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Unleashes  
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# Lenovo Unleashes Unreal Power

**Epic Games relies on Lenovo ThinkStation workstations for development of its cutting-edge game-creation system** By David Cohn

The soldier runs through a ruined urban landscape, the hulk of a burned out vehicle burning in the distance. Suddenly, an alien creature looms in front of him. Reacting quickly, he aims his Lancer assault rifle and fires away at the beast, blasting away bits of its armor until at last, the monster crumples to the ground. But as he moves forward, he can hear other battles raging, and he knows that within moments, he'll be confronted yet again.

A scene from yet another sci-fi blockbuster at the local multiplex? It could be. But in this case, it's just another encounter in the fast-paced video game *Gears of War 2*. This third-person shooter—a game consisting primarily of shooting in which the player assumes the role of one of the characters and views a 3D virtual world from the cinematic perspective of a virtual camera—is hugely popular, selling more than 5 million copies, winning

numerous awards and grossing more than many Hollywood films.

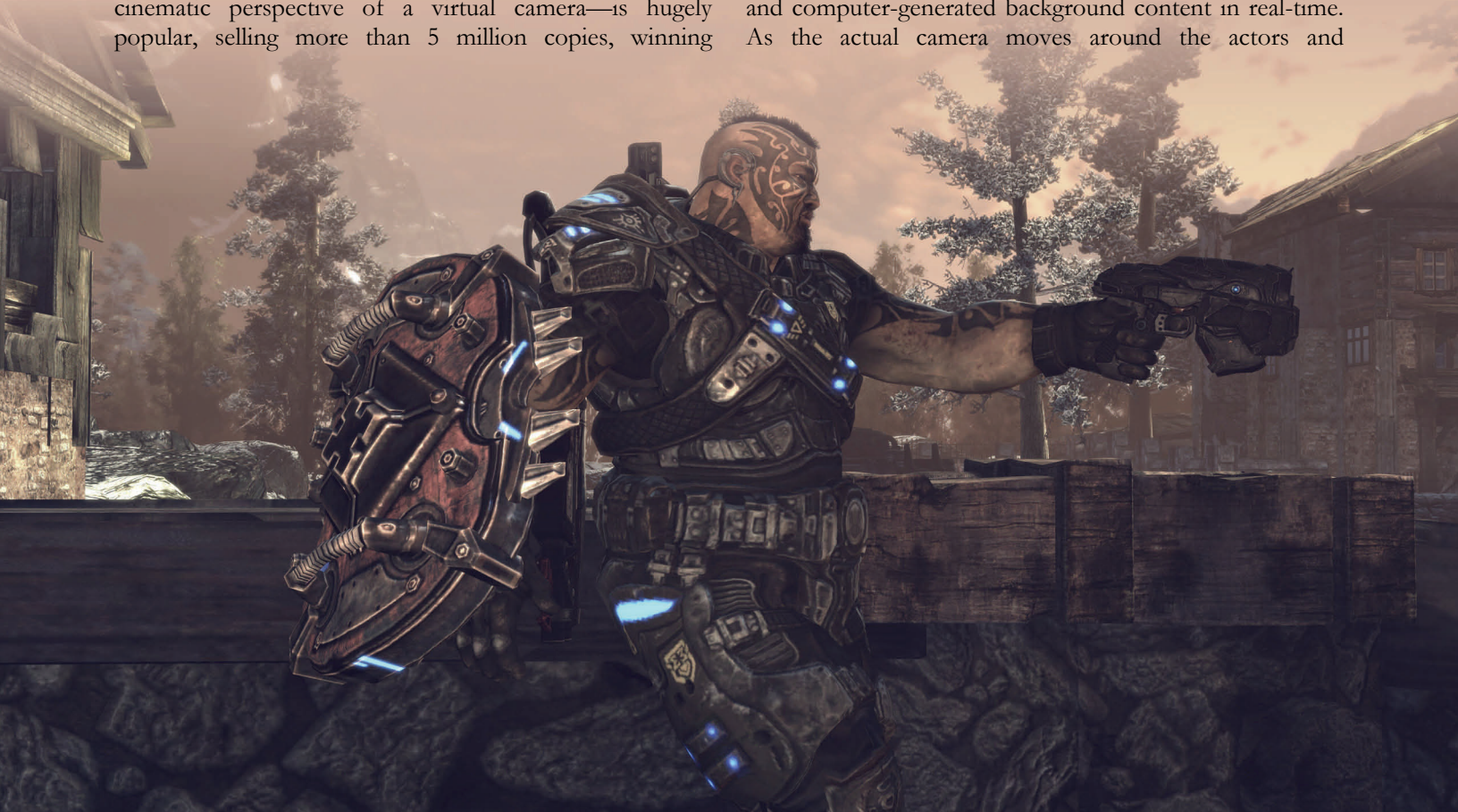
The fast-paced action and stunning visuals come about in large part thanks to the game's underlying technology, Unreal Engine 3. Developed by Epic Games, a cutting-edge game developer based in Cary, North Carolina, the Unreal Engine is a game development platform providing an array of technologies, content creation tools, and support infrastructure tailored specifically for the unique needs of game developers and creators of other 3D animated content. According to its developers, every aspect of the Unreal Engine is designed to put as much power as possible in the hands of artists and designers.

## **Not just playing around**

First used in 1998 in Epic Games' own first-person shooter game *Unreal*, the Unreal Engine has since been the basis for many popular games, including *BioShock*, *Medal of Honor: Airborne*, *Tom Clancy's Splinter Cell*, and *Harry Potter and the Philosopher's Stone*.

Epic's Unreal technology also provides the platform and tools needed to develop other cutting-edge 3D projects. HKS, one of the leading architectural firms in the world, is using the Unreal Engine to bring 3D building models to life on projects such as the W Hotel in Dallas and the Dallas Cowboys football stadium. By leveraging the interactive gaming technology of the Unreal Engine, the architects and their clients can walk through and experience virtual buildings in real-time at their own pace.

Producers of Nickelodeon's award-winning children's TV series *LazyTown* utilize the Unreal Engine to blend live-action and puppetry on a physical set with a green screen and computer-generated background content in real-time. As the actual camera moves around the actors and





*LazyTown*, Nickelodeon's award-winning children's show, uses Epic's Unreal Engine to combine live-action and puppetry with computer-generated content in real-time.

physical set, the backdrop scene also moves in real-time, opening up creative possibilities never before possible.

In addition to its technical wizardry, the Unreal Engine provides a high degree of portability, supporting multiple platforms including personal computers running Microsoft Windows operating systems as well as video gaming consoles including Xbox 360 and PLAYSTATION 3. The Unreal Engine's constantly evolving toolset and support for numerous platforms have made it one of the most popular development tools currently available. But it's in the world of video games where its reputation shines.

### More demanding than movies

Video games are among the most demanding of applications. In order to achieve the high degree of interactivity and visual fidelity expected by game players, video games require high-end hardware—sophisticated graphics cards and multiple processors, or the latest gaming consoles. If the games themselves require this kind of horsepower to play, imagine what it takes to create them.

The development of any successful game involves many of the same processes traditionally found in film making. Games begin with pre-production, in which the game designers develop early concept art, come up with the overall design, produce early prototypes and 3D models, and generate elaborate storyboards to help chart the story arc. Once the development team moves into actual production, teams of artists must not only produce complete three-dimensional worlds, they also have to create the actors, the three-dimensional avatars representing both the characters that the game player will control throughout the life of the game as well as every other antagonist, monster, bit player, and extra they interact with. Unlike films with physical sets and live actors, everything in a video game must be created digitally and the story and interactions programmed by teams of technical and creative designers.

Much of this begins by capturing the movements of real actors. Epic does all of its own motion capture in-house, in a state-of-the-art mocap facility equipped with more than three dozen Vicon cameras. All of the cinematic sequences in the games are recorded using real actors and physical props. Epic's animators then translate that data into highly polished realistic scenes.

While post production may not involve hours in a cutting room, it does require weeks of testing, bug fixing, and endless tweaking. Even when the development team goes home for the day, their computers continue running 24/7, rendering models and scenes to be incorporated into the next day's production schedule. A team of 60 developers, artists, and programmers were involved in the production of *Gears of War 2*. The team at Epic is always maxing out its hardware.

### Standardizing on Lenovo workstations

To live at the forefront of the highly demanding world of game development, Epic Games requires computer workstations that deliver both state-of-the-art performance and unsurpassed reliability. Epic recently began rolling out Lenovo ThinkStation workstations company-wide for all game and gaming engine development.

The company first started using Lenovo workstations in March, coinciding with its exhibition at the 2009 Game Developers Conference (GDC), the world's largest professionals-only game industry event. It was at that event, held at the Moscone Center in San Francisco, that Epic unveiled the latest edition of its game development engine, Unreal Engine 3. One of the highlights of the new



Epic's creative staff uses Lenovo workstations, such as the new ThinkStation D20, powered by a pair of Intel Xeon quad-core processors, to develop its cutting-edge games.



Architectural firm HKS used Epic's Unreal Engine technology to let clients experience projects, such as the new Dallas Cowboys football stadium, as real-time virtual buildings before they're built.

release is Unreal Lightmass, a global illumination solver that produces high-quality lighting effects, including soft, highly accurate and realistic shadows.

For its unveiling at GDC 2009, Epic ran this highly demanding function on a "swarm" of Lenovo workstations, utilizing a cluster of nine Lenovo ThinkStation workstations, including a mix of D10, S20, and D20 machines, configured and managed using its Unreal Swarm technology. Yet another new feature of the new release, Unreal Swarm is a massively scalable job distribution system optimized for high-speed networks of multi-core PCs. It transparently spreads applications such as Lightmass out over the entire network, harnessing the computational power of all the machines running the Swarm Agent.

"Swarm ran beautifully on the networked Lenovo ThinkStations at GDC 2009," an Epic Games representative reported after the show. "Performance was smooth and consistent, and we were pleasantly surprised with how cool and quiet the server room remained throughout the show."

Even on an eight-core system, rebuilding lighting for large, complex scenes is extremely time-consuming. As a result, in the past, Epic's designers were hesitant to try out different lighting schemes. But with Unreal Swarm, portions of the Lightmass computation can be performed in parallel, distributed across the entire network, multiplying performance many times over and bringing extremely time-consuming operations like global illumination into the realm of iterative development—something heretofore considered to be impossible.

Throughout the week at GDC, and since returning to North Carolina, the Lenovo workstations have performed flawlessly, enabling Epic Games developers and artists to complete work on its new games and upgrades to Unreal Engine 3 on schedule.

"The ThinkStations are really well built, quiet, and fast," said Epic Games vice president Mark Rein. "The service and support from Lenovo has been outstanding as well. We really put our workstations through the ringer when we're building games and engine technology, and the ThinkStation workstations have proven to be valuable and reliable tools."

For its ongoing development, Epic Games has standardized on the powerful Lenovo ThinkStation D20 workstation, each equipped with a pair of Intel Xeon quad-core processors. With the CPU's Hyper-Threading enabled, each workstation can execute 16 simultaneous operations, providing a huge performance increase over the company's older workstations—a significant factor when rendering the complex scenes in a computer game, video production, or architectural simulation. Epic has already rolled out more than 20 of the new Lenovo ThinkStation D20 workstations and will eventually install them company-wide. They not only improve performance, but also consume 35% less power than the previous generation of workstations.

Epic employees use Lenovo ThinkStations to power all aspects of their work, creating 3D models and animations, programming the actual game play and engine code, and releasing the latest build of Unreal Engine 3 to the company's many licensees. Development team members transfer hundreds of gigabytes of data on a daily basis, so reliability and outstanding hardware performance is mission critical. Epic's art and animation teams use 3ds Max, Maya, ZBrush, and Photoshop; the cinematics department utilizes Final Cut Pro to create trailers, cut scenes, and in-game cinematics; and engineering and Q/A rely on Visual Studio 2008, Perforce, TestTrack Pro, and internal tools for game play balancing and stats tracking, along with programming tools such as Intel Threading Building Blocks.

"With Lenovo's S20 digital workbench and two powerful Intel Xeon 5500 series processors, Epic's animators are presented with a premier digital canvas on which to test and refine their ideas," said Tony Neal-Graves, workstation segment general manager at Intel's Data Center Group. "It is amazing what one generation of Intel and Lenovo technology delivers. Epic can make virtual reality feel so real it's incredible."

The Intel-powered Lenovo ThinkStation workstations are helping Epic Games and its partners to not only develop entertaining games with stunning visuals, but also enabling this technology to be leveraged in other fields, such as architectural design and more linear visual storytelling. Not bad for a technology originally developed for shooting aliens.

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