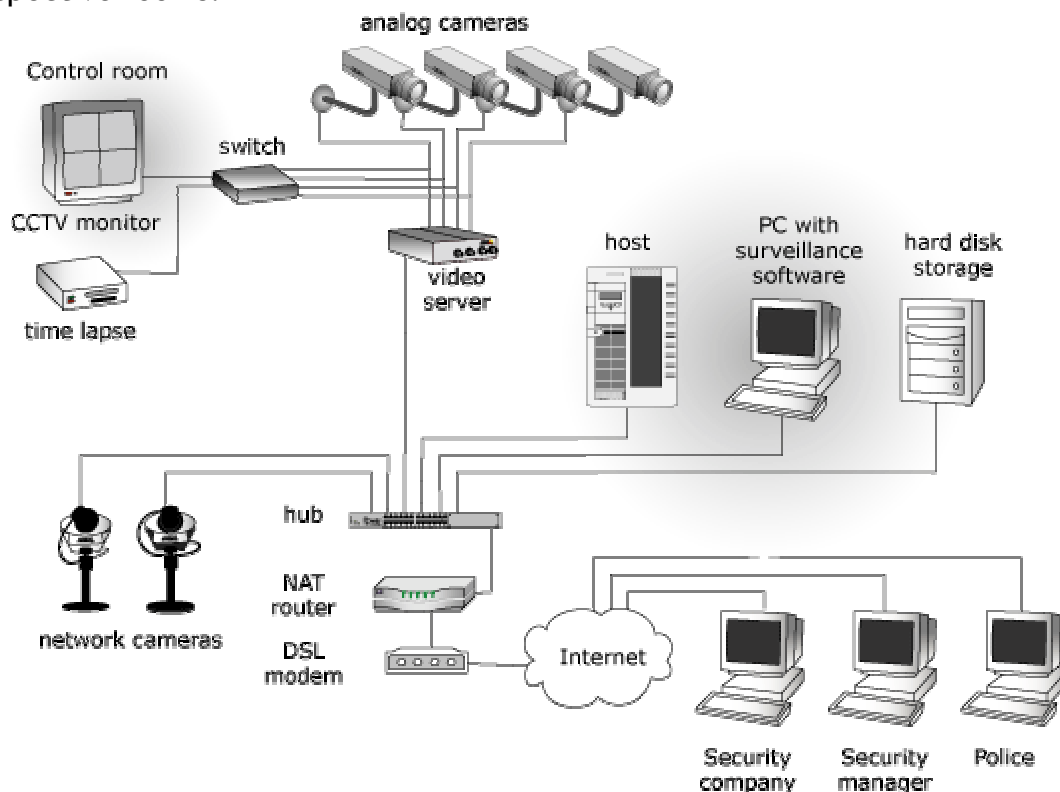
You have already made significant investments in analog CCTV systems and as long as these systems are delivering value, you do not, understandably, see the need to change? For this reason, Axis' product range allows you to integrate your existing analog system with products that bring it up to speed with the latest IP-technology.

So instead of starting from scratch, it is possible to combine your analog CCTV system with a network video system, thereby acquiring all the functionality and benefits that digital technology offers:

- Remote accessibility
- Cost-effectiveness
- Flexibility
- Scalability
- Integration and future-proof functionality
- Superior Image Quality

The following is a possible solution through with an existing analog camera surveillance system could be upgraded to an IP based network video surveillance system

- The existing analog cameras can be connected to a four port video server by a device known as the splitter, which splits the video signals sending one stream to the television monitor.
- The videosever is connected to the standard Ethernet network, which could be separate from the main network or part of it.
- The surveillance system can be monitored by the guards in the control room and also by the security chief, the managing director and the general manager from their respective rooms.



- Built-in motion-detection in the software and the video server can trigger an alarm and start recording.
- In case of an alarm, the security manager can view the images from the nearest PC in the building or remotely from any PC connected to the Internet. The police could remotely follow what is going on in the building.

- The images can either be stored at a computer in the building and/or at a host computer at an ISP. Storing images at remote locations eliminates the risk that the intruder will destroy the evidence.
- Either the cameras send images automatically to the host computer, or the host computer retrieves images from the cameras. The host computer can be a Windows computer running specific surveillance software.



- The program can display real-time images of multiple cameras at the same time as well as old images. When the images are of a specified age e.g. two weeks old, they could be automatically erased. Furthermore, this software also has a client that could be installed on any other machine where people with the required login and password could view the cameras and the recordings. This computer could be any computer, the general manager's, the security officers or generally anyone who has permission to view the recordings and the cameras conveniently from his or her office.

This is just one of the many possibilities that can only be made practical through an IP based video surveillance system.

2.0 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.

2.2 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,

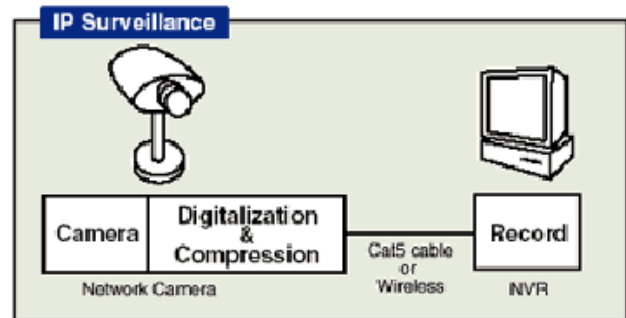
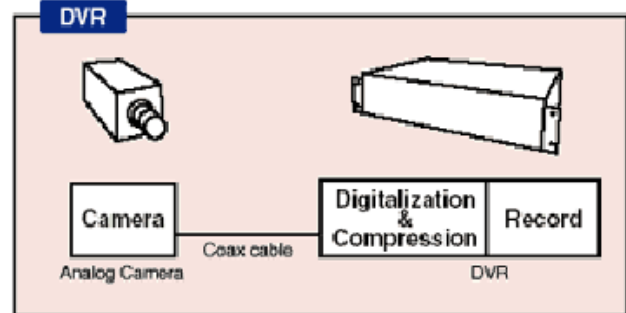
just to make an analogue-to-digital conversion on the DVR? These multiple conversions slow down performance and increase the cost of the system.

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.

2.3 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 Mega pixel. Mega-pixel Network Cameras are already available, and soon they will become multi mega pixel.
- **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.

2.4 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.