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## Epic's Unreal Engine 3 Gets Faster with Intel<sup>®</sup> Graphics Performance Analyzers

Epic Games, over its 22-year history has established itself as an industry leader and a "Triple Threat": The company creates best-selling, multi-genre blockbusters, including *Unreal Tournament*\*, *Gears of War*\*, and *Infinity Blade*\*. It delivers immersive games on a wide variety of PC, mobile, and console platforms. And it provides legions of developers with its Unreal Engine\* technology, the algorithmic wizardry that transforms a designer's imagination into a gamer's reality.

The award-winning Unreal Engine is the cornerstone of Epic's success and is considered an industry standard among many game—and motion picture—houses. The free version of Unreal Engine 3 (UE3), the Unreal Development Kit (UDK), has more than 2 million unique installations. Licensees of full source UE3 have used it to power more than 300 triple-A games since 2006, including *BioShock*, *Batman*, and the *Borderlands* series. Most recently, the company released *Epic Citadel*\*, a free, downloadable application that showcases the technical prowess of UE3 for mobile platforms including Android.

Epic's success is driven by a singular goal: Deliver a superior gaming experience on as many major platforms as possible. The PC, which comprises desktops, laptops, and Ultrabooks, remains the leading gaming platform, having knocked consoles out of the top position by sales volume nearly four years ago. But mobile is seeing incredible growth as well, particularly as mobile technologies are increasingly capable of supporting compute-intensive graphics and higher frame rates.

Given that Intel<sup>®</sup> processors power a majority of the world's gaming platforms by volume, it made sense for Epic Games to take advantage of the Intel<sup>®</sup> Graphics Performance Analyzers (Intel<sup>®</sup> GPA), using the comprehensive tool suite to optimize UE3 for the latest Intel processors.

Niklas Smedberg, Epic's senior engine programmer, is deeply familiar with UE3 and how to get the most out of it. "We chose Intel GPA for two main reasons: the ability to debug our rendering pipeline and graphics effects, and the ability to profile graphics performance on many different platform configurations."

### Optimizing Gameplay: More Platforms, More Better

The game engine is a sophisticated piece of software that is the heart of a videogame, making the storyline, characters, objects, and action come to life. Not only does it control the operation of elements such as textures, physics, and artificial intelligence, it allows game content to be created, tested, and optimized on a PC, and then exported to other gaming platforms.

Until recently, Epic targeted UE3 toward the high-end spectrum of desktop PCs. But with the exponential growth of laptop users who play games, Epic expanded its strategy and now includes as many laptop configurations as possible, with specific focus on systems with the world's most prevalent graphics chipset; Intel<sup>®</sup> HD Graphics. Using Intel GPA's remote profiling feature, Epic was able to connect several differently configured laptops to a single Intel<sup>®</sup> Xeon<sup>®</sup> processor-based PC and simultaneously profile, test, and optimize each configuration quickly.



## Mobile Game Development Just Got Easier

Unreal Engine 3 for Android is packed with the same tools developers use to create best-selling games, training simulations, and cinematic content. If you're a licensee, Epic will provide the code used to ship *Epic Citadel*, giving you the full benefit of the new optimizations.

Unreal Engine 3 games for Android can now support both ARM and Intel processor-based devices natively.



Additionally, Intel GPA improved UE3's iteration time—the ability to implement and test large amounts of gameplay features in short, rapid development cycles—which is vital to the quality and “fun factor” of the game. Aided by Intel GPA, Epic was able to significantly increase its test iteration speed and get deep performance analysis and debugging capabilities for new content and features being developed. These fast iterations allowed them to optimize graphics features and performance on a much larger range of consumer laptops than would have been possible in the past.

## Debugging: Replacing Trial-and-Error with Precision

In addition to cranking up the iteration speed, Intel GPA boosted UE3's ability to improve overall game quality and performance by helping identify, profile, and debug graphics-effects issues.

“One of the most important use cases for Intel GPA is its debugging capability. Although it's very important that GPA can profile performance,

its debugging capability is absolutely critical to making sure each bucket works for all of the various configurations,” said Smedberg.

In a typical scene, lighting, shadows, and post-processing effects are the three main culprits that monopolize frame time. Using Intel GPA's Frame Analyzer, Epic engineers were able to capture and analyze every draw call, uncovering exactly how much time was being spent and exactly where it was being spent; for example, on which shadows, how many shadows, what kinds of shadows. This allowed them to make informed decisions about things such as which shadows to remove or optimize, and which lights to tweak, ultimately enabling the development of much smoother frame rates and optimizing the game for lower-end hardware, which historically has been a lower priority.

According to Smedberg, the ability to precisely measure and tweak these frame-time culprits was crucial. “Anything in the scene that sticks out as being unnecessarily slow can degrade the user experience simply because of a mistake in a setting somewhere. With Intel GPA, these types of issues were all found and fixed. Otherwise we would have been forced to resort to trial-and-error debugging, which is very time-consuming.”

## Shaping the Future

Using Intel GPA, Epic was able to uncover optimization opportunities and improve UE3 to support games played on Intel processors-based machines, from budget laptops to high-performance gaming systems.

For Epic Games, Intel GPA was a clear choice over competitor tools. “It's very easy to set up and get started, and the layout, usability, and user interface are really nice,” said Smedberg, adding, “But in particular, the ability to keep taking frame captures and analyzing them without having to shut down the application is great for fast iteration time.”

The game industry is larger than ever and the variety of gaming platforms—user-friendly PCs, ubiquitous mobile devices, and mature consoles—is evolving at cosmic speeds. So what's a developer to do? “The gaming space is at a very interesting point, and every major industry player has a unique opportunity to shift the tidal wave,” said Smedberg. “But no matter the game platform, using tools like Intel GPA to debug and optimize games is still the most efficient. In many ways, Intel GPA is better than any other tool on any platform.”

Learn more about the Unreal Engine: [www.unrealengine.com](http://www.unrealengine.com)

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