



The Power to Bring Characters to Life



AMD64 technology helps DreamWorks Animation stay on animation's leading edge

THE CHALLENGE

- Today's animated films require huge numbers of CPU hours for rendering — and future projects will likely require more
- In complex scenes, 32-bit systems can only deal with a small portion of a frame due to memory limitations
- Any initiatives to increase processing capabilities had to meet tight constraints on data center size, power and heating requirements

THE SOLUTION

- AMD Opteron™ processor-based servers and workstations
- HP xw9300 and xw9400 artist workstations powered by Dual-Core AMD Opteron processors
- HP ProLiant DL145 render farm servers powered by Dual-Core AMD Opteron processors
- Homogenous multi-core AMD64 technology

THE IMPACT

- Seamless transition from 32- to 64-bit afforded use of much greater memory, enabling artists to work on larger portions of more detailed frames
- Reduced turnaround time using the dual-core systems makes animation process much more interactive
- Dual-core render farm servers significantly increased the processing power while keeping data center space, power, and heat constant

A move to HP workstations based on the 64-bit AMD Opteron™ processor has helped empower DreamWorks Animation SKG artists' creativity when developing the characters, scenes and special effects behind its popular animated films. In addition, HP servers based on the same AMD Opteron processors have enabled the studio to significantly increase the rendering power of its server farms without expanding its data center, all while keeping electrical power and heat demands constant.

With computer-generated hits like "Shrek," "Shark Tale," "Madagascar," and "Shrek 2" in its portfolio, DreamWorks Animation SKG has a history of pushing the edge, using more sophisticated special effects and more detailed animation in each subsequent film. However, last year the company realized that continuing that trend of innovation would require a change in its computing strategy.

Specifically, it took an estimated 15 million render hours to create its recent release, "Over the Hedge." For the audience, those render hours add up to a very different computer generated movie experience.

"It's not like any other CG movie that we've seen yet," says Karey Kirkpatrick, a co-director of the movie. "Usually, animation starts with painting and it's sort of bringing the painting to life, bringing

artwork to life. We brought a camera to the characters and treated the whole thing photographically. It's funny — people see it and they wonder if it's 'photo-real,' but it's really more experiential."

The movie's other director, Tim Johnson agrees. "We made the filmmaking as experiential as possible. We made a rule very early on that with the exception of one or two shots, everything was going to be experienced from the animal's point of view. So we basically put the camera 12 inches above the ground and looked up at the human beings. And as a result, I think that 'Over the Hedge' ends up being a more immersive experience to the audience than it might be in another animated movie."

“Multi-core technology lets us put more cores in front of an artist - using the same space, same power, and same heat.”

- Skottie Miller, Senior Technologies, Feature Animation, DreamWorks Animation

To continue in this tradition of pushing animation in new directions, DreamWorks Animation expects every new film will require even more compute power to deliver better on-screen performances and experiences. To stay ahead of these continually increasing compute demands, DreamWorks Animation made the transition from 32-bit to 64-bit computing and from single-core to Dual-Core AMD Opteron™ processors.

“We deal with very memory-intensive applications. We wanted to be able to access as much memory as we could afford to put into [a] machine,” says Jeff Wike, director of R&D at DreamWorks Animation.

When using 32-bit systems, the memory limitation meant artists would have to work on one small portion of a scene at a time. And in some cases, the systems simply could not handle some tasks.

“When working on ‘Over the Hedge,’ one scene just wouldn’t load,” says Wike. “We had to put it on 64-bit hardware to debug it and to see why it was using so much memory.”

While 64-bit computing seemed ideally suited to handle the company’s memory-intensive workload, much of its work is based on custom-written software, which consisted of about 4 million lines of 32-bit code. To migrate all of their applications to native 64-bit computing over time, they had to ensure the existing code would continue to operate as efficiently as possible during the transition. AMD64 technology was critical in this transition in that both 32-bit and 64-bit applications could run on systems using the AMD processors.

As DreamWorks Animation migrated its applications over the last year, the company has made some changes in the code that were not practical when using 32-bit systems.

For example, when required, double precision floating-point arithmetic could be supported.

Wike notes that this was very useful in movie situations where there was a change of scale, such as when there was a small character living in a huge world. “For example, when we’d zoom into a scene, we were getting round off errors,” says Wike. Use of double precision eliminated these problems.

Another benefit of the shift to the new systems was that artists could work on a larger portion of a scene and could incorporate much more detail. With 32-bit systems, “we had to break down work into parts,” says Skottie Miller, senior technologist, Feature Animation, at DreamWorks Animation. “Now that artists are freed up, they are putting more things in a scene.”

Dual-Core Changes Workflow

The move to 64-bit AMD Opteron™ processors helped DreamWorks Animation overcome the memory limitations of 32-bit systems, but some important applications required both more memory and more processing power.

Wike notes that the people who handle lighting effects deal with texturing and surfacing. Essentially this work takes into account surface features, coloring, and light reflection. Such work is both memory- and compute-intensive.

“The most compute intensive part of [our work] is lighting, which is done in the late stages,” says Miller. “[Because of compute issues] a lighter can only do so much on each scene in a single sitting.”



"The whole [lighting] process is based on iteration," says Miller. "If there is motion [in a scene], lighting changes, so the work would need to be sent to the render farm." With this approach, the lighter might not see the results until the next day.

With 64-bit, multi-core workstations, "the lighters can get their hands around one scene – all of it at one time," says Miller.

Additionally, multi-core is allowing lighting to be more interactive. "Multi-core technology lets us tighten the loop between creative vision and output. It changes the workflow," says Miller. For example, a director or animator can quickly try different things to see which approach is better. "They might ask to see Shrek in this light, jump that way and do it over with different conditions until they get the scene the way they want it," says Miller.

In the creative and production processes, animators use a mix of workstations and render farm servers. Small jobs run on the workstations; major work is submitted to the render farm. Jobs running in either environment benefit from Dual-Core AMD Opteron™ processors.

"Multi-core technology lets us put more cores in front of an artist – using the same space, same power and same heat," says Miller. "Moving [our 1,000 render farm systems] with two sockets to dual-core, we increased the amount of compute processing [to] 4,000 cores in the same space," says Miller. "We didn't have to trade real estate, meaning we had less capital outlay."

AMD All Around

DreamWorks Animation is aggressively adopting AMD technology across the board.

The top tier render farm is completely converted to HP ProLiant DL145 servers with artist workstations close behind, being upgraded rapidly to HP xw9300's and xw9400's, all powered by AMD Opteron™ processors. "We can't get hardware in here fast enough. We're deploying desktops as fast as we can," says Wike.

Part of the demand has to do with meeting the artists' expectations. Wike notes that some of the staff members have incredible systems at home. "The guys who can afford [these systems] and who are graphics aficionados want the same quality and performance at work," says Wike.

Additionally, DreamWorks Animation is adopting notebooks based on AMD processors in other areas of its operations. For example, "the studio runs 24/7, and we want to be able to troubleshoot a problem remotely, [so] we want to use the same platform," says Wike. "Besides, having homogeneous hardware makes sense."

But the bottom line is that DreamWorks Animation needs and will continue to need increasingly more compute power to bring new films to market. AMD64 technology and AMD Opteron processor-based servers and workstations are providing the means to meet these growing demands.

For more information, visit www.amd.com/dreamworks

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