AXIS COMMUNICATIONS

Technology and Applications

WHITE PAPER

What is a Video Server?

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1. Introduction

Today's businesses—large and small—need easy to operate, affordable systems for security surveillance, production monitoring, and advanced applications like monitoring quality of service and point of sale transactions. These enterprises want more from their CCTV systems—integration of existing equipment like analog cameras, secure storage, and the ability to monitor and manage their systems anytime from anywhere. And the system should be based on a technology that's future-proof and will last for years to come.

Since the introduction of analog video surveillance systems in the early 1970s, sales of CCTV systems to deter crime and aid in criminal investigation have increased with each passing year. In 2001, global factory revenues for the CCTV-based applications market topped $4.7 billion, according to Frost & Sullivan.

Traditionally, CCTV surveillance systems have been closed, with quite limited functionality. Today's digital, network-based surveillance systems have proven to have numerous advantages over analog technology: remote accessibility of live video, scalability, improved storage, integration potential, and much more. The spread of more versatile, reliable digital technology has opened the door to a solution for the vast group of users who want to take the first step towards a digital solution: video server technology.

2. Video Server technology is the answer

The term "video server" refers to a network-attached server for video that is connected to a computer network like a LAN. A video server can deliver live video, automatically or on request, to a browser or other professional security applications. Security systems have traditionally been based on analog CCTV (closed-circuit television) technology. Video servers digitize analog video sources and distribute digital video over an IP network—turning analog cameras into *network* cameras. A video server can also be connected via a modem for access over a phone or ISDN line.

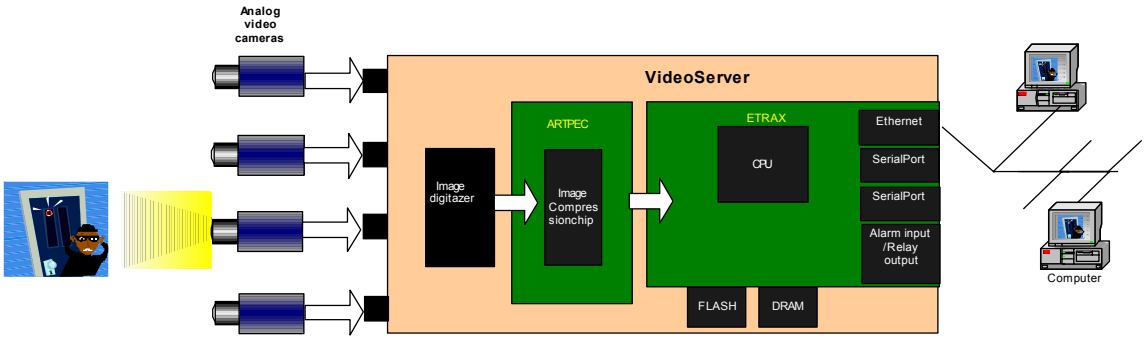
3. Why use a video server and where?

As noted above, a major advantage of a video server over less flexible and more expensive analog CCTV technology is the ability to access real-time video remotely, via an IP network. A video server on the network offers a tremendous range of monitoring and surveillance capabilities by distributing live video anywhere with a network connection. Whether it's a public place or a production line that needs to be monitored, live video can be accessed by authorized personnel at any defined workstation on the network, or over the Internet. Compared to analog, video server technology brings the many benefits of a digitally networked system:

- Remote access of images utilising the IP network—eliminating the need for dedicated security monitors in a central office
- Ease of integration with other systems and applications
- Lower TCO (total cost of ownership) by leveraging existing network infrastructure and legacy equipment
- Creates a future proof system, so no more complete system overhauls
- Quick and easy search capabilities of digitally stored images

4. Under the hood: Video Server technology

With a video server, everything needed to digitize analog video sources and distribute those digital images over a computer network is built into the unit. A video server can deliver up to 30 frames per second NTSC (25 fps PAL) over a standard Ethernet.
It includes one or more analog video inputs, image digitizer, image compressor, a Web server, network and serial interfaces. Let's take a closer look:



1. The Video Server receives analog video input from the analog camera first into the **image digitizer.** The image digitizer converts the analog video to digital format.

2. The digital video is transferred to the **compression chip**, where the images from the video are compressed to either JPEG still images or MPEG video.

The conversion to digital format and compression to JPEG images are performed by Axis' proprietary camera controller and video compression chip, ARTPEC™.

3. The Axis ETRAX™ chip, containing the **CPU**, the Ethernet connection, the serial ports and the Alarm input and relay output, represents the "brain" or computing functions of the video server. It handles the communication with the network. The CPU processes the actions of the Web server and all other software (e.g. drivers for different Pan/Tilt/Zoom cameras).

4. The **Ethernet connection** enables a *direct* network connection.

5. The **Serial ports (RS-232 and RS-485)** enable control of the cameras' Pan/Tilt/Zoom function or surveillance equipment such as time-lapse recorders. A modem can also be connected.

6. **Alarm inputs and relay output.** The alarm input can be used to trigger the video server to start transmitting images. The relay output can start and action such as opening a door. Video servers equipped with image buffers can send pre-alarm images.

The flash memory is the hard disk of the video server and contains all software, such as the operating system and all applications needed in the product**. The DRAM** is the so called volatile memory, where programme execution and temporary data storage takes place.

5. The Video Server in action

We've now seen the component parts that make up the video server. But how does it actually function in terms of collecting and compressing images, and then transferring them over a network for remote viewing?

5.1 Connecting to the network

A video server can be connected to the Internet/intranet in a number of ways:

***LAN (Local Area Network)* -** 10/100 Mbit Ethernet, e.g. company intranets, offices, industries, warehouse facilities.
***xDSL connection* -** Varying transfer speed, e.g. subsidiaries, small businesses, shops.
***Standard modem* -** Offers limited bandwidth, e.g. small businesses, home offices.
***Wireless network adapter* -** Mobile applications that require live streaming video, e.g. live events, trade shows, remote locations without Internet connection.
***Cellular phone modem* -** Offers limited bandwidth, suitable for transferring still images, e.g. construction job sites, remote technical equipment.

5.2 The TCP/IP Network

TCP/IP is the most common computer communication protocol today, used for Internet, E-mail and almost every newly installed computer network. TCP/IP is highly scalable, and works in installations from those very small to quite large. Within an office today, computers are most likely connected via an Ethernet network, a Local Area Network (LAN). Each device in a LAN must have a unique IP address to be able to connect directly to the Internet. Today's computers and network devices have a high capacity to simultaneously communicate with several different units. A high-end video server, like those from Axis, has its own IP address, making it accessible from any authorized PC on the network.

5.3 Storing and transferring images

To connect to the Internet many kinds of transmission types are available. These include standard modems and Ethernet connections. In addition, cellular phone modems and various wireless network options are also available. Transfer of video using TCP/IP is independent of transmission type and can be transferred using any of above. However the time for transferring video depends on the "size" of the video and the bandwidth available for the transmission.

Digital video can be stored on hard disks, which makes retrieval of images easier and quicker. When the hard disk is full, the computer can be programmed to automatically

erase old images and make space for new ones. There are many types of professional security software managing the complete security application available on the market today.

5.4 Compression techniques and image resolution

Resolution of digital images is measured in pixels. The more detailed an image is, the more pixels (data) it contains. Detailed images require more space on a hard disk and more bandwidth for transmission. For storing and transmitting images over the network, the data must be compressed or it will consume too much disk space or bandwidth. If bandwidth is limited, the amount of information being sent must be reduced by lowering the frame rate or accepting a lower image quality. A number of compression standards exist that deal with the trade off between frame rate and image quality in different ways. Of the more common standards, both JPEG and MPEG transmit high-quality video, while the H-standards, used mostly for video conferencing, do not generate clear images of fast-moving objects.

5.5 Integration into an existing analog CCTV system

A video server enables the user to migrate from an existing analog CCTV system into the digital world. A single server can network up to four analog cameras—a cost-effective solution for transmitting high-quality digital video over computer networks. By bridging the analog-digital technology gap, video servers complement previous investments in analog cameras and avoid extended problems with complex coaxial cabling.

6. Video Server applications

Video servers are used in professional security systems and enable live video to be viewed remotely by authorized personnel. Easily integrated into larger, complex systems, video servers can also function as stand-alone solutions in entry-level surveillance applications

Video servers are easily connected to the existing IP-network and enable real-time updates of high-quality video to be accessible from any computer on the network. Sensitive locations can be remotely monitored in a cost-effective and simple way, over the local network or via the Internet. The security and remote monitoring applications are best illustrated by observing a highly complex, professional installation:

6.1 Video server application: Sydney Airport

With some 45,000 international passengers to be processed in a single day during the Olympic Games, Sydney Australia's Kingsford Smith international terminal represented a highly demanding security challenge. To meet this challenge, the airport took on a comprehensive upgrade project aimed at increasing total passenger throughput by more than 50%, while simultaneously upgrading security as well. The airport authority chose a security system based on Honeywell's Digital Video Manager™ —a state-of-the-art video surveillance system utilizing Axis video servers.

Sydney Airport security employs hundreds of analog cameras for monitoring areas such as check-in counters, car parks and general traffic areas. The analog video signals are fed directly to the Axis video servers. The scalable nature of the system allows cameras to be

added and moved around the location with ease. In addition, the total system solution is fully integrated into the airport's existing security, access control, and surveillance systems. Security operators are able to view images and control camera functions from multiple locations at a click of a mouse, and with true plug-and-watch functionality.

With Axis video servers at the center of the security system upgrade, airport officials were able to meet their goals to maintain leading-edge technologies that deliver information that is easier to use and faster to obtain, while consistently staying ahead of the security requirements that ensure the physical safety of both people and property.

7. Market potential—a video server in your future?

If we look at how interest and sales in video server technology has increased in recent years, it's clear that video server technology is meeting the security and remote monitoring demands of a wide range of businesses and organizations. In the 2001 "Network Camera and Video Server Market" report, research firm Frost & Sullivan predicts that the global network video server market will reach approximately $350 million by 2005—nearly a ten-fold increase in five years.

In that same report, Frost & Sullivan comment that Axis Communications has established strong market leadership in video servers and today is the worldwide leader in the video server market, as well as in network cameras. For users searching for a way to migrate from an existing analog CCTV system to the advantages of the digital world, a video server provides a cost-effective, future proof solution.

About Axis

Axis Communications

Axis develops solutions for user-friendly and secure communication over wired and wireless networks. The company is a worldwide market leader in network connectivity, with products for office, facility and industrial environments. Axis was founded in 1984 and is listed on the O-list (Attract 40) of Stockholmsbörsen (XSSE:AXIS). With more than 300 employees, and offices in 14 countries, Axis operates globally in cooperation with distributors and OEM partners in some 70 countries. Markets outside Sweden account for more than 95 percent of sales.

Information about Axis can be found at www.axis.com

Contact Axis

info@axis.com

Head office, Lund

Axis Communications AB
Emdalavägen 14
SE-223 69 Lund
Tel: +46 46 272 18 00
Fax: +46 46 13 61 30

Subsidiaries

BOSTON:
Phone: +1 978 614 20 00

LONDON:
Phone: +44 870 162 0047

MIAMI:
Phone:+1 305-860-8556

MADRID:
Phone: +34 91 803 46 43

MUNICH:
Phone: +49 811 555 08 0

PARIS:
Phone: +33 1 49 69 15 50

ROTTERDAM:
Phone: +31 10 444 34 34

SEOUL:
Phone: +82 2 780 9636

SHANGHAI:
Phone: +86 21 6431 1690

SINGAPORE:
Phone: +65 6 836 2777

SYDNEY:
Phone: +612 9957 6700

TORINO
Phone: +39 011 841 321

TAIPEI:
Phone: +886 2 2546 9668

TOKYO:
Phone: +81 3 5531 8041