Movie theaters worldwide are rapidly switching from film-based movie projection to digital playback technology. To help theaters manage this transition, the Dell OEM Industry Solutions Group has developed a cost-effective, high-performance digital cinema solution that is designed to be reliable and easy to support.

Movie theaters today are looking for ways to reduce costs, improve their product and create new revenue streams. Digital cinema indicates a huge savings for theater owners and a chance to succeed in the new digital era.

For over a century, the movie industry has used film as the medium on which to distribute and play back movies. Film is easy to use, and movie theaters have experience in owning and operating film projection systems. But film is also expensive. A single film print, for example, can cost as much as US$2,000 to create and weigh over 50 pounds. A movie in wide release is generally shown on more than 4,000 screens, which can mean a cost of US$8 million in prints plus the cost of shipping heavy film canisters to movie theaters around the globe. Furthermore, a film print lasts only for roughly 30–40 showings, so shipping and print costs for successful movies can easily double or triple as film prints wear out and need to be replaced.

Now, the high cost of movie distribution is about to change as the movie industry transitions to the digital distribution and playback of movies. With digital cinema, movies are distributed via hard drive or satellite, avoiding the need to create and ship expensive, heavy film prints. Once at the theater, movies are stored digitally and played back using digital projectors. Movies stored on digital media do not wear out as film prints do, so they do not need to be replaced during long runs. Overall, the movie industry anticipates such tremendous savings from the switch to digital media distribution that it is expected to convert entirely from film to digital media in the next few years.

Digital cinema offers significant benefits to theater owners as well. Unlike film prints, digital cinema does not limit the number of screens showing a given movie, so each theater complex needs only one copy of a particular movie. In addition, theater owners can use digital projection equipment to show non-movie entertainment such as live music and sports.

However, movie theaters must undergo a technology makeover for digital cinema to work—changing from tried-and-true film-based projection systems to digital storage and projection. Many theater owners are reluctant to switch to a digital infrastructure because they are concerned about the cost and manageability of such an environment. To help movie theaters make the transition to digital technology, the Dell OEM Industry Solutions Group is working with digital cinema vendors to develop a robust, high-performance solution that is also cost-effective and easy to support.
Meeting strict industry standards for digital cinema quality and reliability

Although digital cinema has the potential to deliver tremendous cost benefits compared with film, the movie industry requires any digital cinema playback solution to deliver the same level of quality and reliability as film. To address this concern, six major motion picture studios—Walt Disney, Fox, Paramount, Sony Pictures Entertainment, Universal, and Warner Bros.—formed Digital Cinema Initiatives (DCI). This joint venture was created to establish voluntary specifications for an open architecture that is designed to ensure a uniform, high level of technical performance, reliability, and quality control for digital cinema. To receive movies digitally, theaters must implement a digital cinema storage and playback solution that meets stringent DCI standards for picture and sound quality, storage capacity, network performance, and reliability.

For example, theater-quality digital movies require a significant amount of storage—potentially as much as 500 GB for a full-length feature. As a result, DCI standards specify that any digital cinema solution make available a minimum of 1 TB of storage per screen. Also, movies require high-performance network bandwidth, so the DCI standards specify a minimum network throughput between central storage and each individual screen of approximately 400 MB/sec. For actual projection of movies, the DCI specifies that the image and sound quality of a digital projector be comparable to that of 35 mm film.

Perhaps the most important quality of any digital cinema playback solution is reliability. It is essential to the moviegoing experience that a movie not be interrupted, so DCI standards regarding continuity and reliability are especially stringent. According to the DCI standards, a movie in progress should not be interrupted during presentation for any reason except in the case of a catastrophe, such as a natural disaster. Also, DCI standards stipulate that any failure within the system be repaired within two hours, and that the mean time between failures should be no less than 10,000 hours. A digital cinema solution must have the redundancy and reliability to meet these strict standards.

Movie theater operators are generally not used to working with digital equipment, not to mention meeting strict DCI standards. A digital cinema solution needs to be easy to install, use, manage, support, and upgrade. Also, because theater owners are used to purchasing relatively inexpensive film projection technology, a digital cinema solution must be cost-effective.

Smoothing the transition to digital cinema

For many years, the Dell OEM Industry Solutions Group has worked with companies and vendors to design, deploy, and support vertical original equipment manufacturer (OEM) solutions in a wide range of industries. (For more information, see the “Ticket to Growth” sidebar in this article.) To help movie theaters make the transition to digital cinema, the Dell OEM Industry Solutions Group is working with several digital cinema vendors to design and develop solutions that meet the stringent DCI standards for quality, performance, and reliability in a cost-effective, manageable way.

The Dell OEM Industry Solutions Group offers a cost-effective digital cinema infrastructure based on Dell servers, storage, and networking products that is designed to be robust, reliable, and easy to manage. Because movie theater complexes vary in size and requirements, Dell does not offer a single, specific digital cinema implementation but rather a general design that can be scaled up or down to meet the individual requirements of a particular theater complex.

Deploying a scalable digital cinema solution: How it works

Storage is at the heart of any digital cinema solution. To meet the massive storage requirements of digital cinema, the Dell OEM Industry Solutions Group recommends a Dell™ PowerVault™ MD3000 modular disk storage array supported by one or two Dell PowerVault NX1950 networked storage systems running the Microsoft® Windows® Unified Data Storage Server 2003 OS (see Figure 1). The PowerVault MD3000 is a Serial Attached SCSI (SAS) array designed to support up to 15 SAS hard drives, for a maximum capacity of 4.5 TB of storage—enough to support approximately 10 feature titles. For theater complexes that require additional storage, up to two Dell PowerVault MD3000 storage arrays can be daisy-chained, with the SAS cable connecting both Dell PowerVault MD3000 storage arrays to a Dell™ PowerVault™ NX1950 networked storage system.

Ticket to Growth

The Dell OEM Industry Solutions Group offers digital cinema vendors and their customers extensive services— including configuration, deployment, support, and upgrade assistance—that make it easy for a theater owner to operate a digital cinema solution. All services, such as two-hour on-site repair service, are available through a single point of contact so customers do not have to worry about whom to call for what issue.

For many years, the Dell OEM Industry Solutions Group has worked with companies and vendors to design, deploy, and support vertical OEM solutions in industries ranging from aerospace to telecommunications. By leveraging Dell’s trusted technology and flexible, cost-efficient manufacturing processes, the Dell OEM Industry Solutions Group enables customers to focus on their competitive strengths, decrease time to market, and broaden product offerings without adding complexity or sacrificing quality.

For more information about the Dell OEM Industry Solutions Group, visit www.dell.com/oem.
PowerVault MD1000 disk expansion enclosures can be added for a maximum storage capacity of 13.5 TB—enough to support at least 30 feature titles.

Besides providing massive storage capacity, a configuration based on the PowerVault MD3000 modular disk storage array and PowerVault NX1950 networked storage server is designed for reliability and ease of use. For example, the PowerVault MD3000 SAS array features multiple redundancies throughout the system to help ensure continuity even if an individual component fails. Additionally, the PowerVault NX1950 storage server is designed to work with the PowerVault MD3000 SAS array to facilitate storage deployment and help simplify storage management. Together, the PowerVault MD3000 SAS arrays and PowerVault NX1950 networked storage servers offer outstanding storage capacity and performance.

To provide for the network bandwidth required by digital cinema, Dell recommends an add-in 10 Gigabit Ethernet network card for the storage servers connected to one or more 10 Gigabit Ethernet switches, which can help reduce congestion and manage network traffic. Configuring one to four Gigabit Ethernet links to each auditorium exceeds the per-screen bandwidth requirements specified by the DCI and also allows for simultaneous screening of multiple movies from the central storage array.

In addition to the storage and network infrastructure, digital cinema vendors must also provide a theater management system that allows theater personnel to perform basic functions such as routing movies to individual screens and beginning playback of a movie. To support each vendor’s theater management system, Dell recommends a Dell PowerEdge™ 2950 server. (Figure 1 does not show digital projection systems, which also are expected to be provided by digital cinema vendors.)

**Designing for scalability and ease of management**

In addition to meeting the performance and reliability standards of the DCI, a best-practices digital cinema solution from the Dell OEM Industry Solutions Group is designed to be flexible and easy to manage. For example, all Dell digital cinema solutions are built using scalable, standards-based Dell components that can be custom configured to suit the unique needs of individual theater owners. Additionally, Dell components can be easily integrated with other systems and easily expanded to enhance performance and functionality, minimizing the cost of expensive integrations and upgrades.

Digital cinema solutions have the potential to revolutionize the way the movie industry shoots, distributes, and plays back movies. The Dell OEM Industry Solutions Group is committed to helping theater owners join this digital revolution by offering cost-effective, high-performance digital cinema solutions that are designed to be reliable and easy to support. Let the show go on!

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