



# FIEA DEVELOPERS RATE INTEL® SOLID-STATE DRIVES AN A+

BY GARRET ROMAINE

**SOMETIMES ENGINEERS JUST HAVE TO SEE FOR THEMSELVES** They can read the specs and study the numbers, but until they actually perform experiments in a lab setting, they tend to be doubters. Various marketing literature and anecdotal evidence may suggest that solid-state drives are faster than conventional rotating drives, but maybe those tests were in uncommon configurations that don't equate to real-world settings. Or maybe the testers were biased.

It turns out that, based on easily duplicated tests taken from throughout the game-development process, Intel® Solid-State Drives (Intel® SSDs) offer performance improvements from top to bottom. Access times for standard, spinning hard-disk drives average about 5 to 10 milliseconds (ms), mostly because those heads have to move and wait for the data to rotate into position beneath the read/write head. Solid-state drives feature access times around 0.1 ms. The drives access data directly from the flash memory, resulting in dramatic speedups.

Recently, a team of bright graduate students from the Florida Interactive Entertainment Academy (FIEA) received a gift of Intel SSDs to perform rigorous testing against conventional hard drives. The team had recently completed an exhausting, eight-month, game-development exercise that resulted in a solid, professional-quality game demo. The students then decided to retrace their development steps and



compare the compile times, rendering tasks, and other chores between drives. For any PC enthusiast who has recently built his or her latest “dream machine” without an SSD, the results are sobering indeed.



## Four Guys and a Dream

Like other universities with game-development curriculum, FIEA requires graduating students to complete a grand, unifying capstone project that puts to use their newly gained knowledge. For eight months, team members perform as if they work at a real game studio, mapping out levels, creating original art, perfecting the artificial intelligence, and completing dozens of other tasks. The ultimate goal is to create a professional-quality demo, or portfolio piece, that is ready to show off. Doing so requires a lot of PC horsepower, performing some tasks repeatedly in a grueling, iterative process.

*Intel® Visual Adrenaline* caught up recently with students Joey Hannes and Alan Landau, who

walked us through the project. Landau said the game actually started taking shape far ahead of the first day of class. “It was basically four guys in a room—Andrew Bertino, Andrew Gassen (who became the lead designer), Tim Tryzbiak (who became the lead programmer), and myself, who became the project lead—and we were just talking and throwing ideas around. We had to come up with a large-scale game for our graduate school program. We found out quickly that the game we each wanted to make was relatively similar.” Other students, including Joey Hannes, producer and lead level designer, soon joined the team, and the project gained momentum.

Eventually, what took shape was a game called *Nexus*, a third-person puzzle and platforming action game built on the Unreal\* Development Kit and featuring a journey through the hidden ruins of a forgotten civilization. Players fight adversaries and solve puzzles to escape before the ultimate collapse of the ancient ruin. To create the game, the students used Dell Precision\* M6500 laptops with 4 gigabyte (GB) RAM and Hitachi Travelstar\* 7K500 hard drives, all powered by the 2nd generation Intel® Core™ processor family.

Landau said the student team felt they had the PC horsepower to strive for some lofty goals. “We wanted to create a student game that was as close in quality as possible to an industry game. We really focused on quality and user experience over quantity of levels and time played. At the beginning, we all had high aspirations and we wanted to create four hours of content, but it wound up coming down to about 30 to 45 minutes of awesome game experience.”

The four-man team grew to 19 different students at one point, and they borrowed the art and graphics expertise as needed. Course requirements

included some modest documentation, marketing plans, and even packaging.

Although the game was successfully completed, the team found that during the process their PCs often got bogged down with compute-intensive tasks, resulting in increased program lag time, longer load times, and frame hitching. “It can be tough to stay on task when you’re uploading a level build, and it seems like you’re waiting forever for it to finish. You start getting distracted and work on other things such as e-mail or social media. At the end of the day that lost productivity adds up,” said Hannes.

And as interesting as their final grade was on their transcripts, they were curious to take their title “on the road” and get some feedback from active gaming professionals. Eventually, the team met up with Intel representatives. According to Landau, “We were showing it at the SIGGRAPH conference in Vancouver, and that was where we met with Intel’s Kevin Crow. He saw the game and he was impressed.” The team and Kevin talked for quite a while about the various tasks they had performed, and soon enough the hardware specs for their development system came up.

The team was curious to know how a solid-state drive would increase productivity during the development process. Could they render scenes, update levels, and increase overall team productivity? And would Intel SSDs be able to reduce lag time to improve gameplay?

Crow saw an opportunity for real-world, bona fide comparison testing, or as he calls it, a “proof point.” He asked the team if they were interested in replacing their conventional spinning hard drives with new Intel SSD components, in order to perform “before and after” tests using the

*“When you add up all of the time saved, it is not necessarily going to be an instant impact . . . it might be a 50 percent savings, but that savings might only be two seconds. But if it is a larger savings, like 30 seconds while you open a file . . . and you do that 300 times a day . . . it adds up to many man-hours saved. And in the game production cycle, that means more time to work on a game and less money spent on producing that game.”*

– ALAN LANDAU, NEXUS PROJECT LEAD

team’s code. After exchanging information and handshakes, the team went back to Florida and started checking their mail daily, looking for that special package.

### Pick Apart a Laptop

In days, the FIEA students found themselves unwrapping brand new Intel SSD 320 Series. “The laptops that we have are pretty much desktop replacements. They’re like workstations with SATA drives built in,” Landau said. “So it was a pretty easy exchange.”

But before they could make the swap, they needed baseline data. Landau said they began their investigation before the drives arrived. “We started doing tests based on our usual typical tasks for artists, programmers, and producers, and that’s where we did all the comparisons. We set up our initial task list, and we started with the original spinning hard drives. We ran through the typical scenarios we were already familiar with, because we did those tests on a daily basis during development.”

Then it was time to swap out the hardware. While some of the most seasoned PC enthusiasts loathe taking apart a laptop, fearing the act of removing the case, the students weren’t fazed. “We just had to take a couple of screws out and actually remove a hard drive, but it was pretty much plug and play,” Landau said, shrugging it off.

Next came the same experiments with the new drives, which were formatted and provided with a software image identical to the original. The tests involved a variety of common developer tasks, such as timing how long it takes to have the

game demo ready from a cold PC boot, performing a full sync of project game files, making scene adjustments, and packaging up an executable demo build for their project lead to review. They also compared the two PCs for gameplay to see if there was a noticeable difference in user experience. “We did the same tests with the [Intel] SSDs and saw a couple of differences here and there, but they weren’t really that far off. They were all within the same ballpark of the results that we showed earlier,” said Landau.

But when they moved to the tests that were hammering the hard drive repeatedly, the results were dramatic. There were big reductions in time for rendering, for example. Joey Hannes said, “That

was one of the heavier tasks, and overall with everything we did, it was usually about a 50 percent or better difference in how long it took. Then from there it just went up exponentially as the time went out. It was more noticeable on something that took an hour before and now takes only 30 minutes.”

Landau said that there were subtleties in the time differences as they kept testing. “What is really evident when you add up all of the time saved, it is not necessarily going to be an instant impact. Like Joey said, it might be a 50 percent savings, but that savings might only be two seconds. But if it is a larger savings, like 30 seconds while you open a file or something like that in [Autodesk] Maya\*, and you do that 300 times a day and you have 15 artists, it adds up to many man-hours saved. And in the game production cycle, that means more time to work on a game and less money spent on producing that game.”

### More RAM versus Solid-States Drives

The team also tested their 4 GB RAM PC with an Intel SSD against a more powerful 8 GB RAM PC with a Hitachi Travelstar 7K500 hard drive to really put it to the test. They compared PC

TEST	PC WITH HARD DRIVE	PC WITH INTEL® SSD	TIME SAVED WITH INTEL SSD
Perform cold boot to have game demo ready	6 min 19 sec	1 min 51 sec	4 min 28 sec
Full sync of project game files	1 min 30 sec	1 min 4 sec	26 sec
Perform scene adjustment and update level	3 min 24 sec	2 min 29 sec	55 sec
Create fully packaged level .exe demo build	24 min	16 min 15 sec	7 min 45 sec

TEST	PC WITH 8 GB RAM AND HARD DRIVE	PC WITH 4 GB RAM AND INTEL SSD	TIME SAVED WITH INTEL SSD
Batch rendering of dynamic animation	1 hr 49 min	1 hr 5 sec	48 min 55 sec



Comparison of image texture 1.5 seconds after loading a level: PC with hard drive (LEFT); PC with Intel® Solid-State Drive (RIGHT).  
(See lines on coat, detail in cube, and detail inside the structure.)

performance when batch rendering a dynamic animated element. The results from the game-development tests were clear, with the performance of the Intel SSD surpassing the Hitachi drive.

"Intel SSDs give you back time that you didn't realize you could have in your day, enabling you to stay focused and really dive into your work," said Hannes.

Landau agreed, saying, "Intel SSDs allowed our team to move faster, and with greater agility and productivity. If we had Intel SSDs for our entire eight-month project, we could have gone even further."

The performance boost the Intel SSDs offered also improved gameplay. Their video game loaded and ran faster, even with multiple programs open. When playing the game on a PC with a traditional hard drive, they periodically experienced a lag in game visuals and effects. Intel SSDs delivered a smoother gameplay experience. And with video-game worlds becoming more complex and visually rich, Intel SSDs provide the performance boost to help users truly immerse themselves in the experience.

## What's in Your Dream Machine?

Landau said there are three reasons why developers have traditionally been reluctant to upgrade to SSDs. "There's the size of the drive," he said, noting that spinning drives are routinely into the 2 terabyte range now. Then there's price. "SSDs are still relatively expensive for their size, although they are getting a lot cheaper," Landau noted. And finally, there is performance. "Are they really that much faster? That's what we were wondering. I think it is a definite upgrade for any enthusiast, designer, or developer, as well as just a normal PC user—or an [Apple] Mac\* user for that matter."

Landau took the plunge after the experiments were so convincing. "I personally, just two or three weeks ago, built a new dream machine. It is powered by the 2nd gen Intel Core processor. It has 16 GB of DDR 3 RAM, is liquid-cooled, and has a 2-terabyte hard drive. Everything was 7.7, 7.8, 7.9 on the [Windows\*] Index, except for my hard drive, which was 5.4. So I added an Intel SSD 320 Series, and now it is a 7.7."

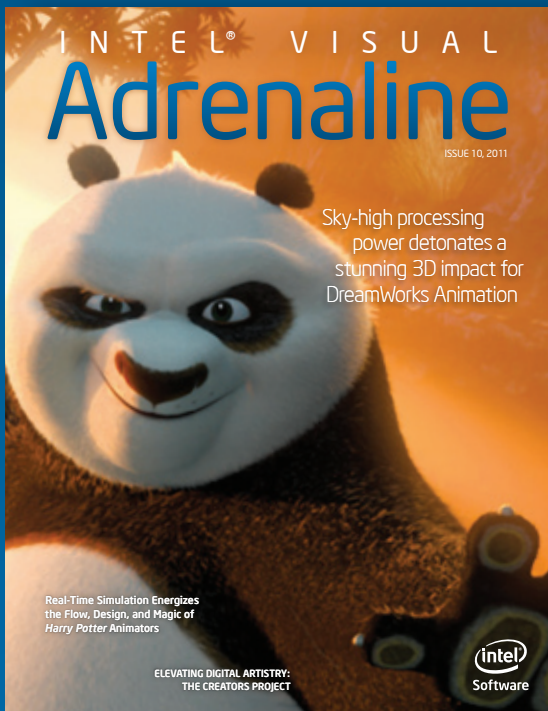
"Once you experience gaming and development with Intel SSDs, you'll have a hard time going back to your old hard drive," said Landau. "Once you go SSD, it is an instant change. You notice it in everything you do, especially if you turn your computer off and on a lot, bring it to hibernate, or do repetitive tasks, such as opening and closing programs or files. For example, artists who open a texture and change something, and then close it and open another one and do that 200 times a day will see a very noticeable change. I would definitely suggest investing in an SSD over buying more RAM. Both don't hurt, but I would pick an SSD before RAM."

Still, you should probably check it all out for yourself. ■



## About the Author

Garret Romaine is a senior writer, working for *Rose & Her Minions*, from Beaverton, Oregon. Garret started in gaming as a beta tester for Epic Megagames and has been a columnist, editor, and reviewer ever since. Garret is a Fellow in the Society for Technical Communication, and he teaches technical communication at Portland State University.



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