Technology Paper

Video Surveillance Storage: How Much Is Enough?

Introduction

While digital video surveillance systems offer an embarrassment of riches compared to their analog ancestors, they still require thoughtful design and deployment to ensure maximum cost-effectiveness. Among the various criteria that impact surveillance digital video recorder (SDVR) system value, storage capacity can be particularly significant—and easily misunderstood.

In conventional computing environments, hard drive capacity is typically viewed only in quantitative terms; how much data can the storage system hold? But in the context of SDVR solutions, drive capacity plays a key role in determining both the quantity and *quality* of data that the system can store.

Because 24x7 video streams are the very lifeblood of SDVR systems, to deliver superior performance and efficiency in a given security environment, these systems must have sufficient storage capacity to address three fundamental video parameters:

Quantity—the number and time duration of the video streams

Quality—the image quality of the video streams, expressed in terms of frame resolution (for example, 1280x1024 pixels) and frames per second (fps)

Archiving—the length of time the video streams will be stored

Video Balancing Act

Once the specific balance of video data quantity, quality and archiving required for a given security application is determined, it's easy to estimate the amount of storage capacity an SDVR system must include. Simply go to one of the video surveillance storage matrix tables to select the table row that lists the frame resolution and fps needed for each 24x7 video stream, then read across to find the nearest desired archival period (shown in days) and the corresponding drive capacity required for each individual stream.

Note: Table 1 reflects MPEG-4 compression, while Table 2 reflects the H.264 encoding; results will vary depending on video compression formats and specific video recording applications used.

Video Surveillance Storage: How Much Is Enough?

NTSC: Recording Variable: 10fps			Surveillance Hard Drive Capacity		
			1TB	2TB	3TB
176 x 120	Low Quality	# Days	694	1388	2082
352 x 240	↓	# Days	266	532	798
704 x 480		# Days	86	172	258
1280 x 1024	High Quality	# Days	26	52	78

NTSC: Recording Variable: 20fps			Surveillance Hard Drive Capacity		
			1TB	2TB	3TB
176 x 120	Low Quality	# Days	346	692	1038
352 x 240	↓	# Days	132	264	396
704 x 480		# Days	42	84	126
1280 x 1024	High Quality	# Days	12	24	36

NTSC: Recording Variable: 30fps			Surveillance Hard Drive Capacity		
			1TB	2TB	3TB
176 x 120	Low Quality	# Days	230	460	690
352 x 240	↓	# Days	88	176	264
704 x 480		# Days	28	56	84
1280 x 1024	High Quality	# Days	8	16	24

Table 1. Video Surveillance Storage Matrix (assumes MPEG-4 encoding)

NTSC: Recording Variable: 10fps			Surveillance Hard Drive Capacity		
			1TB	2TB	3TB
176 x 120	Low Quality	# Days	1080	2160	3240
352 x 240	↓	# Days	414	828	1242
704 x 480		# Days	134	268	402
1280 x 1024	High Quality	# Days	40	80	120

NTSC: Recording Variable: 20fps			Surveillance Hard Drive Capacity		
			1TB	2TB	3TB
176 x 120	Low Quality	# Days	540	1080	1620
352 x 240	↓	# Days	206	412	618
704 x 480		# Days	66	132	198
1280 x 1024	High Quality	# Days	20	40	60

NTSC: Recording Variable: 30fps			Surveillance Hard Drive Capacity		
			1TB	2TB	3TB
176 x 120	Low Quality	# Days	360	720	1080
352 x 240	↓	# Days	138	276	414
704 x 480		# Days	44	88	132
1280 x 1024	High Quality	# Days	14	28	42

Table 2. Video Surveillance Storage Matrix (assumes H.264 encoding)

Video Surveillance Storage: How Much Is Enough?

The tables show the enormous variation in the hard drive's recording capacity based on a 24x7 video stream's resolution and frames per second.

With so many security applications entailing dozens of cameras and 24x7 video streams, it soon becomes apparent that a typical SDVR system's storage requirements can easily reach hundreds of gigabytes. In the following three examples, the varying video profiles of different security environments (and the storage capacities they require) are compared.

Example A: Extended Archiving

There are many businesses (point-of-sale and retail, restaurants, banks, and so forth) where high-resolution, full-motion 24x7 video streams are simply overkill. Typically employing a modest number of fixed cameras to record customer activity, SDVR solutions in these environments are able to employ lower image resolution and fewer frames per second while still delivering sufficient video detail for subsequent review as needed.

When the quality of an SDVR system's 24x7 video streams can be relatively low, the benefits of greater HDD capacity come from enabling longer archival storage. Archive periods can be economically extended from a select number of days to months, or even years; indeed, continuous video signal at 10fps/352x240 resolution can be streamed onto a 3TB drive for 798 days with MPEG-4 compression and an astounding 1242 days with H.264 encoding (refer to Table 1 and Table 2).

Example B: Enhanced Quality

Environments with more stringent security requirements (for example, schools, public buildings and airports) rely on 24x7 video streams with higher resolution and more frames per second to better identify suspicious persons and activity. Coupled with broader camera deployment, the enhanced video quality of such streams gives security personnel a more detailed, comprehensive view of the areas under surveillance.

Not surprisingly, the higher resolution and frame rates of such 24x7 video streams can significantly increase the capacity requirements of the SDVR system. As shown in Table 1, just one continuous video stream at 20fps/704x480 image resolution can fill a 1TB drive in only 42 days with MPEG-4 compression. Table 2 shows how H.264 encoding extends video storage in this scenario to 66 days. Multiply that by the dozens of 24x7 video streams that such SDVR systems typically employ, and the need for massive storage capacity quickly becomes clear.

Example C: Intelligent Video

Designed for maximum-security surveillance environments, intelligent video takes full advantage of the exceptional detail found in high-resolution, full-motion (30fps) 24x7 video streams to recognize visual patterns.

The best-known use of this technology is facial recognition; intelligent software analyzes the faces of persons in stored surveillance footage, comparing their features to those of known suspects/criminals on file. When a match is found, the application automatically notifies security personnel for follow-up investigation.

These high-resolution, full-motion 24x7 video streams deliver superlative visual quality, but do so at a price; they consume vast quantities of storage capacity. The tables show the voracious nature of such streams. Using MPEG-4 compression, a single continuous stream at 30fps/1280x1024 resolution fully exhausts the capacity of a 3TB drive in just 24 days, while H.264 encoding delivers approximately 42 days of the same quality video.

Conclusion

Boasting an unprecedented blend of visual detail and storage capacity, digital video recorder systems are spearheading a new era of surveillance effectiveness and flexibility. Purpose-built surveillance drives are key enablers of this revolution, storing enormous quantities of video data at remarkably low cost per GB. The result is SDVR systems that can seamlessly accommodate the unique image quality and extended archival needs of modern security environments.

www.seagate.com

AMERICAS Seagate Technology LLC 10200 South De Anza Boulevard, Cupertino, California 95014, United States, 408-658-1000
ASIA/PACIFIC Seagate Singapore International Headquarters Pte. Ltd. 7000 Ang Mo Kio Avenue 5, Singapore 569877, 65-6485-3888
EUROPE, MIDDLE EAST AND AFRICA Seagate Technology SAS 16–18, rue du Dôme, 92100 Boulogne-Billancourt, France, 33 1-4186 10 00