



Indications for Analog, IP, and Hybrid IP/Analog Video Systems for Security and Surveillance

June 2008

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Executive Summary

The discussion among security and surveillance video manufacturers, systems integrators, and end-users about the relative advantages and indications for different kinds of video installations is often oversimplified. Simplification aids end-user decision-making and furthers the business interests of equipment manufacturers and systems integrators. Industry writers also have good incentive to simplify information. The many motives include making a larger point, supporting a specific-case argument, and getting and keeping readers' attention.

Simplification most often leads to statements like "IP video is more expensive than analog video," which are true with so many exceptions that they are not actually true at all. Studies sponsored by interested parties¹ have shown the opposite to be true, and editors and bloggers have covered the studies' findings widely. In fact, oversimplification often leads to an assertion and its opposite both being true. Another manifestation of oversimplification is the argument that each installation is so unique that no useful rules-of-thumb can be developed.

In this paper we provide as simple as possible an explanation of the factors which indicate analog, IP, and hybrid IP/analog video systems respectively. This paper seeks to provide a reference for editors, end-users, and integrators who may need to evaluate a specific case or understand the general principles.

¹ Axis Communications, *Total Cost of Ownership (TCO): Comparison of IP- and analog-based surveillance systems*, white paper, 2008

Indications for choosing a pure IP camera system

Ability to use an existing IT network

In some cases, digital video systems with IP cameras can be plugged into the existing IP infrastructure. At other times the cost for the upgrade to the network, to make it viable for video, is easily managed. A user with an existing Ethernet network which is able to handle large amounts of data, or a user who just needs a few cameras or plans to record low frame rates or low resolution, is a good case for a pure IP system. Recording at the "edge" of the network with only occasional requests for video over the main network may also provide a way to implement IP video on existing infrastructure.

Quick and easy data protection

In many mission-critical recording environments, lost or missing data is not acceptable. IP systems can shorten response times and speed up NVR reassignments. In cases where a NVR goes offline, the user can use software to reassign the camera to a different NVR without making any wiring changes. Response times to recording problems are also fast, since the recording systems are monitored at the IT network management level alongside all the other servers, routers, switches, and network applications.

Ability to move and add cameras easily

Users with fluctuating camera counts and locations can avoid the need to power down recording servers to add, move, or remove cameras. This means seamless, pain-free recording from existing cameras, rather than scheduled downtime with alternate-server recording or missed recording.²

Ability to collect megapixel images

Users who need really high-resolution imagery want the ability to selectively deploy megapixel network cameras providing images with resolutions at least four times higher than analog images. Megapixel IP cameras can provide much more detail than an analog camera (which is limited to standard image dimensions that do not exceed 704x576 pixels (PAL) or 720 x 480 pixels (NTSC) image after the signal has been digitized in a DVR or a video server).

Megapixel cameras can collect so much information that you can zoom in to catch the smallest, subtlest detail of a video frame. Megapixel IP cameras can provide superior, unambiguous images of

² Users with spare channels on a DVR can usually add an analog camera without powering down the DVR, but in general it is not efficient to leave channels unused and this provides quite limited "plug-and-play ability."

point-of-sales transactions and other events that can be used for business intelligence, loss prevention, and security.

Ability to use facial recognition analytics

Facial recognition software depends on high-resolution images to be effective. Any camera being used for facial recognition should have more than the 704x576 pixels (PAL) or 720 x 480 pixels (NTSC) provided by an analog camera.³

Minimum disruption and installation expense

Even in cases where a new Ethernet network needs to be installed to handle video traffic, pure IP surveillance systems can be more disruptive to install than their pure analog counterparts. Unlike IP systems, analog systems require the installation of a direct coaxial, Fiber, or UTP cable running from every camera to a DVR, as well as additional encoding hardware to be installed on the DVR itself.

IP systems can also distribute the power and HVAC loads to help users avoid expensive and disruptive site modifications to HVAC and other site features.

Need for video transmission over wide geographical range

Putting video on the IT network makes it possible to use switches, hubs, and routers to expand the network to a broader range. Analog cameras have significant transmission limits over wide surveillance areas, and they are not appropriate for some wide-area installations due to their need to be physically cabled to a DVR.

Need for advanced features like digital zoom

Many new IP cameras have on-board encoding and analytics as well as additional features that certain users need to successfully implement their surveillance plans. And only IP cameras have the image resolution necessary to be able to zoom in and still retain enough image detail for analysis.

Need for camera-level redundant recording

Some IP cameras can provide redundancy by recording onto built-in memory cards.

³ An analog camera can work for facial recognition in the rare case where the subject is close and the facial image occupies most of the field of view (at an ATM for example). However, in the vast majority of cases it is not possible to get an analog image taken from a close enough range to provide enough pixels of information for the analytics have to work with. A shot from further away with a megapixel camera can have a much higher probability for success, as there are more pixels of facial information at the higher resolution.

Indications for choosing a pure analog system

Analog can meet user's recording needs for a lower cost⁴

There are many lower-end, low resolution IP cameras that are low in cost. But high-end IP and megapixel cameras are very expensive, and the disk capacity required to store the higher volume of video data is a very significant increased expense. Across a network array of hundreds or thousands of cameras this cost can be prohibitive.

A large network of IP cameras will usually require the installation of a separate network so traffic doesn't exceed bandwidth. An installation of just 40 IP cameras with video streams of 1,000-20,000 Kbps each will overtax many existing corporate networks. Many high-end analog cameras, though limited in resolution to 704x576 pixels (PAL) or 720 x 480 pixels (NTSC), use image processing, automatic back focus and imager sensitivity to produce images that are superior in quality and clarity to a similarly or higher-priced IP camera.

The cost advantage of analog recording is especially true for users who already have a legacy coaxial or UTP wiring in place and do not need to install a large number of cameras (analog cameras require a lot of wiring, which can be expensive and disruptive in terms of site modifications).

Network traffic exceeds the user's existing capacity

IP camera recording and viewing will increase network traffic, especially with lots of IP cameras or with or megapixel cameras. If recording will exceed the existing usable network capacity, a user will need to add the costs of installing an additional network for the video. These costs must be added to the operational and equipment costs of pure IP when comparing it to analog and analog-IP hybrid options.

Ability to avoid hardware upgrade expenses

The recording of IP cameras tend to rely on the processing power of the NVR CPU. Many analog systems use additional processors to share the video processing with the CPU. But an IP camera stream comes into the network port and requires the CPU to be recorded and viewed. This limits the number of IP cameras that can be added to a given NVR server.

These factors depend on bitrate and video encoding format (MJPG, H.264, MPEG). Most IP cameras send large files (MJPEG) to the server to process and store. These files provide a good image but are very large and consume large amounts of storage very quickly. Newer compression formats for IP cameras will help address this issue.

⁴ The savings described here need to be balanced against the installation or system modification costs the user is facing with either option given the site requirements and existing infrastructure.

Need for minimum latency

Latency is defined as the time it takes for an image captured at a camera source to be presented to the viewer. Every camera has latency to a degree, because the image data must travel from one location to another. Latency is much greater for IP systems, however, because their signals need to be encoded at the source and then must travel through the network to the decoder in order to be presented to the user.

Because analog signals are point-to-point (camera-to-monitor), they don't have the additional latency caused by network routing and the encoding and the decoding process. Because of this they are typically preferred in industries such as gaming and corrections.

Need for system to suit staff abilities

Many businesses operate without complex or extensive computer systems and do not have a need for dedicated IT professional(s) to provide timely and effective response to network emergencies on a system of any size or complexity. A fully IP-based video recording and viewing system will add greatly to the need for an IT professional to oversee smooth operation of the system.

In many organizations, physical security staff takes care of the surveillance system administration as well as the overall security plan design and implementation, and there are no existing IT needs that require IT professionals.

Wider camera variety and choice

There are a large variety of Analog cameras — for instance, mini covert cameras and pan-tilt-zoom cameras in various sizes and shapes) — to choose from. With IP cameras, not every vendor has many varieties and not every vendor's surveillance software supports others' cameras.

Insufficient documentation and reference

Because IP video recording is still relatively new, references and information as well as history of reliability for IP camera recording is difficult to find. It is much easier for many users and integrators to design a site plan based on proven metrics and extensive benchmarking and reference information.

Vendor relationships and support

Vendor relationships have the power to greatly enhance or greatly damage the user experience and dissolve the integrator's margin. Integrators and users at installations that already have analog cameras have an existing relationship with the manufacturer, so support and trust in the product are already in place. If the camera or DVR manufacturer with whom a relationship exists doesn't have or support IP cameras, a new relationship of trust and access to support must be developed.

Indications for choosing a hybrid IP/analog system

A hybrid system will provide many of the advantages of the pure systems on a per-camera basis. The following define cases where *only* hybrid recording will suit user needs.

Ability to add IP camera recording to existing investments in analog

Where there is existing analog infrastructure, the hybrid approach allows the user to avoid expensive replacement of their existing analog cameras and wiring. Instead, the user can add IP cameras to their surveillance resources and record from both analog and IP cameras in the same DVR.

The right camera for the each site

Hybrid recording allows the user to choose analog cameras or IP cameras according to the recording requirements and conditions of each camera site. A site requiring the lowest possible latency will call for an analog camera, whereas a site using facial recognition or other data-hungry analytics will need an IP camera source.

Minimal retraining expenses

Surveillance operators familiar with an existing analog-system user interface will be able to manage new IP cameras without disruptive and expensive retraining. Using hybrid DVR/NVR recording allows integration of IP cameras with little change to the end user's normal routine.

This paper is has been prepared by Airship Industries. Based in Bellevue, Washington, Airship develops no-compromises video recording and management solutions for demanding users. Airship IP and IP-hybrid security and surveillance video systems are affordable and reliable, built on an advanced open platform that integrates easily with analytics, POS systems, and other data sources. All information herein is the sole property of Airship Industries and can not be reprinted without permission from Airship Industries.

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