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By Michele Hope

On the cover:

The Stranger, a grizzled 3D bounty hunter, headlines a bizarre cast of misfits in the new title from Oddworld Inhabitants, *Stranger's Wrath*. For more information, see pg. 10.



**Phil
LoPiccolo**
Editor-in-Chief

Pursuing Pirates

Everyone knows that piracy of digital content is a serious issue. But it has been notoriously difficult to get a handle on just how widespread the practice has become. Now a new report from the International Intellectual Property Alliance—a coalition of film studios, video game publishers, and other copyright-based industries—gives us a clearer picture of just how enormous the problem really is and what steps can be taken to get the situation under control.

The IIPA's analysis is contained in a Special 301 filing prepared for the US Trade Representative's annual report to President Bush. It finds that many forms of content theft—including factory copying of disks, cartridge counterfeiting, and Internet downloading—contribute to piracy levels exceeding 90 percent in many parts of the world.

Moreover, the new report estimates that in all countries, including the US, revenues lost from piracy last year reached more than \$25 billion. What's more, these figures underestimate true totals because they do not account for Internet piracy, which could not be tracked accurately enough even to hazard an estimate, and because they are based on pirate prices as opposed to those at which legitimate sales might occur.

Despite such staggering losses, some contend that no one is really harmed by piracy. But the reality is that everyone loses, except the pirates, according to Stevan Mitchell, vice president for intellectual property policy at the Entertainment Software Association, which represents the video game industry. When pirated copies are sold, the revenue does not go to the digital artists, developers, and producers, says Mitchell. Nor is it funneled into R&D to improve the next generation of content for end users.

What should content developers do to attack this problem? One answer would simply be to develop better pirate-fighting technologies. In fact, the gaming industry, which has been among the most proactive on this front, builds copy-protection measures into video game consoles and embeds corresponding access codes into the software.

Of course, technologies designed to circumvent such protections—mod chips, game enhancers, game copiers, and similar devices—inevitably find their way into the mainstream. Thus, legal reform and anti-piracy enforcement measures are also essential deterrents. But the effectiveness of any such methods depends on input from those at the front lines.

Therefore, the most straightforward way to join the effort, says Mitchell, is to contact your industry trade association—the Entertainment Software Association, the Motion Picture Association of America, the Independent Film & Television

Alliance, and so forth. These organizations maintain enforcement programs, and hearing from industry members helps them target programs more effectively. They can also put you in touch with lawmakers so you can weigh in on important legal reforms. And they can take action through the US government and multilateral organizations or directly with the offending countries' governments.

Conventional wisdom says that the best way to expand any market is to be ever more innovative. And so far, the computer graphics industry, one of the most innovative in history, has thrived on that principle. But now its members need to get more involved to help stop pirates from stealing their work. Otherwise, they may end up spinning their creative wheels ever faster only to fall further behind. ■■

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spotlight

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VIDEO

PRODUCTS

1 Beyond Launches NLE Laptop

1 Beyond, a provider of digital video editing and compositing systems, has unveiled a laptop computer designed for editing and graphics applications.

For high-definition (HD) editing and delivery, the 1 Beyond 3817 HD laptop system features a Pentium 4 processor with up to 3.8GHz and Hyperthreading technology, a dual-bus architecture, a maximum 4GB of memory and 200GB of internal storage, and support for the PCI Express video bus. Because it simultaneously supports Avid Mojo and external storage, users are able not only to access more footage than typically possible, but also to combine HD, HDV, uncompressed SD, and DV footage. An 800MHz front-side bus and 2GB bridge enable the 3817 HD device to edit HDV and full-resolution HD content in real time, as well as to process multiple streams of real-time audio and SD and

HD video without lag, delay, or skipped frames.

The 1 Beyond 3817

HD NLE laptop also offers support for the

latest editing software, including Avid Xpress Pro HD and Adobe Premiere Pro, and such popular HD hardware as the Panasonic DVC Pro HD or HDV cameras from JVC and Sony. Rounding out the 3817 HD are its 17-inch, high-resolution, wide-format screen and professional DVI video output.

Now available for purchase, 1 Beyond 3817 HD's pricing starts at \$2695; fully configured, it carries a \$5995 price tag.

—Courtney E. Howard



MODELING

PRODUCTS

SensAble Technologies Unveils ClayTools 1.0

SensAble Technologies has presented its ClayTools touch-enabled system for use with Autodesk Media Entertainment Division's 3ds max software.

ClayTool, designed for digital content creators serving the game and entertainment industries, provides unconstrained modeling for highly detailed, organic

models. That is, the system employs a virtual clay metaphor and a true 3D interface with force feedback, enabling users to model virtual clay as though it were real clay. Creative professionals can smudge, smooth, carve, or tug models to create game content that is organic in nature, such as characters, props, and scenery.

The ClayTools system en-

compasses the ClayTools virtual modeling program, HapticExtender/MX plug-in, and Phantom Omni device. ClayTool software assists users in creating 3D concept models or high-resolution models, in addition to capturing and normal-mapping detail onto low-resolution models. The HapticExtender/MX plug-in enables users to navigate 3ds max and physically interact with its tools in 3D. A user's 3D gestures, for example, can be used to define motion-capture paths.

Now available, ClayTools 1.0 is compatible with 3ds max Versions 6 and 7, and is priced at \$2795. Customers who already own the Phantom Omni can purchase ClayTools for \$1995. —CEH



MIDDLEWARE

PRODUCTS

Havok Complete 3 Debuts During GDC

At the recent 2005 Game Developers Conference (GDC) in San Francisco, Havok introduced its Havok Complete 3 integrated middleware for the video game industry.

Havok Complete 3 incorporates the company's flagship Havok Physics 3 and its recently released Havok Animation 3. It aids game developers in the creation of dynamic character performances and next-generation gameplay through a combination of physical, key-frame, and procedural animations. Able to work within various game architectures and pipelines, Havok Complete 3 meets the needs of current and next-generation game platforms.

Havok Physics 3 has been updated with Continuous Physics, which eliminates challenges, such as "bullet-through-paper" problems, created by high-speed game objects. Havok Animation 3 features such run-time animation functionality as compression and decompression, blending, inverse kinematics, and an export, filtering, and preview tool set that works with today's modeling and animation software packages. —CEH

VIDEO

PRODUCTS

Combustion Upgraded to Version 4

Discreet, recently re-branded as Autodesk Media and Entertainment Division, has upgraded its Combustion digital visual effects and compositing software to Version 4.



For desktop motion graphics and visual effects artists, Combustion 4 boasts enhanced interoperability with 3D animation programs, as well as with the company's Cleaner, Flint, Flame, Inferno, Fire, and Smoke.

The upgrade employs Discreet's second-generation Diamond Keyer advanced keying technology, in addition to Time-Warp, a keyframable, time-remapping operator for the creation of slow-motion and speed-up effects. Version 4 also offers expanded file import and export options, an optimized "Fast Gaussian Blur," an improved user interface, and enhanced paint tools, including new customized brushes. Combustion 4 is scheduled to ship for the Windows platform this month for \$995. —CEH

WORKSTATIONS

PRODUCTS

Boxx Technologies Releases New Workstations

Boxx Technologies has introduced three workstations targeted at digital content creation applications, such as 2D/3D graphics, simulation, and digital video.

The Boxx 7300 family of workstations combines dual AMD Opteron series 252 processors with Nvidia's nForce Professional 2050 and 2200 media and communications processors (MCPs) and Nvidia SLI technology. The 64-bit-ready workstations provide support for the upcoming Microsoft Word x64 operating system, which will enable users to run 32-bit and 64-bit applications simultaneously. Additional features include dual PCI Express x16 slots, multi-GPU dual monitor support, and the AMD Hypertransport bus.

The Boxx 4300 workstation—well suited to graphics, animation, and video ed-

iting tasks—takes advantage of the Intel Pentium 4 Processor Extreme Edition with HT technology and EM64T. The system also boasts PCI Express x16 graphics, a 1066MHz front-side bus, onboard FireWire, and six internal drive bays.

Boxx Technologies' latest mobile workstation for graphics, animation, DV, and HDV, the GoBoxx 2200 is powered by the Nvidia Quadro FX Go 1400 OpenGL graphics board, complete with PCI Express and 256MB of 256-bit framebuffer memory. The laptop system features an Intel Pentium 4 processor (up to 3.8GHz) with HT technology and an 800MHz system bus, a 17-inch WSCGA+ (1680x1050)

resolution GlassView Active Matrix display, and dual-channel DDR2 memory.

The company also announced Combustion 4 from Autodesk Media and Entertainment as a purchase option with its high-performance workstations. Additionally, it is offering the 64-bit Intel Xeon 3.6 processor with a 2MB cache for its Boxx 8200 series. —CEH



spotlight

MARKET OUTLOOK

Digital Video Market Gains Momentum

The video market as a whole has been struggling with the upgrade to digital video. Five years ago, companies were predicting enormous growth as content creators in the film and video industry moved to digital technology and updated their production facilities. As so often happens, the analysis was not wrong—the timing was. In fact, it was not until 2003 and 2004 that companies began to see the growth they hoped for in digital video and film production. The result was a 12 percent growth in 2004 compared to 2003, and a promising future as new technologies drive upgrades.

In 2004, several trends came together all to the benefit of the companies in digital video content creation. First, the transition to digital TV has gained momentum as consumers understand that digital means better—better images and new services. As a result, broadcast companies are transitioning to digital technology to take advantage of the efficiencies in the production pipeline—better asset management, access to archived content, on-site editing, and a more efficient pipeline that empowers frontline creative people rather than backshop technicians.

Second, the film/video industry has long embraced

digital technology for certain aspects of film such as special effects and other post work, but in the last two years the concept of digital intermediates (DI) has caught on, and whole productions are being transferred to digital formats for postproduction and then transferred back to film for distribution.

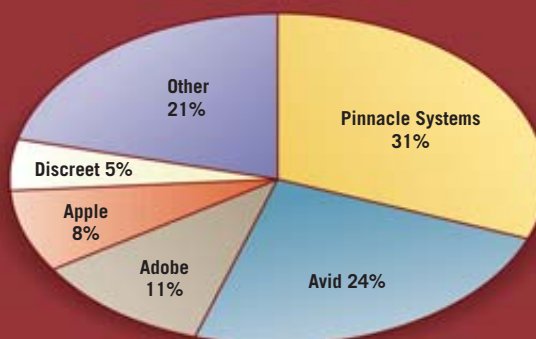
In general, there is great interest in lengthening the digital pipeline to incorporate digital capture and digital distribution.

And finally, new advances in consumer technology, new digital cameras, the proliferation of DVD drives, and easy-to-use DVD production tools have driven the increase of sales in digital video for

consumers.

The train is just picking up speed for digital video. There is a large untapped market of consumers who are video enthusiasts but who are still using older analog cameras. In addition to transferring old videos to digital, low-cost digital video cameras will spark a new wave of interest and attract a new generation of customers. In the professional sphere, the transition to digital is also just getting started and will be boosted with the introduction of a 64-bit version of Windows and Longhorn. —Kathleen Maher, senior analyst, Jon Peddie Research

Digital Video Market Share



Source: Jon Peddie Research

The total digital video software market grew 12 percent in 2004.

IN BRIEF

NEWS

Avid Technology (Tewksbury, MA) has entered into an agreement to acquire **Pinnacle Systems** (Mountain View, CA). **Discreet** (San Francisco), a division of **Autodesk**, is transitioning its name and brand to **Autodesk Media and Entertainment Division**. The Autodesk branding, the first public viewing of which will take place during the National Association of Broadcasters Conference (NAB 2005) in Las Vegas this month, will be applied to the division's products, technologies, and consulting services. **The Walt Disney Company** (Burbank, CA) Board of Directors has announced that Robert A. Iger has been unanimously elected chief executive officer effective September 30. Iger will succeed Michael D. Eisner, the company's current CEO. On Sep-

tember 9 of last year, Eisner submitted a letter to the Board of Directors announcing his intention to retire; he steps down as CEO on September 30. **Midway Games** (Chicago) has acquired **Paradox Development** (Moorpark, CA), which will be creating the next *Mortal Kombat* game. Mobile games publisher **Sorrent** (San Mateo, CA) has acquired European rival **Macrospace**, a large player in the mobile games market. The **Florida Interactive Entertainment Academy** (Orlando; <http://fiea.ucf.edu>) has launched a video game development program to begin this fall. For its visual effects work on *Farscape: The Peacekeeper Wars*, a mini-series for the SciFi Channel, **Animal Logic** (Sydney) received an Australian Effects & Animation Festival (AEAF) award.

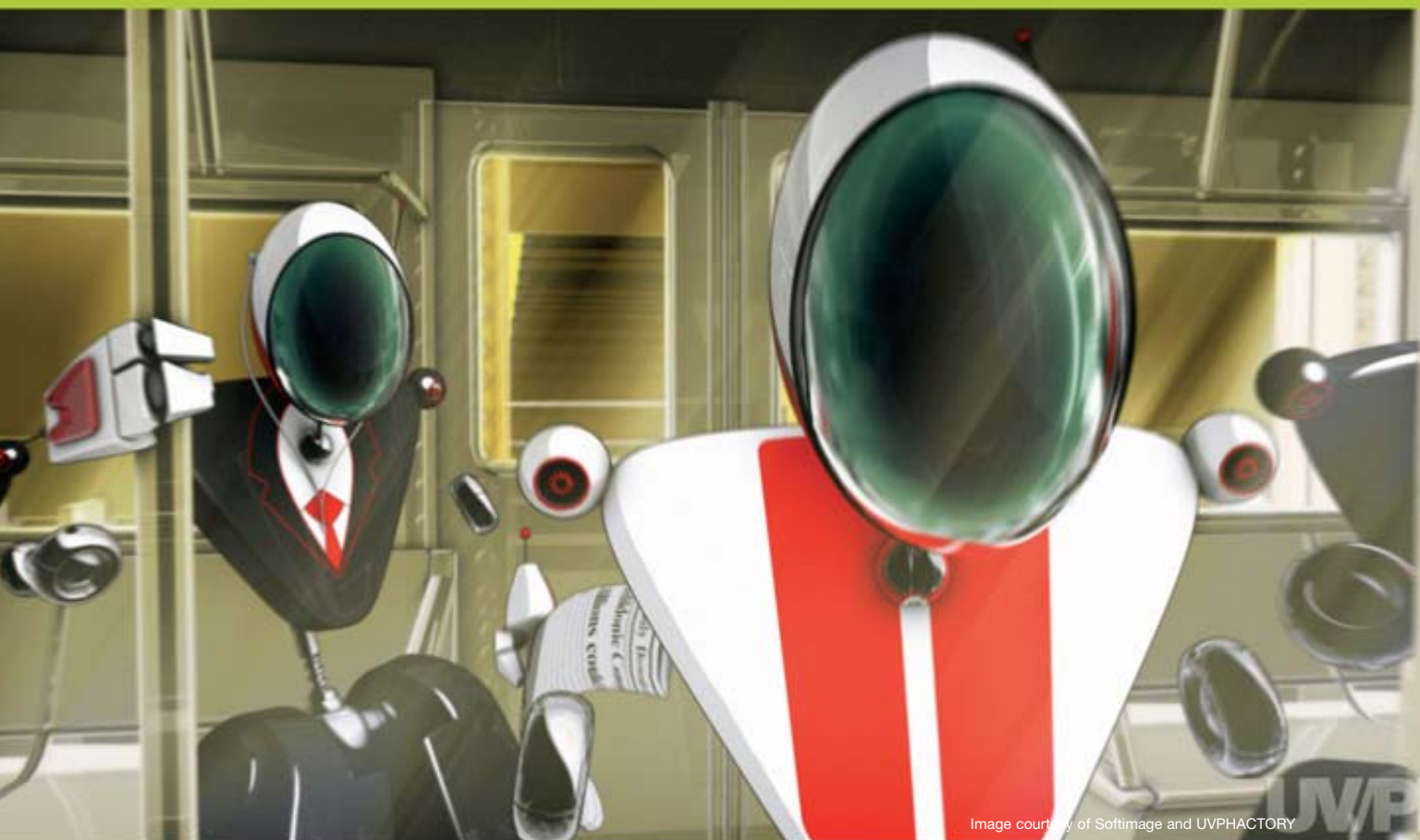


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If You Build It...

By Jeff Sauer

The first product review I ever worked on, some 11 years ago, was a roundup comparison of 22 different Windows 3.1 video capture cards. Only the top two or three could capture “multimedia quality” (320x240 resolution, 30 fps) video without dropping any frames, and if I’m not mistaken, none of the companies represented still exists today. But those that have been around digital video for a while

would recognize a few of them as real pioneers—including Miro, Fast, and Truevision—whose early technologies ultimately changed desktop digital video forever.

By combining these capture cards with editing software—such as Adobe Premiere or Ulead Media Studio—and zooming the video to full screen on NTSC output, videographers could build relatively affordable non-linear editing systems for the first time.

It was the birth of the open-system non-linear editing station. The systems were modest, of course, but it wouldn’t be long, only a little more than another year, before CPUs, hard drives, and capture cards would get fast and powerful enough to capture full-frame 60 fps video, and the image quality gap started to close.

Exciting as those early

Video professionals may opt for turnkey NLE systems, such as this one from Boxx Technologies, rather than build their own solutions from off-the-shelf products, because system integrators offer support for the entire system, not just the hardware or software.



days were, however, installing and testing all 22 of those Windows-based capture cards took roughly two months. That was back, too, in the very early days of Microsoft’s Video for Windows, DLL hell, and pre-Plug-n-Play IRQ and memory conflicts. Installing and using every card was an adventure, and to give each one a fair shot, I had to reformat the C: drive and re-install Windows before putting each card in the computer.

A lot has changed since then. Windows hardware installation is considerably easier. Off-the-shelf hard drives are fast enough for at least a couple simultaneous streams of DV without tweaking the mode page settings. And for standard-definition DV, expansion hardware often isn’t even needed thanks to Windows native IEEE-1394 drivers, although there are some very affordable hardware cards for high-definition I/O as well.

The success of open systems is not just built on affordability, however. They have become highly capable creation tools for video professionals doing real work and earning a living from their craft. And while the hobbyists may take pride in the do-it-yourself challenge of building a system, chances are the pros would rather be shooting and editing.

Open Systems vs. Turnkeys

High-end systems have almost always been sold as turnkey systems, in pre-configured, pre-tested qualified workstations from authorized dealers. The computer, after all, represented just a small fraction of the cost of the whole system. And there was no reason to tempt troubleshooting fate by adding unfamiliar system elements to the mix, especially for serious professionals for whom time is the most precious commodity.

The computer is a larger part of the cost in more affordable open systems, and it’s not surprising that videographers of more modest means would want to find the most affordable box. Ultimately, in order to compete in the independent film/prosumer/event videographer marketplace, even Avid, with a reputation for exclusivity, was forced to give in to the market pressures and unbundle its software. You can now buy Xpress series products off the shelf, just like Adobe Premiere, Canopus Edius, Ulead Media Studio Pro, Pinnacle Edition, and others. But should you?

Interestingly, amid a robust open-system market, a surprisingly strong business in selling turnkey versions of those same open systems exists. Companies such as 1 Beyond, Boxx

Jeff Sauer

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A turnkey NLE may be more cost effective than a do-it-yourself system.

Technologies, Core Microsystems, Laird Telemedia, and others may all seem somehow reminiscent of the PC clone makers that once dotted the PC landscape, but the difference is that these companies specialize in systems for content creation.

Like those clone makers, most editing system integrators don't make anything themselves (Laird does make proprietary breakout boxes and a few other video peripherals.) Some don't even make the clones, instead reselling Hewlett-Packards or other quality computers. They use off-the-shelf I/O cards—such as those from Blackmagic Design, Bluefish444, or CineForm for High Definition—and install a software editing application. Yet they do it in configurations with motherboards, graphics cards, hard drives, RAM, and more that are sure to work.

For a get-your-hands-dirty, do-it-yourselfer (like me), there's always a temptation to buy a Gateway or Dell and the software directly. Dell even offers Adobe Premiere

configurations. After all, Intel processors, hard drives, and graphics cards are all somewhat standard these days, and many companies even have lists of qualified hardware.

What the turnkey companies offer, however, is video experience and support—and that can often translate directly into more time for you to do your work. These integrators have built systems before. They've tested the configurations, and if there's a problem, they'll fix it. Perhaps more importantly, they typically have staff on hand who know video (and often 3D, audio editing, and graphics creation) and offer technical support for the entire system, not just the software or the hardware.

Of course, all editing software manufacturers offer tech support of some kind. But the line between supporting the editing software, the operating system, and any hardware can come up surprisingly fast, and when you start calling multiple vendors for the same troubleshooting problem, the otherwise billable hours start adding up very quickly.

On the other hand, if you buy a 1 Beyond solution, for example, you can get a real person on the line who knows video and knows your system. If you're working on a production, especially if you're on a deadline, that insurance policy can be very comforting. As good as Dell is at consumer-oriented computer support, they're going to send you to Adobe for anything past very basic software support.

I've reviewed a lot of video editing products since that capture card roundup, and I've installed plenty more hardware and software. It's gotten a lot easier than those first 22. But my experience is that all goes smoothly if the company sends a pre-configured system that's ready to go. Several years ago when this started to be the trend in NLE reviews, even from open system companies, I worried a little about missing the user experience, but I got over that quickly. These days, with such capable open-system tools readily available, most of us would rather build edits on a timeline than spend time building a system. ■■

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●●●● Gaming

Oddworld takes aim at the
first-person shooter genre
with *Stranger's Wrath*

By Martin McEachern



The Good, the Bad, & the Oddly

B

eginning with the release of *Abe's Oddysee* in 1997, the video game world was introduced to the twisted universe known as Oddworld, a series of fully functional ecosystems where grotesque yet adorable creatures struggle for survival against the encroaching industrial forces gathering around them.

The first in a planned five-part series, the game told the story of Abe, a hapless laborer in a meat-packing plant who tries to save his fellow race from becoming the next new delicacy. In the sequel, *Munch's Oddysee*, our hero continued his adventures by teaming up with an escaped laboratory test animal named Munch as each tries to realize his own goal: for Abe, it is to rescue his captive Mudokon buddies, and for Munch, it is to save his species from extinction. And in the third title, *Abe's Exoddus*, the character strives to close down a brewery after discovering that the addictive drink is made from the bones of dead Mudokons.

Focused on world simulation and simple action puzzles, these games were set in beautiful environments that served as habitats for mutant creatures resembling all manner of animal crossbreeding. Infused with spunk, attitude, and endearing charm, Oddworld's kingdom of evolutionary rejects quickly earned legions of dedicated fans around the world, while defining an aesthetic and appeal as unique and distinctive as the characters of Looney Tunes or Disney.

For the latest chapter, *Oddworld Stranger's Wrath*, series developer Oddworld Inhabitants (OWI) heads to the Old West to explore a new frontier for the company: the first-person shooter genre. The game, for the Xbox, invites players to step into the

boots of a large, toad-like creature known only as the Stranger, a cowboy drifter cut from the same grizzled mold as Clint Eastwood's characters in the Spaghetti Westerns of Sergio Leone. Working as a bounty hunter, the Stranger tracks down outlaws for moola, hoping to earn enough to pay for a mysterious operation whose purpose and nature the player unravels slowly over the course of the game's 15-hour adventure.

A Shooter, With a Twist

Concerned by the violence of games such as *Halo*, the developer wanted to rely more on humor and visual creativity than the rampant bloodshed that typifies the medium. Hence, instead of the standard arsenal of high-powered assault weapons, the Stranger is armed only with a crossbow, which shoots—quite literally—live ammo, including chipmunks, skunks, porcupines, bees, bats, and various marsupials.

According to OWI cofounder Lorne Lanning, several revelations influenced him to take the series in such an unlikely direction, including what he believes makes a game great and shooters like *Halo* undeniably successful. He also found a way to make these factors work within the Oddworld philosophy set up by himself and his partner, Sherry McKenna: that of responsibility and accountability for the effect that these types of games have on those who play them.

"I was fascinated by the conceptual differences of a 'shoot-out,' like you might find in an Old Western, versus a 'shooter,' which you find all over modern-day Hollywood and gaming," Lanning says. "I wanted to inject some strategy and mind games into an otherwise mindless function. Also, we have always wanted to populate the Oddworld

universe with more species and characters. These new gameplay ideas seemed to coincide nicely with the introduction of a new hero and story line."

Aside from injecting the formulaic genre with a refreshing dose of strategy and "Oddworldly" fun, the game is one of the first to combine a first-person perspective, used primarily for shooting, with elements of third-person play, which require a view of the Stranger and his relation to the environment so he can execute jumps and other intricate movements.

But, such motions can't be performed effectively in a first-person view. Therefore, the game allows the player to switch between views at any time during play. Interestingly, unlike the third-person perspectives seen in other shooters, in which the character merely becomes a new axis of rotation for the camera, the third-person view in *Stranger's Wrath* functions more like a platform game, in which the camera can frame the action from any direction.

Oddworld Inhabitants conceded to the popularity of the first-person shooter genre with *Stranger's Wrath*, but the developer didn't lose its sense of irony: The main character shoots live ammo, albeit critters such as these pictured above.



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Oddworld's Wild West

In *Stranger's Wrath*, each time the Stranger apprehends an outlaw, he is directed to a new town, each a bustling hub of activity inhabited by chuckleheaded chicken-men called Clakkerz. After buying ammo and armor at the general store and collecting information from the Clakkerz, the Stranger acquires his next mission at the Bounty Trading Store. These tasks can range from storming a fort to apprehending an outlaw boss running an illegal mining operation to taking out a gang of no-good varmints stirring up trouble and terrorizing the Clakkerz.

From twisted Old Western towns, lush forests, and reed-choked wetlands, to fertile farm country, snow-mantled Tibetan-inspired mountainscapes, and large industrial facilities, the player is taken on a expansive journey through diverse settings that, while evoking a semblance of the familiar, are all skewed through the lens of the Oddworld aesthetic. Hence, amongst the weathered wood and

a 'found-object' style, as the Clakkerz are poor and have to live off of what they can scavenge." So, while every town is unique, each has to retain a unifying visual signature, which makes for a noticeable contrast with the more natural regions of the game.

As the artists created content for each level, they stored common items, such as mailboxes, in an instance library, which every-



In contrast to the game's dusty, Western look, some environments are teeming with lush, green foliage whose look originated from actual plants and shrubs before being altered to fit into the unique Oddworld universe.

one could access to furnish a level. Nevertheless, in their conceptual art, the production designers tried to give each area a unique atmosphere—from the plush, executive-style furnishings of the sleazy tycoon Sekto's lair to Filthy Hand Floyd's rugged wooden fort. This forced the artists to make as much unique content as possible, even for smaller sections of the game that the player may run right through without a second glance. "I think this [kind of attention to detail] is what helps our environments stand out from those in other games," says Lanning.

The team modeled most of the diverse foliage pervading the natural environments in high resolution before importing orthographic renders into Photoshop, where the group used the renders to create transparency maps. To create some of the more exotic shrubbery, the artists took photographs of existing plants and painted them until they seemed unique and indigenous to the Oddworld universe.

While some of the environments appear to stretch for miles into the distance, the team did not use any matte paintings to create the deep vista views. Instead, the artists modeled and textured all the visible imagery, and then relied on OWI's programmers to build a graphics engine that could "portal" in and out only the necessary geometry based on the player's location.



Rather than rely on stock textures, the artists acquired a range of dirty, industrial-like surfaces from real-world objects and later tweaked them in Photoshop to give them a richer, more organic look, as seen in this scene from a Clakkerz village.

rusted copper pipes of towns such as New York City mingle flashing neon signs and fluorescent lights.

To create the textures for the game, OWI artists painted texture maps to conform to the Oddworld style—which Lanning describes as a dirty, industrial, and heavily saturated look—and then finessed them in Adobe's Photoshop to ensure that they remained organic to the story and characters. "For instance, the areas where the Clakkerz live look like the Old West, but we painted the textures to reflect the tacky culture that characterizes their way of life, which is suggested by the neon signs," says Lanning. "When you head into a native village, you'll see that the architecture changes to more of

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A major challenge for the team was to handle the sheer size of the levels, which expand across miles and miles of terrain and involve an inordinately large number of intelligent creatures. “In a typical region, there are Clakkerz walking around town, taking jobs as the *Sims* characters do. There are outlaws who fight you, and thousands of critters in the world that you can hunt for ‘live’ ammo,” says lead programmer Charles Bloom. “But to have all of these in one level and maintain a smooth frame rate, we had to balance the intelligence of (non-player characters), so that a group of them didn’t perform complex activity all at the same time.”

Settlers of the Odd West

Working in Alias’s Maya, the modelers used the software’s polygon tools to surface the game characters with a density ranging from 800 to 3000 polygons. Meanwhile, the group modeled the main characters, such as the Stranger and the outlaw bosses, in three levels of detail, comprising 1500 to 2500 polygons at the highest levels and 70 polygons at the lowest level. For the real-time cut-scenes, the artists reused the in-game models, though for the five prerendered cinematics, they modeled higher-resolution meshes.

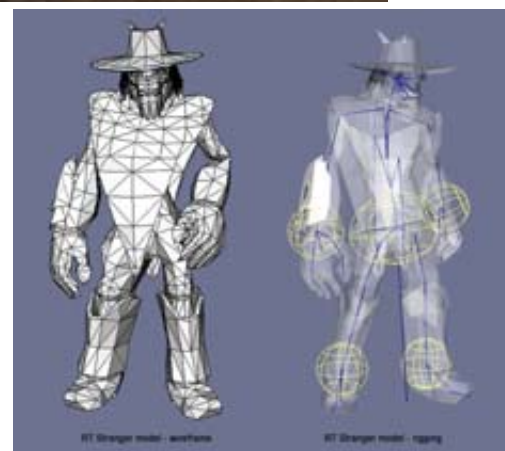
For the characters’ clothes, the team avoided using procedural cloth-simulation tools in favor of traditional modeling and skeletal deformation. The group also made extensive use of normal mapping for texturing the mottled animal flesh of the creatures, their fur and feathers, suits, overalls, and other garments, and the grain of the well-weathered leather of the cowboy attire. While the artists initially derived the normal maps from high-resolution models, they turned to hand-painted gray-scale normal maps near the end of production to achieve faster turnaround times.

To individualize homogeneous characters, such as the Clakkerz or an outlaw’s goons, OWI developed a flexible attachment system that allowed simple props, such as hats and handheld items, to be attached automatically to a character. “The designer simply chose a character and a prop, and then selected a bone on the character’s skeleton to attach the props to,” explains modeler Raj Nattam. “Our engine also allowed flexible animation sharing, so we could create entirely different character models that shared existing animations.”

Nevertheless, *Stranger’s Wrath*’s cast of bizarre animal hybrids



The main Stranger character was created in three levels of detail, from 70 to 2500 polygons. Because the Stranger’s movements can shift from bipedal, when he walks and stands, to quadrupedal, when he takes to all fours during a chase, a secondary model with a complex rigging system was also required.



confronted the team with a wide array of rigging scenarios. For instance, the Stranger walks and stands on two legs, but when he starts running, he takes to all fours, using an entirely different character model and skeleton rigged for the quadrupedal movement. To overcome these challenges, OWI grouped all the characters into types—including shooters, knife guys, and bombers—and designed scalable rigs to serve each type. The skeletons for these base character types ranged from 45 to 65 bones, and featured both forward and inverse kinematics for the arms and legs, and Set Driven Key controls for storing predefined foot roll and finger movements. Meanwhile, for the little critters shot from the Stranger’s crossbow, the animators created simple rigs with low joint counts. And unless they had hind legs, like the “chippunks,” all the live ammo was animated with FK, sans constraints.

Compared to previous Oddworld titles, *Stranger’s Wrath* features much faster characters (and gameplay), resulting in three main animation modes: a walk, a trot, and a full-on four-legged run. For

Oddworld Moviemaking

Aside from the frequent real-time cut-scenes, the *Stranger’s Wrath* story unfolds through five polished cinematics.

“These prerendered movies span a wide range of environments and end with some large-scale scenes of chaos and destruction,” says technical director Iain Morton. “They range from a dried-up wasteland to a number of dark Western town interiors and a massive snowy landscape. Bringing the natural world to life involved a lot of dynamically driven scene elements such as grass, leaves,

trees, snow, and a number of water effects.”

The process required to create these extensive cinematics resembled that of a feature film, beginning with a series of storyboards that were cut together on an Avid editing system. Then, the artists re-created the storyboard animatic as a 3D animatic in Maya, which included rough animation for timing and basic choreography, before completing the animation in Maya. Next, the group assembled the finished scenes on the Avid system, and, running at

30 frames per second, rendered them at the NTSC resolution of 720x486.

Except for a few in-game characters and environmental assets situated in the background of three of the cinematics, the team modeled new environments and characters exclusively for the prerendered movies. Additionally, the cinematic’s characters sport much denser meshes, higher-resolution textures, and a more complicated skeleton and animation rig than their in-game counterparts.

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blending these animation cycles, along with attack animations, damage reactions, and so forth, the animators utilized Granny 3D from RAD Game Tools, which enabled them to set the amount of blending between the animations on a per-animation basis.

Dynamic Worlds

Because strategy was an integral element of the gameplay, this placed increased importance on AI and physics modeling. The player's interactions with the NPCs and their surroundings are more complicated than in previous games, due in part to the intricacy of the environments and the strategic deployment of live ammo critters, each of which has its own purpose. For instance, zapflies are chargeable and can be used to stun adversaries and set off electrical switches to open doors, bolamites are web-slinging spiders that can ensnare victims, fuzzles are personnel-seeking porcupine mines, skunks lure enemies and incapacitate them with their stench; and chippunks distract them with their loud demeanor. In addition, the environments are laden with hidden traps that the Stranger can use to his advantage, such as activating giant cranes to drop boulders on unsuspecting goons.

All of these elements required almost universal destructibility of the environment and characters. The team wrote the proprietary physics simulation used in *Stranger's Wrath*, through which all the objects in the game are associated with simple physics bodies approximating their size and shape,

In *Stranger's Wrath*, players can transition between first- and third-person action for different gameplay strategies. The main character's weapon of choice is a unique crossbow that shoots ammo creatures, such as these Thudslugs (below), at the enemy Wolvarks (right).



such as cubes, spheres, and so forth. "When objects move, it's these simple physics primitives moving and colliding against the world," says Bloom. "When an object is destroyed, we simply delete it and spawn new objects for the debris. When a 'destructible' is destroyed, we update the movement caches to reflect the fact that the space is now clear, so enemy NPCs will be able to walk through it."

Lanning was determined to maintain the integrity and consistency of the story world through persistent AI, which is most prominently displayed in the player's interaction with the Clakkerz.

For example, the Stranger can talk to the Clakkerz or eavesdrop on their incessant chattering at any time, but if he mistreats them, they'll scatter and hide, and even relay the player's bad behavior to the next town. "If you annoy the Clakkerz in their town, when you return, they might be hostile and belligerent toward you," he says. "It's a way to support the notion that the world you are in is one that you have an effect on, while staying on track with, and perhaps even complementing, the story line."

"Story is very important to us, but we didn't want to restrict the players either," notes Lanning. "You have to give them choices that have a valid effect on gameplay, without affecting the plot. One method of doing this is to get the players to the major plot points



and then send them back into town a different way, as opposed to having them double back through an area they just spent an hour in." Other methods for maximizing interactivity within the story-driven game include allowing the player to find and purchase upgrades, and choose the order in which they bounty outlaws.

A New Sheriff in Town

Though ambitious, the project was worth the effort, judging by the universal acclaim that greeted the release of *Oddworld Stranger's Wrath*. Successfully transplanting Oddworld's award-winning imagery into the most commercially successful gaming genre not only has brought newfound innovation, experimentation, and humor to first-person shooters, but it has also proven OWI's ability to adapt and evolve with the times.

Moreover, OWI's new take on the first-person shooter is a welcome change, and if the enthusiasm with which the game has been embraced thus far is any indication, *Stranger's Wrath* will not only expand the Oddworld universe and fan base, but the first-person shooter genre as well. ■■

Martin McEachern, a contributing editor for Computer Graphics World, can be reached at martin@globility.com.

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Effects studios
create CG
backgrounds
surrounding
actors filmed
against green-
screen for the
movie Sin City

By Barbara Robertson

Shots of actors such as Bruce Willis were captured in Sony HDCAM SR format and converted into stylized black and white to match the graphic style of Frank Miller's novels.

Images copyright and courtesy of Dimension Films.

The Devil's in the

Frank Miller's stark, black-and-white graphic novels are about as far removed from what many people think of as comic books as is the movie *Spy Kids* from the film *Pulp Fiction*. But it was *Spy Kids* director Robert Rodriguez who cajoled a reluctant Miller into letting him make a movie based on the novels.

"Robert made a test film, took it to Miller, and told him, 'This is my gift to you,'" says Stu Maschwitz, founder of The Orphanage, a visual effects studio. "I hope you will direct a film with me."

The offer to have Miller co-direct the film ultimately caused Rodriguez to resign from the Director's Guild, which doesn't allow co-directors. But the collaboration resulted in Dimension Films' *Sin City*, co-directed by Miller and Rodriguez and scheduled for release April 1.

Rather than try to expand one novel or create a new story based on Miller's concepts, Rodriguez picked three Miller novels—*Sin City: The Hard Goodbye*, *Big Fat Kill*, and *That Yellow Bastard*—and compiled them into one feature-length film. Three visual effects studios worked on the film, each handling all the shots for one novel. Each novel needed around 600 visual effects shots: The film's every frame is a visual effect.

Actors Bruce Willis, Benicio Del Toro, Josh Hartnett, Clive Owen, Mickey Rourke, Jessica Alba, Jaime King, and others were shot entirely on greenscreen stages. Surrounding them, 96 distinct environments—from cityscapes, to car chases, to room inte-

with amazing movie stars," says Stu Maschwitz, who co-founded The Orphanage (San Francisco), which handled shots for *That Yellow Bastard*. Café FX (Los Angeles) took *Big Fat Kill*; Hybride (Quebec) worked on *Sin*

worked, so we came up with a mix of stylized black and white with selective use of color and details in the background."

"We wanted the film to look as much like the books as possible," adds Boerner. "Some-



Throughout the film, selected elements were either rendered in color or had color added in compositing, as in this scene created by Café FX for *Big Fat Kill*.

City: The Hard Goodbye. All three studios had worked with Rodriguez on *Spy Kids*.

"I needed people who knew how Robert worked," says Keefe Boerner, visual effects producer. "I wasn't going to a new company to do 600 shots in six APRILs when they didn't know what they'd be getting into."

Stylin'

The film's look was developed at Rodriguez's Troublemaker Digital in Austin, where a small team of artists typically brainstorm with Rodriguez at the beginning of his films, and then follow the work through completion.

"We picked panels from Miller's books to test with live action plates that Robert had shot of himself and a few other people on greenscreen,"

says Chris Olivier, Troublemaker artist. "Our job was to recreate the panels in 3D and explore different looks to see what would be readable. We went from stark black and white, just like the comic, to the opposite—gray scale. Robert decided neither extreme

times the blood is in color, sometimes it's not. Sometimes it glows white in the shadows."

Once the Troublemaker team had fashioned a basic look that Rodriguez approved, they picked key shots from the most complex sequences in the three novels and translated those into 3D, working in Softimage XSI and in Mental Images' Mental Ray. "We built 3D backgrounds, textured them, and lit the scenes, all very quickly to get an overall look, and then Robert would tweak them," Olivier says. "When he was happy, we sent the models, textures, lighting, QuickTimes, and image files to the vendors for reference."

Miller's graphic novels provided the choreography and the storyboards. With few exceptions—car chase scenes, for example—animatics weren't needed for the visual effects teams. "There was no point," says Olivier. "The stories flowed so well from panel to panel, they could see what Frank did."

Rodriguez didn't require storyboards for filming, either. "The books were the storyboards," says Boerner. "Robert knew in his head what would be behind the actors and just started filming them on the greenscreen. He knows what can and can't be done."

Details

riors—were created with computer graphics in black and white, and, as in the novels, a little bit of color. By all accounts, the film is as true to Miller's novels as it could be, in look as well as story.

"It's a violent, black-and-white triptych

●●●● Film

The Hard Goodbye

Working with Rodriguez on set at the beginning was Daniel Leduc, visual effects supervisor at Hybride. Rodriguez shot the film in full color and stored it in Sony's HDCAM SR format. "We'd get output in full resolution and 10-bit color, and we could record it with all the definition. It's a black-and-white movie, but it has tons of shading. We were able to have 10 bits per channel; 1024 shades of gray per channel." Having that much dynamic range made it possible to have details in the dark blacks and bright whites, and to create a stylized realism.

"Some scenes are almost photoreal now," Leduc adds. "The style changed a lot from the beginning to what we're doing today. The way the film was done is that the three vendors worked separately on their books. Robert wanted to have separate styles. That way, he picked what he liked and didn't like. Today, I know what the other studios were doing, but in the beginning I didn't."



As with all the scenes in *Sin City*, actors Rosario Dawson and Michael Clarke Duncan were filmed on a greenscreen stage. The CG backgrounds were added by Café FX.

For its part, Hybride delivered 726 shots that included 45 different locations, all virtual sets. "All the backgrounds are CG," says Phillippe Theroux, 3D supervisor. Some were 2½D matte paintings—textures painted in Adobe's Photoshop and projected onto simple XSI geometry from camera view; some were full 3D sets. "Occasionally—like in the jail—we used the same set for 20 or 30 shots, but usually, we were changing sets every 10 or 15 shots," he says.

Although animatics weren't needed for shot choreography, Hybride's artists created shot layouts. Sometimes the layouts were quick drawings given to Rodriguez for approval; sometimes the shots were framed using simple geometry in XSI to create the backgrounds, with 2d3's Boujou and Science.D.Vision's 3D Equalizer tracking camera movements from the live-action plates.

"People wanted to see the same images as on page 25 in the book, the same icons," says Theroux. "When the police car jumps

into the river, they wanted to see that. But the book is framed vertically, and movies are, of course, horizontal."

In addition, framing the shots helped keep the production efficient. Models were always built from the camera viewpoint. "When the framing was approved, we'd know what needed to be modeled," says Theroux.

To further save time, although the scenes were lit using tools from within XSI, sometimes artists would paint highlights in Photoshop and project them onto the models rather than create CG lighting effects. Particle effects—rain, explosions, water, muzzle flashes, and so forth—were handled in Maya.

"Sometimes we made images that Robert felt were too real," says Theroux. "He would say, 'If I wanted real, I would have shot a real background.'"

Many shots were rendered in 4K and 6K resolution to allow additional camera moves in art and compositing. Some were rendered in color; others in black and white.

"When we turned the color shots into black and white, they created a richer gray scale image than if we'd rendered in black and white," says Theroux.

Between 16 and 20 compositors worked on the project, always in gray scale, adding color as needed. "When we have color, it's an object—the bed, a red dress, an eye," says Leduc. "It's a comic book look. Sometimes we have an iconic picture that's 2-bit definition, sometimes it's photoreal, other times there's nonrealistic lighting."

Getting the right look took trial and error. "We tried to have all the details in back and white with no clipping and without losing the shading in the skin tones," says Leduc. "It was tough because there are so many adjustments

you can make. You can move the gamma—the brightness slider—or the curves. We decided to use curves because you can change the definition in the low blacks and high whites without changing the middle."

Toward the end of the production, the studio decided the film needed more color. "The easiest thing was to color the blood," says Leduc. "This isn't a kid movie—there's blood everywhere."

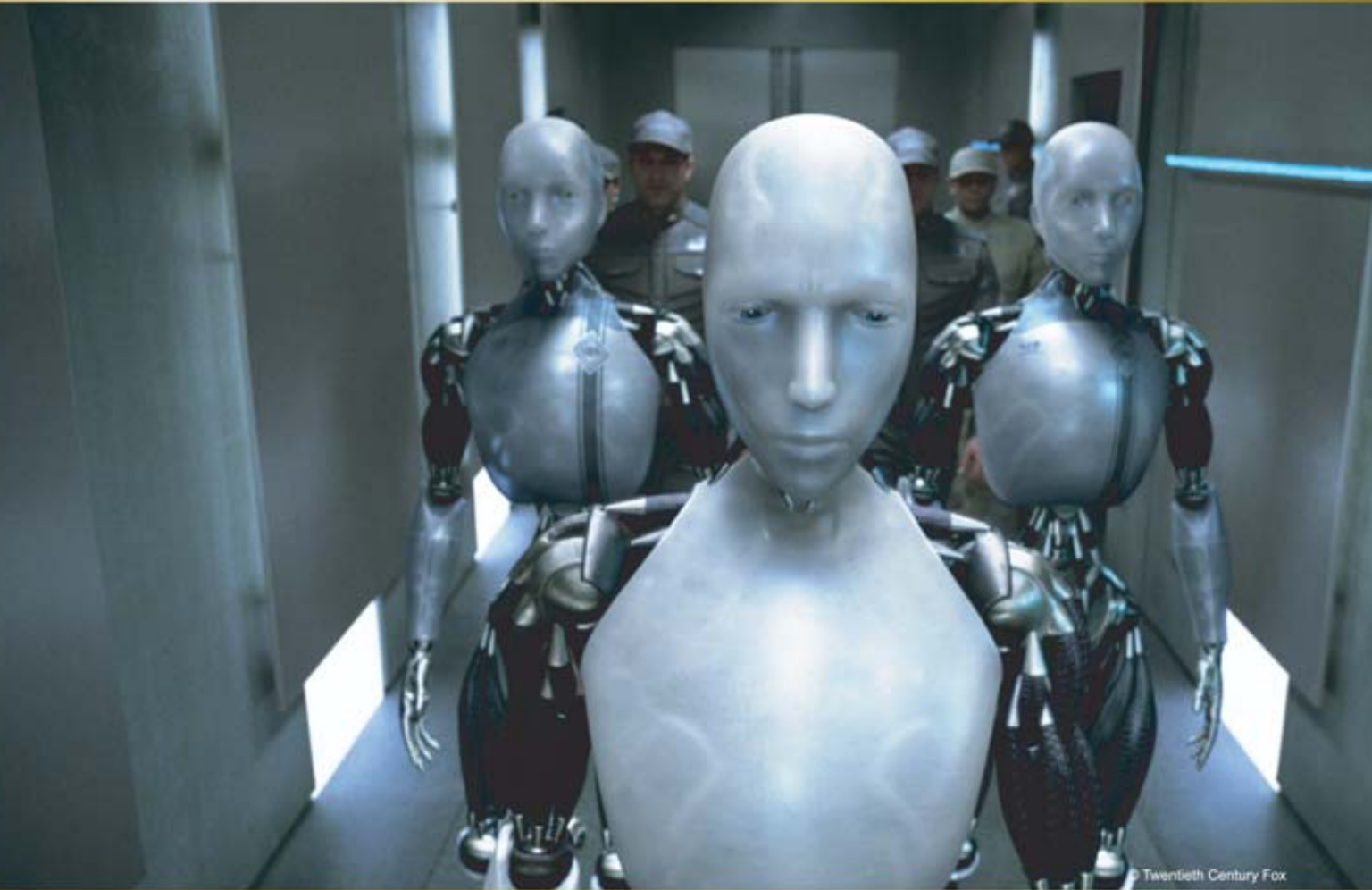
Big Fat Kill

"They tamed it down a little bit," says David Debner, effects supervisor for Café FX, which handled *Big Fat Kill*. "No one is really a good guy; there are just different levels of bad people. They cut back on some of the gore we created."

In addition to supervising effects at the studio, Debner was Café FX's onset supervisor. "One unique thing for this film was working

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● ● ● ● Film

with the new generation of HD,” he says. “The signal was much cleaner. We used a brand new [Blackmagic Design] DeckLink card that’s 4:4:4 compatible.”

On set, the film crew had two HD monitors. “It was easy for me to see whether the tracking marks would show up on an image—something I can’t see on the video tap monitors used for regular films,” Debner says. “One monitor showed the real color; the other was turned to black and white that a video engineer pushed into high contrast to tell if the lights were too hot in certain areas.

“An advantage of this format,” Debner continues, “Is that it doesn’t clip the data. We work with ILM’s EXR format in floating point TIFF. The high dynamic range will be noticed onscreen in this movie. The brights and darks got close attention.”

As did Hybride, Café FX created interior and exterior backgrounds for live-action shots and entire CG car chases, all in black and white with spots of color. In one car chase sequence guest-directed by Quentin Tarantino (*Pulp Fiction*, *Kill Bill*), for example, only the lights from a police motorcycle are in color. “Quentin wanted red and blue colors streaking through the back window,” says Debner

For editing, Café FX used Apple’s Final Cut Pro on Macs; for graphics, PC systems equipped with AMD’s 64-bit Opteron processors running NewTek’s LightWave and Alias’s Maya. “We primarily use Light-

Wave, but some car crash scenes were animated in Maya, in which the programmers wrote a custom rain program,” Debner says.

Some scenes were painted in Photoshop. Cameras were tracked with Boujou; and compositing and rotoscoping was handled primarily by Eyeon Software’s Digital Fusion with an assist from Pinnacle Systems’ Commotion.

“It was nice to do one continuous sequence,” says Debner, “rather than isolated shots here and there. It was almost a movie in itself.”

Shots ranged from an urban alleyway to the LaBrea Tar Pits. “That’s where they go to stash Benicio Del Toro’s body,” Debner says. “Some vigilantes come; there are a lot of bullets and an explosion. But the cool part is the environment we did—everything from the grass to the lightning. We have dinosaur statues dripping with rain.”

Although much of the scene was created in black and white, the cars were built in color to better match the live-action cars. It was a fortuitous decision. The studio later asked for some black-and-white cars to be re-rendered in color.

“We basically hit the ground running,” says Everett Burrell, digital effects supervisor who split responsibility for the 600 shots with Jeff Goldman. “We started in July, and had to have a version of every shot done by Thanksgiving so the director could see all his stuff cut together. Then we went back to the beginning and started over again with Robert’s notes.”

Toward the end, Rodriguez began singling out objects he wanted in color. “Sometimes the sky would be blood red,” Burrell says. “And sometimes the blood might be white, or black, or red.” Thus, the studio ended up delivering two color versions for 200 of the approximately 600 shots.

That Yellow Bastard

One color that didn’t change was the Yellow Bastard’s sickly mustard-colored pallor. Shots for this third of the film were created at The Orphanage, where visual effects supervisor Maschwitz followed live-action rules to create the exaggerated graphic effects.

“This film was an art direction challenge,” Maschwitz says. “Every shot was unique, powerful, bold. By following the rules of live action—the language of movies—we could make it more graphic. I wanted the combination of live action and CG to feel like the comic book, not have it look like live-action actors were walking in a comic book. It had to look photographed, even if it couldn’t have been photographed.” The photographic look was accomplished through painting, texture details, effects, and lighting.

Roger Gibbon led a matte painting team that included Michael Pangrazio, a longtime matte painter, who was also a creative director on the show. The painters worked in gray scale in Photoshop. “It made them rethink the way they composed an image,” says Gibbon. “As a matte painter, you try to create the illusion of depth and shape, and when you reduce a painting to black and white you have only light and dark to lead the eye. We constructed the look through the placement of patches of light and the way in which those areas reacted to people passing in front of them.”



Programmers at Café FX wrote a custom program in Maya to create the effect of rain dripping on the dinosaur statues in the scene with mercenaries from *Big Fat Kill* (top). Mickey Rourke and Jaime King say “the hard goodbye” against a background created at Hybride (bottom).

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That Yellow Bastard played by actor Nick Stahl, here with Jessica Alba, achieved his sickly pallor in this black-and-white scene thanks to visual effects artists at The Orphanage.

Once the paintings moved into compositing, the details disappeared—and then, sometimes, reappeared: The compositors turned the gray-scale paintings into high-contrast black-and-white graphic images. However, when a shadow, for example, moved across a blown out white area, the detail was revealed. Similarly, hints of details appear in shadowed areas.

“We worked hard not to throw away the information,” says Ryan Tudhope, associate visual effects supervisor. “If we pushed the graphic look too far, it didn’t work. We stayed grounded in reality.”

In one shot, for example, actor Bruce Willis runs out of the woods toward a barn. In Miller’s novel, the barn is black against a white sky. But the shot takes place at night. “We couldn’t suddenly have a bright white background with black shadows,” says Tudhope. “Everyone in the theater would be blinded. It wouldn’t work. So we thought about how we would have achieved the shot if we had been on a set or on location. We gave the barn an atmospheric glow.”

For this shot and throughout the film, the crew used photometric lighting—volumetric lights modeled after real-world lights. “We didn’t use CG cheats,” says Maschwitz. “We even emulated the artifacts you see in films—the way you sometimes see big light flares, for example. They’re totally obvious and totally fake, but they’re part of the language of movies.”

One thing that helped Maschwitz and the team create lighting effects such as these is an artifact of the film’s storyline. “It doesn’t pay to optimize unless an environment is rendered often,” says Tudhope. “So we turned on all the bells and whistles and really

pushed SplutterFish’s Brazil.”

For example, in a night shot, two shady characters filmed on a treadmill walk (once they’re composited into the CG background) past a row of seedy motel doors toward the camera. Maschwitz had the lighters add tiny aperture flares as bare bulbs flash into the scene. Also in this shot, a CG truck parked in the background reflects snow from the ground in a hubcap. The snow was baking soda that the crew photographed; the truck was rendered with Brazil. In many shots, however, the snow

was created with particles in Side Effects’ Houdini and rendered with subsurface scattering in Brazil.

For example, during one of many car chases in snowstorms, a CG Chevy fishtails into the frame. CG supervisor Rodrigo Teixeira created the snow by generating 500,000 particles in a box around the car. The box moved with the camera; the camera was tied to the car. The car had a kind of force field around it to keep the particles from penetrating. To make all this efficient, Teixeira recycled particles rather than regenerating them. “Whenever the points hit the ground, instead of dying, they pop back to the top,” he says.

The car was created in Autodesk Media and Entertainment’s 3ds max, animated in Maya and 3ds max, and rendered in Brazil. As it



In this all-CG shot from *That Yellow Bastard*, the car fishtails into the frame and trails an almost subliminal flash of red from the taillights. Created at The Orphanage, the car was modeled in 3ds max, animated in Maya and 3ds max, and rendered in Brazil. The snow was generated in Houdini.

does a 180 into the frame, you see a flash of red from the taillight, and then it stops and fills the frame. It’s a shot the crew is particularly proud of. “We nailed the CG problem of broken reflections and refractions,” says Maschwitz. “Even though it’s in black and white, it’s the closest thing to photoreal that we’ve done.” ##

Barbara Robertson is an award-winning journalist and a contributing editor for Computer Graphics World.

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••••• Video

SuperSp

By Karen Moltenbrey

This year's Super Bowl commercials

entertained with subtle digital effects



FedEx/Kinko's "Top 10" spot offered tips for accomplishing successful Super Bowl ads, including the use of animals, such as this digitally enhanced bear.

message, humor, and effects. Although the spots were criticized for being ho hum, many still managed to provoke a laugh or two, complements of the subtle digital effects that made them crowd pleasers.

effects facility Quiet Man, required rig removal to erase the compressor and air hoses attached to the animatronic bear. For several scenes, though, the artists had to rebuild the neck portion of the animal. That's because the eye level of the person wearing the costume fell below that of the bear, requiring the man inside to lift a flap cut into the material so he could see while performing a dance and a simulated groin kick. To cover the exposed area, the artists roto-scoped patches of fur and rebuilt them using a Flame and Inferno system (Autodesk Media and Entertainment), and hand tracked the patch into the frame. "The fur had to look natural," says executive producer Steve Holiner, "especially when the bear was moving around."

Indeed, judging from the high ratings the spot received in post-game polls, the audience seemed to get a "kick" out of the way the commercial poked fun at the predictable con-

T

he Super Bowl isn't just a football game; it's an event. Each year the broadcast of this NFL championship matchup draws tens of millions of viewers who are reluctant to lift their eyes from the television screen for even a minute, lest they miss a great play—or a great commercial.

Without question, the Super Bowl is the biggest day of the year for Madison Avenue, annually drawing television's largest crowd. And despite this year's 4 percent decrease in viewership, the game still pulled in an audience of 86 million. So there's little question why agencies and clients go that extra yard, and pay that extra dollar, to show off their most daring, memorable, and creative efforts. Yet, last year's negative publicity stemming from the combination of Janet Jackson's half-time fiasco coupled with the predominantly off-color humor of the commercials had many agencies and clients "airing" on the safe side this year with clever but subdued ads in terms of their

The Key to Success

Humor and effects aren't the only major ingredients of a successful Super Bowl commercial, at least according to FedEx/Kinko's humorous "Top 10" spot, which appropriately summed up Super Bowl commercial content past and, as it turned out, present. The ad, featuring a dancing bear and actor Burt Reynolds, highlights the 10 key elements of a successful Super Bowl commercial: an animal, a dancing animal, a talking animal, a groin kick (popular last year), attractive females, a famous pop song, a cute kid, a celebrity, a bonus ending, and a product message, which is optional, according to the commercial.

The post work for the spot, done by Charles Quinn and Steve Koenig of visual

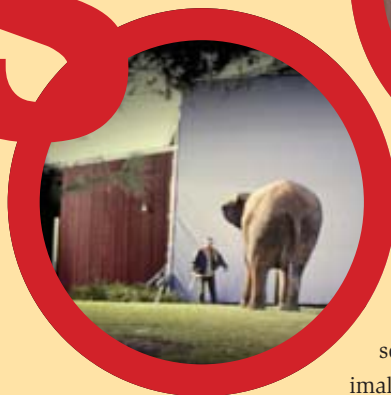


Artists added fur to the area around the neck of this bear costume in postproduction, making the faux animal look more natural.



ots

Numerous animals were filmed individually on greenscreen and "herded" together for a group shot in a Bud commercial.



act properly, making it appear as if the animals were filmed in a group.

"You can't go wrong with an animal spot," says Poulatian. "And people seem to be attracted to the Clydesdale commercials; they are appealing and endearing to nearly everyone, no matter the age."

dlers present in nearly every frame.

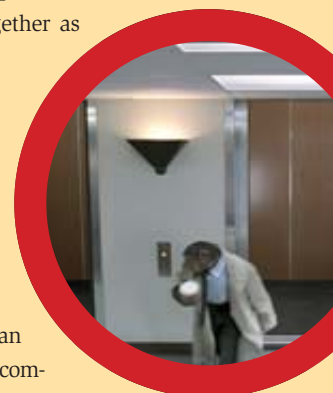
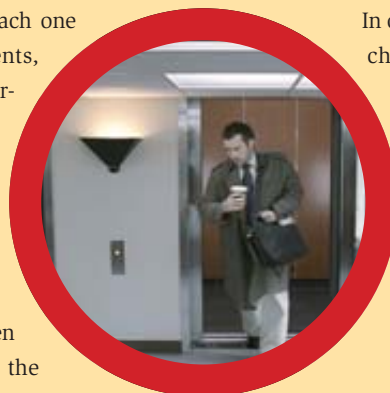
Moreover, some of the animals, such as the

camel and the ostrich, were particularly uncooperative during the filming, and as a result, the film crew lost valuable daylight. "We filmed the first two animals in the sunlight, and then we lost our light," explains Poulatian. "So quite a few of the beasts had to be filmed at night, which resulted in inconsistent, unnatural light and hard shadows against the greenscreens." To fix these problems, the group first cut the mattes by extracting the animal, then added each one into the environments, where the artists color-corrected the images. They also added the appropriate shadows, lighting, and interaction that would have been present naturally if the herd had been standing together in the sunlight. This process enabled the team to cast shadows from left to right and have them re-

Artists roto-scoped shots of individual chimps and composited them together to create a group for three Careerbuilder.com ads.

Apparently the folks at Careerbuilder.com agree with Poulatian's view of using animals in TV ads. In its three popular commercials that ran during the game, "Whoop-ee Cushion," "Monkeys," and "Titanic," the company featured an office staffed by live chimpanzees whose antics thwart the business efforts of the only human employee not monkeying around. While it appears as if there are dozens of chimps, there were only four, which were dressed in different outfits for multiple roles. Given their volatility, however, only one or two could be filmed at a time. Therefore, it was up to postproduction boutique Vendetta Post to staff the office using a good deal of shot duplication, performed in Flame.

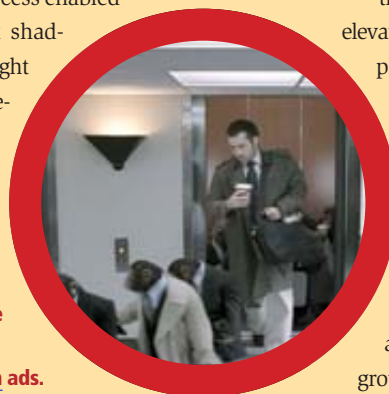
In one sequence, two dozen chimps are shown together as



they exit an elevator. To accomplish this effect,

the team used a partial motion-control rig to achieve the desired camera rotations and pans as each animal was filmed individually stepping out of the elevator.

Using Flame, visual effects artist Crawford Reilly and his group roto-scoped the chimp from



tent and gags used in Super Bowl advertisements. But what makes the ad so successful is the fact that most of the spots really did use one or more of the must-have elements listed in the commercial.

Animals Deliver Results

Commercials containing animals are a sure bet with viewers. Last year, Budweiser's "Born a Donkey," featuring a burro that succeeded in joining the famous Clydesdales, was the definitive crowd favorite based on postgame surveys. Capitalizing on that success, Budweiser continued the story line this year in "Journey," as an array of zoo and farm animals make their way down a dirt path to a barn for an unscheduled "cattle call" in hopes of fulfilling the same dream as the donkey's.

"Having so many different animals on set complicated the shoot," says Patrick Poulatian, visual effects artist at Brickyard VFX. An obvious setback was that "some of the animals just couldn't be near others without causing problems." As a result, each of the 12 animals—ranging in size from that of an elephant to a pig—was filmed individually against greenscreen. Later, the team at Brickyard used Flame to roto-scope and composite the 11 separate live-action film plates into group shots, making it appear as if the animals were filmed next to one another. They also used the Discreet system to remove the tethers and animal han-

●●●● Video



Spontaneous artists did a complete CG mouth replacement that enabled this live dog to converse with its owner in a Toyota spot.

each shot, then tracked and composited all of them into the final scene, making sure that the 20-some layers of animals did not appear to be walking over one another while they shuffle forward.

Meanwhile, Toyota's "Leash" commercial takes the talking animal approach to advertising, as a live-action dog prompts its owner to go for a walk. When the owner, who is engrossed in a television program, declines, the dog tells him that if the leash is the problem, it had just heard about the car company's "\$199 a month *leash* deal," to which the owner promptly corrects the canine that it is a *lease* deal, not a *leash* deal.

To make the dog speak, artists at production house Spontaneous did a complete CG mouth replacement for the animal within Softimage's XSI to achieve a natural look. Under the supervision of director of CG Lawrence Nimrichter, the team modeled the jowls, lips, tongue, and teeth in 3D, which enabled the animator to move the rigging as needed for the animation.

"When the dog realizes its mistake, the animal raises its eyebrows sheepishly and blinks its eyes inquisitively," says 2D director and compositor David Elkins. "To accomplish this, I created a 2D mesh of the dog, which allowed me to track the movements of the face and adjust areas like the eyebrows, cheeks, and eyes, so it's just not a mouth attached to a face." The group then removed the real mouth and replaced it with the CG version, tracking the 3D model into the live scene first using XSI and later Inferno.

Faux Animals Also a Favorite

Live animals are popular in Super Bowl ads, though faux animals can be equally effective, as demonstrated in "Exaggerated Dad." In the spot, a talking unicorn and the Easter Bunny confront a father after he makes excuses to his young daughter why she shouldn't sample his Emerald Nuts, lest harm befall these fabled characters.

To give the animals their unique looks, the ad agency opted to capture the effects in camera, and then have artists at visual effects/tele-

cine facility The Syndicate augment them in postproduction, to preserve the quirkiness of the piece. For example, the unicorn was a white horse with a prosthesis attached to its head. The group then used Flame to make the animal's nostrils flare, its cheeks puff, and, more important, its mouth move, as when it scolds the father for his white lie.

Conversely, the rabbit consisted of a smaller puppet body and a proportionally larger costume head, worn by an actor. "The directing team decided this would allow for more extensive head and mouth movements," says visual effects supervisor Kevin Prendiville. "It also gave the structure of the animal an odd sensibility that fit well with the theme." Later in post, the team tracked and composited the bunny head onto the body within Flame, removing the rigs from the body puppet. Even though the actor was responsible for the eye, nose, and ear movements, the post group enhanced those motions and manipulated the facial features.

"It's a simple concept with a simple execution," Prendiville says of the commercial. "You don't always need over-the-top effects if you present a good story."

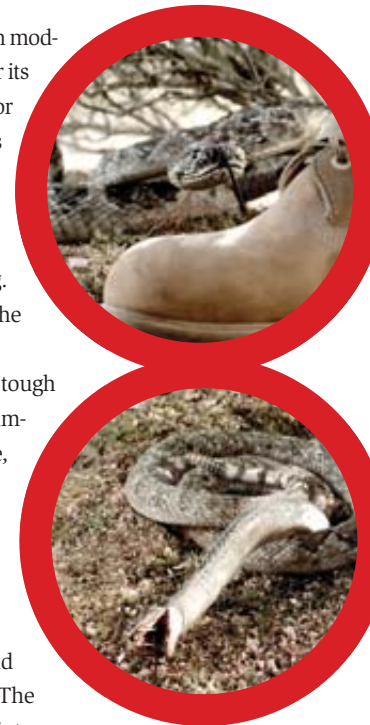
The Syndicate also used a combination model—part live action, part animatronic—for its HD commercial called "Rattlesnake" for Ford Trucks. In it, a man packs up his gear after mending fences, only to catch a glimpse of a rattler coiled at his feet. The snake turns to face him, opens its mouth, flicks its tongue, and strikes the man's leg. The man looks stricken until he hears the snake coughing before rolling over dead.

Using this scenario to show just how tough a Ford truck owner is required extensive image manipulation to the reptile sequence, which featured live-action footage of real and animatronic snakes. According to artist MB Emigh, the group rebuilt the snake in Flame with elements from the live-action shoot, adding emphatic rattles to its tail, more coil to its body, and choking motions as its body convulses. The team also used Flame to track the image into the scene, and to composite a 3D animated snake tongue, created in NewTek's LightWave, into the serpent's mouth.

"Mixing and matching the snake parts really brought the reptile to life," notes Emigh. "And working in HD takes the idea of visual effects to a new level because it is so unforgiving. You can't hide anything like you can in NTSC."

Cute Kid

Visual effects and design company A52 coupled explosive visual effects with a cute kid to sell Nationwide Insurance's "Science Project" spot, shown to a regional Super Bowl audience. In this latest



A part-live, part-CG snake provided the director with a perfect combination of action for a Ford truck commercial.



The Syndicate composited a bunny costume onto the body of a rabbit puppet to create this quirky-looking character for Emerald Nuts.



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●●●● Video

commercial in an ongoing series, a boy's homemade robot goes haywire, eventually blowing up the family car with Hollywood flare, much to the surprise of the youngster and his parents. To ensure that the digital effects would integrate properly into the plates, visual effects artist Simon Scott supervised the live-action shoot. Later, using Flame, he and his team composited several effects into the scenes, including computer-generated laser beams.

In addition, Scott used the Flame system to achieve the spot's interactive lighting. "Because I was on set, I knew where the lasers were going to go and what they were going to hit," he says. "So we shot the plate once, and we shot it again with neon tubes placed in the scene that illuminated the environment. We then used this plate as a compositing element for our interactive light."

The commercial ends with a big bang, a practical explosion filmed in camera. "It was meant to be smaller, but someone got overzealous," says Scott. "However, the agency loved it, so we kept it."

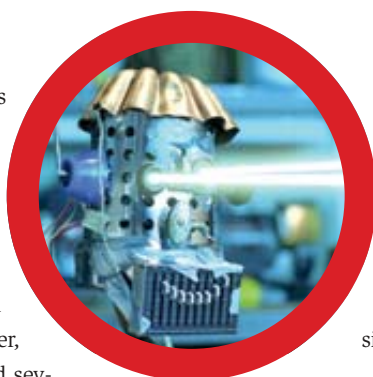
Celebrities Sell

Verizon, with help from visual effects company The Mill, used a celebrity bent in its HD commercial called "Miniaturization," which reduces various stars to miniature proportions so they can be seen on the company's new 3G broadband phones that play movie trailers, sports clips, and music videos.

The ad opens to an Oscar-like red carpet as a limo pulls up to the curb and a mini Kid Rock jumps from the vehicle amid gasps from the crowd, which is told that Tinsel Town is clamoring to get tiny in order to appear on the phone. The camera then cuts to a petite version of Christina Aguilera, and then to a tiny Shaquille O'Neal, followed by a diminutive Deion Sanders. To achieve these "small" effects, the celebrities first were filmed against greenscreen, and then artist Dirk Greene composited them into full-size backgrounds.

Accomplishing this illusion required careful choreography so that the angles would match up in the final plates, as in the scene when a small O'Neal had to high-five his full-scale teammates. This was done with motion-control camera moves while shooting the players and

then replicating those same moves while filming O'Neal on greenscreen. Greene and his group augmented the scene by adding full-scale images of hands and feet, which were shot on a separate plate and composited with the other imagery using Flame, thus giving the scene a greater sense of scale.



Digital and practical effects resulted in an explosive combination for Nationwide Insurance's latest commercial when a robot runs amok.

The most challenging part of the project, says Greene, was replicating the lighting changes of the wide shots in the small-scale elements and matching the shadows. This was particularly tricky with camera flashes going off in most of the sequences, he adds. In situations where the team was unable to match the lighting from the main plate, the artists simply painted the backplate.

Pizza Hut and visual effects facility Quiet Man also used celebrities—albeit Muppets—for "Destined to Dip," a live-action/CG spot. The commercial features several well-known characters, among them Miss Piggy, who is dragged around a room after she catches a fast-moving strip of pizza as the rectangular

slice tries to reach a dipping sauce.

Using Softimage XSI, lead CG artist Kris Rivel crafted the 3D pizza sticks, which had to match the actual food in the first shot. "Our CG pizza had to look realistic, but we had to fix the lighting and create shaders in Mental Ray so that the cheese and pepperoni looked translucent but not too greasy and unappetizing," he says. In all, the group rendered five to six passes of the pizza stick using Mental Images' Mental Ray, and composited the model into the live action using Flame. The artists also used Flame to remove the extensive rigging that was needed to animate the puppets.



CG pizza and a roto-scoped Miss Piggy team up to promote Pizza Hut's new dipping strips, thanks to postproduction work by Quiet Man.

Postgame Report

The Super Bowl is no longer just about football; it's also about entertainment, both on and off the field, from the players and plays to the star-studded half-time shows and the dazzling, ambitious commercials that people talk about the next day at the watercooler. In fact, Super Bowl commercials have generated so much interest and buzz over the years that they have spawned their own competition, dubbed the Ad Bowl, and even receive their own pregame media hype and postgame ratings and analysis.

Yet, unlike in years past, there were no clear-cut winners in this year's battle of the ads, despite the average price tag of \$2.4 million for a 30-second spot. Perhaps that's because many clients and agencies overanalyzed their content, ensuring that it was in good taste, and chose to play it safe with formulaic material. While it's unlikely that any ad from this year's selections will appear in high-light reels years from now, the examples highlighted here show that by using digital effects, companies were able to entertain audiences with some interesting offerings. Maybe next year they will apply the technology for more daring ads worthy of MVP status. ■■

Karen Moltenbrey is a senior technical editor for Computer Graphics World.



Compositing techniques were used to shrink celebrities, including Shaquille O'Neal, in size to promote Verizon's new phones.

Storage in the Studio

Storage systems
help content creation
and production
studios design digital
workflows

In the following stories, we
examine the steps these visual
effects studios and postproduction
facilities are taking toward developing
more efficient digital pipelines:

***Pacific Title & Art Builds
a SAN-Based Pipeline***

***DNA's Disk Storage Ensures
Quality Effects for The Aviator***

***Sesame Workshop Stores
Sesame Street on Disk***

***Optimus Turns to Disk-Based
Color Correction***

***DKP Achieves Full Digital
Rendering and Compositing***

***Tippett's SAN Aids Workflow
and Creativity***

***FotoKem's SAN-NAS System
Streamlines Workflow***

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Storage in the Studio

SPECIAL SECTION

The Power of the Pipeline

BY MICHELE HOPE

As postproduction houses and visual effects studios continue their quest to build digital production pipelines, more attention than ever before is being focused on the data storage components at the hub of these new systems. Whether used in the production of commercial spots or full-length feature films, digital storage devices are now viewed not only as essential to improving the productivity of studio artists, but also as vital to enhancing the quality of their work.

This will be a watershed year for storage in digital content creation environments, says Tom Shearer, a 30-year industry veteran in both the storage and entertainment fields and executive vice president at Bright Systems, a storage integrator in Reno,

Nevada. He attributes the turning point to a confluence of issues, including significant price drops for Fibre Channel components and new low-cost options for disk storage such as disk arrays based on high-capacity Serial ATA disk drives.

"We've reached a time when you can put your money into tape recorders for single users or, for the same price, have multiple users on the same disk storage," says Shearer. "The kicker is that you can put any resolution on disk, and after it's been edited, you can push it to any resolution you want." This transition from resolution-dependent "islands" to resolution-independent, disk-based storage, he contends, represents the future direction of production houses.

Pacific Title & Art Builds a SAN-Based Pipeline

Pacific Title & Art Studio has a long tradition of taking bold first steps. Back in the mid-1920s, the Hollywood-based facility performed titling work for the first talking picture, *The Jazz Singer*. In the late 1980s, the firm was among the pioneers that moved into the emerging computer-generated visual effects market. And since then, the now 86-year-old studio has transformed itself into an all-digital postproduction house that performs everything from titling to digital intermediate (DI) services for major motion picture productions, including, most recently, *Elektra*, *Constantine*, and *War of the Worlds*.

One of the biggest challenges the studio has faced in recent years has been to expand its network and storage systems to keep pace with the explosion of digital data it has been creating. Indeed, doing the math for the storage capacity required to digitize an average feature-length film begins to tell the story. When scanned at 2K resolution, each frame of a film requires some 13MB of storage; and when scanned at 4K, each frame consumes 53MB. When multiplied by the total number of frames in a feature-length film, the storage requirements quickly mount up to more than

2TB for a 2K film or 8TB for a 4K film.

But that's not the end of the story. "When you work on a movie, you have multiple versions of it," notes Andy Tran, Pacific Title's chief technology officer. "Even at 2K, a movie could end up with 8TB or more when you account for all the versions, and a 4K movie could end up with more than 32TB."

With that much data, Tran says, the first lesson one learns is to minimize the movement of data around the network. "If you try to move such large quantities from one file server to another," he explains, "it could take days."

In fact, minimizing data movement was the main reason the company moved

to a clustered storage network architecture, based on SGI's servers and storage arrays and running SGI's CXFS distributed file system. With the 200TB storage area network (SAN), Pacific Title can now place scan data directly onto the network, which allows the studio's artists to work directly from the SAN simultaneously, saving the time they might otherwise spend waiting for data.

"As an early adopter of a SAN, we allowed people to work directly from it for compositing and 2D and 3D work," says Tran. "Then about a year ago, when we migrated to a digital intermediate workflow, we just plugged that directly into the SAN as well."

Key to allowing the DI workflow to take place on the SAN was to enable 2K film playback from the SAN in

continued on page 36



Pacific Title & Art uses SAN storage from SGI for DI and effects work on films such as *Elektra*.

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DNA's Disk Storage Ensures Quality Effects for The Aviator

Back when work on the Miramax movie *The Aviator* was just getting off the ground, Oscar-winning visual effects supervisor Rob Legato realized he would have to use a lot of boutique effects houses with low overhead to stretch his budget. So

when he needed a shop to produce some key shots for the film and set up a quality control station to preview work in progress, Legato and his producer, Ron Ames, placed a call to Venice, California-based Digital Neural Axis (DNA), whose president, Darius Fisher, was known for his ability to meet such challenges with off-the-shelf tools.



Image ©2004 Miramax Film Corp. and Initial Entertainment Group. Courtesy of Digital Neural Axis

DNA used a Medéa VideoRAID array to store its visual effects work for 53 frames in the film *The Aviator*.

The bulk of DNA's work centered on 53 shots recreating flight of the famous Howard Hughes aircraft, the *Spruce Goose*, over California's Long Beach Harbor in 1947. To create the scene, DNA artists took film footage of the actors in a cockpit against green-screen to simulate the historic flight. They then helped create the appropriate window views of the harbor from inside the airplane, adding sky, water, and boats to the scene outside. These would ultimately be combined with exterior views of the aircraft produced by Sony Pictures Imageworks, the film's principal visual effects vendor.

Fisher was also tapped early on to help set up a quality control (QC) station at The Aviator Inc.'s Imageworks VFX headquarters. The station would allow Legato and Ames to evaluate work from different effects vendors in high-definition (HD) format. Having had success in designing DNA's viewing station using Medéa's dual-channel, 2Gbps Fibre Channel-based VideoRAID disk arrays, Fisher was asked by the production team to help set up its own QC station with a similar, SCSI-based version of the Medéa array.

In the Imageworks QC suite, the plan was to preview the effects work by loading preview renders from the various VFX vendors onto the storage array connected to an Apple Macintosh G5 workstation. Work-in-progress shots from each vendor would be combined using Apple's Final Cut Pro HD editing software. The merged shots could then be previewed in HD QuickTime playing off the Medéa storage array via a PCI-based HD/SDI (high-definition/serial digital interface) CineWave card.

At DNA, the edit room setup was virtually identical to the ImageWorks-based QC station, except that a Blackmagic HD card was used instead of the CineWave card. "We wanted to mirror the same system that the production team had so we could see how our shots were working in sequence," says Fisher. DNA intercut its VFX shots with HD footage of the exterior shots for its own review.

Since both the QC station and DNA's edit room needed the ability to play back the frames in HD (24 frames per second, 8-bit, uncompressed) format, it was important that the storage system be able to sustain consistent data throughput rates of 85MBps to 95MBps, according to Fisher.

"In the storage realm, if you're going to play back 10-bit, interlaced HD footage, you need a data rate of at least 140MBps to 150MBps. Our Medéas can read at sustained rates in excess of 350MBps and write in excess of 270MBps. Because we had fewer frames per second, it brought our data-rate requirements down to between 85MBps and 95MBps," Fisher explains. "So we had no problem working at the lower data rate."

Each morning, Fisher and his team gathered all the latest renders from the previous day and cut them into the timeline. They then reviewed them in QuickTime format in the DNA edit room.

Combining DNA's shots with the Imageworks shots provided the creative team with a broader perspective of how the whole scene was shaping up. Says Fisher, "To really check the flow and pacing of the scene, it was invaluable to be able to see the progression of our interior *Spruce Goose* shots intercut with the external shots from Imageworks, and see it all played back in real time."

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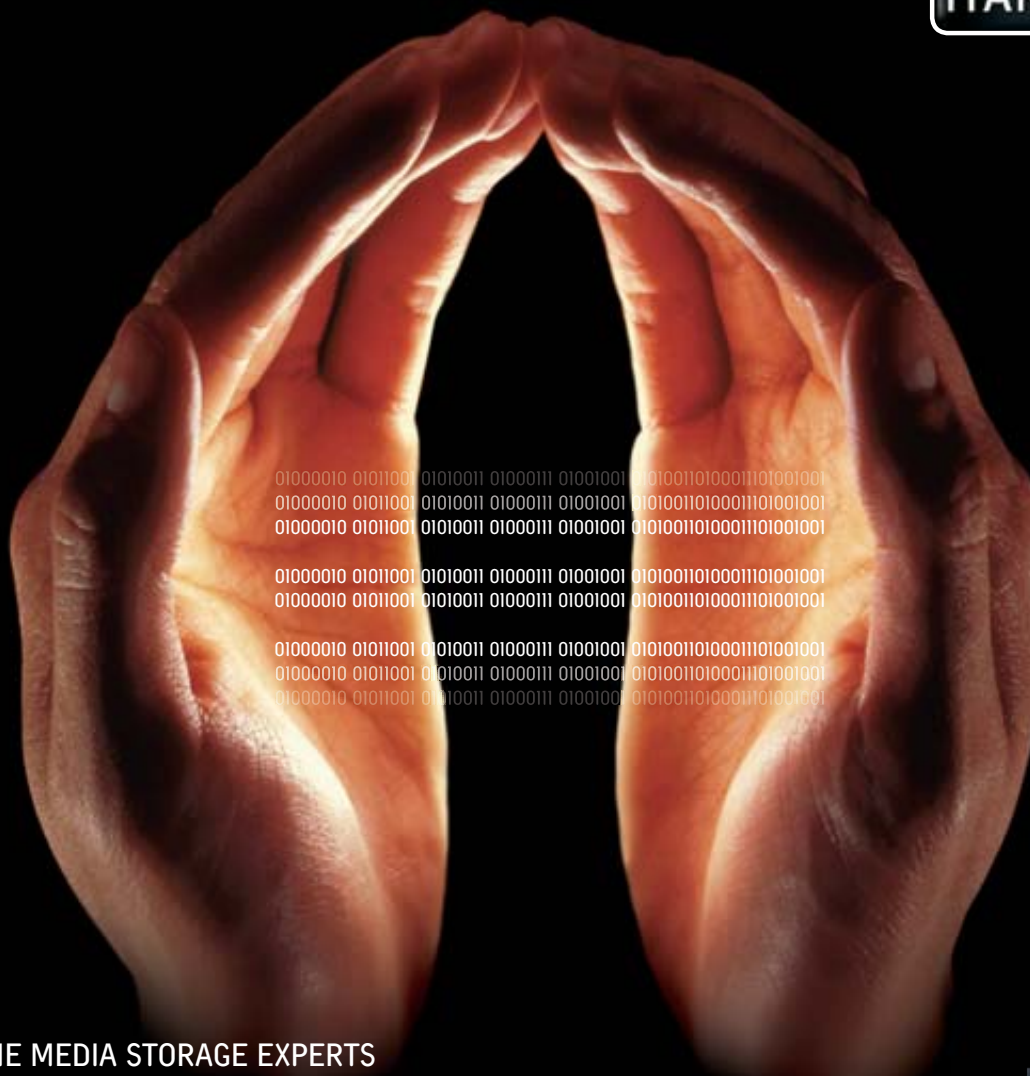
real time, a feat that would require 274MBps of data throughput. To meet the challenge, the studio had to add several storage controllers as well as perform the associated modifications and integration work.

Yet, despite enabling real-time playback from the SAN, the studio was unable to completely eliminate data movement around the network, as some viewing bays and DI tasks still require data to be transferred to workstations. To accommodate this type of data transmission, Tran and his IT team learned that it was necessary to add to the systems surrounding the storage "multi-dimensionally" to avoid network bottlenecks. "Every time we expand our SAN, we expand our network capacity and our servers at the same time," Tran explains. "That way we don't bog down our servers."

What are the benefits of this SAN-centric approach? "The ability to play back directly from the SAN gives us a leg up in the industry," says Tran. "Even though we're a smaller company, the SAN now allows us to finish digital intermediates faster than some larger studios. The SAN is also faster for accessing data. The artists don't have to spend time looking for their data now. They can just continue working."

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Sesame Workshop Stores Sesame Street on Disk

In theory, one of the benefits of producing 35 years of material for the popular PBS series *Sesame Street* is that segments from so many past shows can be reused in new episodes. But in practice, it's been a different story, as the show's editors at Sesame Workshop have often found themselves struggling to locate and preview specific clips from previous seasons.

The problem stemmed from limitations of the Workshop's legacy video-on-demand system, explains Stephen Miller, IT project manager for the nonprofit education organization. Indeed, Sesame Workshop has been storing the last few years of *Sesame Street* programming—totaling some 6000 clips—on hundreds of Ampex tapes, which required a lot of manual work to locate specific segments from past shows.

Using three large Ampex tape libraries, the system is capable of streaming high-resolution clips in real time from tape, which is practical when the editors know exactly where to look for the material. But when they need to peruse the content over several shows or seasons, the system has proven cumbersome. So to facilitate the search and retrieval process, Sesame Workshop is converting the files from tape to disk format.

The motivation for making this transition came from an unexpected quarter. In October 2004, Sesame Workshop signed a joint agreement with Comcast, PBS, and HIT Entertainment to launch a 24-hour children's TV channel and accompanying video-on-demand programming.

As part of the deal, Sesame Workshop is responsible for transferring its initial 6000 *Sesame Street* segments—some 8TB of data—



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Sesame Workshop uses a disk array from Nexsan to digitize *Sesame Street* clips from past seasons for rapid viewing and retrieval.

onto disk as well as transcoding each segment into both low-resolution and high-resolution video files for future viewing. According to Miller, accomplishing these tasks required replacing the Ampex tape library, connected to three servers (Irix, Linux, and openBSD), with a disk-based repository that would be capable of processing the huge volume of data.

Miller and his team worked with IBM to determine the key elements involved in the new system. And once Sesame Workshop performs the June 2005 hand-off of its disk-based library, IBM will be responsible for managing and integrating the library into a co-located facility that will handle the video-on-demand service.

Storage for the new disk repository came in the form of a low-cost ATABeast disk array from Nexsan Technologies with nearly 10TB of capacity. The disk arrays include Deskstar ATA disk drives from Hitachi Global Storage Technologies. On the server side, the organization uses a *continued on page 40*

Optimus Turns to Disk-Based Color Correction

The workflow at Chicago-based Optimus studios, like that at many postproduction houses, would often begin when film footage was transferred to videotape via a telecine machine and then digitized onto disk storage so that digital artists could add content. Then, as creative work progressed, files would be transferred from disk to tape several times for key operations, such as when producing digital dailies and performing color-correction work.

While this approach enabled Optimus to produce a number of top TV commercials, including spots for the US Army and Dell, director of operations Knox McCormac decided that to maintain a competitive edge, the studio needed to streamline operations by moving to an all-digital workflow.

Of particular concern to McCormac was

the color-correction process, as it required several manual steps that often severely restricted the workflow. Color correction had to be performed from a videotaped version, then manipulated in real time using a da Vinci 2K system. The color-corrected version was then fed back out to videotape again, requiring it to be re-digitized if editors and artists needed to perform further work. "If for some reason you needed to do final color correction," he says, "you had to find the tape that had the scene on it, bring it upstairs to the color-correction suite, put it back on the telecine, do the color correction, lay it back off to tape, and take the tape downstairs and re-digitize it."

In an effort to eliminate this kind of reliance on tape transfers, McCormac and one of Optimus's colorists, Craig Leffel, investigated some of the newer digital workflows being used to

color-correct feature films. They found that several shops had begun using various color-correction software, such as Discreet's Lustre.

Optimus had already been using a variety of Discreet's editing programs—such as Smoke, Flame, and Backdraft—on SGI Tezro workstations. So the studio decided to add Lustre to its suite of tools. With Lustre's software-based color-correction methods, Leffel and his team can now show clients color-corrected changes to footage in near real time, thanks to the use of lower-resolution images stored on an IBM IntelliStation M Pro desktop system with about 4TB of storage capacity. The M Pro also uses a digital video card from DVS that allows Optimus to digitize footage from tape.

"With Lustre in place, instead of taking the telecine to tape, *continued on page 40*

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Sesame continued from page 38

IBM eServer BladeCenter to perform key functions in the tape-to-disk conversion process. The ATABeast storage subsystem was connected to each of the blades via a Fibre Channel SAN fabric.

The blades include an Ancept Media Server (AMS) from Stellant, which helps track and update metadata about each segment. The BladeCenter contains a TeleStream FlipFactory blade responsible for transcoding the 6000 clips from tape to disk.

Files were first copied over a Gigabit Ethernet LAN connection between the Ampex tape library and the AMS blade. The AMS blade then sent each file via FTP to the FlipFactory blade that first makes a high-resolution video copy in MP2 format of each clip and stores it on the ATABeast disk array. At the same time, the blade transcodes a lower-resolution MP1 video file of the same segment for later viewing in QuickTime via an Internet browser. The low-resolution version is also stored in another ATABeast partition.

Once the new disk-based repository comes online, Miller expects the system to improve Sesame Workshop's current edit and production workflows by three to four orders of magnitude. "Our teams will be able to create a playlist and perform searches for all Elmo, the Count, and letter 'W' segments, for example," he says. "Since it will all be digitized, we can quickly browse the metadata and low-resolution versions of segments from five years of programs."

Looking forward, Miller plans to install several more ATABeast storage arrays to help tackle the next big job: digitizing the other 30 years of footage.

Optimus continued from page 38

we can now take the telecine directly to a hard disk over a data pipe," McCormac explains. "Data can then be copied into Lustre, where we perform color-correction work on it. The data can then be saved out to local hard drives."

According to McCormac, software-based color correction is just the start in Optimus's quest for an all-digital workflow. He is also installing a 20TB Discreet SAN that combines the fast 1.5GBps throughput speeds of Data Direct Networks' storage controllers and disks with two SGI Origin 350 metadata servers and the CXFS shared file system.

With all SAN components running 2Gbps Fibre Channel, McCormac anticipates the SAN will allow Optimus artists to push three streams of 2K data off the SAN in real time. He expects to have the full system up and running next month.

"This is something we've wanted to do for more than 10 years," says McCormac, referring to the ability to share data over a digital network. "But back then it would have cost millions of dollars to be able to pass around data like this. Today, that cost has dropped to an affordable level."

DKP Achieves Full Digital Rendering and Compositing

DKP Studios is used to dealing with the challenges of sending large data sets over its network. In 1985, the Toronto-based postproduction house became the first in North America to go to full digital production for its rendering and compositing work, according to DKP vice president of production Terry Dale.

The company's increasing workload in HD for TV, video, 3D animation, and special effects projects—including IMAX 3D films and animation work for the MTV Movie Awards—recently required DKP to triple its storage capacity just to keep up with the growing data files. "The big projects are the feature films and IMAX projects that chew through huge amounts of data," Dale explains. "One of those productions can take up 30TB of storage very quickly."

In the early days, DKP's efforts to process such huge volumes of data (typically requiring 24Gbps of throughput) often resulted in servers going down, artists waiting for massive data pulls, and frames getting dropped when composited work was sent over the network. "Serving the data to and from users, or to and from the renderfarms, without bottlenecks was a real challenge," says Dale.

About a year ago, the DKP team set out to find a system that could help them avoid these types of data storage and transmission problems. The equipment they chose included two Titan SiliconServers from BlueArc, which now support the rendering and compositing functions of the digital pipeline, says Dale, even with the renderfarm running at full capacity.

One 20TB Titan SiliconServer disk array now assists DKP's 400 to 500 dedicated CPU render nodes in storing renders. This data is then pulled from the first array for further compositing. Composites are written back to the second array, which is approaching 10TB of capacity.

According to Dale, the storage system's ability to change data flow rates on the fly—which he refers to as "throttling I/O" to different departments—has been crucial, given the company's growing need for rapid data transfers. I/O pipes on the back of the systems can be aggregated when needed, he adds, to essentially create one larger pipe.

"Within minutes, we can change the aggregation in order to give departments the bandwidth they need to get access to the data," Dale explains. All of this results in faster iteration times and faster time to completion. For example, he says, load times for large files have dropped from 10 or 20 minutes to two or three.



DKP uses a BlueArc system to store its animation work for productions such as the MTV Movie Awards.

For Maximum Compatibility...

Choose one from column **A** and one from column **B**

-A-

NON-LINEAR SYSTEM

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Aurora
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Digital Voodoo
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Media100
Newtek
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etc.

-B-

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Tippett's SAN Aids Workflow and Creativity

Tippett Studio is no stranger to the storage and network requirements needed to support its creative efforts. During the visual effects facility's 20-year history, it had to continually upgrade its systems to accommodate the growing size and complexity of the work it produces for television commercials and feature films.

In fact, work that the studio recently completed for the film *Matrix Revolutions* illustrates how much storage just one scene can now consume. According to Dan McNamara, Tippett's director of operations, the shot required several terabytes of storage for just the rendered shadows to appear on a scene filled with complex machine creatures.

Unfortunately, backing up such large data sets to Tippett's DLT tape library created bottlenecks on the company's network. The backups consumed as much as 25 percent of total bandwidth, says McNamara, and began to impede the production of other tasks in the workflow.

To speed up the flow of data, McNamara decided to change the studio's underlying storage architecture, which had consisted of a 5TB TP9400 storage array from SGI and a 1.2TB EMC Clariion array. "One requirement was to be able to easily integrate our existing storage into the new system," explains McNamara. "We also wanted to tie it into our backup system so that our tape library could back up the main file systems off the network. So with these requirements, a SAN architecture was a necessity."

Tippett decided to use SGI's InfiniteStorage solution and CXFS

shared file system. The studio's SAN architecture initially included a 10TB SGI TP9500 disk array that connects to the studio's other storage devices and servers via two 16-port Fibre Channel SAN switches from Brocade. Since then, Tippett added an additional 2TB of storage and upgraded several of its SGI Origin 350 servers (or CXFS "nodes") from four processors to eight. The studio is also in the process of adding another TP9500 storage array with an extra 10TB of capacity, along with another eight-processor Origin 350 server.

Using SGI's FailSafe Cluster HA software, Tippett's administrators can now migrate data from file system to file system, or from primary to secondary/backup storage systems without affecting users, says McNamara. Backups now run off the Fibre Channel SAN and do not

impede the Ethernet network. Tippett uses an Origin 300 server with Legato Networker backup software to back up its files to a 600-slot Sony AIT tape library.

How has the new storage architecture improved workflows? "Before, we had to be frugal about the number of elements we kept around. Because we had a limited amount of disk storage capacity available, we had to quickly pull material offline," says McNamara. "The added storage now allows the artists to be more creative in terms of the elements they have to choose from to create the final composite. There's more opportunity to mix and match elements across different rendered outputs."



Tippett Studio uses SGI storage systems for visual effects projects for TV commercials and films including *Matrix Revolutions*.

Photo courtesy Warner Bros. ©2005 Warner Bros. Village Roadshow Films (NZ) Ltd.

FotoKem's SAN-NAS System Streamlines Workflow

FotoKem is a 40-year-old postproduction studio that often works on hundreds of projects simultaneously, ranging from creating digital masters to color correction. Recent credits include the digital processing of film trailers for the 2004 Oscar winner *Monster* and a variety of other motion pictures.

To address the requirements of its DI processes, FotoKem needed to upgrade its existing storage systems, which include a mix of SAN and Network Attached Storage (NAS) configurations. A typical DI project may include creating thousands of digital files—averaging 13MB each—that are accessed, processed, and rapidly moved throughout the workflow at 24 frames per second. FotoKem's SAN-NAS environment

supports Windows, Macintosh, Linux, and Irix servers and includes multiple digital asset management and creation tools.

"While our SAN is good at some tasks and applications, it did not scale well when it was loaded with multiple concurrent jobs," says Paul Chapman, FotoKem's senior vice president of technology. "We needed to handle more than 10,000 large files in a single directory."

FotoKem opted for an Isilon IQ storage system, which Chapman says is "optimized for sequential, linear reads and writes and delivers the high performance that's required in our digital content environment."

The studio manages more than 25TB of digital content at any one time, with up to

8TB of content moving in and out of the 8.6TB Isilon IQ cluster in the editing process. The storage cluster handles the daily workflow of creating, processing, and editing film content and manages hundreds of thousands of files in the DI process.

According to Chapman, other advantages of the Isilon IQ storage system include the ability to scale capacity and throughput quickly to accommodate workload spikes, a single view for managing all content in the system regardless of the size of the storage pool, and support for heterogeneous platforms. ■■

Michele Hope is a freelance writer. Her address is mhope@thestoragewriter.com.

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Portfolio

Student Art Contest



Clockwise from top left:

Grand Prize: "Saranggola (The Kite)" by Samuel De Leon from the University of the Philippines represents one of the burgeoning artist's early works, and was produced in Photoshop running on a Mac. The piece was inspired by his first glance at Mayon Volcano as a child. (Appearing directly below the image are three other works submitted by De Leon.)

Second Prize: "Nightmare Serenade" by Deborah Kazakoff Moniz from Foothill College in California represents the artist's vision of what a punk rock nightmare would be like. To create the image, she used Painter and Photoshop, as well as a KPT Lightning filter.

Merit: "The Highwind" by Steven Muniz from the University of Pennsylvania is the artist's rendition of the airship from the game *Final Fantasy VII*, which was mostly obscured from view throughout the title. This inspired the artist to re-create the entire ship in 3D, where it could be seen from all angles and where he could inject the model with a personality based on his knowledge of the game. This was accomplished in Maya and Photoshop.

What's in your dreams? That was the question posed to budding artists around the world by *Computer Graphics World* for its first annual student art contest, and those willing to share their visions did so through beautifully crafted digital imagery, whether photographic-based or CGI. "The contest enabled us to showcase the innovative work by a new generation of artists and animators," says Susan Hughes, director of marketing. "*Computer Graphics World* has a rich history of recognizing what's new in the digital arts field, and this allowed us to offer a glimpse of what the industry can expect in the near future."

According to art director Suzanne Heiser, who served as one of the



judges, the theme of the contest was chosen because of its broad appeal, and as such, was open to creative interpretation. And this was reflected in the 110 submissions whose focus ranged from the high-flying childhood dreams of the grand-prize winning image to a '50s-style diner that inspires daydreams, the subject of the fourth-place winner.

Several prizes, including an HP workstation, Discreet and Softimage software, and passes to this year's SIGGRAPH, were awarded to the various winners, whose imagery appears on these two pages. Additional submissions can be seen on the *Computer Graphics World* Web site at www.cgw.com. —Karen Moltenbrey

Clockwise from top left:

Third Prize (tie): "Dream Machine" by Eric Shore from the University of Pennsylvania was inspired by an actual dream in which he saw a robot, like the one in the image, that was capable of controlling the dreams of other people. The image was created in Maya and Photoshop.

Merit: "Remember" by Brett Goodwin from the Collingwood Arts Center in Ohio illustrates that things are not always as they appear, through the use of Photoshop and hand-drawn imagery.

Fourth Prize: "Diner at Night" by Erica Ehrlich from the University of Pennsylvania uses Maya and Photoshop to focus on a period-style diner, after hours.

Merit: "Self Portrait" by Lorin Wood from Brookhaven College in Texas projects the artist's self image through a collage of iconography and imagery composed in Photoshop.

Third Prize (tie): "Cloudy Dreams" by Annis Naeem from Lodi High School in New Jersey was composed in Photoshop and highlights the artist's ultimate dream: to fly.

VIDEO

Apple Production Suite

Apple's software bundle is powerful, professional, and affordable

By Tom Patrick McAuliffe



Production Suite is a serious set of advanced SD and HD tools in an integrated, inexpensive package.

A bundle of the company's high-end products for the Mac, Production Suite is truly more than the sum of its parts. It's a synergistic environment in which professional postproduction applications work together seamlessly to increase productivity and creativity.

Final Cut Pro HD non-linear editing software, Motion for creating sophisticated motion graphics, and DVD Studio Pro 3 for professional DVD authoring are at the core of the Suite. Also included are Apple's Soundtrack audio tool, LiveType 1.2 for resolution-independent animated titling, Cinema Tools for 35mm and 16mm filmmakers, and QuickTime Pro and Compressor 1.2 for encoding to HD and importing/exporting projects for various delivery mediums.

It's clear that Apple has fully embraced high definition. In his keynote address at Macworld Expo, Apple CEO Steve Jobs defined 2005 as "The year of high definition." Final Cut Pro HD works in standard definition (SD) and, for those with a high-definition (HD) device, in HD using a FireWire cable. The ability to capture, edit, and output broadcast-quality HD video over a single FireWire cable is, in and of itself, worth the cost of this bundle.

Final Cut Pro HD offers 150 new effects for DV, SD, and HD with real-time functionality and a new timecode display, generator, and reader. More filmmaker-friendly, the HD version enables you to take a 25 fps PAL video and export an EDL for 24 fps, transferring

your video project to motion-picture film. The Digital Cinema Desktop feature lends to viewing in HD on Apple Cinema HD displays. Thanks to its DVI, the Apple Cinema 30-inch flat liquid crystal HD display is one of the best-looking RGB displays I've ever seen.

From a video-editing standpoint, there's nothing Final Cut Pro HD can't do. Its familiar timeline approach and customizable user interface, as well as the ability to work on a single project in several programs, make this professional media creation tool the cornerstone of Production Suite.

If you've ever envied the sophisticated multilayer look of titling on television, Motion is your application. Its powerful animation design engine provides real-time previews and procedural behavior animation. With minimal effort, I was able to create and import into Final Cut Pro a layered sequence with animated titles and images.

Motion's Behavior tool automatically generates simulations of fluid motion effects, such as rain and wind, the actions/reactions of items like billiard balls, or the effects of gravity. Hassling with keyframe animation is not necessary; Motion does it for you as you work interactively with elements and layers in real time. Using Motion's advanced particle engine, I was able to create realistic-looking fire, smoke, and welding sparks. I even gave a blocky title a neon glow. Better yet, I used the Dashboard menu

ed professional-looking content quickly and easily. I viewed all the layers, filters, effects, and objects within a project in the Project Pane. Every Mac user who is serious about animated graphics for professional video or the Web should have Motion.

When outputting a finished project with DVD Studio Pro 3, Apple's high-end authoring program, you can use prebuilt templates or opt to label chapters with LiveType, create menu objects in Motion, and produce background music in Soundtrack. The program includes transitions, enabling blur, wipe, or other effects between chapters and during title selection without building a separate effects track. DVD Studio 3's Graphical View tool provides a look at the whole project, including the hierarchy of the chapters and the flow. I was able to open Final Cut Pro HD files and Motion projects in the application; add menus, transitions, and sound; and burn a DVD. All things in life should be so easy.

I put Production Suite through its paces on a PowerMac G5, creating a 22-minute video documentary. During the process, I found the applications to be intuitive and seamlessly integrated, even more so than similar bundles. I saved time and produced a video with a high-end look that was easy to achieve. With its unprecedented integration, serious features, and flexibility for moving a single project easily between applications, Production Suite is a coordinated, complete postproduction package at a great price. ##

Tom Patrick McAuliffe is a writer, award-winning video creator, and former member of the US Navy's Combat Camera Group.

Apple Production Suite

Price: \$1299 (\$699 as an upgrade)

Minimum System Requirements:

Requirements, listed on Apple's Web site, vary by application and include a Macintosh computer with a PowerPC G4 or G5 processor, Mac OS 10.3.5 or later, a high-end graphics card, 512MB of RAM, 20GB of disk space, and a DVD drive.

Apple Computer
www.apple.com

to select an element on the screen—a logo, title, or picture-in-picture box playing live video—and animate it on an x, y, or z axis. Spinning logos are a breeze. Using the 25 prebuilt motions, which Apple calls Gestures, I creat-



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VIDEO

Digital Voodoo SD|Flex

The company's new board offers
10-bit uncompressed SD and HD video

By Tom Patrick McAuliffe

For years, the holy grail of broadcast-quality digital video boards has been 10-bit input and output. The folks from Digital Voodoo in Australia raise the bar with its SD|Flex standard-definition (SD) and high-definition input/output (I/O) card. The SD|Flex offers a choice of SDI, component (YUV), S-video (Y/C), or composite video in and out. The added feature of an onboard Keyer with dual-link support is unique, allowing full 10-bit keying of a live source together with a composited background in real time. With it, artists can see in real time what graphics will look like when output to video.

With the flexibility to input and output a variety of different signals, the end user is provided an almost unrestricted work flow with high-quality internal processing and 10-bit color processing. Unlike 8-bit capture boards with 256 levels of color, 10-bit products have the full range of 1024 levels. Providing support for Apple's Final Cut Pro HD 4.5, the PowerMac G5, and OS X, the SD|Flex board is a natural for high-end power users on the Mac.

Digital Voodoo has an impressive track record: the first uncompressed QuickTime video card for the Mac, the first QuickTime product to capture full 10-bit video, and the first uncompressed SDI solution for Final Cut Pro non-linear editing software. Digital Voodoo offers Mac products, whereas its partner company, Bluefish444, offers devices for Windows, Linux, and Mac systems. Unlike

Bluefish444's multi-platform SD|Envy, Wildblue|AV, and 64 RT, the SD|Flex is a Mac-only product. Perhaps cross-platform compatibility will be addressed in future software driver versions; the ability to use the card on Mac and PC would add significant value.

I tested the SD|Flex on a dual 2GHz CPU PowerMac G5 and a single 1GHz CPU G5 running OS X Version 10.3, as well as a single CPU 866MHz PowerMac G4 with Mac OS 9.2 and the old 5.2 drivers. The board supports dual displays, so I attached two Sony MultiSync flat-screen monitors. For storage, I used an internal ATTO Ultra-SCSI card to access a Rorke Data u320 external hard-drive system and a LaCie IEEE-1394 hard drive. In many ways, the SD|Flex board is a simple affair: install the board into a PCI slot, install the drivers, attach sources and output, and away you go. I hooked up analog SuperVHS and Composite video sources and output SDI digital via a Flying Cow format converter and a Miranda SDI-to-DV converter.

SD|Flex's internal RGB image processing became readily apparent. The video output looked great—almost better than the original signal—with no artifacts or jaggies. I ran a signal from an expensive Magni test signal generator to produce SMPTE color bars. After passing the signal through the board, the output was virtually the same on the Waveform/Vectorscope, with a small shift to the blue hue and a black level just below 7.3 IRE. Well within tolerance, they could be adjusted at the source or on the board.

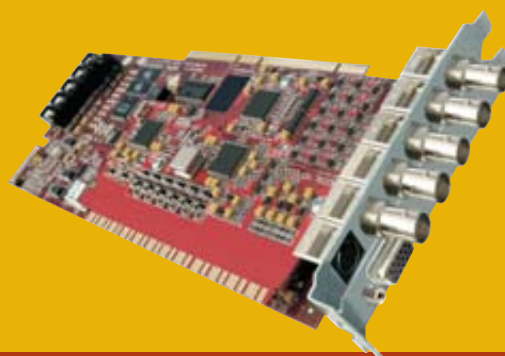
Perhaps my favorite function is that the board enables Analog and SDI

signals to be monitored simultaneously. Monitoring is customizable and independent, so you can, for example, monitor an SDI input via SDI/analog and then monitor your analog inputs and analog/SDI output. An Internal Keyer, for real-time title and graphics overlay of your inputs (SDI), enables those working with the Betacam-SP video format to perform RGB-to-YUV and YUV-to-RGB color space conversion in real time. Desktop Preview and Photo JPEG support for off-line editing help get projects done quicker.

At press time, a new driver was released with new functionality, including 8-bit RGB I/O and DV/DVCP/DVCP 50 codec I/O support. As with all Digital Voodoo software updates, it was free to registered users. The card is covered by a warranty that includes free repair for the first two years. Lifetime 24/7 customer support, although handled by one person in the US, is free and offered via phone and e-mail. An online area for registered users is provided, but no forum. My card arrived with no documentation, but a user's guide now ships with the product.

The SD|Flex is a solid investment offering excellent image quality, multi-format compatibility, and SDI. With image-critical HD video becoming commonplace and the need to support older formats (SuperVHS and BetacamSP), semi-pro and professional video editors, 3D animators, and video graphic artists should consider the SD|Flex. ■■

Tom Patrick McAuliffe is a writer, award-winning video creator, and former member of the US Navy's Combat Camera Group.



Designed for professional Mac users, the SD|Flex offers high-end digital output that is future-proofed with SDI.

SD|Flex

Price: \$2495

Minimum System Requirements:

Dual 2GHz computer with 512MB RAM or more, ATI Graphics card, ATTO UL3D SCSI card with 4x Seagate Cheetah Ultra 3/160 SCSI disks (10,000 RPM or greater), Keyspan USB Serial Adapter, Mac OS 10.3.5, and QuickTime 6.5.1.

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SIMULATION

Crafting Crowds

Win Genemation has released GenHead 2.0 and GenCrowd 1.0, 3D face synthesis tools targeted at digital artists and programmers



in the gaming, postproduction, and Web authoring markets. GenHead 2.0 enables users to create 3D animated heads from 2D images and includes a 3D interface, real-time updates, and integrated variable-resolution mesh. Enabling the production of thousands of photorealistic 3D animated heads, GenCrowd 1.0 aids users in developing families and offspring, and controlling age, gender, and ethnicity of individuals or groups.

Genemation; www.genemation.com

VIDEO

Restorative Measures

Win Red Giant Software has announced the availability of Film Fix, film and video restora-

tion plug-ins for Adobe's After Effects Versions 6.0 or later. Developed for documentary filmmakers and postproduction studios, the Film Fix set of plug-ins employs algorithms that enable the automatic detection and removal of such problems as dust, dirt, and other artifacts. Film Fix also can stabilize footage with software-based 2D translation, as well as eliminate inter-frame brightness fluctuations. Red Giant Software, now offering Film Fix for the Windows operating system at a cost of \$1995, anticipates adding support for the Macintosh before the end of the second quarter.

Red Giant Software; www.redgiantsoftware.com



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2005 VES-VFX Festival, held in Santa Monica, CA. Contact 310-822-9181, www.vesfestival.org, www.visualeffectssociety.com.

JULY

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Macworld Conference and Expo 2005, held in Boston. Contact 800-645-3976 or 805-677-4294, www.macworldexpo.com.

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**Chris Landreth's Academy Award winning Ryan**

A Copper Heart Entertainment Production in Co-Production with the National Film Board of Canada in Association with Seneca College - Animation Arts Center. © Copyright 1380098 Ontario Inc./National Film Board of Canada.

Quick Facts: Products

- Maya 6.5 is the latest version of Alias' award-winning 3D software
- For the awards year 2002, the Academy of Motion Picture Arts and Sciences awarded Alias|Wavefront an Oscar® for scientific and technical achievement for the development of Maya
- 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
- Alias' Custom Development Center in California provides custom Maya development services to film and game development customers
- StudioTools is used by all major automotive manufacturers in the world
- Alias SketchBook Pro is bundled with Acer®, Electrovaya®, Motion Computing®, NEC Solutions America, Toshiba® and ViewSonic®
- In November 2004, Alias started shipping MotionBuilder®6
- The unique Alias MotionBuilder real-time architecture, intelligent character technology and breakthrough story system lets any 3D animator create state-of-the-art results in record time
- Alias MotionBuilder is built to surpass the demanding requirements of animators working on state-of-the-art feature films, FX, games, television series and commercials, and deliver unrivaled animation power

Quick Facts: Global Customer Services

- Alias support ensures that the maximum potential of your software investment is achieved. A full suite of support services are available including: online resources, single incident phone support and Platinum and Silver membership services
- Alias' vast selection of Learning Tools include books, DVDs and CD-ROMs and offers users a self-paced approach to learning. The "Learning Series" is aimed at the new user to develop principles and foundation knowledge and the "Techniques Series" is aimed at the advanced user to master particular features or workflow
- MasterClasses and seminars provide short-format training solutions where industry leaders present their own tips and tricks when using Maya or StudioTools
- Alias Professional Services provide the ultimate control over integrating and enhancing Alias software in your organization. Whether it's custom engineering, custom training, custom support or visualization services, Alias Professional Services will deliver the right solution at the right time for you to meet your objectives

For more information on Alias solutions, please visit www.alias.com

**Range Stormer**

Image courtesy of Land Rover

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Our Debut Product: NUKE™

In keeping with that mandate, D2 Software released NUKE, Digital Domain's flagship compositing application, at NAB 2003. NUKE (short for "New Compositor") has been used by Digital Domain for over ten years on over 40 feature films and hundreds of commercials. It offers several key feature advantages over competing products in the high-end segment:

- A full 3D compositing workspace
- 64 channel scripting
- Fast, 32-bit floating point rendering
- Open FX™ (OFX) plugin support
- Spline and grid-based warper/morpher tools
- Paint tools

Since its release, high-profile effects houses throughout the world have adopted NUKE as their compositing and effects solution.

**nuke™**

NUKE 4.3 interface displaying (clockwise from top left) flowgraph, 3D viewer, 2D viewer (with wipe), operator panel, and curve editor.

What's Next

Given the success of NUKE in the marketplace, D2 Software has plans to release other powerful, production proven products in the near future. Like NUKE, each will draw on D2 Software's unique relationship with Digital Domain, a visionary in high-end production software with a broad portfolio of marketable products.

D2 Software's long-term goal is to offer a complete suite of interoperable production tools designed to provide facilities with end-to-end solutions for even the most difficult jobs. These products will not only address content creation, but also infrastructure and pipeline needs.

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- Cross-platform floating licenses
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To learn more about D2 Software and the product solutions it has to offer, please visit www.d2software.com, or contact us at sales@d2software.com or (310) 314-2883.

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