Technology Article

Network Cameras

Ten Reasons To Buy a Network Camera

or What Your Analog Camera Vendor Won't Tell You

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Introduction

Network cameras have been around for a number of years; the first one was released in 1996. In the early years, network camera technology was not on par with that of professional level analog cameras. They were thought of as web cameras used to view objects and events over the Internet or a LAN. Initially designed to take advantage of digital imaging, networking, and the Internet in new application areas, these cameras were not used for surveillance applications. That has certainly changed. Over the last year, network cameras have caught up with analog camera technology and now meet the same requirements and specifications and, as we'll see below, in some important areas network cameras surpass analog camera performance.

1 Ten Things You Won't Hear from Your Analog Camera Vendor

Viewed in a wider context, the convergence to IP-based networks includes a number of factors to consider aside from a comparison of what two types of cameras can provide the end user. Things such as performance, open systems interoperability, flexibility, future-proof, and network connectivity. However, in this paper we seek to explore 10 of the most important functional differences between today's network cameras and their dated analog cousin, and why these factors are important to understand when making that next camera purchase.

1. **End to interlace problems.** An analog camera at high resolution (4CIF) has a significant problem with *interlacing*. This is because with an analog video signal, even when connected to a DVR, all images are made up of lines, and each image is formed from two interlaced fields. When an image has a lot of movement, the image will become blurry. The blurriness results from the objects moving between the image capture of the two interlaced fields. A network camera employs "progressive scan" technology that better suits depicting moving objects clearly. This more advanced image capture technology means that the whole image is captured at one time, thus providing crystal clear images even with a high degree of motion.

2. **Power over Ethernet increases savings and reliability.** Getting power to an analog camera has always been a major obstacle and cost. The IEEE 802.3af standard for Power over Ethernet (PoE) has proven to be quite successful due to the tremendous cost savings it offers. Not available for analog cameras, PoE means that networking devices get power from a PoE-enabled switch or midspan over the same standard Category 5 cable that transmits data and video. Since a standard is in place, all equipment is compatible, maximizing the benefits for all end users. In a surveillance application, PoE provides an additional benefit: cameras can get centralized backup power from the server room, so in the event of a power failure they will continue to operate.

3. **Megapixel resolution**. Analog cameras are stuck at NTSC/PAL specifications, with a resolution corresponding to 0.4 megapixel at 4CIF. For newer high-resolution computer screens and digital cameras, end users now require resolution in the higher megapixel range; a requirement end users at starting to demand for surveillance applications as well. A network camera's higher resolution provides more detail and can cover larger areas. This ensures the security system investment will not be wasted because a perpetrator's face or what he is carrying cannot be discerned. Also, the network camera's increased resolution enables functions such as digital pan, tilt and zoom.

4. **Intelligence at the camera level.** In a world in which far too much video is being recorded for anyone to ever monitor or search, *intelligent video* is the next big trend. To accommodate such demands, the advanced network cameras can have standard 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. Ever more intelligent algorithms—number plate recognition, people counting, etc.—are being integrated into network cameras. Intelligence at the camera level empowers a much more productive and effective means of surveillance than is possible with a DVR or other centralized system. The network camera also solves another emerging dilemma: the shortage of computing power to analyze more than a few channels in real time. Network cameras have purpose-built, highly integrated hardware that excels in image analysis tasks, thus enabling installation of large-scale intelligent video systems.

5. **Integrated PTZ and input/output control.** With an analog PTZ camera, the serial communication that controls PTZ movement requires cabling separate from the video signal. This is costly and cumbersome. Network camera technology enables PTZ control over the same network that transports the video. With a Network Dome camera, the PTZ commands are being sent over the IP network, resulting in major cost savings and greater flexibility. What's more, network cameras can integrate input and output signals such as alarms and controlling locks. This all adds up to less cable, less money, and increased functionality and integration potential.

6. **Integrated audio.** For some applications, audio has become increasingly important. With an analog system, audio is not possible unless you want to run separate audio lines to the DVR. A network camera solves this by capturing audio at the camera, synchronizing it with the video or even integrating it into the same video stream, and then sending it back for monitoring and/or recording over the network. The audio can also be fully bi-directional to allow communication over speakers. Such audio capabilities are easy to install and cost-effective—but only with a network camera.

7. **Secure communication**. With an analog camera, the video signal is transported over a coax cable without any encryption or authentication. In this way, anyone can tap into the video or worse, replace the signal from a camera with another video signal (some will remember this from the movie *Ocean's Eleven*). In a network video scenario, the camera can encrypt the video being sent over the network to make sure it cannot be viewed or tampered with. The system can also be set up to authenticate the connection using encrypted certificates that only accept a specific network camera, thus eliminating the possibility of anyone hacking into the line. The network camera can also add encrypted "watermarks" to the video data stream with information on image, time, location, users, alarms and more, in order to secure an evidence trail. Does the analog camera offer any of this highly advanced functionality? No, it does not.

8. **Flexible, cost-effective infrastructure choices.** Analog video is typically transmitted by expensive coax, or over proprietary fiber, or by wireless means. All methods where distance will influence image quality. Adding power, inputs/outputs and audio further complicates this situation. Standard IP-based digital systems surmount these obstacles at much lower cost and with many more options. Like viewing website images from anywhere in the world, the network camera produces digital images, so there's no quality reduction due to distance. IP-based networking is an established, standardized technology meaning the resulting costs are comparatively low. Unlike analog systems, IP-based video streams can be routed around the world, using a variety of interoperable infrastructure. Many streams of different types can be transmitted over the same line because it works through packet-based communications. New construction now has low-cost Category 5 data wiring, and a single wire can carry hundreds of simultaneous full frame rate video streams, when running at 1 Gigabit Ethernet speeds.

9. **A true digital solution.** The CCD sensor in an analog camera generates an analog signal that is digitized by an A/D converter to make possible the image improving function in a DSP. The signal is then converted back to analog for transport over a coax cable. Finally, at the DVR the signal is once again digitized for recording. That makes a total of three conversions, and with every conversion image quality is lost. In the network camera system, images are digitized once and they stay digital for the duration—no unnecessary conversions and no image degradation.

10. **Lower total cost of ownership.** It stands to reason that all the advanced features described above come at a cost. The initial price for a network camera can indeed be higher, if one compares *only* the camera. But compare the **cost per channel**, and the network camera, with all its superior flexibility and performance, quickly becomes comparable with an analog system anchored by a DVR. In many system configurations, the upfront cost for a surveillance system based on network cameras is even lower, when compared to analog options. This lower total cost for the network camera system is mainly a result of back end applications and storage that can be run on industry standard, open systems-based servers, and not on proprietary hardware like a DVR. This radically reduces management and equipment costs, in particular 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 and are much less expensive alternatives than traditional coax and fiber. So, with this one last possible objection to network cameras fully solved, what are you waiting for?

If you are wondering why you haven't heard how the network camera compares so favorably from your analog camera vendor, would you be bringing the subject up if you didn't have much to say?

2 Conclusion: The Future Belongs to Network Cameras

Respected industry analysts J.P. Freeman and Co. Inc., have forecast that the network camera market is the fastest growing segment in surveillance and will pass the sales of analog cameras in 2008. As security management over the IP network expands in understanding and implementation, it represents the next era in advanced security management. The analog camera, on the other hand, displays a lack of flexibility and performance that does not meet demands of this new era.

As network cameras move the frame grabbing and intelligence capabilities out and away from the DVR, systems can scale much more easily and customers will be able to use cost-effective, industry standard servers for recording and storage, and they will be able to choose from a wide variety of video management and analytics software. This move to open systems and away from proprietary DVRs, combined with the benefits of networking, digital imaging, and camera intelligence will constitute a strong impetus for rapid adoption of the network camera and its many advantages.