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## Introduction

In the early 1970s, the VCRs burst out of the evolving mosaic of the IT/Electronic industry. More than thirty years later, VCRs have gone near to extinction, while traditional analog camera cronies have grown to an astonishing multi-million dollar industry.

Today's increasing crime rates and terrorist activities, as well as a growing demand for increased protection of people and assets are changing the face of video surveillance. Moreover, increasing IP connectivity and emergence of modern network technologies have triggered the onset of network/IP-based surveillance solutions, revolutionizing the way video data is analyzed, archived, distributed and managed.

Businesses are looking for better ways on how they can make use of their existing analog CCTV cameras and still take advantage of new technologies. In line with this growing demand, a new line of surveillance solution was born - the **video servers**.

This whitepaper aims to discuss and explain the technology, benefits, applications and market potential of video servers. Additionally, this whitepaper will discuss Neugent's video server solution and its comparative advantages versus other video servers in the market.

## **What is a video server?**

A video server (sometimes called encoder, sender or transmitter) is a network-attached server that converts analog video into IP-MPEG4 streams that traverse the IP network. With a video server, users can view live digitized video images of traditional analog CCTV cameras over an IP network, via any standard Web browser, by a video management application or a hardware decoder for viewing on a monitor.

Video servers are scalable and cost-effective surveillance solutions for users who want to be able to monitor property, people and equipment remotely from anywhere on the network.

Video servers normally have one to eight analog ports for connection to analog cameras, an Ethernet port for connection to the network, built-in web server, operating system and a compression chip that enables the conversion of analog data to digital data. It's also common in most video servers to have digital inputs and outputs, and audio and serial ports.



**NX-5000 Video Server Series**

## Introducing Neugent's Dual Core Network Video Servers



Neugent's Network Video Servers, NX-5000 Series, convert analog video into IP-MPEG4 streams and transmit these video images to remote clients over an IP network, such as a LAN, intranet or Internet. Now, you can view live images of your existing analog CCTV cameras on any local or remote computer on a network anywhere via any standard web browser, or via our [Remote Client](#) or [Remote Client Mini](#), our freely-bundled video management softwares, or via any of our Hybrid DVRs.

### Dual Core MPEG4 Encoding

Designed for professional IP-surveillance systems, NX-5000 Video Servers offer dual core MPEG4 encoding to allow simultaneous streaming to multiple client devices, i.e. one to mobile phone and one to PC.

### Quad-speed Network Acceleration

The NX-5000 MPEG-4 streaming video is optimized for both low bandwidth and high bandwidth connections that demand high resolution DVD-quality videos. You can enjoy four video streams at data transfer rates equal to one CIF video stream without noticeable change in perceived video quality.

Ideal as an integrated part of a larger system, the NX-5000 Video Servers will give you the ability to secure people, assets and property remotely from anywhere within a network. The NX-5000 Video Servers offer real-time DVD-quality live display, crystal clear streaming audio, and PTZ control via RS-232. Gain versatile alarm management capabilities such as e-mail notification upon alarm and sensor and relay integration, i.e. automatically or remotely turn lights on or off. Remote firmware upgrade, remote monitoring via mobile phone and HTTPS and IP address filtering add value for the demanding customers.

The NX-5000 Video Servers come in a compact and stylish housing and are well-suited for numerous applications such as school video surveillance, traffic monitoring, tourist spot surveillance, production lines and factory monitoring, to name a few. By combining existing analog CCTV with Neugent's plug and play Video Servers, you can effortlessly

and cost-effectively extend the functionalities of your security system and reduce total installation and maintenance costs.

## What are the benefits of using a video server?

Video servers offer the following advantages:

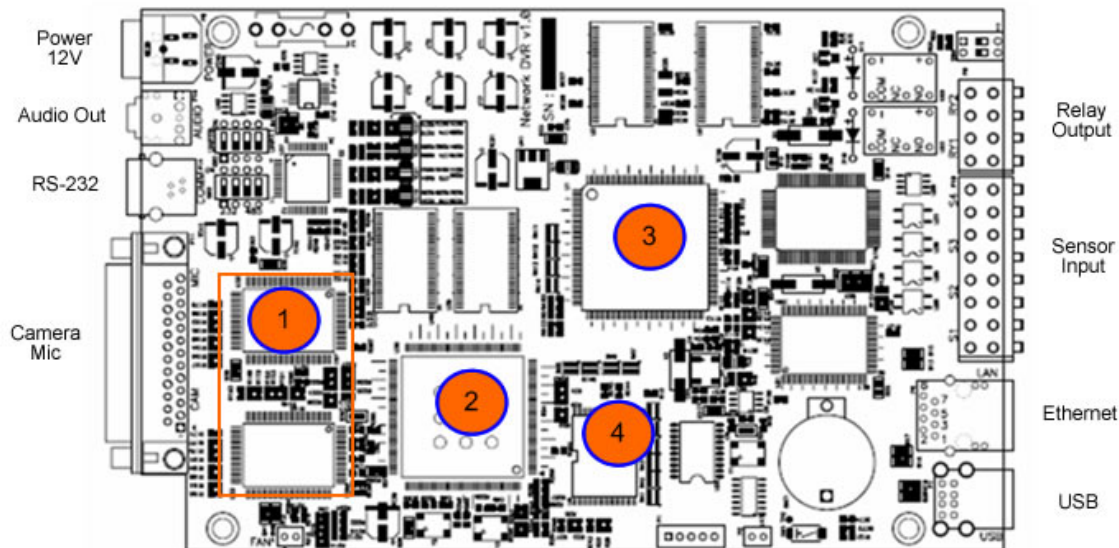
+ **Remote Accessibility** - Video servers allow several users to gain access to real-time live video at anytime and anywhere via an IP network. Whether its traffic or kindergarten children surveillance, live video can be accessed by authorized people even at home, in the office or on the road via wireless Internet connection.

+ **Cost-effectiveness** - With video servers, there is no need to replace or discard existing analog cameras. Users can also leverage on existing network architecture and deploy several video servers connected to several cameras, as needed.

+ **Hassle-free Integration** - Video servers are very easy-to-install and can easily be integrated with other devices, such as PTZ (pan/tilt/zoom) cameras, sensor/alarm and relay devices and even audio equipment. What's more, you can simply connect to any video server and monitor camera views even on your laptop or at any Internet café.

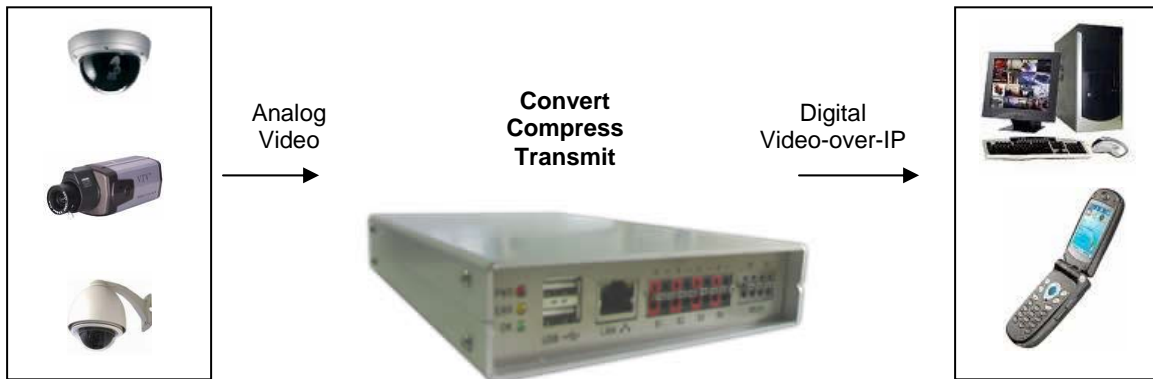
## Looking inside the Video Server

Let's take a closer look inside a typical video server.



1. First, the video server receives analog video input from analog CCTV cameras into the **image digitizer**<sup>1</sup>, which does the conversion of analog data into digital format.
2. Next, the digitized video is transmitted to the **compression chip**<sup>2</sup>, where images of the video are compressed to either JPEG still images or MPEG video. Neugent's proprietary MPEG4 ASIC is responsible for this compression.
3. The CPU<sup>3</sup>, Ethernet connection, RS-232, and I/O ports process all communication with the network. The CPU handles the actions of the Web server and all other software, i.e. drivers for different PTZ cameras.
4. **Ethernet port** facilitates direct network connection.
5. **RS-232** (serial port) enables control of speed dome cameras.
6. **Alarm/Sensor Inputs** are used to trigger video streaming, while the **Relay Outputs** can set in motion events, such as opening a door or turning on/off lights. Video servers equipped with image buffers can send pre-alarm images.
7. The **flash memory**<sup>4</sup> is the hard disk and contains all software, such as the operating system and all other applications. **DRAM**, so-called volatile memory, is where program execution and temporary data storage takes place.

## Video Servers in Action



### Connecting to the network

Connect a video server to the Internet/intranet through:

**LAN (Local Area Network)** – 10Base-T Standard Ethernet (10Mbps), Fast Ethernet (100Mbps), i.e. company intranets

**xDSL connection** – Varying transfer speed, i.e. small businesses

**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

NOTE: NX-5000 currently supports LAN connections.

### The TCP/IP Network

TCP/IP, short for Transmission Control Protocol/Internet Protocol) is one of the core protocols of the Internet protocol suite<sup>1</sup>. Via TCP, connections are made over the network and exchange of streams of data is guaranteed from sender to receiver.

### Transferring Images over the Network

Network is limited by the amount of traffic it can carry. The term used to describe this is **bandwidth**, which is measured in bits per second (bps).

IP Video utilizes a large amount of bandwidth. One camera might consume between 100 kbps and 2 Mbps, while audio typically consumes only 80kbps, ergo - VoIP's instant success.

Bandwidth consumption is affected by:

1. **Video compression** method, i.e. MPEG4, MJPEG, JPEG2000.
2. **Frame rate**, measured in frames per second. If bandwidth is limited, the amount of information being sent must be reduced by lowering the frame rate.
3. **Image resolution**. Image resolution is the number of horizontal and vertical pixels, i.e. QCIF, CIF, half D1 and D1. The more detailed an image is, the more pixels it contains. The more pixels an image contains, the more hard disk space is required and more bandwidth for transmission is needed.
4. **Scene activity level**, which is the amount of activity in the camera's field of view
5. **Video quality**, i.e. low, medium or high
6. **Quiet time**, which is the fraction of time where there is no movement

Once bandwidth runs out, you will experience the ff:

- + Video blocks in MPEG and M-JPEG, and increased fuzziness in Wavelet compression methods
- + Frame drops, resulting to choppiness
- + Drop in resolution, making the picture less clear
- + Video freeze
- + Temporary loss in connection

Network bandwidth consumption must be accurately predicted; otherwise the network might get overloaded.

### *Integration into an existing analog CCTV system*

A video server bridges the analog-digital gap, so that users can migrate from an existing analog CCTV system into a network/IP-enabled surveillance solution. Typical video servers can hook between 1 to 8 analog CCTV cameras. Neugent currently offers 4 ch (NX-5004) and 8 ch (NX-5008) video servers.

## **The BIG problem of Limited Bandwidth**

Bandwidth will always be limited. In most cases, bandwidth usage is shared, i.e. for security and for online business-related activity. In fact, at the very start, most company intranets, which have 10Mbps or 100Mbps connections, allocate network bandwidth usage mainly for Internet use, such as sending e-mails and online conferencing, to name a few. Allocation for security purposes may not be yet in place. The problem of limited bandwidth arises now because these companies would want to maintain their existing network speed subscriptions.

## **The Solution**

### **Dual Core MPEG4 Encoding**

Dual Core MPEG4 Encoding is a concept that makes possible encoding of two totally independent streams of video, separately configured for different frame rates and video resolutions. Imagine 4 cameras streaming high-quality video at 30fps at 1Mbps. If only single encoding is used, you would need four times the bandwidth, which is 4Mbps. Ergo, you get four times, a.k.a. quad-speed network acceleration.

Neugent's NX-5000 Video Servers offers dual core MPEG4 encoding, thereby allowing support for both low bandwidth and high bandwidth connections. Now, companies wouldn't have to apply for a higher bandwidth network, saving them thousands of US dollars worth of network expenses.

In DVD recording, the term "dual encoding," enables simultaneous digital recording of two TV programs while viewing live playback of one of the selected channels.

In some cameras, dual encoding is the capability to supply two streams of video, i.e. JPEG and MPEG4, simultaneously. The purpose of dual encoding in this sense is because in some security applications, still images are preferred for subject identification.

## **Applications**

### **Solution for Monitoring – NX-5000 Video Servers with bundled applications**

Small to medium enterprises who require monitoring only will enjoy the many benefits of the NX-5000 Video Servers. Owners and managers of small offices and establishments, such as pawnshops, day-cares, hospitals, money exchangers, factories, and mini-retailers will be able to monitor their facility and property at the comfort of their homes.

Schools, which often have limited network bandwidth, can also offer added value service for parents who want to monitor their kids while in school. With Neugent's NX-5000 Video Servers, several users (parents, in this case) can connect simultaneously and monitor their children while at work or at home.

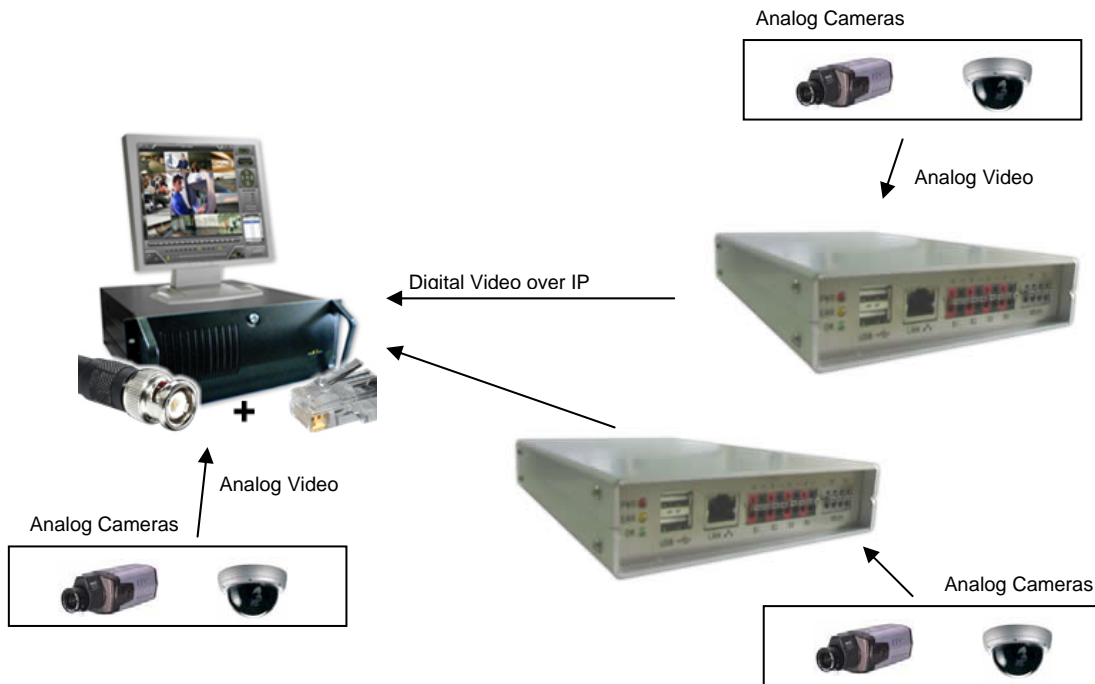
People-on-the-go or abroad can take a peek at what's happening at their home simply by logging in an Internet café. They can even receive intruder alerts via SMS and verify such events over their mobile phone via 3G technology.

Video servers can also be deployed for traffic monitoring applications, allowing users to get significant traffic information thru their cellphones.

Video servers can also be used for promotion of tourist spots and hotel & resort facilities, either as part of their website or inside the facility's show room.

Putting aside security, video servers can be applied as a tool for video conferencing and online training. Businesses can greatly benefit with the NX-5000's optimized bandwidth utilization.

## Complete Solution - Video Server with Neugent's Hybrid DVRs



Customers who demand more than monitoring can integrate NX-5000 Video Servers with Neugent's Hybrid DVRs (see diagram above). With this solution, users can deploy several cameras and several video servers in different offices and centrally manage all video and security information in one location. Not only will you save on cabling and personnel costs, you will also save on actual DVR costs, as the cost of a video server compared to a DVR is twice, and sometimes thrice as low.

## **Market Potential**

Frost & Sullivan predicted that the global network video server market will reach approximately \$350 million in 2005<sup>2</sup>. IP cameras and the video server market share increased from 5% in 2005 to 7-8% in 2006. This figure is projected to increase to 10% this year<sup>3</sup>.

Digital transformation is happening globally. With this in place, the demand for video servers will steadily increase over the next few years and this growth will even be propelled by telecom companies, who are starting to provide video services to its customer base.

## **Conclusion**

In summary, the video server market is tremendously evolving at an accelerating pace as IT progressively takes responsibility for the security and surveillance infrastructure. More and more businesses will turn into video servers as the means by which video is captured, transmitted, viewed and managed.

## Footnotes

<sup>1</sup><http://www.wikipedia.com>

<sup>2</sup>2001 “Network Camera and Video Server Market” report by Frost & Sullivan

<sup>3</sup><http://www.globalsources.com>