

Briefing Papers — CCTV and DVRs

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Whenever CCTV installations are being planned, two questions always arise – how much storage is needed, and what type of storage should be used? There are no ‘one-size-fits-all’ answers, but Jon Hill offers security professionals some salient advice on the matter.

What about a RAID on CCTV?

Wherever CCTV storage systems are involved, one question at least is easy to answer. It’s definitely only worth considering digital systems that store images on hard disks. They are much more flexible and less labour intensive than old-fashioned, tape-based systems, and they allow valuable extra facilities – like fast image searching – to be provided.

The next question – how much storage is needed? – is less straightforward. Every installation must be individually assessed, taking into account the key factors of picture quality, frame rate, compression method and the length of time for which the recordings have to be stored.

Let’s start by looking at picture quality. The lowest resolution normally used for new systems is CIF, equivalent to 352 x 288 pixels, which is about the same as QVGA VHS recording. Higher resolutions like 2CIF, 4CIF and D1 are now commonly available.

End users should note that 4CIF resolution captures a great deal of information which may or may not be of use, depending on the application. The down side is the requirement for around four times as much storage ‘space’ as CIF images.

The latest megapixel cameras produce even better quality images, which are great when it’s necessary to zoom in on the detail of a recorded picture, but they invariably have a significant impact on available storage.

Storage in the frame

The next thing to consider is the frame rate. Live-motion pictures are recorded at a rate of 25 frames per second (fps). Recording at 4CIF resolution means around 1 Mb of storage is needed to record a second of video (the equivalent of 3.6 Gb per hour). That’s 43.2 Gb for 12 hours.

Cutting the frame rate to 12.5 fps halves the storage needed and still allows synchronisation with a recorded audio file. If sound isn’t required, frame rates as low as 4 fps are often acceptable, with corresponding large-scale reductions in storage requirements.

All digital video recorders (DVRs) save storage space by compressing the images. The more recent compression methods like MPEG-4 offer the best results, but it’s important to remember that if a particular DVR needs significantly less storage than a similar machine using the same compression method, the picture quality could well be compromised.

Let’s move on to how long recordings should be kept. It depends, of course, on the application at hand, but bear in mind digital systems are very flexible. It’s no longer necessary

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to be locked into the 31-day storage period that was the norm with VHS recorders.

Recording to hard drives

What type of storage should you use? The simplest option is a DVR that records the images to internal hard drives. The DVR may have several internal hard disks, but these aren't normally RAID-configured.

This arrangement is inexpensive, but it has a potential shortcoming in that if any hard disk fails, all the images stored on it may be lost.

RAID-based storage addresses these issues. This comes in several versions. RAID 0 uses multiple disks to improve writing speeds, but doesn't protect against disk failure. RAID 1, however, records images simultaneously to two disks. If one of the disks fails, no images are lost because they can be read from the other. The drawback is that RAID 1 doubles the number of disks required for a given amount of storage.

With RAID 5, data for the images is divided – the technical word is 'striped' – over several disks. Additional parity data is also generated and stored. If a disk fails, the system uses this parity data to rebuild the images that would otherwise be lost.

Internal or removable disks?

The final decision to make is whether to choose internal or removable disks. Removable disks are an advantage when the police need to impound images for evidence, as they can just take the disk cassette rather than the whole DVR. This advantage is, however, lost if mixed internal and removable storage is used, as the police will almost certainly impound both the DVR and the disks.

Remember, also, that removable disks are potentially less secure than internal storage. It's possible for someone to walk off with a removable disk cassette, but a rack-mounted, fully-cabled DVR is more of a problem!

If specifying disk storage for CCTV installations still seems like a huge challenge, there are two things to bear in mind.

The first is that experienced suppliers are always ready to provide advice on specific applications. The second is that disk storage is comparatively inexpensive, so erring on the generous side will cost you very little.