

It's on the cards

There are as many vendors for video capture cards as there are ways to configure a system, so how do you choose high-quality components and stay within your budget? Matrox Imaging's **Sarah Sookman** sets out the factors to consider, as well as providing some guidelines for working with your vendor.

At a glance

- It's important to be clear about certain key terms such as frames per second -v- fields per second, simultaneous capture against simultaneous connection, and image resolution

- Consider your monitoring requirements, including the level of detail needed in a scene and the size of your field of view

- Read the fine print in product specifications, especially the switching rates

When you design a video surveillance system, the underlying issue is finding the best possible price versus performance. And a key part of a digital system is a video capture card, which acquires images from a camera and transfers them to a PC for viewing and storage.

A video capture card is normally installed in one of the slots on a PC's motherboard. If you're choosing one for your system, an understanding of basic terminology will help you ask the appropriate questions of your vendor.

- FPS. This is a measure of how much video data the card can capture. This term has the greatest potential for ambiguity because it can mean either fields per second, or frames per second. A frame contains two fields (odd and even), so the frame rate always has a lower number than the field rate. When acquiring fields, the capture card can use either the odd field or the even field.

- Simultaneous connection – this is not the same as simultaneous capture. In order to acquire video data, the capture card must be equipped with at least one video decoder. In terms of the number of supported inputs and video decoders, capture cards can differ greatly. Simultaneous connection implies a sequential capture and therefore a

latency between the capture of successive frames (or fields) from a particular camera. The latency will depend on the number of cameras connected to the card and the number of video decoders on board. A capture card that supports eight cameras does not necessarily acquire the video data from all cameras at the same instant. Instead, the card will grab the frame/field from a particular camera, and then, using a round-robin configuration, switch to grab the feed from the next camera. Simultaneous capture implies that the capture card has a video decoder available for each connected camera.

- Image resolution – this is defined as the number of pixels in the image and is dependent on the video format. Along with its monochrome counterpart CCIR, the PAL colour standard features a resolution of 768x576 at 25 frames/50 fields per second, and is typically used in Europe. The NTSC colour standard and its monochrome counterpart, RS-170, feature a resolution of 640x480 at 30 frames/60 fields per second, and are used in North America and Japan.

Selecting the components

Ideally, you will want to capture and record the video data from all your cameras. However, in some cases, the available bandwidth is insufficient for simultaneous capture of all the video. In

systems with a high number of cameras, there is no choice but to rely on sequential capture; in other words, to capture and switch between cameras.

When you work with a vendor or system integrator, you must have a clear understanding of the application, which dictates the level of performance you need from the system. If you need to acquire video from all cameras simultaneously (assuming full resolution), then you need a high-end system, which means either a capture card with multiple video decoders or multiple cards. If you can manage with a reduced frame rate, an entry-level or medium range system will suffice. Since these systems will typically have one or two video decoders to support four, eight, or even 16 cameras, they must rely on sequential capture through channel switching.

You can determine what you need by considering the level of detail in the scene. Do you require a large field of view? Is it necessary to monitor the scene at all times, or is it acceptable to switch the cameras and grab every *n*th frame? When switching between multiple cameras, the maximum frame rate per camera is the maximum number of frames per second handled by the card, divided equally among all the connected cameras. For example, if the card can capture 60 fps, and is

Figure 1: Acquisition capabilities – fields and frames explained. Be sure your capture card vendor is clear on the card's acquisition capabilities. The two fields of an interlaced video signal take the same time as an individual frame; a high field rate does not mean the card can acquire more data than a card with a 'lower' frame rate.

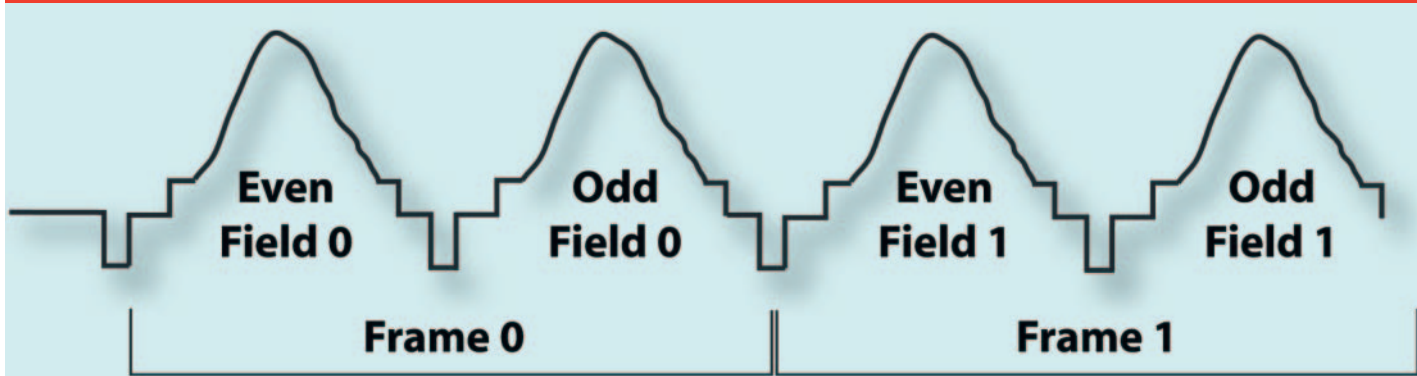
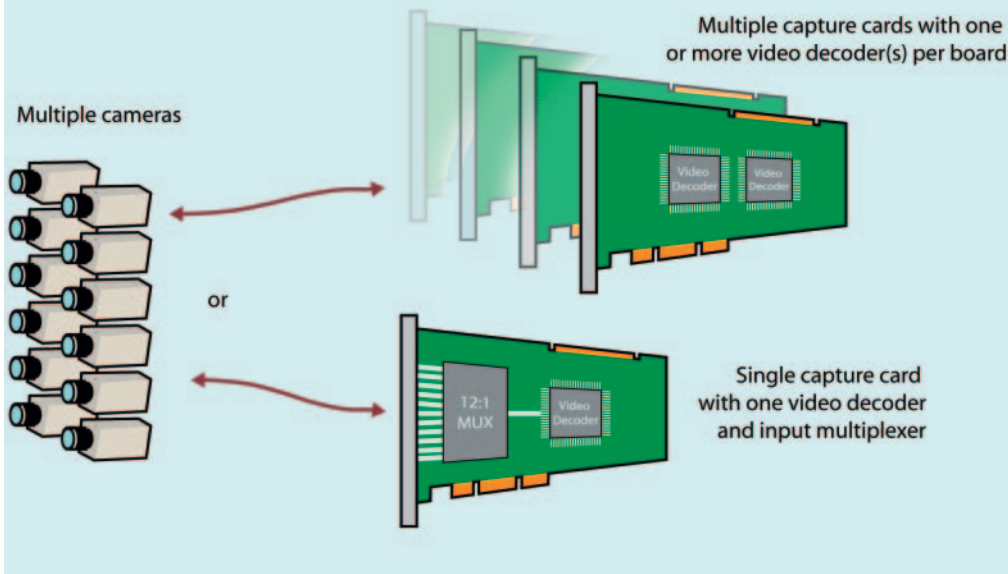


Figure 2: You have different options when assembling the components of a surveillance system. If your system uses multiple cameras, you can acquire from all cameras simultaneously using multiple capture cards with one or more video decoder(s) per card. You can also connect all cameras to a single capture card with one video decoder and input multiplexer.



TROUBLESHOOTING TIPS

YOU'VE hooked up your video camera to your capture card and grabbed those first images. But all is not going according to plan! The image quality is poor: you may be seeing line jitter, colour artifacts, or luminance bouncing, where the image brightness is not consistent.

In order to ensure that high-quality images are effectively captured from your RS-170/CCIR or NTSC/PAL camera, a good signal (i.e. standard 1 volt peak-to-peak) must reach the video capture card.

Sometimes the camera signal degrades to less than 1 volt as it travels along a cable that is too long. There may be other occasions when the signal will have been amplified so that it can travel over a long cable length, resulting in a degraded non-standard signal that outputs more than 1 volt.

Another factor that may affect signal quality is when your camera is working in a noisy environment. In such situations, the signal could be affected by electromagnetic interference.

connected to six cameras, the system will acquire a maximum of 10 frames from each camera per second, or one frame every 0.1 seconds. Furthermore, capturing a larger field of view may give you the option of a lower frame rate: as you are viewing a larger scene you will still see action that could be missed in a smaller scene with the same frame rate.

If you need to monitor a wide area, consider the level of detail in the scene. Do you require colour images? Is it sufficient to detect the motion of a person, or do you need to see facial characteristics? These questions help you determine the resolution needed for your application.

Essentially, the cost depends on the system performance, the number of

decoders on the capture card, and the type of camera you need.

Be an educated buyer

When consulting vendors, read the fine print on their product brochures. Some vendors take liberties when defining channel switching performance. Some cite the 'typical' frame rate, which is a measured average frame rate over time. Other vendors advertise the theoretical maximum frame rate, which might not be sustainable over a long period of time.

Look closely at the product specification, switching rates for monochrome and colour may differ significantly. Since monochrome cameras do not contain a chroma signal, they can be switched faster than colour cameras. If you have a system that features both colour and

monochrome, measuring performance can be even more complicated.

If a single capture card is insufficient for your needs, you can increase the system's performance by installing multiple cards in the system. Note, however, that not all board architecture allows scalability, so if you need increased performance check with your vendor to be sure the product is scalable.

Summary

Choosing the most appropriate capture card for your surveillance system depends on your application. Make sure you know how much scene detail you need and how much data you need to record. Above all, understanding the technology behind capture cards will help you get the most appropriate product.

Is it necessary to monitor the scene at all times, or is it acceptable to switch the cameras and grab every nth frame?

Your choice of capture card will depend, among other factors, on the detail you need in a scene and the update rates

CCTV

