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for Digital Content  
Professionals

# ComputerGraphics<sup>World</sup>

April 2004 [www.cgw.com](http://www.cgw.com)

## Rebuilding Rome

An all-CG version of the ancient city shines in the TV miniseries *Spartacus*

### Digital Demons

Comics hero *Hellboy* goes to Hollywood

### Brave New Bandicoot

*Crash's* next game gets full-motion video

### Storage in the Studio

The latest digital file-saving devices

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news, special surveys and reports,  
and the online gallery.



16



24



30



38

## Departments

### Editor's Note 4

*Indie Opportunities*

### Spotlight 6

#### Products

*NAB 2004 Preview*

*Nvidia's New Graphics Cards*

*The Latest Avid Upgrades*

*WildTangent WebDriver 4.0*

*Allegorithmic MaP|Zone*

#### User Focus

*Making Waves*

#### Market Outlook, Industry News

*Video Market Movement*

*Industry Awards Abound*

### Video Viewpoint 14

*DV Authoring Revolution*

### Portfolio 58

*Alias's Exposé Yourself Contest*

### Reviews 60

*Digital Juice Libraries*

*Anark Studio 2.5*

*Wacom Cintiq 18SX*

### Products 65

## Features

### Cover story

#### Building an Empire 16

**BROADCAST** | A wide range of 2D and 3D imagery sets the stage for the epic miniseries *Spartacus*.

*By Karen Moltenbrey*

#### Devilish Effects 24

**FILM** | Digital studios take the comic-book heroes and villains of *Hellboy* to the big screen.

*By Barbara Robertson*

#### Crash Course 30

**GAMING** | Animators use full-motion video to expand the range of gaming's *Crash Bandicoot*.

*By Martin McEachern  
and Karen Moltenbrey*

#### Grand Opening 38

**VIDEO** | Stargate Digital attracts viewers' attention with a thrilling ride down the Las Vegas Strip.

*By Karen Moltenbrey*

#### Storage in the Studio 43

A wealth of data storage and asset management options are open to today's digital content creator.

*By Dave Simpson and Jenny Donelan*

SPECIAL REPORT

### On the cover:

Stargate built this CG version of ancient Rome for the opening of *Spartacus*. For more information, see pg. 16.





**Phil LoPiccolo**  
Editor-in-Chief

## Indie Opportunities

Contrary to popular belief, the independent game-developer community is not made up entirely of nerdy teenage boys who spend more time stealing other people's code than creating their own. A comprehensive new survey from Acacia Research Group ([www.acaciarg.com](http://www.acaciarg.com)), called "The Amateur/Independent Game Development Tools Market," shows that while this group contains its share of absolute beginners, it is made up largely of professional adults who are well educated, experienced, and willing to devote serious time and money to develop games for a rapidly expanding and diversifying market.

To conduct the survey, Acacia polled independent game developers on the Web sites they tend to frequent, including [gamedev.net](http://gamedev.net). The results showed that the majority were males over the age of 21, that nearly three-quarters had attended "institutes of higher learning," and that a third had game-development industry experience. The data also revealed that approximately half the respondents spend between 10 and 30 hours per week on game projects that earn 20 percent of this group between \$500 and \$50,000 per year and another 5 percent between \$50,000 and \$100,000 per year.

When it comes to paying for development tools, more than 90 percent said they purchased software over the past five years, and nearly 40 percent spent from \$500 to more than \$5000. However, on the downside, nearly 30 percent said they pirate development programs, and 25 percent admitted to stealing more than \$5000 worth of such tools.

How do they justify stealing? Some say it is excusable because they're not making money from their work. In fact, those who make the least steal the most. Other pirates feel it's acceptable to use stolen software when the vast majority of features in a program go unused. For example, stealing Photoshop for pixel art is fine, some say, because buying such an expensive package wouldn't make sense for such limited use.

Despite the lost revenues from pirating, Acacia's five-year projections show total sales

of development tools—including both content and coding software—to the independent game-development market will rise steadily from roughly \$30 million this year to more than \$55 million by 2008, a compound annual growth rate of 16 percent.

Several factors are contributing to the rise of the independent game-development market. First, the Internet has enabled information exchange between developers and provided a ready-made production pipeline for even the most underfunded projects. Second, there has been steady growth in the tools for creating game content—and these have become more accessible to non-professionals, both in terms of price and usability. Third, and perhaps most significant, there are more opportunities to develop content for a greater variety of games

than ever before, even for the emerging "serious games" now being designed for education and training purposes (see "Serious Games," February 2004, pg. 4).

Independent game developers would do well to seek out these new opportunities, as well as use the new development and distribution tools available to them. And tool vendors would be wise to look beyond the tapped-out high end of the market for new customers and meet the needs of this emerging market by providing users with relevant tool sets at affordable prices. ■■

Independent game developers justify pirating software tools because the vast majority of features in most programs go unused.

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## News from NAB2004



The National Association of Broadcasters (NAB; [www.nab.org](http://www.nab.org)) is holding its electronic media show, NAB2004, this month in Las Vegas. The NAB Show reportedly draws approximately 90,000 electronic media professionals from more than 130 countries. Attendees are privy to the latest tools and technologies in the areas of content creation, management, and delivery. NAB2004 and the Entertainment Technology Center at the University of Southern California (ETC-USC) announced the addition of the next-generation Digital Cinema Summit program—a day of speakers, panels, and demonstrations targeted at directors, producers, cinematographers, and postproduction and visual effects professionals—slated for Sunday, April 18. Carly Fiorina, chairperson and CEO of Hewlett-Packard, is scheduled to deliver the All-Industry Opening Keynote Address on April

19. Also at the show, a number of new and updated product releases will be presented during NAB2004. Among them are the product announcements presented on these two pages. For additional NAB2004 product news, turn to page 65.

products | graphics cards

## Nvidia Expands Its Quadro FX Family

Nvidia debuted its latest graphics solution for mobile workstations, the Nvidia Quadro FX Go1000. In addition to 128MB of graphics memory, 12-bit subpixel precision, and 128-bit floating-point graphics pipelines, the Quadro FX Go1000 includes three new vertex engines, two new shader units, Nvidia PowerMizer 4.0 technology, and a high-definition enabled and enhanced video processor. Available immediately in the Dell Precision M60, the Go1000 reportedly not only achieves the industry's fastest performance on key benchmarks, but also exceeds the graphics power of competing desktop-class workstations.

The new Nvidia Quadro FX 700 and 600 PCI are designed to excel in professional 3D and professional imaging applications, respectively. For 3D applications, the Quadro FX 700 fills the technology gap between

Nvidia's Quadro FX 500 and 1100. The new 700 model features

128MB of DDR unified memory, an AGP 8x 2.1GB/sec. interface,

nView multi-display capability with DVI-I and VGA connectors, and passive, silent thermal cooling. The Quadro FX 600 PCI also boasts nView multi-display functionality, offering two DVI-I and one stereo connector. The 600 PCI further offers a PCI-32 system interface and 256MB of DDR memory. —Courtney E. Howard

■ **Nvidia;** [www.nvidia.com](http://www.nvidia.com)  
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products | video

## Avid Enhances Multiple Product Lines

Avid Technology will demonstrate the latest updates to its professional products for the film and video postproduction, broadcast, and asset management markets.

The Avid DS Nitris, Media Composer Adrenaline, and Avid Xpress Pro with Avid Mojo systems have been amended with new



## WildTangent Debuts WebDriver Version 4.0

A leading Web game publisher, WildTangent has upgraded its WebDriver on-line game platform, which boasts more than 53 million users to date.

Based on console gaming technology, WebDriver 4.0 enables the real-time delivery of console-quality graphics securely over the Internet to a PC. Version 4.0 combines a new console gaming engine, which initially was released with Microsoft for its Xbox *Music Mixer* title, with WildTangent's own streaming technologies.

In conjunction with the release of its WebDriver 4.0, WildTangent introduced the Chrysler Group's three new Web-based games built on this next-generation streaming on-line game platform. *Jeep 4x4 Adventure*, *Chrysler West Coast Rally*, and *Dodge Racing-HEMI Edition* demonstrate the console-quality graphics and streaming

capabilities possible with the upgraded WebDriver. Now available to the public, WebDriver 4.0 can be downloaded free from WildTangent's Web site. —CEH

■ **WildTangent;** [www.wildtangent.com](http://www.wildtangent.com)  
infoNOW 102



editing features, increased performance, and expanded networking and work flow capabilities. Additionally, Media Composer Adrenaline gains an HD option, enabling Avid devices to share high-definition media throughout the postproduction process.

At the same time, Avid has infused the Avid NewsCutter Adrenaline FX system with HD support. NAB2004 attendees will be the first to see the upgraded iNews newsroom computer system, now supporting the Linux platform.

While also demonstrating the alienbrain product family it acquired from NXN Software, Avid will introduce several enhancements to its digital media asset management solutions. The Avid Unity Media-Manager sports such new capabilities as expanded full-resolution media browsing, more comprehensive logging, and the ability to search multiple sites. —CEH

■ **Avid Technology;** [www.avid.com](http://www.avid.com)  
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## Allegorithmic Launches MaP|Zone Plug-in

Allegorithmic has entered the US market with its MaP|Zone texture modeling plug-in for Adobe Photoshop and Illustrator.

Founded by a prize-winning computer scientist, producer, and director of animated movies, the new company's goal is to provide graphic artists with innovative, user-friendly, and intelligent tools with which to be more creative, productive, and in control of their



art. Eliminating the need for highly technical and time-consuming solutions, MaP|Zone aids artists in the quick and easy creation and modification of complex texture maps, which, in turn, enable the development of realistic materials, textures, and shaders.

Professionals in the film, video, broadcast, and game industries can use MaP|Zone to cover computer-generated scenes, backgrounds, objects, and characters with complex and modifiable maps, thereby adding greater depth, texture, and realism. The new tool offers users the ability to design a texture map; define its scale, granularity, and roughness; and also move, alter, or erase local elements by hand. MaP|Zone is shipping at a cost of \$99. —CEH

■ **Allegorithmic;** [www.allegorithmic.com](http://www.allegorithmic.com)  
infoNOW 103

## Making Waves

New England is notorious for its Nor'easters, nasty coastal storms that wreak havoc on land and at sea. The most infamous of these tempestuous weather systems is the Halloween Storm of 1991, also dubbed the Perfect Storm, whose 100-foot waves sank the fishing boat *Andrea Gail*.

Although memorialized in a Hollywood blockbuster film, that incident, sadly, was not the area's worst seafaring disaster. Nearly a century earlier, another fierce New England storm—the Portland Gale—sank the passenger ship *Portland*, killing everyone aboard. Recently, that incident also became the focus of filmmakers, only this time for The Discovery Science Channel's documentary.

"The Wreck of the *Portland*," which includes two minutes of 3D computer animation, depicts what researchers believe happened to the ship after it left Boston for Portland, Maine.

Known as the "*Titanic* of New England," the tragedy was one of the worst maritime disasters to occur off the Northeast coast of the US, with the death toll reaching nearly 200. With no survivors, very little debris, and only a few bodies ever recovered, the *Portland*'s fate also became one of New England's greatest maritime mysteries.

Then, just two years before the *Andrea Gail* incident, a Massachusetts firm specializing in locating lost objects at sea, reported having discovered the wreckage

in 460 feet of water just 20 miles north of Cape Cod, but the ocean depth made it difficult to verify the ship by name. During the summer of 2002, though, underwater sonar and the use of a remote-operated vehicle helped confirm that the submerged boat was indeed the *Portland*.

As part of Discovery's *Science of the Deep* series produced by David Clark Productions, researchers give television viewers a glimpse of Mother Nature's wrath and take them down to the watery grave. To augment the produc-

tion, Home Run Pictures in Pittsburgh, along with Kaleidoscope Animations in Cleveland, created a 3D simulation of what experts believe occurred that fateful evening. Photographs of the wreck show no holes in the ship's hull and the top two decks missing, supporting the theory that a rogue wave, rather than a collision, was responsible for the sinking. Lending more credence to this speculation is the side-wheel paddleboat's design, whose long, narrow shape, combined with a shallow draft, made it unstable in high seas.

To bring this theory to light, the artists began researching these ships from yesteryear, working with Discovery producer Stacy Jannis as well as ship-design experts. They even visited a museum in Boston, where they took high-resolution photographs of a large model of the *Portland* on display. Using these pictures and blueprints of the boat as references, Kaleidoscope's Joe von Enck and Chris Holm led a team of artists who constructed the digital replica with Alias Systems' Maya.

The most challenging aspect of the project, however, was creating the CG water, particularly the giant wave responsible for the sinking. Initially, Discovery looked at filming rough seas and then compositing those frames into the scenes. "However, we were able to convince them that the best way to do this was to use all CGI," says Tom Casey, president



Images courtesy Home Run Pictures.

**For the TV documentary "The Wreck of the *Portland*," digital artists created an all-3D simulation depicting what researchers believe happened one fateful evening 100 years ago.**

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Image Rendered on an Alienware MJ-12 Workstation



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of Home Run Pictures, "which gave us far more control over the imagery." The group then proceeded, using Maya's fluid effects tool and shaders.

The production of the giant wave, though, generated a great deal of discussion among the artists, including whether a wave in the middle of the ocean could actually crest like a surfing wave. After discovering that this indeed occurs, the artists then began simulating the effect, first having to decide whether to manipulate the surface data to deform the wave or produce the effect in post-production.

Their solution, in fact, was a combination of CG and compositing. To achieve the desired shape, the artists manipulated the model's control vertices, and later added layers of particle-driven spray rolling off the top of

**In addition to modeling a replica of the Portland, the artists created realistic CG water for the animation.**

the 3D wave. Meanwhile, the actual wave that lifts off the surface of the other undulating ocean was a separate model that was hand-animated and then composited into the scene using Discreet's combustion.

Because of their limited time and the need for high-def imagery, the rendering was outsourced to RenderCore, a remote service provider.

"The bar [for CG water] was set following *The Perfect Storm*," notes Holm.



"And often, people expect feature-film quality on a documentary budget, which isn't possible. But we were able to push hard with the tools that are now available and get something that looks really good, which couldn't have been done a few years ago for a documentary." —Karen Moltenbrey

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## Video Market Movement

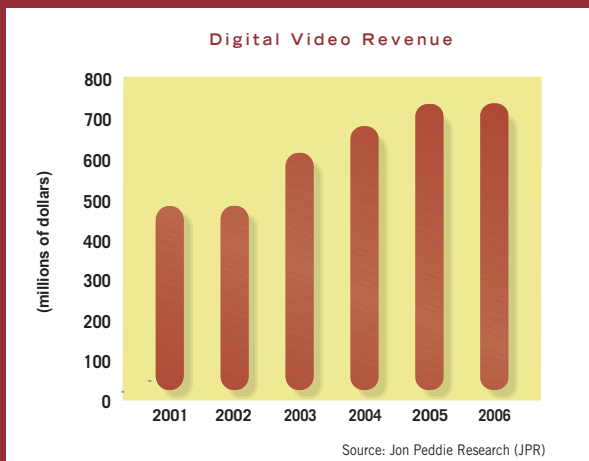
The digital video market has been enormously affected by the downturn in the economy since 2000, which has led to a decline in advertising and capital expenditures. However, toward the end of 2003, the economy, at least the part of the economy that affects the entertainment business, started to turn around. As a result, advertising revenues are increasing, new markets are taking shape, and capital expenditures are again picking up, driven in no small part by increased interest from con-

sumers worldwide in high-definition digital television.

As the accompanying chart from Jon Peddie Research shows, the industry will experience a continued increase in advertising and capital expenditures through 2006. There are several reasons for this growth. First, the transition to digital technologies is gaining speed within studios as companies transition to an end-to-end digital process. At the same time, attractive flat-panel TVs with even more attractive prices are driving demand for digital television. FCC mandates also are having their effect, as TV manufacturers are required to incorporate DTV tuners. And finally, HDTV sales are increasing in tandem with the growing amount of HDTV broadcasting.

The research also discusses the introduction of x86 64-bit processors by both Intel and AMD, and supporting operating systems from Microsoft, all of which should be firmly established by 2006 with the introduction of Microsoft's next major version of Windows, code-named Longhorn. The advent of these new systems will lead to further acquisitions of hardware and software by content creators, as digital video is one application that truly can take advantage of the larger memory addressing of 64-bit processors.

—Kathleen Maier, senior analyst, Jon Peddie Research



Recent research indicates a continuing trend toward the adoption of and investment in digital video technologies.

## In Brief

**DisplayMate Technologies** (Amherst, NH), an independent source for image quality testing, has bestowed Five Star Awards on **Nvidia** for its Quadro NVS professional 2D graphics accelerators. In fact, Nvidia solutions, such as the Quadro NVS 280 and 400, are included in four of the five graphics cards categories in DisplayMate's *2004 Best Video Hardware Guide*. At the fourth annual Game Developers Choice Awards ceremony held during GDC 2004 in San Jose, the **International Game Developers Association (IGDA)** (San Francisco) honored **Mark Cerny** with the Lifetime Achievement Award. Having served a number of roles in the video-game industry—including creator, producer, programmer, designer, and publishing executive—Cerny

founded the Sega Technical Institute and worked on such blockbuster games as the *Crash Bandicoot* series, *Spyro the Dragon* series, *Ratchet and Clank*, and *Jak and Daxter*. **Delaplaine Creative** (Corte Madera, CA) received two Gold Telly Awards at the 25th Annual Telly Awards Show for its postproduction work on two broadcast commercials, *Straw Hat Pizza* and *South Bay Galleria*. **Mental Images** (Berlin, Germany) has acquired Cult3D, an interactive 3D software platform for e-business, from Sweden's **Cycore**. Expected to accelerate the adoption of 3D technology on the Web and Web-enabled devices, the acquisition enables Mental Images to integrate Cult3D technology into its RealityServer server-based collaboration platform. —CEH

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## DV Authoring Revolution

By Jeff Sauer

**Here's a trivia question:** What digital media technology has gone from highly exclusive and price-prohibitive to consumer-level the fastest? Many could make a good argument for 3D OpenGL hardware, which through the mid- to late 1990s advanced at a rate faster than Moore's Law, doubling in operations closer to every six to nine months than every 18. The result is that

visualization power that cost thousands of dollars per card back then is now, more or less, standard fare for a modestly aggressive gaming card. Yet, from where I stand, the answer is DVD authoring software.

It's not an apples-to-apples comparison, of course, considering one is hardware and one is software. But, imagine this: In a two-year span from 1999 to 2001, DVD authoring software went from a high of \$10,000 to free (with the purchase of a new Apple Mac OS computer). What has followed is a proliferation of sub-\$100, consumer-oriented packages for Windows from a variety of manufacturers, as well as an emerging class of highly capable professional products priced between \$500 and \$1000.

### Abstracting

A general move toward the "abstraction layer" was the trigger for, and major outgrowth from, dramatic changes in the DVD industry. Think of it as the GUI built around the powerful back-end DVD engine code that takes all your assets—video, menus, and navigation instructions—and turns them into a compliant "DVD disk image."

Job One for any DVD authoring software is simply building and organizing a set of files that a very simple (relative to a CPU-equipped device) consumer DVD player can read. The DVD specification lays out surprisingly advanced ways for viewers to interact with that simple player, from scrolling through a menu and choosing a movie to selecting features like parental control, region coding, and copy protection to switching the view between different angles of the same scene with no more than a common remote. DVD discs can even be programmed to save viewer selections in a player's "memory," thus allowing advanced authors to write if/then logic statements that might, for example, jump to a different version of a movie if the viewer answers a question a certain way. However, even the most basic authoring requires sophisticated programming to create that "compliant disk image."

Older authoring programs like Sonic's Scenarist and DVD Creator (for the Mac OS) have a user interface, of course, but those applications were, and still are, built to give DVD authors direct access to the entire DVD specification. At the highest levels of DVD creation, Scenarist's complete control over everything the DVD spec allows is the only way to go, even if the interface requires thorough training to accomplish even the most basic operations.

Yet, DVD's broader success clearly comes from bringing DVD creation to a more accessible level and isolating users from both the complexity and the esoteric jargon that plagued early authoring systems. These days, you'll occasionally see references to things like Video Title Sets, GPRMs, color-mapping, and pre-commands, but abstraction-layer authoring software now shields the user from most of the techno-speak and does the programming needed behind the scenes to accomplish a designer's goals.

The most affordable DVD authoring software available today—including InterVideo's WinDVD Creator, MedioStream's neoDVD, Pinnacle's DVD Express, Roxio's DVD Builder (a utility inside Easy CD & DVD Creator), Sonic's MyDVD, Ulead's DVD Movie Factory, and Apple's iDVD4—is designed to offer users a very straightforward working environment for creating simple titles, essentially just a couple of video clips



**Adobe Encore's tight integration with Adobe Photoshop, as well as its price/performance ratio, makes it an attractive DVD authoring option.**



**Jeff Sauer** is a freelance writer, video producer, and director of the Digital Video Group, an independent testing and research organization for digital media

Recent changes in DVD authoring bring about powerful and accessible tools

with a menu in front, in a very accessible way. Many actually include capture utilities so users can go from camcorder footage to disk directly. Of course, even those applications still need the sophisticated behind-the-scenes programming of the DVD engine.

Almost all consumer DVD authoring software supports splashy functions like motion menus (menu buttons over a clip from the video or 3D animation and/or animated buttons), but do so easily. They also support drag-and-drop links to clips and automatically create button graphics from a still frame of the dragged clip. Many use templates to position buttons handsomely on either a stock or a custom menu background. All that seems basic, and it should. It has gone from very difficult to very easy.

### What Professionals Want

Because the main job of DVD authoring is getting compliant media onto a disk, some design professionals will find as much as they need—a simple “print-to-disk” function—in one of those consumer tools. But, more advanced programming options make for better design possibilities. The industry is settling into a professional-oriented class of products for between \$500 and \$700 that includes Adobe's Encore DVD, Apple's DVD Studio Pro, Sonic's DVDit and ReelDVD, and Ulead's DVD Workshop. Pinnacle's Impression DVD Pro has some of the same professional features, via a unique timeline work flow, for just \$199.

Most of these applications offer the same ease-of-use features that the consumer tools have, including stock templates, buttons, and backgrounds. However, most professionals creating custom titles start with Adobe Photoshop files for menus and buttons. Most higher-level applications support layered PSD files, so you can design menu backgrounds and buttons in one layered file and import it into the authoring environment. Adobe even offers round-trip editing between Photoshop and Encore.

Design professionals also may want access to more advanced DVD features, including the eight audio tracks, 32 subtitle tracks for foreign language support, and the ability to create chapter marks within video clips, affording multiple “scenes” or entry points in a movie. More precise navigation options allow, for example, something other than simply returning to the main menu at the end of a clip. DVD Studio Pro 2 provides access to the memory parameters, the GPRMs and SPRMs, for fancy if/then logic, also a strength of Scenarist, which still commands a heavy price.

Interestingly, image quality is tied only peripherally to the authoring software you use. Today, just about any package, from consumer to professional, will include a software MPEG-2 encoder for your convenience. It's part of the abstraction level idea and allows you to drag non-MPEG clips into a project and let the authoring software worry about creating a “compliant” MPEG at the end. Yet, most software (iDVD is a notable exception) can import ready-to-use MPEG files encoded by whatever tool you think best.

Yet, in many ways, that flexibility exemplifies DVD authoring as the final piece of the digital video revolution that began with companies such as Avid and Montage fiddling with the idea of editing video on a computer and Apple dabbling with postage stamp-sized QuickTime movies. In the mid-1990s, when nonlinear editing (NLE) system image quality had gone from off-line, rough-cut editing to industrial-quality finishing, postproduction was, more often than not, a digital island. You'd capture and

digitize analog raw footage into an edit system and ultimately save to analog tape at the end. Later, with Digital BetaCam, D1, and the liberating introduction of the DV format, digital video moved into the production process with digital cameras doing the digitizing. From there, it's little more than a file transfer to the NLE. Still, delivery meant tape, usually analog.

With DVD, digital media can stay digital all the way through the process, maintaining a very high quality even in deliverables to the client, customer, or collaborator. Of course, for a while at the end of the digital video decade of the '90s, it looked as though the digital answer for distribution would be the Web—and maybe it still will be. But bandwidth limitations, especially to the masses, were and still are a serious bottleneck for full-quality delivery.

Thankfully, the success and proliferation of DVD players, as well as the now consumer-level pricing on DVD recorders and re-writable burners, have yielded a diversity of authoring software that enables anything from effective print-to-disk simplicity to an entirely new creative process in menu

design, custom navigation, and other unique design elements.

It's likely that DVD authoring has finally discarded its early reputation for being hard to accomplish—and that's good. The last thing a creative designer needs at the end of a project is more work, and DVDs' increasing ease of output for basic functions solves a genuine need for simple content delivery. On the other hand, the rich design and programming options for building a DVD offer the creative mind a wonderful new method to personalize and customize. In either case, both methods are better than just printing to tape. ■■



**In addition to affordability, Ulead's DVD Workshop 2 offers users ease of use and an intuitive interface.**

# BUILDING

Digital artists re-create ancient Rome for the epic miniseries *Spartacus*

# AN EMPIRE

By Karen Moltenbrey

## ROME WASN'T BUILT IN A DAY.

It took approximately six months. At least, that's how long it took Stargate Digital to create a photorealistic 3D version of the ancient city used in a dramatic 35-second sweeping shot for the two-part miniseries *Spartacus*, airing mid-month on the USA Network.

The television production, like the 1960 motion picture starring Kirk Douglas, is based on Howard Fast's novel of the same name. And like the original movie, the miniseries follows Fast's story line about the real-life hero Spartacus, an imprisoned gladiator who led a slave revolt against the powerful army of the growing Roman Empire.

Filmed in Bulgaria and directed by Robert Dornhelm, the four-hour production contains more than 100 visual effects shots created by Stargate to achieve a period look. The artists formed armies of digital people, constructed numerous buildings, created a wide range of backgrounds and foregrounds, and crafted a plethora of props and weaponry, all of which were composited into live-action scenes. Some of these effects are 3D, others 2D. Some contain CGI, others composited filmed imagery. Some scenes are totally synthetic, while others contain only a few digital enhancements.

While the type and scope of the effects differ greatly from scene to scene, they have one commonality—they were intended to be invisible. "*Spartacus* was never conceived as an effects movie in terms of its visuals. Yet there was no way we could have done this project without them," says Eric Grenaudier, visual effects supervisor. "The effects move the story along and provided a discreet, cost-effective solution for depicting locations—and an entire era—that no longer exist."

As a matter of fact, many of the CG shots were not planned, but rather evolved out of necessity, from the digital reconstruction of Rome to the whip



marks used for enhancing a scene in which Spartacus is flogged by guards.

### Rebuilding Rome

In 73 BC, at the time of the revolt, the great Roman Republic was starting to evolve into what became the even more powerful Roman Empire. During the second and first centuries BC, Rome's military forces were acquiring lands to the east and west of the region. Although art, literature, philosophy, and other culture flourished, Roman imperialism also produced vast military plunder, particularly in the form of captured slaves.

While it appears that Spartacus was once a Roman soldier, his heritage had little bearing as authorities sold him into slavery. Sent to a training school for gladiators in Capua, he and approximately 80

others soon rioted, seized weapons, and escaped to Mount Vesuvius, where their ranks swelled to nearly 100,000 as word of the insurrection spread.

While some in the group wanted to escape by pushing north across the Alps and dispersing, others wanted to remain in Italy and pillage. But before their plans could be realized, they had to fend off legions of Roman soldiers, including those led by Marcus Crassus. The slave army eventually broke through Crassus's lines and pushed south, planning to sail to Sicily aboard pirate ships hired by the slaves. But the ships left without the rebels. Cornered, the men scattered, and many were eventu-

ally captured and crucified along the road between Capua and Rome, although the body of Spartacus was never found.

Telling this action-packed story required a number of sets, which were constructed as accurately as possible to retain a historical perspective. For the most part, the main locales, including the gladiator arena, were built practically in Sofia, Bulgaria, where principal filming occurred.

"You won't see the Colosseum because it wasn't built yet," notes Grenaudier. "We didn't add things that weren't there at the time just to establish that it's Rome." He does admit, though, that some liberties were taken with the city architecture to

**The majority of shots in *Spartacus* are live action with integrated digital elements ranging from CGI objects to 2D matte paintings, including the one incorporated into the background in this shot of Rome.**



All images © 2004 USA Network.

enable the director to describe many of the story points within the confines of the sets.

In addition to these physical locations, there are 2D matte paintings—including those used for the city of Capua—which were designed and constructed in Adobe's Photoshop. For added realism, many of the mattes contain embedded live-action elements composited with Adobe's After Effects. Still other sets were built in the computer, including Rome, which was a combination of CG and digital mattes with 3D camera moves applied to the 2D elements using Alias Systems' Maya Live and 2d3's boujou matchmoving software.

"In Rome, smoke is emerging from the marketplace and people and animals are roaming around in the street," describes Grenaudier. "Sometimes the people and animals are computer generated, while other times they are composited live action."

Conversely, the city of Rome that was featured in the shot at the beginning of the miniseries was entirely CG. For this scene, which sets the stage for the story, the virtual camera pans from a wide view of the city until it pulls into a close-up of Crassus on his balcony.

"Not only is this the most ambitious shot of the show, but it's also the most ambitious thing we've done at Stargate in terms of building a set," says visual effects producer Sam Nicholson,



**In this photorealistic shot of the ancient city of Rome, the team at Stargate Digital built 3D models in Alias's Maya, to which they applied photographic textures.**

founder of Stargate, which creates a number of digital backlot sets for prime-time television shows including *ER*, *Las Vegas*, and *Crossing Jordan*. "We wanted to make the scene big and dramatic, so we started with a bird's-eye view of Rome, and in the middle of it, we nested thousands of computer-generated people. Eventually, we transitioned to live action on a real set with a close-up of our leading characters—all without interrupting the shot."

### Seamless Transition

The first 25 seconds of this 35-second shot is entirely synthetic—the carts, the road, the trees, the ground, the grass, the sun, the buildings, the people, the clothing, the props...everything. "Anything we needed to build Rome, we made," says Grenaudier. The deep backgrounds were created as matte paintings in Photoshop, while the foreground objects were modeled and animated with Alias's Maya and composited within After Effects. The textures, meanwhile, were photographic-based, acquired from hundreds of digital pictures taken on location by Grenaudier. The final scene was then rendered in Maya running on a renderfarm of Boxx Technologies workstations containing 3Dlabs' Wildcat4 7110 graphics accelerator cards.

According to Grenaudier, this segment was planned with a practical set that would be augmented with CGI. "We had a beautiful set built by an Italian designer, though it was limited in scope, containing the senate, the slave market, and the houses of the main characters," he says. "However, out of necessity and desire, we changed direction and instead built everything in the computer." Prompting this decision was



**Artists spent months building this all-CG set of Rome for a dramatic opening shot in the miniseries. In addition to the buildings and trees, the scene also contains a number of digital actors.**



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a malfunctioning camera cabling system that ran from a 150-foot-high crane to the edge of the balcony, as extreme winds on the day of the shoot shook the cable, causing the camera to become too unsteady.

“That forced us to reconsider using live action,” says Nicholson. “So while CG was a necessity at first, we soon realized the advantages this new approach provided, allowing us to showcase the city and giving us the flexibility to change camera angles for optimal results, since the director was no longer limited to a downward-angle shot from the upper right side of the set.”

One of the biggest challenges was to ensure that the virtual shot was perfectly synchronized with the live action. To accomplish this, the Stargate team projected the shot of Crassus onto the CG balcony of the virtual set, thereby providing the artists with a transition point. Prior to that particular slice in time, the digital artists could do practically anything, says Grenaudier, “as long as we found an elegant way to get back to that transition point when we were done.” Notably, the artists didn’t employ digital “cheats” to make the transition easier, such as using a large object, like a pillar, as an intermediate shot between the two environments. Rather, the transition to live action occurs as the camera is moving across the CG set. Moreover, the sequence occurs in broad daylight, which made it even more difficult to complete.

In all, a team of artists spent approximately six months re-creating this virtual Rome. But once they completed it, the group was able to reuse sections throughout the miniseries in a number of ways. “We can re-light it, take it apart, and build other sets from it,” says Nicholson. “And it becomes a tremendous asset for us to use in the future as part of our growing virtual back lot.”

### Virtual Rock Climbing

Another complex sequence in the movie calls for thousands of slaves to descend from a cliff on Mount Vesuvius for a surprise attack on the Roman camp below. Shot against greenscreen on a small set, this live-action scene originally involved a few actors climbing down a rope. Stargate later expanded the shots in height, width, and depth, so in the end, the scene contained more than 200 slaves using multiple ropes to ease down a tree-lined,



**Artists expanded this greenscreen shot of actors climbing down ropes, turning it into a dramatic scene with 200 slaves descending a cliff before attacking surprised Roman soldiers camped below.**

200-foot-tall cliff during the middle of the night. “We shot the actors 20 feet off the ground so they could do their own descent without danger,” Grenaudier says.

The team considered doing a large part of this sequence practically, according to Grenaudier, especially with all the cliffs in Bulgaria that could have served as a backdrop. “But we couldn’t get around the safety issue associated with shooting that live,” he says. Alternatively, the artists created the cliff, trees, and rope extensions in 3D, to increase the size of the set. Then, using as many actual terrain references as possible, they painted a digital matte for the environment below, to which they added 3D elements such as fire and smoke.

“We took still photos of some beautiful locations, and once we got approval from the director, we went back and took hundreds of close-ups of stones, tree bark, grasses, branches, and other objects, and used them as textures for our CGI. So, even though we built the final cliff in the computer, the essence of it is based on reality.”

To enhance the scene, the artists also added crowds, as only a handful of the soldiers are real. This was done by digitally multiplying the men in postproduction using traditional rotoscoping techniques. For other scenes, though, larger crowds were needed. Within the CG city of Rome, for example, the artists created a number of virtual extras as well.

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## When the Cows Come Home

Some of the more inventive “unplanned” digital shots were created for a scene in which Spartacus and his men find themselves cornered by Roman troops on a peninsula. As a diversion, the slaves sent cattle and other livestock out of a thickly wooded forest and toward the Roman fortification with flaming bundles of sticks attached to their heads, allowing the rebels to escape under the cover of darkness.

“We tried to do this practically using live cows with Maglites attached to their heads so we could track the light in the computer and add CG fire,” explains Nicholson. “But cows don’t like to run, especially at night with ‘fire’ on their heads.” In fact, they wouldn’t even walk in the given direction toward the camera. They’d shake their heads and hit them against the trees to get the light off their horns, causing the flashlights to fall off and break.

“It was the perfect example of old filmmaking meets new,” Nicholson adds. “In pre-production, you have a bunch of producers trying to figure out how to get the cows to do this. With all their years of experience, everyone is an expert, but no one has ever done it, so you come up with some obtuse plan. Eventually, you get out there on location with a bunch of cows, like Eric did, and the animals don’t react as you’d planned. So after all that planning, the scene winds up becoming completely CG.”



**For this live-action shot, digital artists filmed background plates at the Black Sea for the background, into which they composited a 3D pirate ship, built using historical data as a reference, on the horizon.**

In the completed version, this sequence begins as tiny points of light (a crowd duplication of black-clad extras holding torches) maneuvering through the woods toward the camera. Next, CG herds run across the open field and into the Roman camp. “And when they got so close to the camera that the CG cows didn’t hold up, we added a few select inserts of the animals as they were prodded along from behind,” describes Nicholson.

“We always try to use a combination of traditional set work and digital photography,” continues Nicholson, “but at the end

of the day, the digital often becomes a whole lot more predictable, especially in this instance.”

To animate the computer-generated cows, the artists used Bio-Graphic Technologies’ AI.implant. The crowd-duplication software provided real-time interactive artificial intelligence for the rich character interactions, enabling the group to add realistic dynamics to the digital animals in the scene.

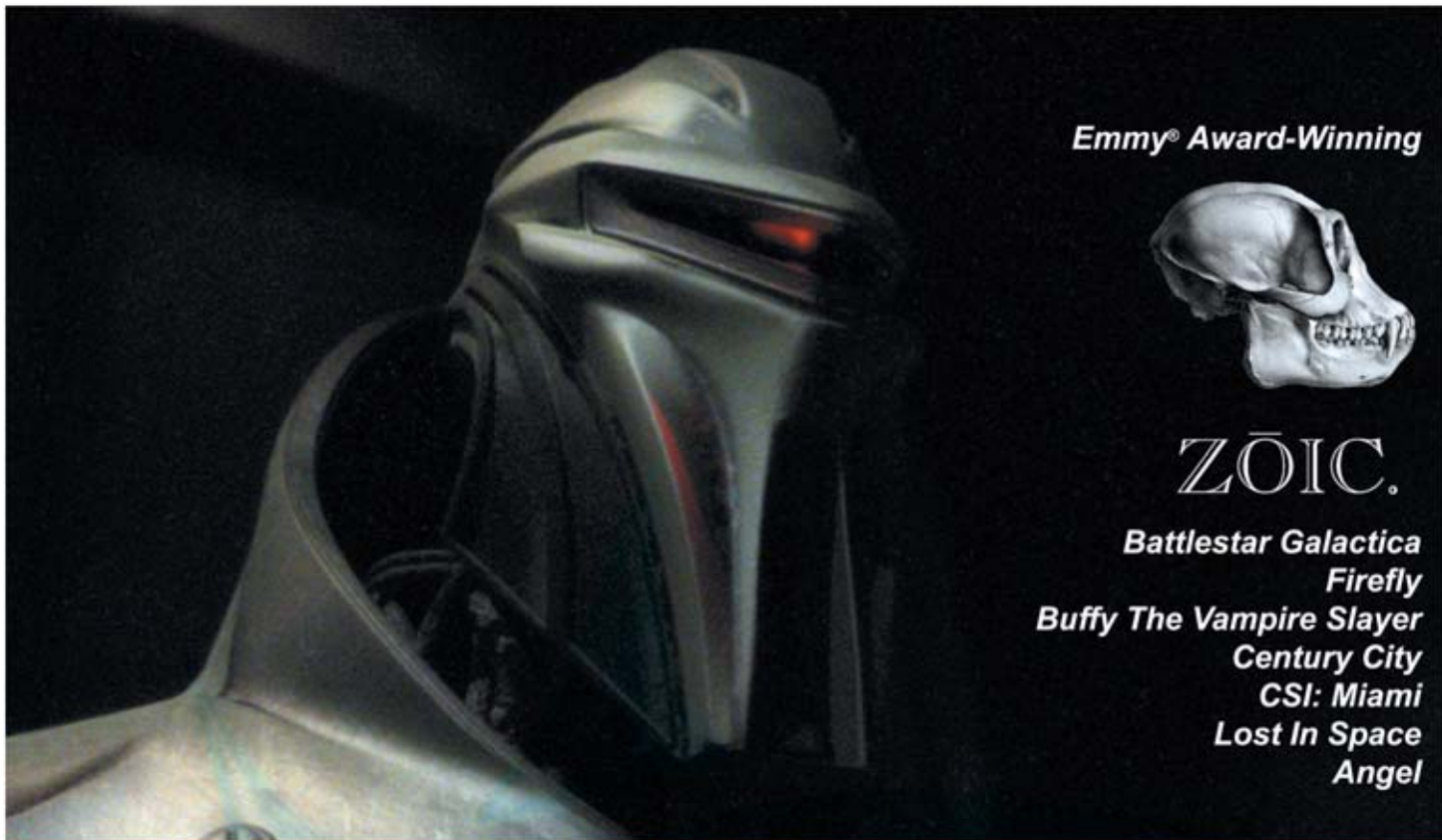
All told, *Spartacus* required 58 days of principal photography and another several months for creating the CGI and completing the postproduction work for the high-def miniseries. And despite all their efforts, Nicholson and Grenaudier hope that viewers will not notice their work.

“One of the biggest compliments we can get is if people watch this and ask what we did,” adds Grenaudier. ■■

**Karen Moltenbrey** is a senior technical editor at Computer Graphics World.

**The city of Rome was constructed in 3D, while Capua was created mainly with matte backgrounds. The image to the left shows the live-action set with actors as they were filmed against greenscreen. The image below shows the completed shot containing the digitally painted scenic elements.**





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Effects studios bring  
Hellboy's monsters and  
heroes to the big screen

By Barbara Robertson

# DEVILISH EFFECTS

**Abe Sapien:** Behind this door... ancient evil.

**Hellboy:** Oh, well. Better let me go in and say, "Hi."

In case you're not a fan of Mike Mignola's comic books, Hellboy was a Nazi experiment gone good; a red demon baby conjured up at the end of World War II by Hitler's occult scientists and rescued by US soldiers. He grew up to become an evil-fighting member of the US Bureau of Paranormal Research and Defense (BPRD) and a comic book cult favorite. Now, thanks to Sony Pictures Entertainment, moviegoers in the US will discover Hellboy's wry humor when *Hellboy*, the movie, opens April 2. Directed by Guillermo del Toro of *Blade II* fame, the science-fiction action-adventure stars Ron Perlman as Hellboy, Doug Jones as fellow BPRD investigator Abe Sapien (with David Hyde Pierce providing the fishy humanoid's voice), and Selma Blair as the fiery Liz Sherman.

Providing much of the action, some of the creatures, and a touch of comic book flair were 850 visual effects shots created by an assortment of studios—including Tippet Studios, which handled such major

effects as the digital creatures, and The Orphanage, which completed 250 shots that showcased its skill with digital doubles, particle simulations, fluid simulations, atmospherics, and hard surface models, such as cars. Additional effects were created by freelancers and other studios. "We got good deals, and everyone is very happy with the work," says Ed Irastorza, former visual effects producer at Tippet for *Blade II*, who took on the dual task of visual effects producer and supervisor for *Hellboy*.

## Digital Double

Work on the film began when Irastorza and Blair Clark, visual effects supervisor at Tippet Studios, met with del Toro to begin planning *Hellboy* even before the project was approved. Once Tippet was officially on board, the studio began developing previzualizations and animatics. When filming began, Clark joined the crew in Prague, where he photographed

actors for reference, shot backgrounds for texture painters, and supervised data collection for scenes into which the studio would later add digital characters.

Except when Hellboy appears in extreme stunts, he is portrayed by Perlman or a stuntman wearing red makeup, stubby horns, and a prosthetic "right arm of doom" created by creature designer and make-up artist Rick Baker. His devilish tail is sometimes a prosthetic, sometimes digital. But when the stunts are too dangerous or humanly impossible, he's all digital. "Hellboy is a monster who makes fierce, aggressive moves, so he was really fun to animate," says Todd Labonte, animation supervisor at Tippet, who made a digital Hellboy crash backwards through a window, among other scenes.

To help studios that had the devilish double in their shots match the real Hellboy, Irastorza took photos of Perlman in costume and makeup on set during filming in Prague. "We'd photograph him over and over in different makeup (for example, if he had blood on his hands) and different costumes in 360-degree rotations against an

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Photo by Egon Erdemir



Photo by Egon Endeign.

**Three members of the Bureau of Paranormal Research and Defense—Hellboy (Ron Perlman) and Liz Sherman (Selma Blair), above, and Abe Sapien (Doug Jones), at right—fight evil in the film *Hellboy*. Digital doubles for Hellboy and Abe Sapien help the director give these characters inhuman powers as does CG fire for Liz Sherman.**



Photo by Egon Endeign.

8- by 5-foot white-board grid with one-inch squares,” says Irastorza.” Ron got a little sick of it, but it gave everyone photographs for texture mapping.”

Tippett Studios also created and animated a digital double for the character Abe Sapien so that the creature could swim underwater. “We filmed a tank of water, added CG matter, put reflections on the glass, and added CG elements in the water to create the environment,” says Clark. “When Abe is swimming underwater, he’s digital.” When Abe is out of the water, however, actor Doug Jones wears a suit and headpiece created at Spectral Motion that was altered, digitally, at Eden FX. “The suit didn’t have a way to blink its eyes, so we added horizontal and vertical blinks and also modified his brows and cheeks to give him expression,” says John Gross, visual effects supervisor.

Animator John Teska worked in NewTek’s LightWave to do the shots and create a transformation scene for Hellboy that included igniting the demonic right hand of doom. “We used particles in LightWave that we output in six or seven passes,” he says.

### Unnatural Moves

The majority of character work for the show focused on Sammael, a leonine creature with a Medusa-like head that was

sometimes played by a stuntman wearing an animatronic suit and was sometimes a CG character created at Tippett. Using a maquette from Spectral Design, which created the animatronics, Tippett fashioned a digital model capable of handling the creature’s unnatural movements. “Every joint was supposed to twist 180 or 360 degrees at any time,” says Paul Thuriot, CG supervisor. “Computers don’t like doing such things.”

Working with fellow CG supervisor Todd Stinson, the two developed a muscle and skin system that worked within Alias Systems’ Maya. “It’s a layer-based system,” Thuriot says. “Muscles are built on

top of a skeleton structure with skin on top and a fat layer in between.” The muscles, which are connected to bones or other muscles, are tube-like NURBS objects that can preserve volume. The fat is all math. When an animator moves the bones, the muscles move the fat, and the skin slides over the muscle and fat layers.

In real life, of course, muscles move bones, not the other way around, so Thuriot built a Mel tool that triggers the muscle and skin movement before the bones are moved. To accomplish this piece of magic, an animator first created the performance, determined which muscles to trigger, and then, essentially



Photo courtesy of Tippett Studios.

**Tippett Studios developed a new muscle and skin system for the CG version of the evil Sammael and rigged the character so that its joints could twist unnaturally.**

pushed a button. The simulation happened later. “The tool walks through the animation, looks at keyframe poses, and based on how much the muscle will deform, triggers the muscle a few frames ahead,” says Thuriot. “The skin rides along. It’s one of those subtle things that you notice only if it isn’t there.”

To move the skin, Stinson developed a system that worked something like a cloth solver. “With a cloth solver, all the vertices are connected and we apply forces to them,” he says. “For the skin, we connect all the points in the skin individually to muscles or perhaps bone underneath with Newtonian spring forces.” As the muscles moved, the fat layer tried to preserve the distance between the skin and the muscle, and all this action moved the spring forces connected to the skin points—in fact, some 15,000 in all for Sammael—thereby pulling the skin.

“One of the things our skin tool does that’s unique is to run in static or dynamic mode,” Stinson says. “In dynamic mode, like a cloth solver, the position of the skin in frame 105 depends on the position and velocity of frame 104.” So, when a character punches a wall, we see a jiggle roll up its skin. To carry this out, the simulation had to run sequentially on one machine, which caused long render times. Thus, Stinson developed a method to render skin points using information based on overall geometry instead. Because this information could be derived on a per-frame basis, the frames could be solved in parallel on many different machines. “The only thing we can’t get from the static solver is momentum jiggle,” he says. “Otherwise, the skin movement is pretty similar to the dynamic solve.”

In addition to Sammael’s flexibility, his 18 strands of “hair” caused animation angst. “It was hard to match the servo controls on the animatronic head,” says Labonte, “so we often used dynamics.” Sammael’s body was hand-animated, though, by Labonte’s crew, which used videos of silverbacked gorillas and lions as reference.

One of Sammael’s most annoying characteristics is that when he’s killed, he’s reborn as two Sammaels. In fact, in a Grotto scene, Tippett supplied animated Sammael embryos. During this sequence, in which several Sammaels fight a sometimes digital Hellboy, compositors controlled the camera moves in the plate by using a plug-in for Apple’s Shake called Twixtor (RE:Vision Effects), to make the shots more dynamic.

The real compositing challenge, however, was having all the CG characters interact properly with water around their feet. “We used a tool that can warp the water in the 2D plate based on the 3D animation,” says Colin Epstein, a lead compositor. “And then we added 2D elements and 3D bubbles, foam, and splashes that were generated procedurally by the effects team. There’s a lot of blending between real and CG.” Lighting and rendering efforts were led by technical directors Kirsten Drummond and Steve Reding who used Maya and Pixar’s RenderMan to match the on-set lighting effects.

In another effects-laden sequence, a long chase and fight between Hellboy and Sammael, the characters fight around a train and on a city street. Sometimes they’re real; sometimes they’re digital. In one scene, for example, only the tracks were real. Tippett added the characters and the background.

During some of the street scenes, the crew at Tippett added Sammael to plates that had been altered by The Orphanage. “The sequence was filmed on streets in Prague,” says Clark, “so, of course, all the cars had to be changed.”

Supervised by Shadi Almassizadeh, The Orphanage created five different types of cars, plus a truck and motorcycle, for the street scenes, making sure that highlights streaked properly in the fast-moving shots. Often during this sequence The



Photos courtesy The Orphanage.

**The Orphanage created a five-million polygon set to allow the virtual camera to move freely, and used rigid body dynamics to break apart the CG bridge. Hellboy is running on a bluescreen set until the end, when he becomes digital.**

Orphanage’s digital cars and trucks were added in the foreground to mask camera equipment and the film crew behind.

The Orphanage also created 17 digital doubles, a bridge sequence, and a dramatic sequence near the beginning. “Hellboy and the BPRD team are looking for Rasputin in this vast unending underground area when suddenly a pendulum shatters part of a bridge that Hellboy’s on,” says Irastorza. “The Orphanage built the digital environment that surrounds the bridge. It turned out to be one of the best shots in the film.”

Supervised by Ryan Tudhope, the 71-shot sequence included a rigid-body simulation for the end of the bridge that breaks apart as

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Hellboy runs. "We used the Reactor plug-in in Discreet's 3ds max, exported the scenes to Maya for the digital-double work, brought them back into max and then rendered the shots in Splutterfish's Brazil," he says. For compositing, the team used Adobe's After Effects and for shots that depended on particles, SiTex Graphics' Air, a RenderMan-compliant renderer.

### Hellish Atmospherics

For the so-called "Abbey Ruins" scene early in the film, sequence supervisor Matt Hendershot used Maya fluids controlled with particles to create a globe-like gateway to hell, and rendered the result in Maya. Kevin Baillie, CG supervisor, added digital rain and lightning.

The Orphanage crew also created CG tails for Hellboy, built the exterior of Ballamy Hospital, managed full CG shots of a creature imprisoned in a crystalline tube at the end of the film, and helped surround Liz Sherman's transparent hand with blue fire. "It was fun to have such a wide variety of work," says Tudhope. "The company as a whole learned from this project."

When Liz Sherman completely turns to fire, the effect was created by Café FX, which used Maya fluid simulations to engulf her body in blue flames. "Scott Gordon and Victor Grant also created an effect that shows her glowing from within," says Everett Burrell, effects supervisor.

**Hatch FX created matte paintings for background and establishing shots such as these by starting with photos of models created at the studio that were scanned, painted, and projected onto simple 3D geometry.**

Photos courtesy of HatchFX



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sor. "We used Maya for the animation and the match moving, but for the shockwave that happens after, we switched to some LightWave tricks using the plug-ins." All the shots except those of the fire were rendered in LightWave; the fire was rendered in Maya.

Of all the effects in the film, the work that's least likely to be noticed is that from Hatch FX, which created 80 percent of the matte paintings and the establishing shots, according to Deak Ferrand, founder and artist. Interestingly, Ferrand has begun using miniatures for his matte painting work. "For the ice cave scene, we started by building a resin model of a translucent ice cave that we could light from behind," Ferrand says. "That's what we're doing a lot of now—building miniatures, taking photos of the miniatures, painting on the photos in PhotoShop, and then projecting the result back

onto 3D models." The result is a 2-1/2D matte painting that accommodates a camera move. For the 3D geometry texture projection, Hatch uses Softimage XSI.

For one shot, the studio photographed miniature clouds built out of pillow fillers. "We projected the photos onto simple geometry shaped like a cone so it looks like the camera flies through a storm," Hatch says. "We must have used 50 or 60 layers of photos into which we mixed XSI particles for transitions. There are no rules in matte painting any more. The only thing that counts is that it looks real at the end."

If the enthusiasm for the project shown by the effects crews is any indication, many of whom are *Hellboy* fans, the movie will be a success and *Hellboy* will move from cult status to the mainstream. If it doesn't, it will at the least have given the crews in these studios a chance to work on a project starring a favorite superhero and will have provided many studios the chance to showcase new skills. ■

*Barbara Robertson is a contributing editor for Computer Graphics World and freelance journalist specializing in computer graphics, visual effects, and animation. She can be reached at [BarbaraRR@comcast.net](mailto:BarbaraRR@comcast.net).*

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# CRASH COURSE

Full-motion video drives Crash Bandicoot to a new level *By Martin McEachern*

## AFTER LEAPING

his way to video-game stardom through six successful action games, Crash Bandicoot—the popular spiky-haired marsupial—is expanding his range as a character, appearing for the first time ever in full-motion video (FMV) throughout his latest game release, *Crash Nitro Kart*.

Recognizing that FMV sequences have become the new norm in state-of-the-art video games, Universal Interactive Studios felt that it had no choice but to ensure that this seventh title in the game series would be the first to contain cinematics. Aside from meeting soaring consumer expectations, the cinematics also provided Universal with the opportunity to reinvent the *Crash Bandicoot* characters into more versatile, fully developed personalities, thereby laying the groundwork for the expansion of the *Crash* franchise into television and other pre-rendered media.

In *Crash Nitro Kart*, the mischievous marsupial finds himself kidnapped by the ruthless Emperor Velo, who then forces Crash to race inside a gigantic galactic coliseum. While the overall story line reads like a typical *Crash* title—heavy on action and light on narrative—the FMV is able to weave thicker plot threads than was previously possible through in-game animation alone. “Therefore, when creating this FMV,



The artists at Red Eye Studios created a high-resolution storybook world awash in bold, saturated colors for the *Crash Nitro Kart* cinematics.

we approached it more like a movie than a game in terms of story and character development,” says Christopher Winters, CEO of Red Eye Studios (RES).

In addition to this monumental departure in structure, the cinematics also signify an upgrade in the graphics, with 360 scenes featuring highly expressive animation for 27 *Crash* characters, including Crash’s sister Coco and his archenemies Dr. Neo Cortex, Dr. N. Gin, Tiny Tiger, and the villainous Krunk.

On the road to accomplishing these enhancements, the creation of *Crash*’s FMV became a case study in the challenges developers confront while transitioning game art to cinematic art. Chief among them was the delicate balancing act of enhancing characters and environments without losing their

consistency with the in-game imagery. In fact, adapting low-res game art for the higher resolution and frame rate of full-motion video has become an almost perfunctory phase in next-generation video-game production. And yet, developers have had to master this fine art, as feature film-quality cinematics become a standard in gaming, thanks to ever-increasing hardware power.

“The high production values that studios are lavishing on cinematics right now will be the norm for the next generation of console and PC game development, forcing game animators to be as good as their feature-film counterparts,” predicts RES president Theodore Bialek.

And, because of the demands of the medium, game artists will continue to have less time to complete a project than film animators. In the case of *Crash Nitro Kart*, RES’s eight artists had a mere four months to re-image the game universe in the FMV and deliver more than 32 minutes of elaborate, pre-rendered cinematics. More challenging yet, the actual animation phase had to be completed in 15 weeks, which breaks down to almost five shots a day, or 15 seconds of animation per day for each artist. In essence, creating cinematics is similar to producing a series of short films albeit in the narrowest of time frames.

Although the game characters were already built for the in-game portion of *Crash Nitro Kart*, they could not be ported directly into the cinematics because of their lower resolution for optimal real-



The full-motion video crowd shots were created using 1200 pre-rendered animation frames. Mapped to cards that were programmed to always face the camera, the frames were updated based on the card’s rotation angle. Additionally, each card’s map was animated with recycled motion showing the characters in various animated states.

Crash demonstrates some of the facial expressions created by the RES team.



time interactivity. Furthermore, RES decided to forego the advantages of adding onto the already-built, in-game Discreet 3ds max models, which were outfitted with full IK setups, morph targets, and UV texture maps by the game's developer, Vicarious Visions. Instead, the RES artists worked from concept sketches provided by Vicarious, using Alias Systems' Maya—with which they were more familiar—to enhance the detail of 27 character models, including Crash (see "Character Recognition," pg. 34).

Employing Maya's Split Polygon tool and the Sculpt Surfaces tool to manipulate the geometry like clay, the artists surfaced high-

ly detailed polygonal meshes to meet the higher resolution requirements. For character features that lacked the geometric complexity for capturing the details of the conceptual artwork—such as Krunk's feathers—the artists subdivided the edges or assigned greater texture density. "It can be tricky sometimes, when you're looking at a low-poly, in-game model, trying to decide which sharp edges should remain as part of the character's style and which were meant to be smooth curves," says animator Ethan McCaughey. "With some characters, like Crash, it's fairly straightforward, but with other, more angular characters like Tiny or N. Gin, it's more difficult to determine because of their shape."

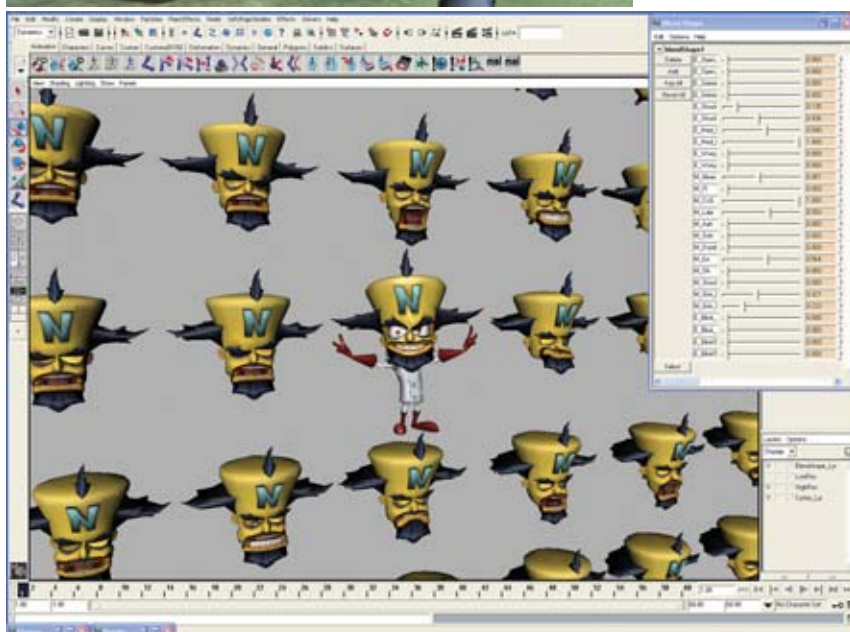
### Crafting Cartoon Performances

Each FMV model was bound to a scalable base skeleton that utilized a series of MEL scripts to form a complex, multi-level IK rig that easily could be modified to suit that character's unique proportions. RES's animators then exploited all of Maya's advanced rigging tools to craft finely calibrated cartoon performances, and underpinning all of them were Maya's Set Driven Keys. These allowed the artists to create a library of movements for any part of the character's body, and operate any of those movements through a single, slider-controlled tool.

To achieve an ideal degree of exaggerated realism, RES used the Set Driven Keys to connect joint rotations for carefully sculpting blend shapes that simulated the behavior of the overlying flesh. For weighting less complex areas of the body, the artists relied on Maya's Paint Weights tool, which provided them with a large palette of brushes for literally painting the degree of influence exerted by the underlying skeleton onto the geometry.

In addition, the group applied automated secondary character animation, including belly wobble and feather flutter, using Maya's Jiggle deformer. Other tools that charged the characters' movements with the flair and fluidity of feature-film animation were Maya's Wire and Wrinkle deformers, which were used for the

**For all the characters, including Dr. Neo Cortex, the artists modeled 25 facial blend shapes for the mouth, cheeks, eyes, and brows that could be blended to achieve a wide range of performances.**



# sweet.

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*Image produced by Patrik Puhala, Oregon3D student.*

furrowing and creasing of the characters' skin and clothing, and Maya's Spline IK, which was used primarily for animating their stylized hair and tails.

However, due to the wide variation in the facial proportions of the cartoon characters, the artists forewent the interchangeable bone structure typically used to create faces, and instead modeled 25 blend shapes for each character. Along with the eight phonemes required for lip synching, these blend shapes included a set of standard expressions for the mouth, cheeks, eyes, and brows that could be combined to achieve an almost limitless range in a character's performance.

### Creating Personalities

With their newfound ability to convey expression through the characters' facial animation and body articulation, the RES artists were tasked with forming the personalities of the *Crash*



*Nitro Kart* game cast via the FMV. For the first time in a *Crash* title, each character's personality had to be fleshed out, and all their behaviors, mannerisms, traits, and speech habits had to be carefully calculated to define their individuality. Interpreting the storyboards, the animators drew upon their conception of the characters to supply the likely motivations and behaviors for their actions.

"We had certain rules for how each character would carry itself by default," notes animator Thomas Happ. "N. Gin, for example, would always default to twitchy, side-to-side glances, while Tiny would often scratch his head in confusion. There were a lot of scenes where the characters are just standing around listening to Emperor Velo talk, and we had to invent ways to personalize their mannerisms and create a uniquely 'thinking character.'"

Once defined, the animators accentuated and differentiated the attitudes of the characters by providing them with contrasting actions. According to animator Keliu Zhu, one of the greatest challenges of working at such a frenetic pace was to maintain a consistency in a personality when several animators were assigned to the same character.

Once their personalities were established, the characters had to perform within the 3D environment—here, an illustrative, story-book world containing detailed sets permeated with bold, deeply saturated colors. To achieve these textures for both the characters and the environments, the team used Maya, as well as Adobe's Photoshop and Corel's Painter. Seeking the soft, highlighted appearance of cartoon rendering, artists used shaders to create a rim effect on the characters' skin, then tempered it by adjusting the

## CHARACTER RECOGNITION

Game developers take the popular character Crash Bandicoot back to its early roots

By Karen Moltenbrey

**ONE OF** computer gaming's most endearing characters, the mischievous mutated wombat Crash Bandicoot has starred in a number of titles running on all the major gaming platforms, including the original Sony PlayStation and, more recently, Nintendo's GameBoy Advance. Highly recognizable with its exaggerated nose and large mouth, Crash's overall design, however, was slightly different in each title.

Aware that the character's appearance had been inconsistent since its 1996 debut

on the PS1, Vicarious Visions (Troy, NY) decided to bring Crash back to its roots when it developed the seventh title in the franchise, *Crash Nitro Kart*. "Our idea was to explore the original vision for the character," says Karthik Bala, CEO and chief creative officer at Vicarious.

That vision developed in the mid-1990s, when designers Charles Zembillas and Joe Pearson teamed with the newly formed Naughty Dog to bring Crash to life in the original game for Universal Inter-



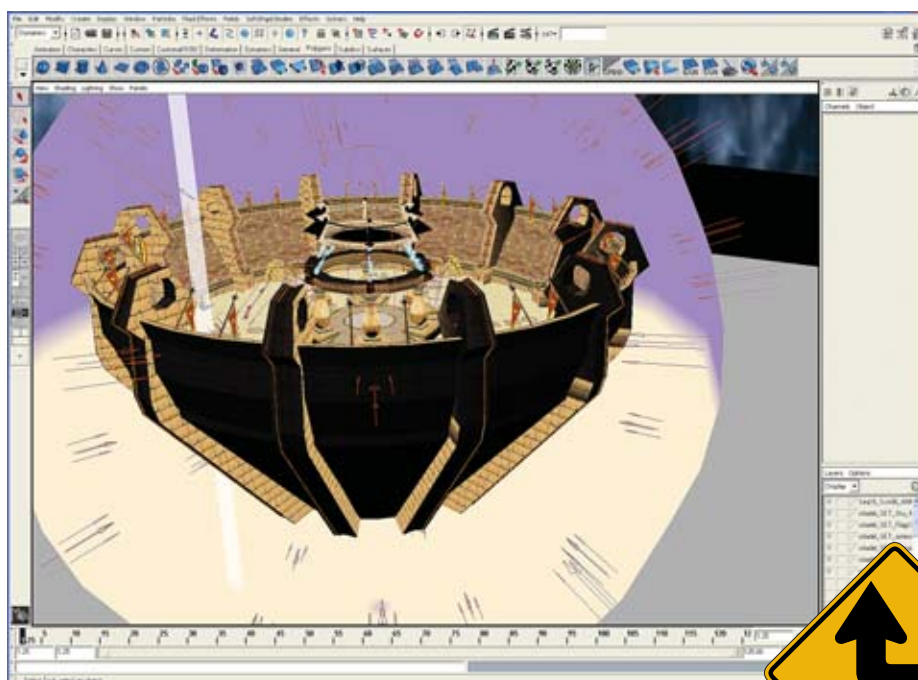
The original Crash Bandicoot character was a low-polygonal model created for the Sony PlayStation One console.

luminance of the surface. This forced more light to stretch across the illuminated areas without losing the warmth of the shader.

While many of the sets and props in the cinematics were adapted from in-game counterparts, the artists re-created the majority of these objects from scratch in order to add surrealism to the imagery.

According to compositor Orde Stevanoski, rebuilding the sets was crucial to the lighting and shading phase, “where colors were used to evoke a feeling or to define the temperament of a character.” To imbue the sets with this sense of surrealism, the art team used an array of light sources, including volume lights for the indoor environments, and dome and pre-baked light maps for the exterior environments.

Once the cinematic scenes were created and edited together, the group rendered the myriad layers with 2D motion blur in Maya at a resolution of 640x360 (the letterbox TV aspect ratio). To manage the rendering, RES used Virtual Vertex’s Muster, a stand-alone distributed network rendering system. To composite the imagery, the group used eyeon Software’s Digital Fusion,



To illuminate the game’s environments, including the coliseum set, the RES team employed a number of Maya directional lights, as shown in this screen shot.



adding shadows and depth of field before completing the final editing within Adobe’s After Effects and Premiere.

### Screen Test

Completed well in advance of the four-month deadline, the cinematics surpassed Universal’s expectations, setting the stage for what appears to be *Crash*’s eventual realization as a TV property.



The new Crash was redesigned to resemble the early game models, yet move closer to the artists’ original vision.

active Studios, which still retains the *Crash* property rights. Enjoying the success reaped from *Crash*, Naughty Dog produced three subsequent titles for the PS1—though without Pearson, whom Zembillas credits for being largely responsible for the original look of the character—before focusing its attention on other subjects, including the now-popular *Jak and Daxter*. This opened the door for Traveler’s Tales, which produced the fifth and six titles—including *The Wrath of Cortex*, the first *Crash* game for the PS2—but now without Zembillas onboard.

When Vicarious Visions was selected by Universal to create *Nitro Kart*, “we were looking at Crash and trying to decide where he needed to go from a design perspective,” Bala says. “We had a lot of ideas and tracked down Charles and Joe for guidance.”

According to Bala, both designers had created fabulous illustrations for *Crash* and the game worlds years before, but the final imagery had to be scaled down because the PS1 couldn’t perform the required real-time rendering. Then, when *Crash* finally did migrate to the current consoles, the new developers faced the challenge of evolving the character and the franchise visually while retaining its cartoon-like charm.

“Crash just didn’t look like Crash anymore, and the worlds just didn’t have the same style or signature elements,” says Bala, “though they were more detailed because of the new platform capabilities.”

To resolve this appearance issue, Vicarious Visions took a step back to the drawing board, reviewing a number of original development sketches from Zembillas’s archives. Then, the Vicarious team redesigned the main characters by

incorporating details from the concept art and adding girth to the characters while retaining the unusual angular, top-heavy, skewed geometry and asymmetry of the objects within the worlds. "We had to avoid the tendency artists have of making objects round instead of angular when there are more polygons available," notes Bala.

With only one year to produce the game, the artists at Vicarious focused on reworking Crash and his nemesis, Dr. Neo Cortex, whereas Zembillas designed new characters and Pearson designed new worlds that moved the title forward. Then, modelers at Vicarious turned those concepts into compelling 3D in-game characters using Discreet's 3ds max.

Now, in this latest title, Crash sports a slightly larger nose, fuller eyebrows, and a far



Through the game's cinematics, the artists were able to form personalities for the game cast, both old and new, including the villain Krunck.

And other game franchises are likely to follow, as developers continue exploring a title's story potential through its FMV.

A secondary consequence of this FMV trend is the unification of the film and gaming worlds, which is prompting a convergence in the skill set and production tools of these two groups. "You can see this in the number of FMV artists now making the transition to the film industry," says Bialek. "At the other end of the spectrum, we are starting to witness [Pixar] Renderman shader writers from the film industry making the transition into the real-time game arena. Because the mediums are so similar and the tools also have equalized in affordability, the skills for both jobs are closer now than they've ever been before."

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In the previous title in the series, *Wrath of Cortex*, Crash sported a slightly different appearance than he does in *Nitro Kart*, including a smaller nose and thinner eyebrows.

more textured body compared to the version in the last two games. With additional bones and complex morph targets, Crash once again became more expressive in his movement.

Because of the camera viewpoint employed in this first-person racing game, the in-game Crash character is shown only from the back. However, he and the others are shown from all angles in the

numerous pre-rendered game cinematics (see "Crash Course," pg. 30).

"Crash is slimmer and more appealing now," says Zembillas. "There's also more emphasis on his eyes, and you can see the craftiness in his personality. That's Crash to me, and he's alive again in *Nitro Kart*." ::

**Karen Moltenbrey** is a senior technical editor at Computer Graphics World.



And expect this line to blur even more, as many large film-effects studios continue replacing their expensive SGI Irix- and Sun Solaris-based boxes with cheaper Linux-based workstations running the same software as the game companies. Soon, the powerful new game consoles will roll out, further minimizing the difference between game and film art. "Game artists will have to rely more heavily on the same production methods and techniques their counterparts in the film industry have used for creating realism and successfully telling a story," concludes Bialek. "And, though it is reasonable to assume that film will always be a step ahead of FMV, and FMV will likewise be one step ahead of in-game graphics, each step is getting smaller." ::

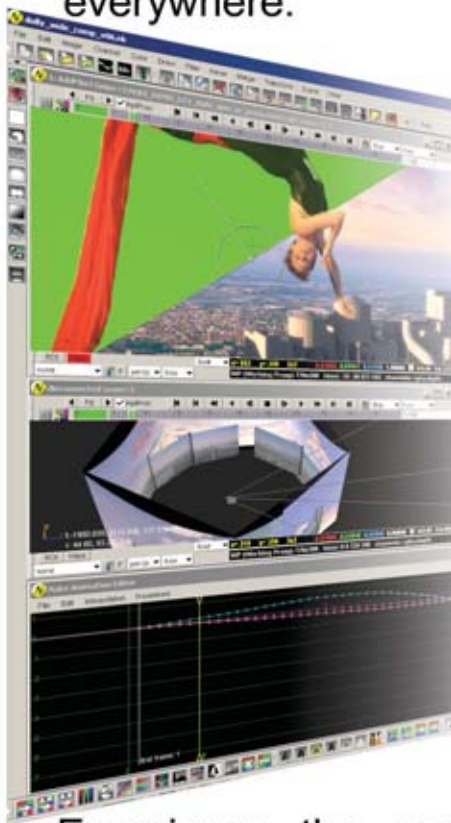
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# grand opening

TV's hit series *Las Vegas* makes a powerful first impression with its state-of-the-art intro

By Karen Moltenbrey

Creators of new prime-time television shows have just a short period—often only a few weeks—to win the loyalty of a substantial viewing audience or risk being replaced by the network.

Recently, a number of shows followed the “franchise” formula of the highly successful *Law & Order* crime drama by using an already popular show to lure viewers to a new but similar series. Conversely, there are a number of recently launched properties that are striving to make it on their own, without the help of a flagship program. When these shows debut, whether in September or as a mid-season replacement for another series, they have but a few minutes to capture viewers’ attention and stave off the often-fatal channel click.

Realizing the importance of an introduction with impact, the creators and producers of the NBC television show *Las Vegas*, named one of the year’s best new dramas, achieved what could arguably be

the most exciting one minute of weekly television footage. Created by the team at Stargate Digital (Pasadena, CA) in just three weeks, the opening segment used to introduce *Las Vegas* touches on three major story points by identifying the show’s location (the fictitious Montecito Hotel in Las Vegas), the main characters and their roles (including the beautiful pit boss Nessa Holt, head of casino security Ed Deline, and his protégé Danny McCoy), and the show’s focus (high-tech surveillance).

The opening also simulates the same “warp-speed camera mode” used throughout the show, and in the segment, taking viewers on a thrilling ride from the Las Vegas airport, down the famous Strip, across the casino floor, up an elevator shaft, down a hallway, and through the keyhole of a hotel room—all the while maintaining the high-paced action and visual intensity. The ‘trip’ had to be seamless and uninterrupted, says Sam Nichol-

son, president of Stargate, so it would draw the viewers into the action and the story. “We also wanted them to experience Las Vegas like no one else had,” he says.

According to James Riley, visual effects supervisor at Stargate, when he and Nicholson first read the script, they immediately knew that they had to do the show. “The series creator/executive producer, Gary Scott Thompson (*The Fast and the Furious*), was clearly thinking outside the box with this show,” he says. “He likes to move the camera without cuts, to tie everything together, so you physically move from one part of the city to another in a blazing motion. For us, that was both exciting and frightening, because we had to figure out how to do that for the opening.”

Riley notes that Thompson wanted the initial segment to begin with the camera focused on a dead body lying in a field outside the city (the plot of a subsequent show). Then, he wanted a flyover from the



body to the nearby airport, then down the Strip at hyperspeed, passing over the top of cars, narrowly missing buildings, and circling in and around various objects, such as a blowing newspaper and a simulated volcano, before entering the hotel. There, the camera was to slow momentarily on the various stars, before continuing on its high-speed journey through the hotel and into a VIP room where the character Danny McCoy is seen in a compromising position with his boss's daughter.

"We faced some challenges in meeting Gary's vision. We couldn't fly a helicopter close enough to the ground over the Strip to obtain the basic shots, nor could we film over or around the airport," Riley explains. "Because of all the strict rules and regulations, we had to figure out how to move the camera in one seamless motion from this dead person outside of town and into the hotel room while showing all the things [Thompson] wanted along the way."

To pull this off, Stargate employed state-of-the-art film and video technology that was seamlessly blended with high-end 3D computer graphics to create a dynamic look that could not have been achieved in either medium alone.

"The issue with visual effects in television is that we are often working with a limited budget and timeframe," says Riley. "So we started with the overall physical experience, broke it down into its most basic parts, determined what could be shot in camera (using various frame rates and motion-control techniques), what needed to be created as multiple 2D layers, and what areas were best suited for nested 3D. Then we created and weaved the various elements back together—with all the nuances and inconsistencies of the physical world—until we had achieved the heightened sense of reality we were going for."

Following this approach, a little more than half the imagery in the opening

sequence is live-action film footage, while the remainder is integrated 3D.

### Video Breakdown

Logistics, rather than aesthetics, usually determined what was to be either computer generated or live action. First, the team filmed a time-lapse, day-to-night sequence for the shot of the corpse, then pulled back, boomed up, and flew over the dead body toward the city. Next, the group transitioned from the live action into a full-CG segment of the airport at night—complete with an underbelly shot of a synthetic plane landing on a synthetic runway—and a 3D Las Vegas glittering in the background.

Creating the Las Vegas Strip entirely in 3D was out of the question because of the associated time and expense. "So the first thing we did was attach a film camera to one of our camera vehicles so it was approximately 10 feet off the ground, then



Stargate Digital created a stunning introduction for the TV series *Las Vegas* by moving the camera at "warp speed" to key locations throughout the city. Conversely, for some shots, they slowed the action for more impact.

we undercranked the camera [slowed down the film] and drove down the Strip. This 'photo survey' became the basis for our previz animatic for simulating and allowing us to study various speeds, heights, angles, and lenses," Riley explains. Using this previz as a reference, the Stargate artists determined which elements needed to be created as layered live action, 360 mega-matte plates, matte paintings, or nested 3D.

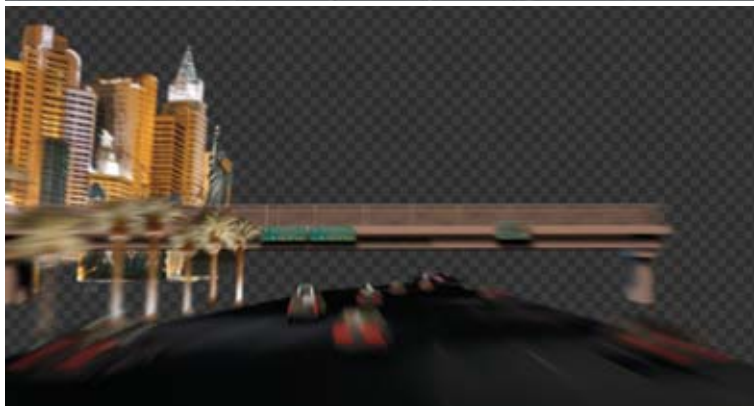
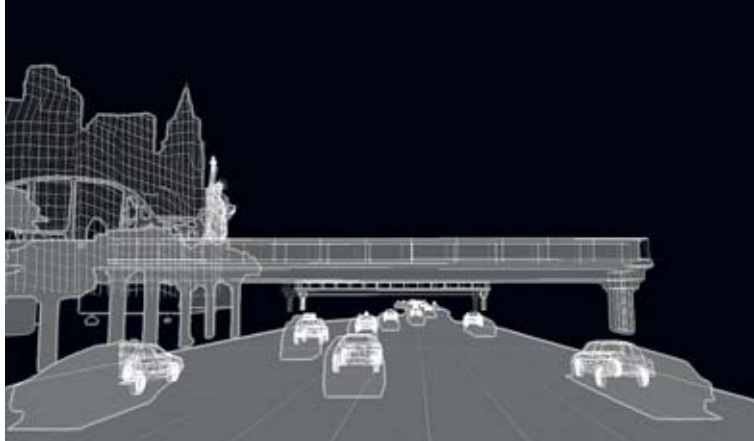
The live-action shots of the Strip were filmed at different angles and frame rates with Stargate's motion-control system mounted on a specially rigged car at the precise height to achieve the most dynamic flythrough of the Strip. "Since the opening was at night, we were able to take advantage of the new 5218 Kodak film stock. All the amazing lighting and colors of the Strip could be fully realized, and the solid grain gave us tremendous latitude for manipulating the image."

To create a sense of flying, the road, cars, island dividers, pedestrian walkways, and palm trees were all created as nested 3D objects, to allow the camera to "fly" over and, sometimes, around the objects. Additional elements along the Strip, such as hotels, casinos, and marquees, also were created as 3D objects in Alias Systems' Maya to heighten and enhance the experience.

Eight teams of artists, each assigned to a particular segment, were responsible for the final high-resolution CG imagery for their section. This entailed building the Maya models, applying photographic-based textures onto the geometry with Adobe's Photoshop, and rendering the imagery with Stargate's proprietary renderer. After this work was completed, the artists tracked the 3D models into the film footage using 2d3's boujou camera-tracking software, and lit the geometry to match the specific camera moves. Finally, the group composited the elements into their portions of the shots using Adobe's After Effects, and roto-scoped objects out of the footage as required.

"We used a lot of tricks and enhancements to finish off the experience, to take viewers way beyond where the physical camera can go—in this instance, flying down the Strip at a thousand miles an hour," says Riley.

"It's usually the design and approach, rather than the tools or techniques, that make a shot great," continued Riley. "Ultimately, the best visual effects shot is a combination of multiple layers



**In addition to the high-speed camera moves, the artists also used integrated CGI to achieve a compelling scene by first previsualizing the shot, creating the digital elements, and then compositing them into the video to create the final scene.**

of 2D, matte paintings, and nested 3D because you get all the irregularities of reality in a controlled way." All told, Riley estimates that the opening segment contains upward of 600 layers that contain approximately 1500 pieces, or visual elements, that have been seamlessly integrated.

Since the show's debut, the opening sequence has been edited somewhat to reflect current story lines, though it still retains its high visual impact. And given the chance, Riley says he would like to add more extreme POV camera moves to it in the future. "It's always fun to take the viewers for an unexpected and exciting ride outside their normal experience. That's what the writers and producers of the show wanted to do, and we enjoyed helping them bring that to the screen." ■■

*Karen Moltenbrey is a senior technical editor at Computer Graphics World.*

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A special report on the latest trends in data storage for digital content professionals

# storage

IN THE

# studio

## INSIDE

### Net Savings

Content creators turn to network-based file storage to streamline collaborative projects.

### Affordable Arrays

New disk arrays provide the performance of traditional systems—at a fraction of the cost.

### DAMming the Flow

Digital asset management (DAM) tools help graphics professionals control rivers of data.



# Net Savings

Content creators adopt network-based storage  
to streamline work flow and collaboration

By Dave Simpson

When it comes to saving their massive and ever-multiplying stores of digital assets, content creators can use any of the following techniques:

- Direct-attached storage (DAS), in which disk subsystems are directly attached to workstations or servers
- Network-attached storage (NAS), in which disk subsystems are directly attached to Ethernet networks
- Storage-area network (SAN), in which disk storage and servers are attached to a Fibre Channel network.

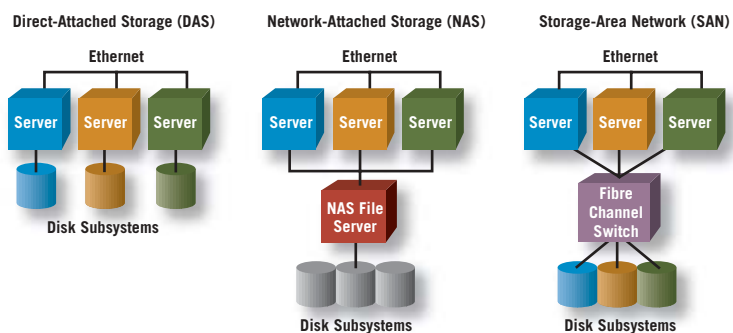
However, in most studio environments, the trend is clearly away from DAS systems

tems, also could reap rewards from making the transition.

“Direct-attached storage poses problems in media environments because everything is a collaborative process, with many people having to manipulate content before it goes out the door,” says Farney. “If you do it with direct-attached storage, you have to copy and move data over and over among graphics professionals. And as you move to higher resolutions and larger files, that becomes an onerous and time-consuming task.” As a result, he says, there’s a growing realization that professionals in collaborative environ-

speed 2Gbps Fibre Channel network.

“In the broadcast media space, there is a big trend toward networked storage because media facilities are moving huge amounts of content,” echoes Jay Krone, a marketing director at EMC, whose Clariion storage systems were used by editors on a variety of films, including *The Perfect Storm*, *Gladiator*, *Mission: Impossible—2*, *American Beauty*, and *X-Men*. Indeed, a 90-minute feature film in uncompressed HDTV format could require more than a terabyte of storage capacity, he notes. Moreover, handling such massive files efficiently requires the high bandwidth available only in networked systems.



**The three primary storage architectures are direct-attached storage (DAS), network-attached storage (NAS), and a storage-area network (SAN).**

and toward faster-performing networked storage architectures of NAS or SAN.

Jim Farney, senior marketing manager for media industries at SGI (and former longtime owner of a major postproduction facility), says that while most large studios already are using and benefiting from networked storage, smaller studios, which are still primarily using DAS sys-

tems have to move to some form of networked storage, whether it’s NAS, SAN, or a combination of the two.

In addition to the content-sharing advantages of networked storage, studios may need the increased bandwidth of NAS, which attaches to 1Gbps (Gigabit per second) Ethernet networks or a higher-capacity SAN, based on the high-

## Network-Attached Storage

For digital content professionals working in collaborative environments, the primary advantages of NAS are its low cost (compared to SANs) and its facility for file sharing (as opposed to DAS). To enable file sharing among diverse platforms, virtually all NAS servers support CIFS (the network protocol for Windows platforms) and NFS (for Unix platforms), and some NAS servers also support protocols for file sharing within Apple and other environments.

But whether NAS will serve your needs compared to a higher-cost SAN depends on your bandwidth requirements. “NAS works great, if, for example, you’re doing standard-definition digital-video editing with four or five video streams at up to 50MBps (megabytes per second) per client,” says Gerry Johnson, senior product manager at Ciprico, which supplies digital media storage systems.



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“But NAS may not provide enough performance in film editing environments that require throughput of, say, 200MBps and 2K-by-1K film-resolution playback in uncompressed format,” says Johnson. The reason is that NAS file servers are typically attached to Ethernet networks, the fastest of which currently run at 1Gbps, versus 2Gbps for Fibre Channel. Gigabit Ethernet is rated at a maximum of 125MBps, although in reality, users may achieve only 60 to 70MBps because of network overhead. Therefore, according to a variety of storage vendors that focus on media applications, Gigabit Ethernet may be a good choice when many clients must access files, but not when they have sustained requirements for transferring large amounts of data, as is required in a renderfarm, for example.

Gigabit Ethernet networks have boosted the throughput you can get with NAS servers and have enabled high-speed file sharing in media applications. But the real breakthrough will come with 10Gbps Ethernet, which is just starting to be used in IT environments. “Although expensive, 10Gbps Ethernet will enable more than adequate performance in all video environments, including high-definition video,” says Johnson.

Another way to boost performance of NAS systems is to add TCP/IP off-load engine (TOE) cards, which are available from vendors such as Alacritech and Intel. TOEs accelerate NAS performance by off-loading TCP/IP processing from the host processor.

Is NAS ready for big-budget film and TV production? Absolutely, if a number of high-profile applications of the technology are any indication. In fact, in one of the most asset-heavy film productions ever undertaken, Weta Digital in New Zealand used NAS file servers from Network Appliance as primary storage for the special effects in New Line Cinema’s *The Lord of the Rings* trilogy.



**Network-attached storage (NAS) file servers from Network Appliance were used by Weta Digital artists in the making of *The Lord of the Rings* trilogy.**

## Tippett Banks on a SAN

Tippett Studio, a visual effects facility in northern California, faced huge amounts of data as it was working on films such as *The Matrix: Revolutions*, *Stepford Wives*, *Hellboy*, and *Starship Troopers 2*. To cope with the rapidly increasing storage capacities required for those projects, the studio installed a storage-area network (SAN) in mid-2003.

Originally, Tippett’s storage infrastructure was based primarily on direct-attached storage with some network-attached storage (NAS) systems. “The main reason we went to a SAN was so that we could back up all our data without impinging on server bandwidth,” says Christian Rice, director of technology at Tippett. “Our disk capacity is doubling every year or so, and sometimes we generate more than 200GB of new data every day.”

At the heart of the SAN are two 16-port, 2Gbps Fibre Channel switches from Brocade, which attach to the studio’s servers, storage arrays (most of which are from SGI), and backup systems. The SAN has hundreds of client workstations (mostly Linux and Windows), and a total storage capacity of 16TB, which is expected to increase to 19TB in a month or two.

Beyond enabling better backup operations (without impeding overall performance), the SAN provided Tippett centralized storage and content management, as well as data sharing via SGI’s CXFS shared file system, according to Rice. The SAN also allowed Tippett to balance work loads across the storage network to optimize performance, he says, “and to export data to clients much more dynamically.” —DS



**By migrating to a storage-area network (SAN) Tippett Studio enabled better content management, sharing, and backup.**

trilogy. Specifically, Weta used the company’s F840 NAS systems, which Network Appliance refers to as “filers,” for special effects and other content-creation work requiring terabytes of storage capacity, high-speed image manipulation (with single images that often exceeded 12MB), and more than 150 graphic artists. (Network Appliance NAS filers also are used to store the content on the film’s Web site at [www.lordoftherings.com](http://www.lordoftherings.com).)

Similarly, for a variety of high-profile TV productions—including the NBC movie *Saving Jessica Lynch*, heavily animated TV commercials for Hasbro, and a direct-to-DVD *G.I. Joe* film—Reel FX Creative Studios, a 3D animation and visual effects facility in Dallas, relied primarily on NAS file servers. The studio uses SGI’s InfiniteStorage NAS 2000 systems for storage tasks performed during the animation, as well as during the effects, video editing, and postproduction work its artists performed on Windows, Macintosh, Linux, and Irix platforms—all of which can access the same images simultaneously without file copying.

Despite the performance and file-sharing capabilities of NAS, in the end, it may be its relatively low cost that is most appealing to studios with limited budgets. For example, Huge Systems, a storage vendor that specializes in the video and rich media markets, sells a 1TB NAS server for \$10,600 and a 3TB version for \$23,900. The company targets digital video and standard-definition

applications with its NAS servers, according to Mike Anderson, chief technology officer at the company.

### Storage-Area Networks

If a NAS system doesn't provide high enough performance, you may need to consider a SAN. For example, says Johnson, "If you have hundreds of seats in a collaborative environment with high-definition editing, then a SAN is the only way to go."

For studio environments, the primary advantages of SANs are consolidated storage, centralized management, and a dedicated high-speed network, typically based on Fibre Channel technology, which can potentially achieve speeds up to two times that of Ethernet networks. By comparison, a 1Gbps Fibre Channel network is rated at a maximum transfer rate of 100MBps, although actual speeds may be more in the 75 to 80MBps range. That's marginally faster than a Gigabit Ethernet NAS system, whose actual top speed is 60 to 70MBps. But a 2Gbps Fibre Channel network, which is rated at a maximum 200MBps, can achieve speeds of 150 to 160MBps.

The downside to SANs is that they're expensive compared to NAS and DAS options. Although difficult to show on a dollars-per-megabyte basis, the price differential becomes clear when you factor in the costs of specialized SAN hardware, which could easily eclipse the total cost of your workstations, graphics cards, and software. Pricing varies widely, but Fibre Channel host bus adapters (which are required for all servers and workstations attached to the SAN) can cost around \$1000 per platform. And Fibre Channel switches are considerably more expensive than Ethernet switches—more than \$600 per port. In addition, Fibre Channel SANs require new cabling, specialized expertise, and, possibly, SAN management software.

However, SANs do provide the ultimate in storage performance. And when coupled with shared file systems—from vendors such as ADIC (StorNext File System), IBM (TotalStorage SAN File System), and SGI (InfiniteStorage CXFS)—they offer file-sharing features such as concurrent file access for collaborative work environments. Other options for SAN file sharing include Fibre Channel SANs that come bundled with shared file systems, including those from Avid and Pinnacle Systems, which specialize in the video/graphics markets.

Some of these shared file systems provide content sharing among diverse platforms, such as Windows, Unix, and Macintosh—a platform mix that is common in many studios. For example, SGI's CXFS file system supports Windows, AIX, Linux, Irix, Solaris, and Macintosh platforms.

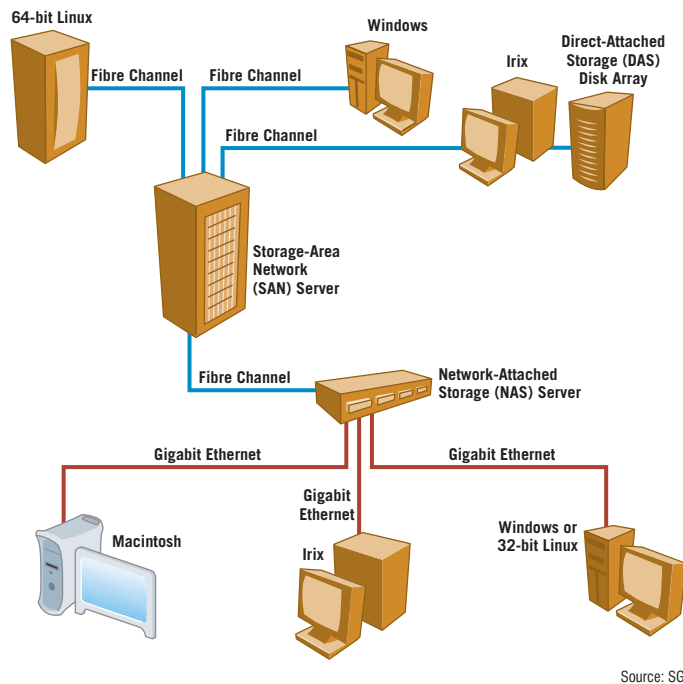
The NAS-versus-SAN decision may also come down to the type

of content you're storing. "NAS is good enough for 8-bit standard-definition material, but if you need to share high-definition content, then a SAN may be necessary," says Huge Systems' Anderson.

Although SANs provide high bandwidth and content sharing, some studios install a SAN for simpler reasons—at least initially. For instance, Tippet Studio deployed a SAN primarily to solve backup problems, according to Christian Rice, director of technology at Tippet, but in the end also used it for file sharing and content management (see "Tippet Banks on a SAN," pg. 46).

### Mix 'n' Match

The various storage architectures (DAS, NAS, and SAN) are not mutually exclusive. In fact, a variety of vendors sell bundled solutions that combine elements of NAS and SAN. EMC, for example,



**A typical hybrid storage architecture combines direct-attached storage (DAS) disk arrays with network-attached storage (NAS) over a Gigabit Ethernet network and a storage-area network (SAN) over a Fibre Channel network.**

has software that enables users to combine its Celerra NAS servers and its SAN-attached disk arrays. This approach allows users to mix NAS and SAN according to bandwidth and budget requirements.

"Professionals who need really high bandwidth, such as for renderfarms, can use a Fibre Channel SAN, while everybody else uses less-expensive NAS on existing Ethernet networks," says SGI's Farney.

"NAS-SAN convergence will be a big trend in studio environments that have a mix of bandwidth requirements," Farley adds. "You get the low-cost, file-sharing benefits of NAS with the higher bandwidth of a SAN." ■

**Dave Simpson** is editor-in-chief of InfoStor magazine. He can be reached at [daves@pennwell.com](mailto:daves@pennwell.com).

# Affordable Arrays

A new disk storage technology promises “good enough” performance at half the cost of conventional systems

By Dave Simpson

Digital content professionals have unique requirements for data storage. They need extremely high capacity and as much speed as they can afford. Unfortunately, most studios operate under tight budgets when it comes to capital expenditures for computing equipment. So to get the most bang for their buck—at least in terms of storage capacity—they often turn to disk arrays based on Fibre Channel or SCSI (Small Computer System Interface) connections for use in stand-alone or networked storage systems.

Now there's a new breed of disk storage based on the Serial ATA (Advanced Technology Attachment) interface that is expected to provide a lower-cost storage alternative to arrays based on Fibre Channel or SCSI drives. Serial ATA (or SATA) disk arrays, which typically hold about 250GB per drive, promise performance levels that are “good enough” for most digital content applications, including animation, 3D rendering, nonlinear video editing, and a variety of other rich-media applications.

Choosing the right disk system for your environment comes down to a trade-off between cost and performance. Although pricing on disk arrays varies widely, Charlotte Rancourt, a senior analyst with International Data Corp. (IDC), says that end users can expect to pay 30 to 50 percent less for SATA disk arrays than for high-end SCSI or Fibre Channel arrays, assuming equal capacity. Indeed, for relatively small configurations (of less than, say, 4TB), the cost differential could be approximately 30 percent, she explains,

while for high-capacity configurations (requiring upward of 12TB), the price difference could reach 50 percent.

In fact, at this month's NAB show, storage vendor Ciprico will introduce a disk array based on Serial ATA that the company claims provides Fibre Channel performance at half the price. Ciprico, which also sells Fibre Channel arrays, will be demonstrating its FibreStore 2212A SATA disk array priced at \$17,100 for a 1.5TB entry-level version. Target applica-

resents a compound annual growth rate of more than 400 percent.

The surge in popularity of SATA drives in non-desktop systems is expected to be robust as well. Reinsel estimates that shipments of “enterprise-class” SATA drives will soar from a half million units last year to 3.6 million units in 2005.

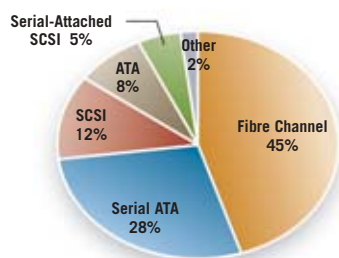
## Performance Factors

On paper, Serial ATA is not as fast as Fibre Channel or high-end SCSI disk systems, but its performance may be sufficient in many media environments. SATA is rated at 150MBps, compared to 320MBps for Ultra320 SCSI and 200MBps for Fibre Channel. However, those are only theoretical maximum (“burst”) throughput ratings. Your mileage will vary.

Actual performance depends largely on the type of input/output streams you're transferring. For random I/O streams with relatively small blocks of data, Serial ATA disk arrays almost always will be slower than Fibre Channel or high-end SCSI arrays. However, if you're inputting or outputting large blocks of data at a time (as many studios do when streaming video data, for example), a SATA disk subsystem may be almost as fast as a Fibre Channel or SCSI disk array.

“Media environments are often characterized by very large, sequential reads and writes, and in those environments SATA delivers almost as much performance as Fibre Channel,” says Jim Farney, senior marketing manager at SGI, which recently began shipping SATA disk arrays based on technology from LSI Logic

**Q: Over the next six months, the majority of your disk-array products will be based on which disk-based interface?**



Source: InfoStor QuickVote reader survey

**IT professionals already are planning to make the transition to disk arrays based on the Serial ATA interface.**

tions for Ciprico's SATA disk systems, according to the company, include nonlinear editing and film scanning.

How popular will SATA disk drives be? According to IDC analyst Dave Reinsel, SATA will be the dominant disk drive interface for desktop platforms within two years. In fact, he predicts that shipments will skyrocket from 2.5 million units last year to some 124 million units in 2005, which rep-



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Storage Systems. Early users of SGI's SATA disk arrays include Efilm and Pacific Title & Art Studio, both of which are using the arrays for near on-line, or "nearline," archiving, which requires faster data-access speeds than are available with off-line tape-archiving systems.

"There's a huge demand for Serial ATA in graphics-intensive environments, driven mainly by SATA's low cost," says Farney. But, he cautions, while Serial ATA RAID (Redundant Array of Inexpensive Disks) can fulfill the bandwidth requirements of most studio applications, if you need the highest bandwidth and/or you have a lot of users (say, 20 or more) who are simultaneously accessing the same storage subsystem, you may need to go with Fibre Channel RAID arrays.

Of course, performance is highly application-dependent and will vary according to factors such as the size of the data blocks being transferred, sequential versus random access, standard-definition versus

high-definition video, and so on. But vendors that sell storage systems with a variety of disk interfaces (for example, SATA, Fibre Channel, and SCSI) are surprisingly consistent in their performance evaluations.

"Our 12-drive SATA array is approximately performance-equivalent to our 10-drive Fibre Channel array—at about half the price," says Gerry Johnson, senior product manager at Ciprico, which discontinued its SCSI-based disk arrays about four years ago.

Similarly, SGI's Farney says, "In general, SATA doesn't have the performance of Fibre Channel. However, in media environments, which are often characterized by very large, sequential reads and writes, SATA delivers almost as much performance as Fibre Channel."

Because of their lineage in desktop platforms, SATA disk drives are often characterized as being less reliable than Fibre Channel or SCSI drives, which were developed for server, rather than desktop, platforms.

However, vendors that have experience with all the major disk drive interfaces say that there is little difference in reliability among the various interfaces, at least in environments that do not require constant storage access. "Even with our Parallel ATA systems [the predecessor to systems based on Serial ATA, also known as IDE, or Integrated Drive Electronics], the drive failure rate was about the same as SCSI and Fibre Channel," says Johnson. "Serial ATA blurs the line between desktop-quality drives and so-called 'enterprise-class' drives."

### Other Options

While Serial ATA is creating a great deal of buzz in graphics-intensive environments, some storage vendors—and end users—are sticking with other disk interfaces, at least for now. For example, Huge Systems, a storage vendor that specializes in video and rich-media markets, will showcase its line of SCSI disk arrays, including a new system based on the Ultra320 SCSI disk interface, at NAB.

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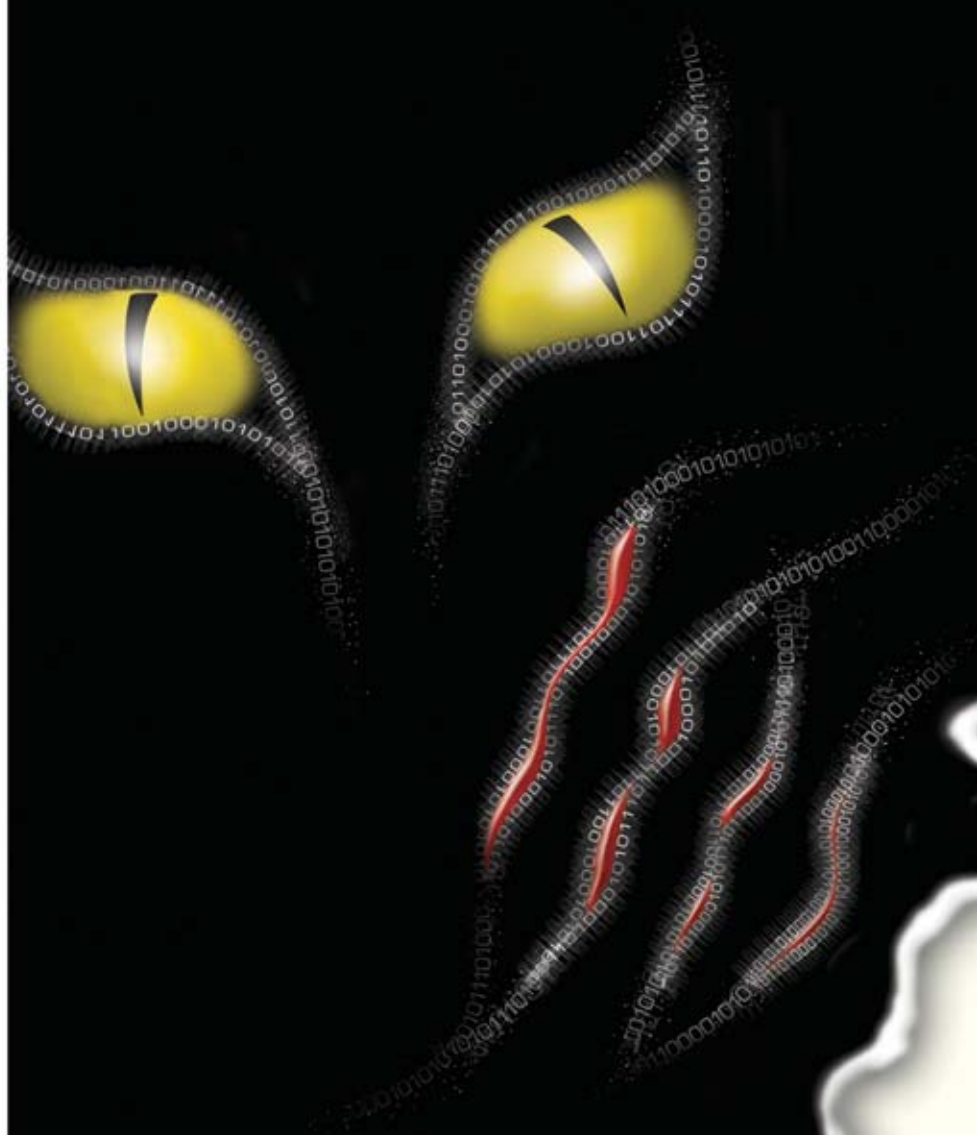
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Mike Anderson, Huge Systems' chief technology officer, points out that the Ultra320 SCSI product may be best suited for studios working with high-definition video. Conversely, he says that single-channel Fibre Channel disk arrays, which feature one connection into the disk subsystem, typically can't handle HD video. Although Fibre Channel is rated at a theoretical maximum transfer rate of 200MBps, users usually realize only about 140 to 150MBps. You can add channels to the disk subsystem to boost throughput rates, he explains, but that significantly increases the price of the array.

Anderson says that Huge Systems' five-drive Ultra320 SCSI disk array can achieve rates of 220MBps, which is enough performance for HD video streams. The system can record and play back high-quality video, including 1080i HD at 10 bits, or it can handle up to six uncompressed standard-definition video streams.

Despite its current emphasis on SCSI disk arrays, Huge Systems plans to introduce a disk array based on Serial ATA drives in the third quarter. "The next generation of SATA drives will have better reliability," says Anderson, "which will make them more appealing for 24x7 operation."

## Secondary Storage

Although some vendors pitch Serial ATA disk systems as primary on-line storage devices, SATA is also a good fit as a secondary, or

nearline, storage device. In these scenarios, the SATA disk system sits between primary storage arrays (for example, high-performance Fibre Channel arrays) and tape systems that are used for archiving content. Essentially, the secondary disk array allows users to "park" content on an inexpensive storage medium. The SATA disk subsystem is less expensive than the primary disk systems and is much faster than tape libraries for content retrieval.

"A film with a lot of special effects can be 30TB or much more, and it doesn't make economic sense to put that much capacity on expensive Fibre Channel arrays," says Farney. He adds that some large studios are starting to implement "tiered" storage architectures, whereby once a film is completed, the content is moved to Serial ATA arrays for subsequent access and then to tape for long-term archiving.

In a related trend, some studios are using Serial ATA disk arrays to replace slow-access tape libraries as backup devices. SATA disk arrays are almost as inexpensive as tape libraries, but they provide much faster access times.

Whether you use it for primary or secondary storage, disk subsystems based on Serial ATA technology are good news for budget-constrained production facilities. ■

*Dave Simpson is editor-in-chief of InfoStor magazine. He can be reached at [daves@pennwell.com](mailto:daves@pennwell.com)*



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# DAMming the Flow

Digital asset management tools help content

creators contain the rising flood of graphics files

By Jenny Donelan

Digital asset management (DAM) is one of those technologies that can be defined in a variety of ways. Is it simply a method for organizing electronic files? Is it software that controls the flow of work? Is it a hardware-based system of servers and storage devices? Or a combination of all of these?

Narrow the definition to DAM for the digital content creation (DCC) space and the variations continue. There's production management software, a DAM tool tailored to the DCC production pipeline. It would seem to fill the bill. But does it rule out less production-oriented programs that control and facilitate the distribution of finished assets at the back end of the production cycle? What about complete hardware/software systems designed to control assets for large media organizations, such as ad agencies and broadcast studios? And, just to confuse things, consider those tangential yet essential tools such as Internet services that combine with other processes to provide asset management.

The truth is that programs offering any and all of these features could be consid-

ered digital asset management tools for the professional content creation market. And while at first glance they might seem to contend with each other, they are actually much more complementary than they are competitive.

## Avid and NXN

Avid Technology's recent acquisition of NXN Software, maker of the Alienbrain line of production management tools, illustrates this synergy between DAM products. Alienbrain has the largest share of commercial production management seats in the rarified world of high-end digital content creation, particularly in the game development market, for which its Studio product (Version 7 is scheduled to ship this month) is specifically designed. NXN also makes Alienbrain VFX, a version of the product that is geared for postproduction.

"NXN Software is a great example of a niche asset-management company," says Tim Claman, director of interoperability and standards

**Version 7 of Alienbrain Studio from NXN offers new features for enhancing work group performance.**



Artesia's Teams software helps link creation data and other detailed information to digital assets.

Image courtesy: Artesia Technologies.



Image courtesy: NXN Software.

for Avid. "They really don't have any direct competitors for games and postproduction systems. For production asset management, they're the only game in town." Although Avid already has two DAM products—the Active Content Manager and the Unity Media Manager—those are designed to manage finished content, "what some people call content management," says Claman.

On NXN's part, the new subsidiary now has greater access to the postproduction world, in which Avid is well-entrenched. "Avid's strategy is to make, manage, and move media," says NXN marketing manager Eric Schumacher, "and we fit in." The company has been looking to branch out from its roots in the gaming world, he says. "We've been looking more seriously at postproduction. We've always considered [moving into] broadcast, but other products, like Artesia and eMotion, are there."



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## Casting a Wider Net

Artesia is one of the original players in the DAM-for-media space, with a background in creating work flow systems (including both hardware and software) that integrate with electronic publishing tools. Its Teams software was introduced in 1998, and Artesia counts among its customers content creators such as DreamWorks and Electronic Arts, but specializes in managing the back end of the process, rather than the front end—content creation. There, the Artesia system can take on whatever files need to be processed, archived, or made into further assets.

“What we did from day one was decide that the unit of information wouldn’t matter,” says David Lipsey, Artesia’s vice president for media and entertainment. Artesia is “asset-type neutral,” he says, and the product is complementary with Alienbrain. “We really don’t go after specialized markets.”

Other DAM vendors involved in the DCC and/or broadcast market include eMotion, which offers a host of business applications for managing digital assets and marketing content; Canto, with its Cumulus software product that offers DAM for a variety of applications, especially Web publishing; and Adam Systems Group, which develops hardware and software DAM systems for the entertainment, geospatial, and medical markets.

Adam Systems’ principals are great believers in hardware and software systems designed specifically for DAM. According to David Breen, the company’s vice president of sales and marketing, “Developing a DAM system based solely on a storage hardware solution does not track the use of resources and the relationships between them. Asset management software packages alone do not deliver an integrated, functioning solution or preserve the quality of digital rich media over time. True digital asset management systems can create an integrated environment to manage, preserve, and re-purpose assets.”

Examples of other DAM system providers include Savvis/Wam!Net and Ascent Media, whose services involve streaming and, in general, transporting assets from one place to another. Because digital assets are integral to just about everyone’s work flow, many other companies are getting involved in the process. Type the words “asset management” into the search window of Web sites for workstation vendors such as Hewlett-Packard, IBM, SGI, and Sun Microsystems, and you’ll find whole pages devoted to the process, often with specific references to DCC applications.

Several of these companies partner with the previously mentioned product vendors to provide DAM services. Sun, for example, lists Canto’s Cumulus and other DAM products as part of its iForce Partners program on the Web. And some of the above vendors are partners with each other. Ascent Media, for example, is a customer of Adam Systems Group.

## Around the Bend

The DAM industry’s current challenge with regard to digital content creators, says Adam Systems’ Breen, is “developing a customized, non-disruptive work flow system that can be integrated with a DCC’s facility, and is dealing with digital rights management, since assets can be easily re-purposed.” In fact, re-purposing represents yet another frontier—controlling digital assets from “birth.” The more infor-



Adam Systems creates hardware and software digital asset management systems for clients such as Ascent Media.

mation an asset starts with, the better it can be classified, used, and protected. Artesia’s Lipsey, using the analogy of an identification bracelet on a newborn in a hospital, contends that the better the bracelet—the more information it contains—the better the work flow.

Many in the industry believe that identifying assets from birth will be the only way to control them, because digital assets are growing at a relentless pace. One reason is that companies have realized the value of converting their licensed assets to an ever-widening array of merchandise. Another is that audiences crave high-quality digital imagery in their movies, television shows, and games. Every time a studio releases a film with breakthrough amounts of imagery, the bar is raised. The challenge to asset-owning companies and DAM vendors is coping not only with all these assets, but also with all their potential uses. ■

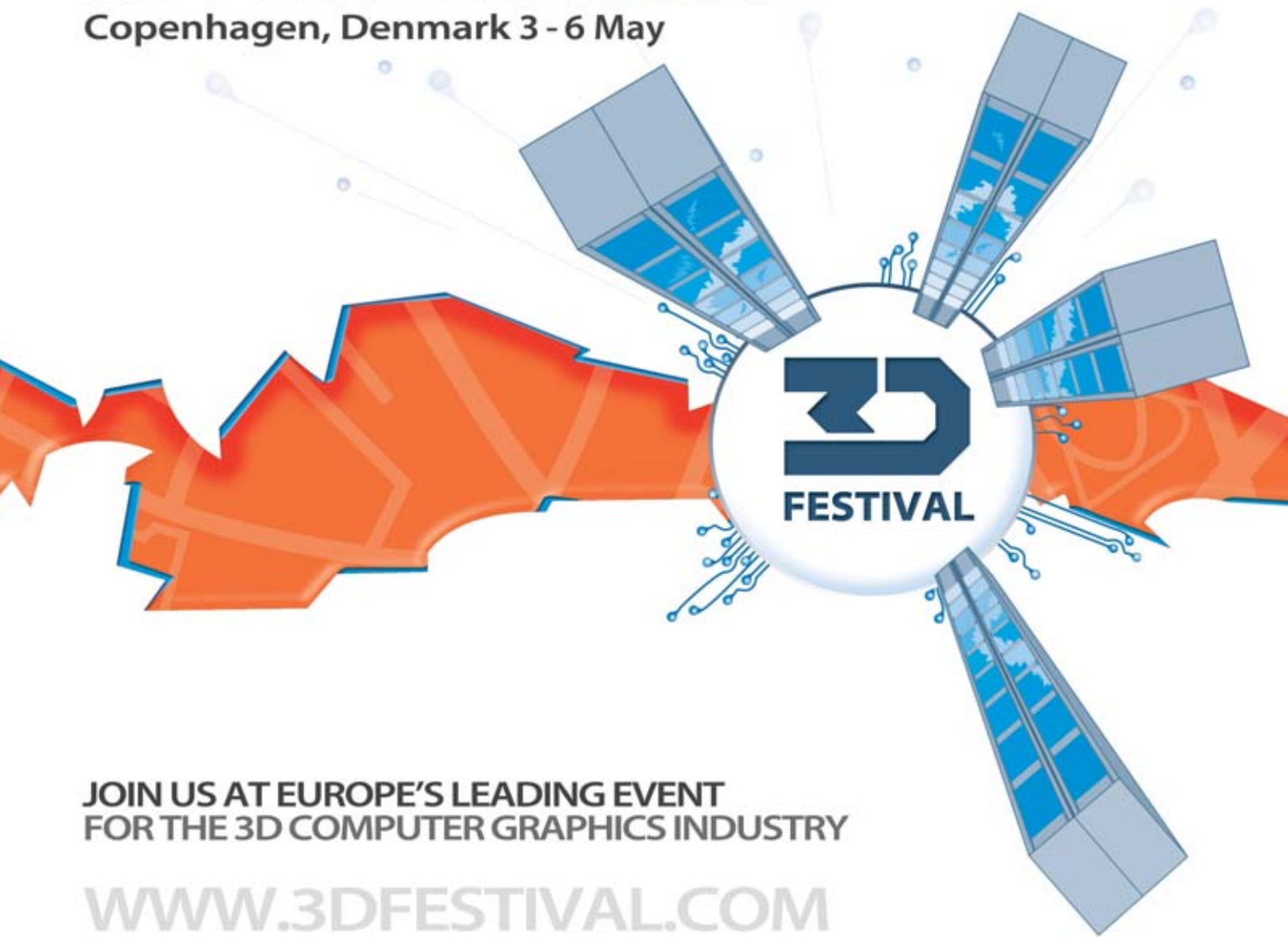
*Jenny Donelan is a contributing editor for Computer Graphics World.*

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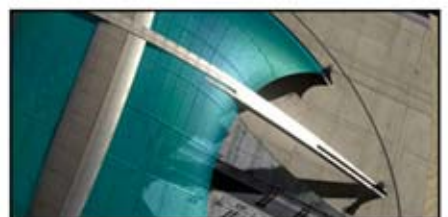
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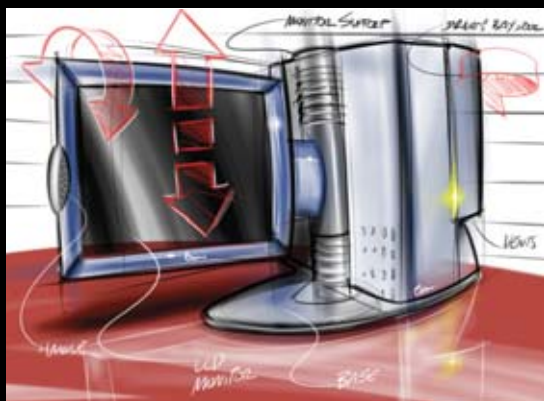


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### Clockwise from top:

**Eerie Feeling** (Grand prize, illustration) By Bob Chiu, Ontario, Canada. "This has a very photorealistic look with a great sense of weight, dimension, and atmosphere," says contest judge Dale Keown. "The rendering was superb."

**Bugatti SUV** (Second place, design) By Benny Assefa, East Lansing, Michigan. "I love the loose yet commanding drawing style," comments judge Gray Holland, "and it shows great control of the tool and free expression of the idea."

**Workstation** (design) By Sergio Gedanke, New York. Holland: "This drawing really walks around the concept: articulation, call outs, materials...all of which are illustrated with a natural feel."

When artists started dropping their pencils and paintbrushes in favor of digital tools, they opened themselves up to a new range of capabilities, which in turn, led to new artistic possibilities. But there was one caveat: They had to forsake the intuitive creation methodology they had honed over the years using their basic, analog tools. Then, with the release of tablet-based PCs and software, artists were finally free to enjoy the benefits of both the digital and traditional worlds.

Recently, Alias Systems recognized the creative works of tablet-using artists with its Exposé Yourself contest, also sponsored by Microsoft, Acer, Wacom, PC Mall, and Intel. For three months, artists, illustrators, and designers using Alias's SketchBook Pro sketching tool for Microsoft and Wacom tablets submitted entries for the design or illustration categories. The digital works were then posted on-line and judged by comic book artist Dale Keown and Gray



Holland, founder of the industrial design firm Alchemy Labs, both of whom based their decisions on the art's originality and the use of color, layers, brushes, and backgrounds.

"The winning entries had a natural feel, displaying an impressive sense of weight, dimension, and atmosphere," says Keown, who judged the illustration category. "It would be difficult to distinguish them from works created with traditional tools, such as markers and pencils."

Steve Maric, Alias marketing manager, concurs. "SketchBook Pro was developed to mirror the appearance of traditional artists' tools. The winning entries showcase this feature by rivaling the results of pencils and paintbrushes on paper."

A selection of the winning images is featured on these two pages. All the submissions can be seen at [www.sketchbookpro.com/contest](http://www.sketchbookpro.com/contest). —Karen Moltenbrey

#### Clockwise from top left:

**Lithic** (Third place, illustration) By Mark Behm, Danbury, Connecticut. "This image stood out with its exaggerated form, rendering, and subtle use of reflective light," says Keown.

**Concept Sketch** (Third place, design). By Scott Chin, Toronto, Canada. "This well thought-out surface illustration contains powerful line work with shading," says Holland.

**Original James Bond** (Second place, illustration) By Blake Loosli, West Jordan, Utah. "The skin tone, color, and composition give this image a traditional feel," says Keown.

**Robot** (Grand prize, design) By Vince Galante, Orland Park, Illinois. "This image contains great detail, powerful shading, and a nice focus and composition," says Holland.

# Digital Juice Libraries

## VideoTraxx and Editor's Toolkit 1 and 2 offer high quality and flexibility

By David Singer

Stock film and video footage provides access to resources that often are rare, unique, and difficult to produce internally, but finding them can be a source of frustration. Searching for the necessary footage can be time-consuming, requiring you to navigate through clip after clip of footage as well as pricing and licensing agreements until you find the content you require, at the quality you need, and at a price that fits your budget. All the time spent on researching can have a negative impact on a studio's bottom line. If only every studio could have its own comprehensive, high-quality, indexed, royalty-free stock library on site. Helping to make that dream a reality, Digital Juice produces high-quality, royalty-free libraries of film and video clips, overlays, lower thirds, motion design elements, and more.

As I was producing a training video on diamonds, the client asked for clips of flowing lava during a segment on the creation of diamonds and methods of discovery. Those I could find were either of very poor quality or beyond the client's budget. But then the Digital Juice libraries arrived.

Each of the libraries includes a copy of Juicer 2, Digital Juice's content management software. Installation was a breeze. When it was finished, I inserted the first DVD of each library, which contains the indexes, and clicked Install Catalog. I was presented with the option of installing still or movie thumbnail previews for each catalog. For the VideoTraxx library, the still preview required approximately 200MB,

whereas the movie preview option requires nearly 2GB.

The Juicer has a clean, intuitive interface with four floating windows—Product Browser, Keyword List, Preview, and Batch—which you can arrange at will. In the Product Browser, you can select a catalog and volume to browse or enter a search query. Alternatively, by selecting a catalog and keyword in the Keyword List window, it automatically is entered into the Product Browser's search field. Once you've found what you're looking for, highlight it in the Product Browser, and it will appear in the larger Preview Window, where you can zoom in or out and, if you installed movie previews, play them. After identifying a file for use, you can either drag it to the Batch window or click Add to Batch. Here, you prepare files for output, setting the length, upper or lower field first, resolution, opacity, and more. When you're ready, select Render, and you're done.

With Juicer 2 and the catalogs installed, I typed "lava" into Juicer 2's search query, and was presented with a selection of clips of flowing lava from the VideoTraxx library. I was impressed not only with the quantity and quality of the clips, but also with the variety of subjects covered. The VideoTraxx library contains a full 220GB of stock footage spanning 34 DVDs, equating to more than 3200 clips in 35 categories. Once you've found the clips you need, you can add effects, such as colorize and cross dissolve, and output them as AVI, QuickTime, RTV, and Image Sequence files. I output to AVI and moved to Editor's Toolkit 1 and 2 for matching graphic elements.



Juicer 2, the libraries' content management software, enables users to export images in various formats.

Editor's Toolkit 1 and 2 provide a wealth of broadcast-quality graphics and animation components ready to import into your nonlinear editor of choice. Volumes 1 and 2 offer a large selection of animation overlays, still and animated lower thirds, stills, wipes and transitions, motion design elements, and Jump Sets (matched sets of animation elements). Each Toolkit adds more than 55GB of content to an in-house stock library.

You can tweak FPS (frames per second) and Speed, and control rotation, flip, frame blend, and more. Still images can be saved in 10 different formats or sent directly to Microsoft PowerPoint as a background or image to the master slide, a current slide, or a specific slide number. After browsing the options, I chose a static lower third that matched the colors in the lava clip nicely and saved it as a PNG file. In doing so, I had control over the resolution (from 72 to 300 dpi), locking the aspect ratio, and adding a drop shadow or glow under the effects tab.

As I browsed the content, I found clips and design elements suitable for projects on various topics. Having a wealth of professional, broadcast-quality design elements accessible and in-house makes the Digital Juice libraries well worth the price. ■■

**David Singer** (*singercreativeservices@charter.net*) is a founding partner of Singer Creative Services in New England.

### VideoTraxx and Editor's Toolkit

**Price:** \$699 for each collection

**Minimum System Requirements:** CD-ROM and DVD-ROM drives, a nonlinear editing system, and processing power and RAM sufficient for nonlinear editing tasks

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# Anark Studio 2.5

**Anark's upgraded 3D authoring software adds power and functionality**

By Doug King

Having used Anark Studio 1.5 following its release in 2002, I was impressed by the ease with which I was able to create custom interactive graphics for the Web or a CD-ROM. Recently, I was afforded a sneak peak at Version 2.5, which will soon ship with a number of improvements and updates.

Anark Studio was designed to be the next generation of multimedia authoring. With the use of drag-and-drop programming and pre-created scripts called Behaviors, users can quickly streamline the authoring process of multimedia and video projects. The creations then can be deployed in small file sizes to the Web, trade-show presentations, kiosks, CD-ROM, and more via the free Anark Web Client and Anark Client for Windows Media 9 Series.

The user interface has changed little. When I launch the program, all the windows open, including the Library, Inspector, Timeline, Assistant, Storage, and main windows. Improvements have been made to the Inspector palette, where each of the controls for scale, position, and more has been visually enhanced with Mac-style buttons and slider controls. This is a vast improvement over the text-based, flat, gray interface of past versions. A new addition is the Animation button on many controls, which, when depressed, enables you to animate that particular modifier.

One problem I noticed in the previous version has been fixed in this edition:

Users can now zoom in on the Timeline. You also can double-click anywhere in the top portion of the Timeline and open a Go To dialog, which aids you in precisely placing queues for your scene. These two enhancements should make fine-tuning your animation and events much easier.

The real power of Anark 2.5 lies in the new set of rendering options for Windows, as well as the remote sourcing of images, an improved cross-platform Storage palette, enhanced video export for Windows, new component and image properties, and new scripting properties.

One of the strongest new exporting features is Remote Sourcing. JPEG and PNG files can be loaded from a remote source, instead of having to be embedded in the project file. Remote Sourcing, when used in conjunction with a properly written behavior, also can load sequential image files. As a result, an architect can create a 3D presentation of a house or a building and offer hundreds, if not thousands, of textures for carpets and walls for a client to review. This can be done without embedding all the images and, thereby, without increasing the size of the file. Moreover, museums can offer 3D representations of an entire exhibit on-line, while keeping file sizes small to ensure efficient page viewing and download times.

Making Anark Media presentations available on the largest number of platforms, the company provides three rendering options: Software, OpenGL, and DirectX. As you develop a media presentation, you can set the export to any of the above and preview in each of the playback applications to determine how your media will perform. The



**Version 2.5 boasts an improved interface, which keeps all the necessary tools at your fingertips.**

support of OpenGL, Microsoft DirectX, and Windows Media Player should make Version 2.5 accessible to more users.

In addition to these improvements, new Behaviors have been added, including a physics-based script called Collider. While not as robust as Havok, for example, Collider enables users to create realistic particle simulations for presentations, with the same ease of use as the rest of the tools in Anark Studio. More Action Behaviors have been added, nearly doubling the number shipped in Version 1.5.

To improve work flow, a new Independent Group aids users in setting a specific play state for an object or event, alleviating the need to define a Pause Behavior and an activating Behavior for the animation. It saves time in creating the application, and the finished project file is smaller given fewer Behaviors in the scene.

Version 2.5 is a fine improvement to Anark Studio, which continues to grow in power and capability without losing its ease of use. Anark fixed past problems, enhanced user friendliness, added new tools and options, and, by working on exporting features, opened it to a larger audience. Anark Studio might give entrenched interactive programming software a run for the money. Those who develop interactive media or programs should check out Anark Studio 2.5. It's what the next generation of authoring software looks like. ■■

**Doug King**, a contributing editor based in Dallas, develops animated projects for his company, Day III Productions.

## Anark Studio 2.5

**Price:** \$995

### Minimum System

**Requirements:** Pentium II 300MHz or better, Windows 98/SE/2000/ME/XP, 256MB of RAM, Windows Media Player 7, 100MB of free disk space, and a graphics card that supports OpenGL 1.2.1

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# Wacom Cintiq 18SX

**Display and tablet combine in a powerful creative solution**

*By Gregor Bernard*

At work and in my personal life, much of my time is devoted to composing creative digital content. For years, I've incorporated a 12x12-inch Wacom Tablet Digitizer 2 (so old that it's no longer listed on the company's Web site) in my work. Although I have few complaints about my current device, I've been looking forward to a time when Wacom would merge a monitor with its pressure-sensitive tablet. So when the Wacom Cintiq 18SX made its debut, I quickly acquired it.

The Wacom Cintiq 18SX sports an 18.1-inch, high-resolution (1280x1024 SXGA) display and ships complete with a new Grip Pen stylus and a software bundle with Corel Painter Classic, Nik multimedia's penPalette, and Wacom brushes 1.0. The tablet also is accompanied by an adjustable stand capable of being rotated up to 180 degrees and inclined a maximum of 70 degrees. The stand was helpful, enabling me not only to move the tablet forward and back, but also to turn it to virtually any angle. When extended forward, however, it would sink slightly as I applied pressure to or leaned on the tablet. It's a minor detail, but I would prefer to mount the Cintiq on a more rigid armature.

The Cintiq weighs in at 17 pounds when removed from the stand. Its weight is such that it's not conducive to working with it in your lap for long periods. Besides, after an hour of working in that position, I

had neck pain from having to look down all that time.

On the other hand, the Cintiq did alleviate a common discomfort. I often suffer pain in my shoulder from

having my arm positioned on a tablet at the side of my workstation, while I look forward at the screen. And I'd stretch even farther to access the mouse or keyboard. Because I can draw, paint, and preview images directly on the face of the Cintiq, I didn't experience that old, familiar shoulder pain.

Everything I do involves shortcuts and key commands, so I require constant access to my keyboard. With Adobe Photoshop and Illustrator, there's no getting around it. It was difficult to access the keyboard while drawing with the tablet in my lap or on its stand. Such awkwardness can be solved by working on a drawing board, which keeps the keyboard within reach. Another minor criticism, the tablet can generate quite a bit of heat, causing me to limit the time spent with it in my hands or on my lap. At the same time, a small groove in the Cintiq held the cord out of the way of the screen. In time, I could adapt to the system physically, but there was a learning curve in that regard.

I prefer the high resolution, sensitivity, and color accuracy of the Cintiq to other hardware solutions. The signal input to the CPU can be made with either a VGA (analog RGB) or a DVI (digital) connection. Although the digital connection offers a faster response, I did not experience any problems or delays with my VGA connection. In fact, I was impressed by its quick, roughly 27-millisecond response time.

I encountered a surprising side effect to using the Cintiq. When I work with a traditional tablet, I have only a



**Through its combination of a display and tablet, the Wacom Cintiq 18SX improves the creative workflow.**

cursor on my image, and it doesn't block my view. Each time I accessed an application's toolbar menu on the Cintiq, however, the drop-down menu was hidden by my hand. Although only a problem for right-handed artists, it was rectified by Wacom's optional CintiqPartner tablet, priced below \$200. I accessed menus with the Partner tablet, and used the Cintiq for painting and drawing.

Compared to other tablets and tablet PCs, the Wacom Cintiq provided a more comfortable and natural way of drawing and painting. It's much better than having the tablet on my desk and looking over at the display. With a traditional tablet, strokes at varying angles don't come out naturally unless I rotate the image on the screen. Using the Cintiq, I didn't have to rotate the image to change the angle of the stroke. The Cintiq is unique in that I can just rotate the unit, much like rotating paper on a table, to create a natural stroke. Or, as I would with pen and paper, I could rotate my arm to make brush strokes in different directions.

My view of Wacom is that it strives to emulate the traditional drawing environment. And to that end, it has been successful with the Cintiq. I can see how the new device would fit well with visual arts, film and video, and character animation applications. The Cintiq changed the way I work for the better, and change is good. ■

**Gregor Bernard is a professional illustrator well versed in a variety of digital software and hardware solutions.**

## Cintiq 18SX

**Price:** \$3499

**Minimum System Requirements:** Windows 98/2000/NT/ME/XP or Mac OS 9 or X, a serial or USB port, a DVI or VGA graphics connector, and a CD-ROM drive

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# products

For a direct link to more product information and vendor Web sites, click on:

[www.onlinecenter.to/cgw](http://www.onlinecenter.to/cgw)



## A Bevy of Broadcasters

Professionals attending the National Association of Broadcasters' 2004 conference and exhibition (NAB2004) will witness the latest and greatest solutions for digital content creation, including the product releases presented on these pages. For more information about the association and NAB2004, visit [www.nab.org](http://www.nab.org).

## SOFTWARE

### CONTENT MANAGEMENT

#### Artbox Arrival

**Linux** During the show, Proximity will introduce Artbox, its content management system for creative departments in broadcast television, postproduction, and corporate facilities. The new product, designed to increase efficiency and accuracy, enables graphic artists to manage their work and content production work flow from a single interface. Artbox incorporates work flow management as well as format conversion, search and retrieval, and storage of art files, including video, graphics, script, and audio. With support for multiple

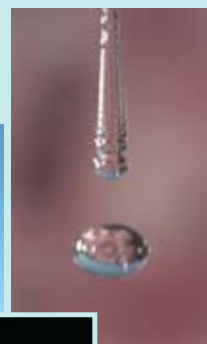


## STOCK OPTIONS

### ARTBEATS IN A HEARTBEAT

During NAB2004, Artbeats will debut more than 40 new high-definition and standard-definition collections of stock footage. Artbeats' royalty-free offerings are well suited to broadcast, film, commercial, desktop video, game development, and multimedia applications. New titles include: *ReelFire 3*, *Sports Metaphors*, *New York City Aerials*, *Big Island (Hawaii) Aerials*, and *Worship*. Of particular interest are the new *Ultra Fire*, *Ultra Water*, and *Ultra Motion* collections. Using an experimental, high-speed digital camera, Artbeats captured footage for these three titles at an impressive 1000 and 2000 frames per second. Artbeats offers footage in D1 NTSC (720 x 486) or D1 PAL (720 x 576) resolutions. Several releases also are available in HD (1920 x 1080) format.

Artbeats; [www.artbeats.com](http://www.artbeats.com)  
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Images courtesy Artbeats

devices and formats, Artbox is capable of interfacing with hardware and software solutions from such makers as Adobe, Avid, Chyron, Discreet, Leitch, Pinnacle, and Quantel.

Proximity; [www.proximitygroup.com](http://www.proximitygroup.com)  
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### VIDEO

#### Canopus Contributions

**Win** Canopus will unveil a new HD nonlinear editing system and upgraded versions of its MediaEdge and Imagine software solutions. Canopus's real-time NLE, a combination of an HD-SDI card and Edius Professional video editing software, enables mixed SD and HD editing on the timeline and exceptional video quality thanks to advanced HD codec technology. Its MediaEdge2 video distribution system gains support for MPEG-4, whereas its Imagine 2.0 still-image animation tool now offers multiple

image support, advanced soundtrack capabilities, and a Wizard for streamlining production.

Canopus; [www.canopus.com](http://www.canopus.com)  
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#### Around Bauhaus

**Win • Mac** Bauhaus Software will present Mirage 1.2, the latest edition of its real-time video paint, animation, and effects software during NAB. Mirage 1.2 can be used with projects of virtually any resolution, whether Web video, film, or HDTV. It assists broadcasters in the creation, animation, and compositing of motion graphics, whereas 2D animators benefit from its paint and effects



Image by Brian Jansen. Courtesy Bauhaus Software.

## events

### APRIL

23-25

**DiGIt: A Digital Media Exposition**, held in Narrowsburg, NY. Contact 845-252-7576, [www.ArtsAllianceSite.org](http://www.ArtsAllianceSite.org).

### MAY

3-6

**3D Festival 2004**, held in Copenhagen, Denmark. Contact [www.3dfestival.com](http://www.3dfestival.com).

12-14

**2004 Electronic Entertainment Expo (E3)**, held in Los Angeles. Contact 877-216-6263, [www.e3expo.com](http://www.e3expo.com).

### JULY

12-15

**Macworld Conference & Expo Boston 2004**, held in Boston, MA. Contact 508-743-0107, [www.macworldexpo.com](http://www.macworldexpo.com).

### AUGUST

8-12

**SIGGRAPH 2004**, held in Los Angeles, CA. Contact [www.siggraph.org](http://www.siggraph.org).

tools, as well as the ability to progress from digital pencil tests to editing in a single offering. Mirage 1.2 is priced at \$895 for the full version and \$395 as an upgrade.

**Bauhaus Software;**  
[www.bauhaussoftware.com](http://www.bauhaussoftware.com)  
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## HARDWARE

### VIDEO

#### Lots from Leitch

Leitch Technology will demonstrate an Integrated Content Environment, defined by the company as a streamlined work flow for the production, processing, transmission, management, and storage of content. Among

## BOOK CORNER

### BIBLICAL PROPORTIONS

Wiley Publishers has released *Adobe Premiere Pro Bible* by Adele Droblas and Seth Greenberg. Whether an expert or beginner, or outputting to the Web or DVD, readers of *Adobe Premiere Pro Bible* benefit from tutorials, tips, and tricks for quickly and easily producing and editing digital video productions. Priced at \$49.99, the roughly 700-page text is accompanied by a bonus DVD with tryout versions of not only Adobe's Premiere Pro, Encore DVD, After Effects, Photoshop, and GoLive, but also Macromedia Flash MX 2004 and Director MX.

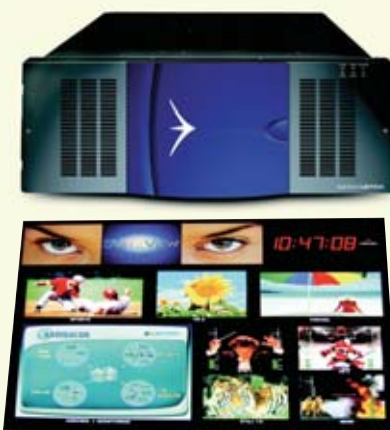
**Wiley Publishers;** [www.wiley.com](http://www.wiley.com)  
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### FUNDAMENTAL FINDING

*Visual Design Fundamentals: A Digital Approach* from Charles River Media is authored by Alan Hashimoto, an associate professor in the graphic design and computer art field. Comprising more than 300 pages with color photos, diagrams, and illustrations, *Visual Design Fundamentals* teaches the principles behind creating brilliant, entertaining, and effective computer-generated designs and images. Hashimoto also walks readers through projects in the areas of modular design, letterforms and shapes, figure abstraction, color theory, typeface design, and more. *Visual Design Fundamentals* ships complete with a cross-platform CD-ROM at a cost of \$49.99.

**Charles River Media;** [www.charlesriver.com](http://www.charlesriver.com)  
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Leitch's high-definition products on display is the new VelocityHD nonlinear editing system, complete with the latest version of VelocityQ. Also on hand, the company's NXMTS Nexio transmission server supports multiple com-



pression formats in SD and HD resolution, an ASI interface, and the recording, processing, and playback of MPEG transport streams. Leitch has expanded its line of broadcast-quality routing switchers with the Panacea Clean Switch, capable of simultaneously handling

multiple channels of SD and HD signals. Its family of multi-source display processors gains two offerings, Neo SuiteView and Neo SuiteView Solo, both capable of rendering video and computer signals in real time to high-resolution traditional, plasma, and projection displays. Whereas Neo SuiteView Solo boasts up to 12 inputs in a 1RU frame, Neo SuiteView is scalable from 4 to 44 inputs in a 3RU format.

**Leitch Technology;** [www.leitch.com](http://www.leitch.com)  
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#### Boxx Breakthroughs

Boxx Technologies will introduce two new workstations that meet the high-capacity storage needs of the digital content, broadcast, and video markets. For those working with such digital media as SD and HD video, the latest Boxx devices accommodate eight and 12 internal drives. The new models were designed expressly to provide both high performance and increased cooling.

**Boxx Technologies;** [www.bboxtech.com](http://www.bboxtech.com)  
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- Low cost Granite CAD converters (ProE, ACIS, IGES, STEP, Parasolids)
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Example  
"CAD to non-CAD"  
conversion. Unigraphics  
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Alias solutions include the Maya® software product line for the entertainment industry and Alias® StudioTools® software product lines for the design industry.

True to the goal of providing value to long standing and new customers alike, Alias continues to develop new products: In November 2002 Alias® SketchBook™ Pro, a sketching, annotating and presentation software application for the Tablet PC and Wacom Tablet was launched. In July 2003, Alias® ImageStudio™, was launched for designers who want to quickly and efficiently transform 3D models created in StudioTools, Maya or popular CAD packages into appealing, informative rendered images.



**The Lord of the Rings: The Return of the King™**  
© Image courtesy of New Line Productions, Inc.

### Quick Facts: Alias

- President: Doug Walker
- Alias Research was founded in 1983. Wavefront Technologies was founded in 1984. In 1995 the two companies merged under SGI®. In July 2003 the company changed its name to Alias.
- Head Office: Toronto, Canada
- Sales Offices: North America, Europe and Asia

### Quick Facts: Maya

- Maya was honored with an Oscar® statuette in 2003 – the highest award the Academy of Motion Picture Arts and Sciences can bestow
- Maya was used to create five of the top 10 selling game titles in the 2003 holiday season
- Alias software has been used in almost every film nominated by the Academy of Motion Picture Arts and Sciences in the category of Best Visual Effects, since its inception
- Maya was the core 3D animation software in all three Lord of the Rings™ films

### Quick Facts: StudioTools

- StudioTools is used by all major automotive manufacturers in the world
- StudioTools software was used to design the Olympic® torch for the 2000 Summer Olympic® Games and the 2002 Winter Olympic® Games
- Alias employees were honored with a Technical Achievement Award by the Academy of Motion Picture Arts and Sciences in 1998 for the creation of technology on which StudioTools is based
- European Car of the Year for 2003 winner, the Renault Megane II, was designed using StudioTools

### Quick Facts: Alias SketchBook Pro

- Launched in November 2002 for the Tablet PC and the Wacom Tablet
- First consumer-based Alias product
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**Chrysler® Tomahawk™ Motorcycle**  
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# NewTek

## The Vision

NewTek, founded in 1985, set out with a mission to make it possible for anyone to realize the dream of creating broadcast television and film. The NewTek team, a group of frustrated filmmakers, has a passion for creating the highest quality production tools that make it possible and affordable for anyone to put their dreams on the screen.



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the industry and, coupled with its affordable price, have catapulted it into use worldwide for broadcast graphics, games, print, web, as well as visual effects for film and television.

## The Results

Today, extraordinary artists use NewTek tools to deliver the best our industry has to offer. Television projects using NewTek's VT[3]™ and LightWave 3D® have taken home Emmy and Visual Effects Society awards two years running, and in several recent years every nominee in the visual effects for a series category used LightWave 3D® as the cornerstone of their effects arsenal. Visual Effects Oscar winners have put LightWave to the test as well in Titanic (in more than a hundred effects shots), and Gladiator. NewTek's proven production tools get the job done for both independent artists and major production houses with dozens or even hundreds of artists at work — any size project, on deadline and at the highest standards.

## The Artists

Zoic Studios used LightWave® and NewTek's VT[3]™ broadcast production suite for their Emmy and VES Award-winning work on Firefly and Battlestar Galactica. Regional Emmy-winner Tim Johnson of KUTV-2 in Salt Lake City finds NewTek's VT[3]™ unbeatable for fast performance and tight integration with LightWave® and with other popular production tools. Tim refers to VT[3]™ as "one screaming finish machine. We've got more expensive systems we can only off-line on, and with VT[3]™'s uncompromised uncompressed output, we can online edit at pristine quality, with incredible speed and ease — just what we need in our fast-paced broadcast environment." Rich Helvey, lead animator for NBC's Access Hollywood, makes a similar assessment: "NewTek's VT[3] allows us to complete projects under ridiculously short deadlines by letting us do in minutes work which would otherwise take hours." Many more major studios, production houses, and independent artists with a story to tell share NewTek's vision.

For more information on the complete NewTek product line and to meet some of the great artists using NewTek tools, visit NewTek at NAB 2004, Booth #SL5045 or on the web at: [www.newtek.com](http://www.newtek.com).

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# The Last Samurai.

Australia's **Rising Sun Pictures (RSP)** Uses **SOFTIMAGEIXSI** to Revisit Old Japan in Edward Zwick's **The Last Samurai**



For a film like Edward Zwick's **The Last Samurai** to look realistic, it would have to look bloody. Put simply, the world of swords, arrows, throwing stars and lethal darts is a most messy one. Striving for an unparalleled level of realistic gore but unwilling to sacrifice any flesh-and-blood extras, VFX supervisor Jeff Okun turned to Sydney's **Rising Sun Pictures (RSP)** for help. As they so often do, RSP fired up **SOFTIMAGEIXSI**.

In the film, **Tom Cruise** plays Nathan Algren, a former American soldier haunted by his past. Down on his luck, Algren accepts a job training a newly modernized Japanese army to fight the relentlessly honorable, but entirely outgunned Samurai, few of whom remain in the new Japan. Following a calamitous first battle, Algren is captured and taken to a Samurai village headed by Katsumoto (**Ken Watanabe**).

Over time, Algren comes to appreciate, then prefer and finally embrace the ways of the Samurai. Just as he is doing so, however, a slew of government-paid Ninjas arrive to assassinate Katsumoto. In one particularly memorable instance, a throwing star slices into a man's neck. RSP neatly removed the rubber prosthetic worn by the actor and returned a perfect replica of his neck to his shoulders. The razor-sharp star is, therefore, actually in the actor's neck, if only digitally.

"It's an exciting, brutal and rather gruesome sequence," says **Tim Crosbie**, VFX Supervisor at RSP. "The fighting is so intense and at such close quarters that it was far too dangerous to have people running around with large swords, shooting arrows and throwing darts and stars. For that reason, we made heavy use of XSI to create and animate photorealistic weapons that are wielded in the fight sequences."

Another equally challenging scene sees Algren yanking a bloody sword from the impaled back of one of the Ninjas. In fact, Cruise mimed the whole scene; the bloody sword was added later by the RSP team.

"SOFTIMAGEIXSI has been a natural progression for us," says **Didier Elzinga**, Head of VFX at RSP. "It's a very natural tool and we were able to turn around shots extremely quickly. We needed to be able to do a good deal of experimentation to provide Jeff with as many variations as possible. The workflow and interface enable our animators to be very fast, and on each successive project, we discover how much further we can push the integrated **mental ray**® renderer."

For **Ben Paschke**, Lead 3D Animator at RSP, XSI's unique scripting capabilities were of particular benefit on **The Last Samurai**:

"The most useful thing we built was a relatively simple track point importer," he explains. "For the shots that required our digital weapons to protrude from a wound, our track importer

enabled us to stick our weapons to certain spots on the footage very quickly and easily, before adding some hand animation to finish things off. Grabbing three or four tracks from the footage also let us derive some rotation information, so we had a procedural way of generating most of the animation in a very small amount of time. It wasn't quite 3D tracking, but because we were only adding relatively small bits of 3D onto the footage, perspective wasn't a great concern. Since then, we use that importing tool all the time. I'd have to say that has been my favorite scripting experience."

Images © Warner Brothers

**"It's a very natural tool and we were able to turn around shots extremely quickly ... The workflow and interface enable our animators to be very fast ..."**

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