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Case Study

Enhance Technology uses Seagate SATA drives to make digital film editing more productive and economical

Over the next few years, even as audiences continue to enjoy films in theaters, the quality of their experience will change drastically. A major shift is underway in the film industry's business model for production and distribution of movies. As more and more movies are shot on digital equipment, post-production services and video editors are using digital workstations for processing and editing. Digitally, they create special effects, add graphics and titles, and turn raw material into a finished product.

Digital movies introduce benefits for everybody involved with making or watching films. Unlike celluloid, a digital file will not wear out after repeated viewing-it's always in mint condition. There is no fading or scratching. The files can be transmitted quickly by satellite or other high-speed connections; nobody must wait for the slow distribution of limited copies of a film on tape. Theater operators can show any digital movie as often as they want and to as many people as want to see it. Theaters don't need to turn audiences away or play a less-than-popular movie to an empty house. As a result of the increased flexibility, theaters likely will be able to increase their revenue. Theater operators do need, however, to make the investment in digital projection equipment and servers. In Europe, China and India, many operators began the conversion to digital format as soon as it became available. The momentum in the United States is a little slower but likely to accelerate as audiences learn to expect the improved image and editing quality of digital production.

A new way of editing movies

Superior editing capability, even for independent filmmakers and smaller post-production companies, is another major benefit of the digital movie format. In a digital file, it is much easier than in a film to insert special effects, subtitles and graphics, or to adjust colors and frames. Digital processing specialists use video workstations in a process called "non-linear editing." Traditional, linear editing works by copying and manipulating film in one tape deck to film in another deck. Non-linear editing lets the editors manipulate and move sections of film freely, usually depending on to the movie's timeline. In any digital shot, non-linear editing can modify the images with much greater precision and control than ever can be possible with linear editing.

The productivity and profitability of non-linear editing depend-to a high degree-on two main elements: the ease and efficiency of working with the often very large data files, and the cost-effectiveness of the editing equipment. In turn, the hard drives in the digital editing workstation have an impact on both of these factors.

Enter Enhance Technology, a data storage systems provider headquartered in Santa Fe Springs, California. Close to 60 percent of Enhance Technology's customers are involved with digital editing. To support its customers more effectively, Enhance Technology designed a new product, the UltraStor 16, and tested its performance in non-linear applications on Microsoft® Windows®

workstations. UltraStor 16, released in April 2004, includes sixteen Serial ATA drives from Seagate® Technology. The overall results of the benchmark tests compelled Luis Rodriguez, Enhance Technology product manager, to state, “By now, I have no doubt that Seagate Serial ATA will help revolutionize the media storage industry.”

Seagate industry leadership delivers Serial ATA drives early

Seagate Technology is a founding member of the Serial ATA Working Group and the first to supply Serial ATA (SATA) drives to the industry. Designed to replace parallel ATA drives with a new interface, Serial ATA drives deliver higher performance, increased reliability and better cost-effectiveness than their precursors. With redesigned serial cables and connectors, SATA drives also provide systems builders with superior flexibility in creating effective storage solutions for their customers. It is noteworthy that Seagate SATA drives are truly native, meaning that the drive controller electronics use SATA protocol throughout the drive, as opposed to translating SATA to parallel ATA protocol at the drive interface.

SERIAL ATA DRIVE CAPABILITIES INCLUDE THE FOLLOWING:

- Native Command Queuing (NCQ) increases performance-by as much as that of a 10,000-RPM SATA drive-and reduces the wear and tear on discs through implementing an internal queue that allows for multiple outstanding commands, which can be rescheduled or reordered.
- Cyclic Redundancy Checking (CRC) integrates on both the command and the data packet level for increased bus reliability.
- Deferred Spin stages the power-up process of each drive to avoid significant power drainage to the system power, an important feature in bulk storage devices.

Seagate Technology is offering Native Command Queuing and Deferred Spin before any of its competitors.

Verifying the value of SATA for high-definition video editing

Asked why Enhance Technology used Seagate SATA drives for its new system, Tinno Chen, director of research and development, explains, “Consistently, Seagate has delivered the best levels of reliability and performance in its products. When SATA drives came out, it was only natural for us to jump on the opportunity to help users become more productive and save money.” Rodriguez adds, “Seagate was wise enough to see, very early, in which direction drives needed to move, and its strategy was perfect for the needs of our video-editing customers.”

To test SATA performance, Enhance Technology set up a typical, high-definition, non-linear editing environment on the Windows platform. Tinno Chen and his team conducted the SATA performance tests using a Liquid Chrome system and benchmark parameters from Pinnacle Micro, a leading provider of optical storage systems. Sixteen Seagate 160-Gbyte SATA drives were configured in two aggregated RAID 5 arrays. QLogic supplied the Fibre Channel host bus adapter for the tests.

The testing took place over several days. In typical high-definition, video-editing tasks, editing file sizes tend to be between 200 and 300 Mbytes large. Enhance Technology tested using a wide range of file sizes between 4 and 5,000 Mbytes, and block sizes of 64, 512, 1,024 and 2,048 Kbytes. The testers established performance measures for linear reading, random reading, and linear writing of the SATA drives. Average disc usage was: for play, ranging from 19 to 54 percent; and for record, between 6 and 9 percent.

The following table shows only a few of the values produced and maintained during the testing process:

File Size	Block Kbytes	Linear Read Mbytes/second	Random Read Mbytes/second	Linear Write Mbytes/second
4 Mbytes	512	322.2	397.3	348.4
	1024	331.0	418.2	365.2
500 Mbytes	512	338.2	420.2	255.1
	1024	353.1	424.5	264.6
1,000 Mbytes	512	325.8	420.4	236.2
	1024	339.3	424.4	246.5
2,000 Mbytes	512	325.8	207.1	248.5
	1024	339.7	352.1	248.6
5,000 Mbytes	512	324.9	60.6	240.9
	1024	348.0	160.3	244.0

“With these strong results in hand, we want to show what the performance will be like on an Apple Macintosh platform,” says Chen. Enhance Technology will conduct a similar series of benchmarks using a Final Cut Pro video-editing workstation running on the Mac operating system.



Why Seagate SATA makes good business sense for systems providers and the film industry

The video-editing industry has been using mostly SCSI and parallel ATA drives, and systems providers, as well as users, are reluctant to abandon a reliable, working solution unless offered compelling advantages. Enhance Technology believes that the new Seagate SATA drives can lead to dramatic changes in the way digital films are created, produced and stored. Nearline editing workstations today can cost from approximately \$25,000 to \$50,000. SATA drive technology offers significant flexibility in lower-end systems while keeping its costs down. Customers can still use SCSI drives for higher-end performance needs. "Now systems providers can offer video-editing workstations with SATA-based storage systems that give you a higher performance than Parallel ATA-at a fraction of the cost of the higher-end systems," says Luis Rodriguez.

In addition to the SATA features already mentioned, hot plugging was attractive to Enhance Technology and its customers. Users can swap out SATA drives without powering down the entire system. Parallel ATA is not designed to accommodate hot plugging. "It happens sometimes," Tinno Chen says, that users need to replace a drive in a hurry. "When you're working under a tight deadline, it helps if you can do so without completely interrupting your work. This is definitely a situation where Serial ATA helped us overcome a limitation of Parallel ATA. The ability to swap out SATA drives without interruption means a great deal to customers."

The economy of high-end video editing may well be transformed by the availability of Seagate SATA drives. Digital film editing is a crowded and highly competitive field. Post-production service providers are always under pressure to squeeze in more projects in less time, and with smaller margins. Now, with SATA drives, they can offer their clients high-quality work at a very reasonable cost, and can get as much or more work done as when they were using legacy drive interface technologies. The improved affordability of Seagate SATA drives can also make it easier for independent and emerging film makers to complete their editing processes and get their work in front of audiences. Thanks to Seagate SATA drives, film fans should have a lot more to look forward to as movie theaters adopt the digital format.