



BY LEE PURCELL

Home-Grown Production Pipeline Rivals Proprietary Platforms: *Attila the Hun* Comes to Life through Cost-Effective Tools

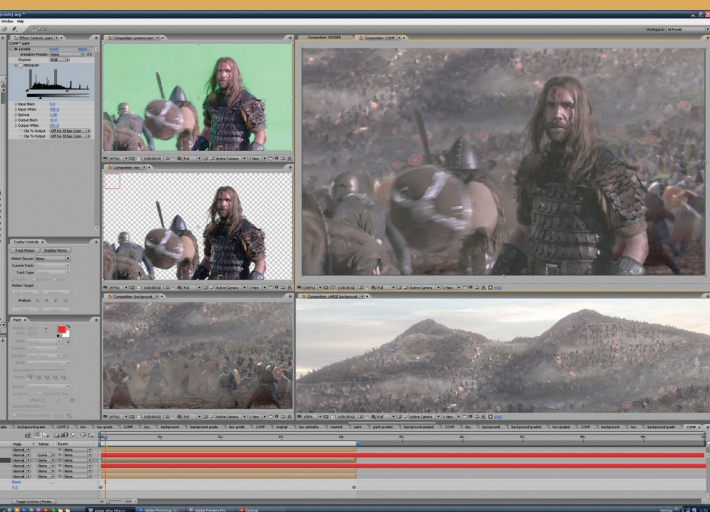
Pushing the performance envelope for video effects was uppermost in Gareth Edwards' mind as he tossed the preconceptions and pricing structures that traditionally hobble video production and created his own accelerated effects studio for the BBC epic, *Attila the Hun*. Over the last few years, Edwards pioneered a number of visual effects processes and he continues to explore new techniques for using the latest platform innovations creatively.

The system platform that he constructed to drive the effects engine—assisted by a friend and technical guru, Dan Goldsmith of Armari Ltd—featured a trio of liquid-cooled workstations, the latest of which features Intel® Xeon® processors and 16 GB of memory. This potent, high-octane processing platform proved equal to the task of producing 250 high-definition (HD) visual effects shots over five months—totaling an incredible two shots a day. Relying heavily on Adobe Production Premium (specifically the Adobe Premiere*, After Effects*, and

Photoshop* applications), Edwards took advantage of the multi-threaded applications to drive the effects-processing pipeline to new levels of performance. Rapid feedback during production was achieved by viewing the ongoing timeline of the production from an HD (720p) QuickTime* file in Adobe Premiere Pro*.

Escalating Effects

Edwards has built much of his professional reputation around the ability to innovatively manage effects—making small budget projects look as though they cost far more. This talent led him to create increasingly more elaborate productions and eventually gain the nod from the BBC to direct the *Attila the Hun* drama. As a one-man, one-workstation, effects-processing wizard for this project, it was in everyone's interests for him to find ways to streamline the workflow, both in the tools and the computing platform used.



Adobe After Effects* was used heavily throughout *Attila the Hun*.

The focus on special effects has propelled his career in ways that even surprise him. After creating the computer graphics for a BBC TV show called *Seven Wonders of the Industrial World*, he received recognition from staff members for achieving an epic look on a low budget. This led to an opportunity to direct a show himself and his reputation continued to build.

“From then on, I plowed all energy into my effects,” Edwards said. “I was given TV shows that were heavy with visual effects to direct. The great thing about doing your own visual effects, the way I am, is that it tends to make your production look like it has twice the money it has, but you can really add to the scope of the project.”

“So, say you have a budget of \$250,000 for a show,” Edwards continued, “you can make it look like half a million. For your next show, people think you had half a million, so they will trust you for half a million, and then you make that look like a million. Then, people will trust you with a million. I found that it was very quick to grow your budget, because normally it takes years to crawl your way up the ladder and get bigger and bigger projects, but by the time I got to *Attila*, it was the third project I had directed. I was very lucky, because without visual effects it could have taken me a few decades to get to that position.”

The Intel-based platform and Adobe Production Premium spurred some genuinely creative adaptations to

expand the scope and appearance of *Attila the Hun*. For example, to create a complex battle scene with 30,000 warriors, he filmed four stuntmen fighting and then copied and pasted these characters, with the timing offset, into the background until he achieved the desired effect. Without the many innovations used in this project, Edwards stated, he would not have been able to complete *Attila the Hun* on time or within the allocated budget.

The Art of Misdirection

One technique that Edwards employs effectively is using the art of misdirection to keep the viewer’s eyes focused on certain areas of a frame and away from areas where subtle flaws in the detail or backgrounds might be visible. He relies on the fact that the human brain can take in only a certain amount of information at a time.

“I don’t know exactly what the math is,” Edward said, “but if you add up 1280×720 pixels (which is what American HD telly is) there are so many pixels and then 30 of those frames every second. You end up with so many pixels that the human brain just can’t take that information in—it is just not how the human brain works: you can only take in so much at a time. I am a great believer that when you watch a shot, there are finite limits to the amount of information you can take from that shot. I have basically pinned my whole career on this idea.”

“If I flash a magazine in front of your face for two or three seconds (which is the length of an average shot in a film), and then pulled it away, you would not be able to recite every single item on that page. You would probably just remember the headline and an item or two. It is like that with shots, as well. Your eye is drawn to a certain place and there are rules about why it is drawn there. It usually goes to the bright areas or to the areas with movement or it goes to areas based on where it was looking in the previous shot.”

“The more you can work on your shot in the context of the film,” Edwards continued, “that is, knowing what content is coming before and after and kind of feeling your way through it, the more efficient you can be. With my Adobe pipeline, I have the whole film laid out on a timeline in Premiere. When I work on a shot, I am constantly rendering it back to the timeline, so I can watch it relative to the sequences. For instance, you might do the world’s

most amazing painting of a city, but if a horse is walking past in the foreground, everyone looks at the horse. Your brain pulls your eyes toward the horse. The great thing about working in telly as opposed to feature films is that, quite honestly, most people are going to watch your show once. There are not going to be

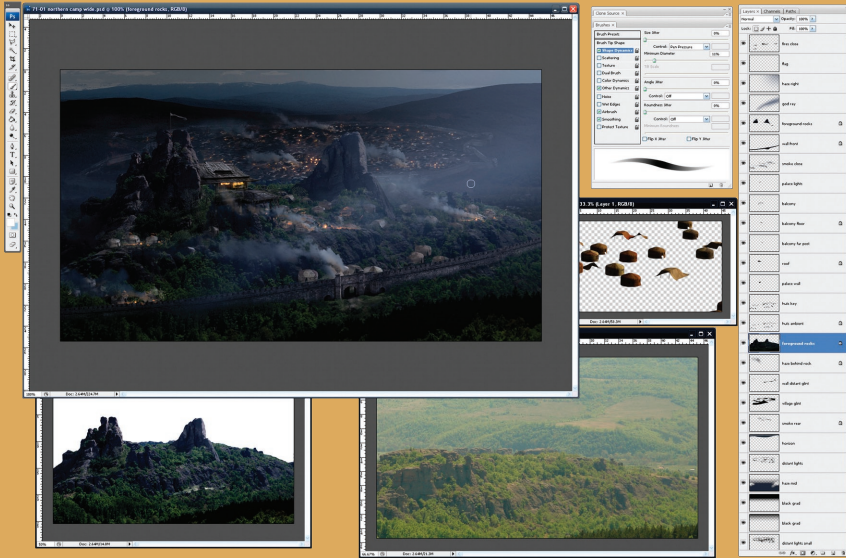
for utilizing the available cores in the multi-processor system. Developed as a flexible workflow tool for Adobe After Effects CS3, Nucleo Pro provides a variety of options for managing rendering and previewing work on multi-core or multi-processor workstations.

I am asleep, because it is downtime anyway. When it starts eating back into your day, however, that is going to cost you money. I launched Nucleo Pro to see the difference and it used all the different cores within the processors. I think it cut the time down to three or four hours. It was a massive amount of difference.”

Adobe Exploits Cores to Good Advantage

The digital content creation tools in Adobe’s Production Premium CS3 get a substantial performance boost from their underlying multi-threaded code. The multi-core processing power available in Edwards’ custom-built system—a full eight cores, four in each of the Intel Xeon processors—can be used to individually divide complex and lengthy operations into discrete threads, which are run in parallel, greatly reducing the overall processing time. Data-intensive operations, which in the Adobe CS3 suite include high-resolution image editing, effects rendering, and audio mastering, benefit from this multi-tasking approach, resulting in better performance and greater responsiveness to operator input through the user interface.

As part of Adobe Production Premium, Premiere Pro, which Edwards used for the post-production of *Attila the Hun*, features a highly threaded program environment well suited to real-time video and audio editing. Multiple threads are used in a variety of ways, including concurrent frame rendering. By rendering multiple frames concurrently—up to the number of cores available on the system platform—overall rendering time can be slashed dramatically.



The multi-threaded software design of Adobe Photoshop* CS3 provided responsive image editing during *Attila the Hun* post-production.

too many people who watch it frame-by-frame for the next twenty years (unless you have got a real hit on your hands). I work on the effects so that people can watch a movie once or twice, thoroughly enjoying it, and not notice anything awry. If you don’t know what has been done to create the effect, most people can look at the same frames over and over and not notice the subtle artifacts. I notice because I know what has been done—I know all the cheats. It is all illusion.”

Boosting Workflow for Rendering and Previewing

Nucleo* Pro 2 from Gridiron Software added another mechanism

The optimized performance option, in particular, works extremely well with After Effects CS3, dividing and managing tasks among the cores efficiently. The combination of Nucleo Pro 2, After Effects CS3, and the custom-built Intel Xeon processor-based workstation cut many tasks down to a fraction of the time required previously. As a rough comparison, Edwards mentions he performed an ad hoc test on a particular segment of video that with his previous system took about 20 hours to render. “For me,” Edwards said, “if I hit Render and it takes 20 hours to render a shot, this is too long. I’m happy to render overnight, while



A furious battle takes place in front of the green screen background.

This approach also scales extremely well so that as additional processor cores are brought online, they can be utilized to further enhance performance.

Other applications in the suite also benefit from threading. Adobe Photoshop achieves a performance increase from splitting portions of images apart for parallel processing on individual cores. Similarly, Adobe Audition* 1.5 streamlines audio monitoring, editing, and mastering operations through strong reliance on multi-threading.

Efficiency in a production pipeline comes down to very real monetary issues and the faster the workflow can be handled, the more cost-effective it is to the producer. Gareth

Edwards demonstrated the validity of using a high-performance workstation and Adobe Production Premium CS3 components to deliver exceptional video project results on an aggressive schedule that would tax any system.

The Benefit of Xeon Inside

Collaboration between Adobe and Intel during the development of Adobe CS3 resulted in a number of strong enhancements that strengthen the responsiveness of the applications during complex processes and shorten data-intensive operations. These enhancements ready the Adobe CS3 applications to fully exploit the capabilities of the latest Intel processor architectures, including the 45nm technology and 47 new Streaming SIMD Extensions (SSE4) available with the Penryn microarchitecture.

The SSE4 instructions are given a workout in a number of functions in Adobe CS3 applications, including the motion module, composite operations, cross dissolves, gamma correction, and color correction. One of the key advantages now is that the results of these features can be viewed in real-time, without the need to render segments from the timeline in order to visualize the effects. The number one effect used in Adobe Premiere—the cross dissolve of two HD MPEG video streams—can be previewed in real-time because of the optimization work that was accomplished.

During the collaborative work, Adobe received guidance from an Intel application engineer, who hand-tuned many of the primary SSE4 functions for detection and execution on Penryn-based and Core 2 micro-architecture platforms, optimizing the code paths. Engineering guidance was also provided to improve threading.

Tuning and optimization work relied on the proven stable of Intel® Software Development tools that have won over a generation

MULTI-THREADED MONSTER: MACHINE SPECIFICATIONS

The computer workstation that drove this project bears consideration, because its performance contributed to bringing the BBC drama in on budget and on time. The key components included:

- Dual-socket motherboard fully populated with Intel® Xeon® 5355 processors, based on 65nm technology, running at 2.66 GHz in a liquid-cooled environment
- 16 GB of system RAM
- Microsoft Windows XP*, 64-bit
- 1-gigabit Ethernet networking
- 3.35 terabytes of total network data storage
- Dual x16 PCIe graphics support
- Software packages that included Adobe Creative Suite* 3 and GridIron Software Nucleo* Pro 2

This particular workstation configuration is well suited to the demands of digital content creation,

including features that make it possible to work with larger, more complex projects and to maintain responsive system interactivity while running multiple applications concurrently. Individual application performance is accelerated, particularly for software designed to take advantage of symmetric multi-processing (SMP) and threading.

of programmers, including Intel® VTune™ Performance Analyzer, Intel® Thread Profiler, Intel® Integrated Performance Primitives, and the Intel® C++ compiler. The productivity boosts that have been achieved thanks to the cooperative engineering work between these companies will streamline digital content creation and cut hours from production times.

Taking it on the Road

Edwards has started taking time off from the grueling production schedules to speak at events and share his knowledge of video techniques that can be accomplished with an Intel Xeon processor-based platform and Adobe CS3 tools. In late June, he spoke at the European Education Design and Technology Conference, sponsored by Intel and Adobe. The attendees included top video professionals and the leading design schools and institutions, with a focus on pure technology.

“Some of the feedback that I received from this event,” Edwards said, “is that even the teachers and professionals involved in this industry have a very hard time staying up to date with the latest developments. Everything moves so fast—especially the hardware and the software.”

The significant advances in home-based production capabilities surprise even some veterans in the industry, many of whom expressed wonder at the current state of workstation power. Edwards said, “I show them they

don't have to be limited anymore. I have always aimed with the work I do to make it as cinematic as I can. *Jurassic Park* came out around 1993 or so and at the time there was no way you could do that sort of thing on a home computer. You wouldn't really be able to attempt that stuff for another seven years or so. But now the gap between cinema and content you can create at home has closed to within months rather than years. As an example of that principle, I point out that *Attila the Hun* had 250 visual effects, which is more per hour than *Lord of the Rings* had. And it was just done by one person. I'm just hoping to open people's eyes to the many things that have changed since I was in film school and get them excited and involved in the latest developments.”

Establishing a New Path

The sophisticated video effects solution and production pipeline, designed around a custom-crafted Intel Xeon processor-based workstation, gave Gareth Edwards the tools he needed to successfully complete *Attila the Hun*, a complex and challenging digital-content creation project for the BBC using Adobe CS3 Suite. The path that Edwards has created suggests that future productions can be accomplished in a cost-effective way on the latest generation platforms based on Intel® Core™ microarchitecture, establishing a trend that promises to greatly improve the efficiency and impact of video productions that rely strongly on effects processing. ■

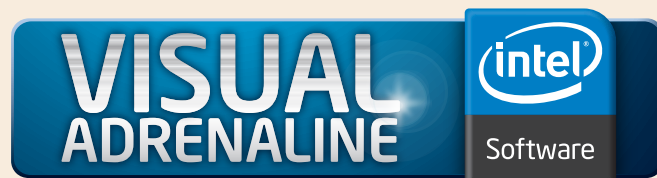


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Having survived the frenetic energy of Silicon Valley in its heyday, Lee Purcell now writes on high-tech and alternative energy topics from a rural outpost in the Green Mountain State. Thanks to Mesh Communications Group (www.meshgroup.com), through which he does much of his writing, telecommuting has replaced long carbon-spewing drives. Lee blogs on alternative energy topics at lightspeedpub.blogspot.com.

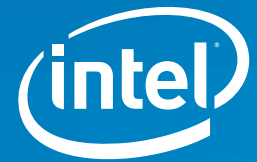
For more information about digital content creation using Adobe Creative Suite* 3 Production Premium, visit www.adobe.com/products/creativesuite/production/.

To learn about how Gareth Edwards accomplished special effects in *Attila the Hun*, go to www.fxguide.com/article463.html.



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The Intel® Core™ i7 Processor Tips the Performance Scales



That day in a product's lifecycle when the code name gives way to the actual product name and the formal announcements begin is always a day to celebrate. Having applied the finishing touches to the processor design code-named Bloomfield, the Intel engineering team have much cause to revel in their next-generation accomplishment. Bloomfield is the first product based on the innovative microarchitecture code-named Nehalem and built with Intel's groundbreaking new hafnium-infused 45nm high-k metal gate transistor technology.

Having already acquired a reputation as a processing workhorse, the Intel® Core™ i7 processor suits applications where large volumes of data, complex algorithms, and real-time requirements converge. The processor design, featuring four cores and eight threads, excels at demanding tasks such as 3-D rendering and animation, video and image editing, and immersive and realistic gaming.

Not only is the Intel Core i7 processor one of the fastest performing processors on the planet, but it also introduces *intelligent processing* features that enable the processor to automatically increase processor performance when it is needed and reduce energy consumption when it is not. The Intel Core i7 processor has a built-in power control unit that monitors the temperature and power

use of the cores, disabling them when they're not in use. Thanks to this technology, the energy consumption of an unused core is next to zero. Intel® Turbo Boost Technology provides extra horsepower, dynamically increasing the processor's frequency when needed by taking advantage of thermal and power headroom when operating below specified limits. Intel® Hyper-Threading Technology supports up to eight simultaneous threads, ideal for distributing AI, physics, and rendering for ultra-realistic gaming. An integrated memory controller boosts memory bandwidth performance, and the 8 MB shared Intel® Smart Cache dynamically allocates resources to match the demands of individual cores for fast, efficient data manipulation.

Working closely with key players in the ecosystem, Intel has helped over a hundred independent software vendors optimize applications to take advantage of multi-threading capabilities. The stage is set for a scorching performance with the Intel Core i7 processor.

