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Fiber Cabling Solutions for Premises Networks

DreamWorks Studio

Centralized Optical Fiber Network Speeds Production

Introduction

Hollywood's acknowledged leader in the making of animated feature films is DreamWorks SKG, producer of such box-office hits as *Antz*, *The Prince of Egypt*, *Chicken Run*, and most recently, *Shrek*. Acclaimed for its collective creative genius, DreamWorks SKG also is famous for employing sophisticated technology in film production. DreamWorks Studio, a 500,000 square-foot, five-building animation production campus in Glendale, California, was mainly constructed to support the development and production of animated feature films. The facility's extensive optical fiber-to-the-desktop network connects more than 1,500 graphics workstations to scores of network servers, allowing end-users to store, retrieve, and edit images that ultimately will find their way into a feature-length animated motion picture.

To collaborate efficiently on the production of these films, hundreds of computer-graphics specialists must share simultaneous access to a multitude of digitized images. The DreamWorks network connects workstations to servers linked to RAIDs (Redundant Array of Inexpensive Disks), where image files are stored. Users employ Network File System (NFS) to access these files. Originally developed by Sun Microsystems, NFS is a client/server architecture that provides remote access to shared file systems across networks. NFS exports directories to the workstations where they can then be accessed as though they were local, in a high-speed process that is transparent to the user: production data appear to be resident on the workstation.

Fiber Satisfies Need for Speed

With so many graphics specialists working together within tight production schedules, speed is essential, says Surya Denduluri, who manages the systems and networking group for feature animation at DreamWorks Studio. "We began by using 10Base Ethernet over CAT5 copper," recalls Denduluri. "But this was a 'small pipe.' Now that we've moved to fiber and ATM (Asynchronous Transfer Mode) to the desktop, we have a quicker response." According to Denduluri, optical fiber has been crucial to the successful operation of the DreamWorks network. "Installing fiber to the desktop supports OC-3 speeds (155 Mbps) for a longer distance than is possible with a typical CAT 5 cable," Denduluri says. "These speeds provide quick interactive access to the production data for image creation, modification, rendering and playback — in real-time or not. All the production data flows through the fiber, which is critical for production."

To accommodate this enormous information-carrying capacity, DreamWorks actually uses two parallel networks: the all-fiber network for animation production, and a distributed fiber/copper system for business-related applications — e-mail, etc. The first is an ATM network; the other runs Fast Ethernet (100 Mbps). Workstation outlets include connections for two duplex multimode fiber cables, for production; three Category 5 copper cables, two for data transmission and one for redundancy; one Category 3 copper cable for voice transmission; and one coax cable for closed-circuit television.

The network cabling infrastructure was designed and installed by Pacific Coast Cabling (Chatsworth, California), a Corning Cable Systems Extended Warranty℠ Program member. The backbone is comprised of single-mode and multimode optical fiber cables laid out in a star topology. From a single data center, multi-count fiber cables — 24-strand single-mode and a variety of high counts of multimode — extend to each of 17 intermediate distribution frames (IDFs), one per floor in all five buildings of the campus. In the IDFs, desktop connections are completed; copper for the distributed network and two-fiber cables for animation production. The multimode fiber is spliced through to desktops, producing direct connections between the data center and individual workstations.

The network backbone consists of Corning Cable Systems FREEDM® cables: single-mode cables containing 24 strands of Corning® SMF-28™ single-mode fiber, and multimode fiber cables of 96, 184, 210 and 266 strands. FREEDM cable is an indoor/outdoor, riser-rated cable that eliminates the need for a transition splice at building entrance points. This capability reduces installation costs

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by eliminating the material and labor expenses associated with the building entrance transitions. Fiber-to-the-desktop connections are completed with Corning Cable Systems MIC® duplex multimode fiber cables — 229,000 feet in all. All multimode fiber is Corning 62.5/125 micron graded-index optical fiber.

To further simplify and streamline the cabling design, Pacific Coast Cabling employed separate racks for single-mode and multimode fiber cables in the data center, using Closet Distribution Frames (CDFs) from Corning Cable Systems LANscape® Solutions structured cabling system. This design included a single CDF for all single-mode cable terminations and five CDFs — one for each building — for multimode cables. Therefore, network designers chose not to use hybrid single-mode/multimode cables, according to Doug Wimberly, RCDD, Systems Engineer and Account Manager for Pacific Coast Cabling and supervisor for the installation.

"Racks for the single-mode fiber and those for the multimode are about 20 feet apart," says Wimberly. "This happened primarily because of physical limitations in the data center. So it was easier just to keep the fiber cables separate."

Centralized Fiber Network Simplifies Management, Lowers Cost

Also, production links, which operate at 155 Mbps, demanded a centralized network of dedicated fiber connections, with servers patched directly to individual workstations with multimode fiber. These dedicated fiber links support the required high speeds over long distances, and they provide a scalable, reliable transport medium as the bandwidth demands grow. The centralized optical fiber design offers many other benefits, as well. Consolidating network electronics, cross-connects, and servers in a single data center greatly simplifies network management and allows for simple implementation of various network applications. Perhaps most significantly, the centralized optical fiber cabling design streamlines installation, simplifies maintenance, and lowers overall costs.

"A good thing about using fiber is that distance is not a limitation," says Denduluri. "Because all fiber collapses to our data center, this design reduces the network switch costs — something not possible with copper cabling. And it offers ease of management because switches are all in one central location. Also, there is consolidation of ports in the data center. So we saved on switches as well as on ports."

Improved port and chassis utilization is a recognized benefit of the optical fiber centralized design. Centralizing all electronics in a main cross-connect, or data center, reduces the number of ports and chassis required by a network, resulting in cost savings. On average, only 70% of hub ports are used in the conventional de-centralized design, due to the varying number of users per telecommunications closet. The centralized design is much more efficient — typically hub port usage is 90%. That 20% differential equals real and immediate savings.

"We want to do that at every desktop," Denduluri says. "But achieving this will mean operating at up to 36 Megabytes per second, depending on resolution and compression used. That's a lot of bandwidth."

Even so, Denduluri is confident the necessary bandwidth will be available on the fiber network. In fact, his plan is to replace ATM with Gigabit Ethernet on the optical fiber centralized network, a conversion brought about not only by bandwidth demand, but also by a planned change to the Linux operating system.

"As we migrate to Linux," Denduluri says, "we will use Ethernet as the primary network, because Linux doesn't offer proper ATM support; however, we will use ATM for other purposes."

The production of feature-length animated films is an extraordinarily labor-intensive and time-consuming process. Each second of film time requires 24 frames, each of which demands many hours of painstaking human effort as well as huge amounts of system bandwidth and compute time. With an extensive optical fiber network in place, DreamWorks Studio is able to significantly accelerate production and shorten the valuable time required to bring an idea from storyboard to movie screen.

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Corning Cable Systems LLC • PO Box 489 • Hickory, NC 28603-0489 USA • 1-800-743-2675
FAX: +1-828-901-5973 • International: +1-828-901-5000 http://www.corning.com/cablesystems