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Security and Surveillance Product Information for Architects and Engineers

Meeting the Megapixel Challenge

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Megapixel video security imaging offers the promise of amazingly detailed video information, with better image quality than ever before. However, megapixel video security imaging presents technical challenges, which must be addressed by vendors, integrators and IT administrators. This installment of Pelco Consultant examines the opportunities and challenges facing our industry in the move to megapixel video security.

What's the Challenge?

End-user demand is also increasing for higher quality video footage, driving a need to deliver cost-effective recording solutions for today's IP and megapixel cameras. However, megapixel technology presents technical challenges in two key areas – low-light performance and bandwidth consumption.

Low-Light Performance

Let's consider low-light performance first. Any video security system begins with a camera capturing an image. At the heart of the camera is an image sensor, which converts light into electronic signals. The two technologies employed by image sensors are charge-couple device (CCD) and complementary metal-oxide semiconductor (CMOS). Each technology has its own advantages and for use in video security, depending upon the particular application environment.

For a given image format size, CMOS sensors are typically megapixel (MPx) arrays (as compared to standard definition CCDs), which results in less light gathered in each pixel. Active circuits in CMOS share light gathering space, which results in less light gathered in each pixel. Also, in the past, the smaller pixels in CMOS imagers yielded an effectively lower Signal-to-Noise Ratio, when compared with CCD imagers. You can see the issues this could cause when deploying MPx cameras in low-light environments. The good news is the advancements in CMOS technology have eradicated the low-light performance gap between CCD and CMOS, making CMOS a viable or even preferable choice for low-light imaging.

Some of the most exciting technology developments are coming in the advancement of Wide Dynamic Range imagers with Megapixel Resolution. These developments are being driven by advancement in CMOS imager technology. Historically, CMOS has not performed as well as CCD under low-light conditions and in warmer environments. The challenges associated with CMOS imagers include smaller pixel size, dark current, higher read noise, and column correction processing.

Over the past 3 to 4 years, CMOS imager manufacturers have been working in each of these areas to increase the performance of CMOS devices. We have seen dramatic improvements, and in fact, testing in our engineering labs confirms that today's CMOS imagers perform at par or better than CCD imagers in similar conditions.

HD Displays for a Complete Solution

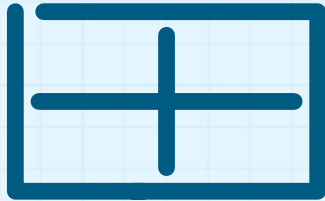
High definition video security begins with megapixel cameras, but a complete end-to-end HD video system requires the proper monitor, to ensure that video is viewed as it is intended. Two brand new series of Pelco monitors offer more choices for system design.

Narrow Bezel LCD Monitors See the Bigger Picture

New full high-definition Pelco Narrow Bezel Series LCD monitors are the perfect viewing solution for any control room. With edges that range from just 9.6mm to 17.4mm, these monitors can be tiled together easily to create a virtually seamless video wall.

Available in three sizes, these large format displays adapt to the changing nature of security in control room design and efficiency. Individual monitors, as well as entire walls, can be configured to meet individual security needs and multiple video streams can be arranged on a single monitor to significantly reduce an installation's power requirements. Energy Star certification enables customers to save money and energy.

Pelco LED-Backlit Monitors The Smarter Choice



Better performance, greater dynamic contrast and lower energy use make Pelco LED-backlit monitors a smarter choice for control rooms and desktops alike. These soon-to-be-released monitors incorporate Pelco quality with the use of LED backlighting, rather than the cold cathode fluorescent lights (CCFLs) used in most other monitors.

The result is better contrast levels and picture quality, which is imperative when making important security decisions. Additionally, the use of LED backlighting dramatically lowers power consumption and heat dissipation making for a more reliable, efficient monitor that can be housed in a slimmer package.

Bandwidth Consumption

Now to bandwidth consumption, storage and image file sizes. More pixels mean more data, which means larger files for each image captured by an MPx camera. When you consider that a typical 1.3 MPx camera consumes 2 to 5 MB/s of bandwidth (or higher!), it's easy to see how you can quickly use up all the bandwidth in the network while filling up all available storage.

H.264 encoding offers the ability to optimize image quality while minimizing file size, particularly compared to previous compression schemes (MJPEG, earlier parts of MPEG-4, etc.). It's important for integrators and system designers to understand that not all flavors of H.264 are the same. Some manufacturers only utilize Base Profile H.264, which offers some improvement in compression, but not as much as High Profile H.264, which offers the greatest benefits and flexibility in compression and image quality.

Integrators should also be aware that the effectiveness of H.264 compression varies, depending upon the complexity of the surveillance scene – scenes with more motion and more varied lighting will create larger image sizes. However, even though the incremental gain in compression (from Base profile H.264 to High Profile H.264), may seem relatively small on an individual camera scale, when you start to multiply it across tens or hundreds of cameras – that additional bandwidth savings can really add up.

The type of storage system also has a big impact on overall system cost and design. Traditional COTS data servers, while being relatively inexpensive, are designed for the “write once, read many” duty cycle of traditional data applications. With video surveillance, the burden placed on storage is opposite – because video is being recorded all the time, so storage devices need to be able to write data to hard disks all the time. If the storage sub-system is not tuned for massive amounts of write operations, the cost of deploying a storage solution increases dramatically. Some manufacturers have designed and developed video storage hardware specifically for the special challenges of recording video surveillance data. This should be an important consideration in any video system design decisions.

Matching cameras and recording/storage using High profile H.264 gives users the greatest outcome, allowing them to maximize the benefits of HD/Megapixel imaging while mitigating or minimizing bandwidth issues on their network.

It's All About the Image

Our industry is constantly striving toward producing better images with more detail, to inform better business decisions – whether for responding to real-time events or conducting forensic investigations. To be sure, today's IP cameras can produce a significantly better picture than their recent analog predecessors. In our experience, once most end users have seen megapixel images, they want megapixel cameras for their system. But it's more than just the end-users saying, “I see it, I want it.” Other factors are driving megapixel adoption as well. New regulations have begun mandating minimally acceptable quality, frame rate, and retention periods, in market niches ranging from gaming to criminal justice to public safety and city surveillance. Ultimately, successful integrators will have to know how to optimize networks for megapixel streams.