

High-Definition Surveillance: **Details Count**

There are several new video formats that have hit the surveillance industry recently that will change the way we think about video.

There once was a time (like just a few years ago) when security video was roughly the equivalent of 1960's television .. except security video didn't even have sound and could only be recorded at low-frame rates.

These days high-definition security video is in full swing just like it's television counterpart and actually goes a step further by offering a variety of new formats, affordable megapixel cameras, and recorders that can actually record it all and more.

What does this all mean?

Unless you've been under a rock, you know that as of February 17, 2009, commercial television stations in the United States will no longer be broadcasting low-definition analog NTSC television signals. Instead they will be sending out new high-definition digital signals with far superior quality and resolution.

The changes taking place in the security world are very similar to commercial television with the exception that no one is forcing you to stop using your old standard resolution camera systems. Even so, with all the new high-definition (HDTV) formats available it might be time to start learning about these new technologies and considering if they make sense for your applications.

The New Formats

The format we've been using for all analog security cameras is based on the National Television System Committee (NTSC) standards which were originally defined in 1941! In 1953 they added color to the standard. The

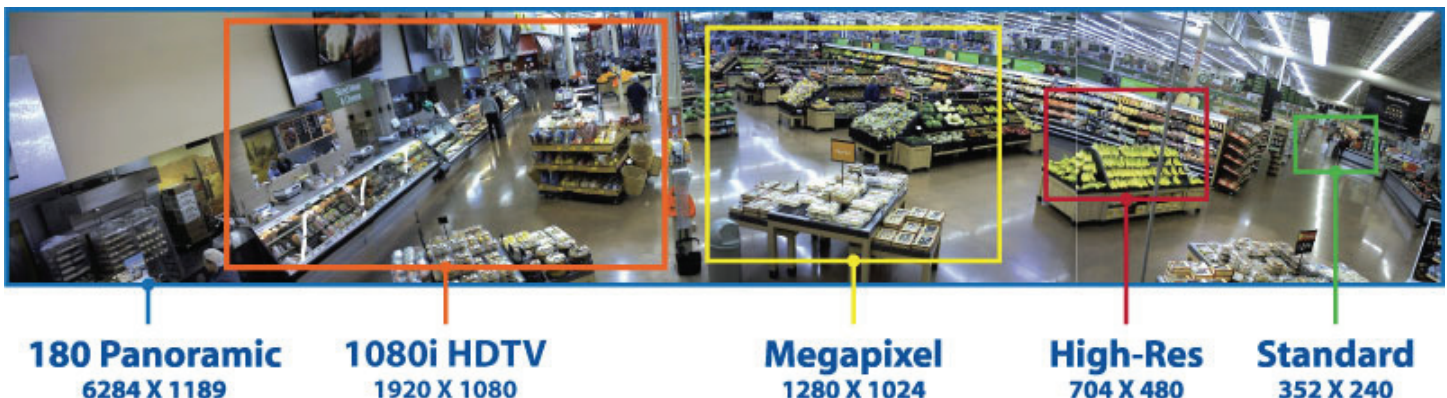
resolution however, has remained quite the same for the last 50 years, although most video surveillance recorders compress the images so much that the quality is actually much less than the old TV standard.

All that has changed very quickly in the last few years with the introduction of IP cameras that technically do not have to adhere to the NTSC standard. This has allowed manufacturers to build cameras using the megapixel technology developed for digital photography cameras. In addition to megapixel, it has also allowed the introduction of new specialty formats including:

- 16:9 and other wide aspect ratios that cover more area horizontally. NTSC was fixed at 4:3 meaning 4 units wide by 3 units tall.
- 180 and 360-degree super megapixel panoramic that allows you to record an entire room from the wall (180-degree) or an entire room from the center (360-degree).
- 180-degree top-down fisheye which allow you to record an entire room from the ceiling.

Comparing Pixels

Below is an actual image (at about 7% of its original size) from an Arecont 180 degree panoramic camera with other common resolutions including commercial 1080i HDTV superimposed on it.



Compared to the 180-degree panoramic image, or even the now relatively low-res 1.3 megapixel signified by the yellow square, it's becoming harder to imagine being limited to analog cameras only. Certainly, analog cameras will have applications for several years yet to come, but it's easy to see why megapixel will quickly replace them.

The Challenges

As with any new technology, there are certain limitations and challenges that we should be aware of before we set out to design and install a system utilizing megapixel cameras.

If we understand the limitations and set our expectations accordingly, we can deploy highly successful megapixel systems today. If we are thinking we'd like to deploy a moderately priced system recording sixteen (16) super 180-degree megapixel cameras recording at 30 fps each we are going to be sadly disappointed. If however, we pick and choose the areas where megapixel makes sense and cover other areas with more traditional cameras, this can be successfully done today rather painlessly.

I certainly advise you work with the manufacturers of the technology to assist you in designing a system that will meet your expectations. The primary challenges associated with megapixel all have to do with the extreme size of the video files produced. Therefore, there will be limitations in the following areas. Some of these can be overcome, some are more challenging.

- Network limitations and congestion can severely limit the frame rate, possible even when using relatively few cameras on the same network.
- Moderately priced (and even some expensive) recorders will only be able to process a certain amount of video because of processor and bus limitations. Even if the manufacturer says it can handle up to 128 IP cameras, that number is going to become much much smaller when we talk about megapixel and frame rate.
- Large file sizes translate into large hard drive storage requirements. Even with today's terabyte drives, you will find that most systems cannot hold enough drives to give you the storage you would need to record more than a handful or two of the

megapixel cameras. Even with external storage, there is going to be a point where it's just not going to fit into that McDonalds manager's office.

- Even with 7-12 Mbps internet bandwidth offered by leading cable companies, these images are not going to stream effectively without transcoding, resizing or frame-dropping, which by the way also uses your CPU.

The point is that megapixel is here and usable but you must understand the limitations to be successful.

The New Recorders and Codec's

As quickly as camera manufacturers are releasing these new cameras and formats, leading video recorder companies are releasing new products designed to make these incredibly large formats usable, streamable and of course recordable.

One of the greatest obstacles to recording and streaming megapixel and super-megapixel video has been the size of the files. Standard codec's like H.264, while a great advancement over the even older M-JPEG format, were not designed for surveillance video and suffer from an inability to provide meaningful decreases in file size at the moderate (3-10) images-per-second surveillance footage is typically captured at.

Newer codec's ([such as our own Aztech codec](#)) are optimized for megapixel security recording and are able to reduce the files size to roughly 1/10th the size of the video stream leaving the megapixel camera. Since this does take additional CPU cycles, it will limit the number of megapixel camera streams that can be recompressed, but depending on your frame-rate you should find covering areas like the parking lots and cash-handling areas is workable.

Technologies such as this is what is finally making megapixel not only a reality, but usable for the first time since you can actually fit your video on your DVR/NVR's hard drives.

Where do we go from here?

Like any new technology, adoption will take time while the public becomes educated and understands not only the benefits, but the challenges as well and can clearly understand exactly how to best implement these systems. It is also imperative that manufacturers lead the way with factual information that allows users to be successful.