CASE STUDY
Engineering & Design Industry
Technical Education

Boost and Enhance SOLIDWORKS* Performance for Engineering Design Workloads

Accelerating CAD workloads on mainstream workstations featuring Intel® Xeon® W processors, Intel® Optane™ SSDs and Intel® CAS.

Computer-aided design (CAD) market trends continue evolving to larger and more complex models, which focus primarily on 3D modeling and 2D drafting. Fast project loading, rendering, and simulations in engineering designs—with the ability for multiple users to update and collaborate on a project—has demonstrated numerous benefits while conversely presenting significant performance challenges.

Challenge

IMPROVED LOAD TIMES MEANS **2X** INCREASE IN DAILY PRODUCTIVITY

Dos Pueblos Engineering Academy (DPEA) is a public four-year Career Technical Education (CTE) program based at Dos Pueblos High School in Goleta, California. DPEA's initial challenge was to serve, from a database, 100 roaming student user-profiles along with complex projects, consisting of up to 10,000 parts. These 100 students initiate separate logon sessions each and every day, on over 60 workstations, in three separate classrooms. Some common operations performed on individual workstations are: synchronizing projects, loading files from the central database or server, retrieving the latest revision of the project for editing, and designing models. To open a model a student must check-out the projects and assemblies, and store a local copy on the client workstation workspace. The students, on average, read and write 60 GB of data per day to the file server. In a typical 8-period school day, they execute on average 246,113 independent read operations and 96,267 write operations. Even while using the best networks, the demands of up to 100 students all at once is tremendous. DPEA needed a cost-effective and non-intrusive solution to the existing infrastructure.

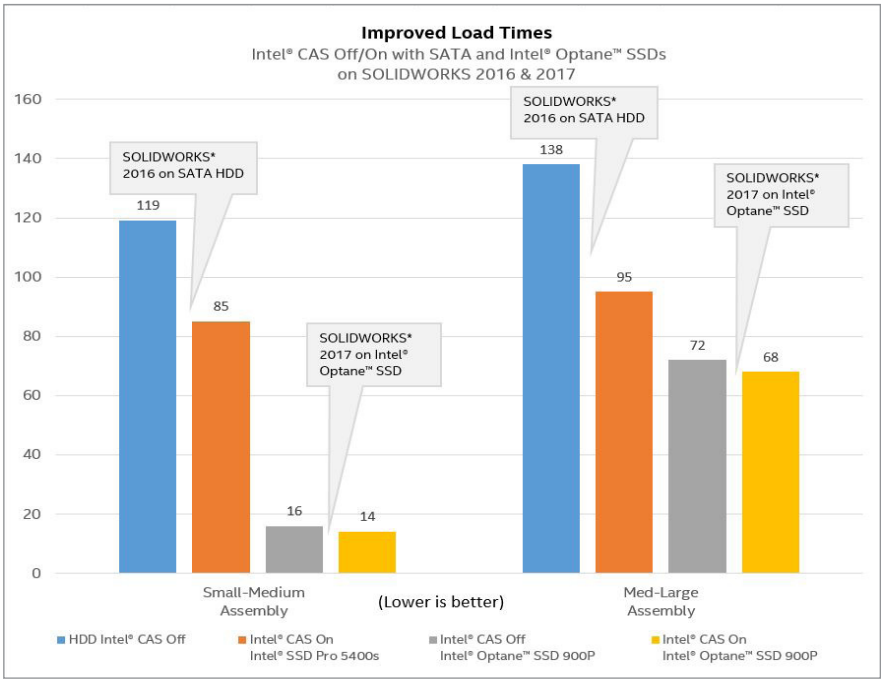
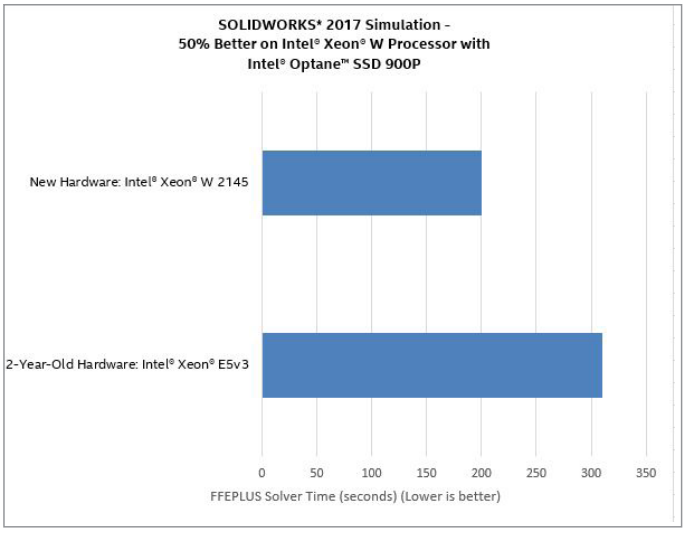
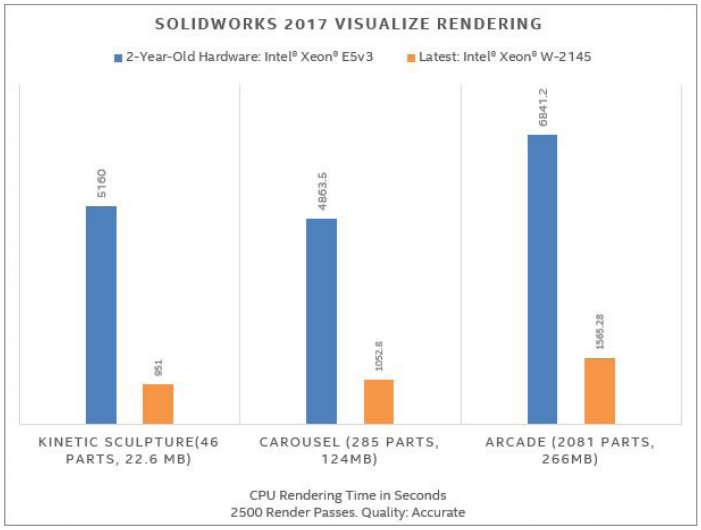


Figure 1. Performance and Productivity Increase with Intel® Optane™ SSD 900P, Intel® Cache Acceleration Software (Intel® CAS) and newer CAD Software



50%
INCREASE IN SIMULATION

Figure 2. Performance Simulations on Intel® Xeon® W with Intel® Optane™ SSD 900P



UP TO 5X
PERFORMANCE INCREASE IN RENDERING

Figure 3. 2-5x performance improvement in rendering

The next challenge was to help DPEA students more efficiently design their kinematic arcade games using SOLIDWORKS* software. Students begin their designs in the R&D phase, during which they research different project-ideas and feasible constructions, model their ideas, and test their practicality. Designs go through multiple revision cycles, until approved by a staff engineer. Final designs can contain from a few dozen to thousands of parts, with the final arcade assemblies containing up to 10,000 parts. The next phase is pre-manufacturing, where the students create a bill of materials (BOM) and research part costs, to create the manufactural product for fabrication. In this stage, simulation tests, such as motion studies, and DimXpert*, are used to validate certain assembly properties before moving to fabrication using lathes, mills, and CNC machines. During fabrication, the part and/or assembly is typically rendered in SOLIDWORKS Visualize* to create a photo-realistic rendering of the final product. Depending on the size, these renders can take anywhere from a few hours to a few days, with final-output photos that are used for portfolios and review.

Currently, tasks in SOLIDWORKS Simulation* and Visualize run at a slower pace than the desired DPEA design workflow. While the system is busy creating renders, that system is unavailable for other CPU- or GPU-bound operations, which brings productivity to a halt. Effectively, that asset is locked-down until the render is complete.

Solution

DPEA's IT department collaborated with the Non-Volatile Memory Solutions Group (NSG) and Data Center Group (DCG) at Intel to improve workstation performance by accelerating SOLIDWORKS application and workflow, thereby mitigating the performance bottlenecks, and reducing file synchronization and load times on individual workstations.

In the process of loading, assemblies can range from a few hundred parts to 10,000 parts. SOLIDWORKS PDM Server software sends the data to client machines, and Intel® Cache Acceleration Software (Intel® CAS) caches the transactions, thereby relieving network and local storage bottlenecks. Holding the active data in cache improved the performance for medium to large sized SOLIDWORKS assemblies, by considerably accelerating the edit workflow of reads and writes to the models. Performance improvements of up to 50% are due to the ability of Intel CAS to intelligently cache the most frequently accessed parts (usually common parts such as fasteners and mounting plates), without making any application or back-end storage infrastructure changes.

Working with Intel CAS greatly improved the students' user experience when interfacing with SOLIDWORKS, by reducing idle time, thereby increasing the productivity of students and teachers. Thus, teachers were able to attend to more students, making for a more effective and efficient experience. This improved performance means that projects once taking an engineering team of teachers, mentors, and students a full week to accomplish, can now be completed in a just few days. I/O operations that took several minutes, can now be completed 2x faster. (See Figure 1.)

DPEA evaluated the latest workstations built on Intel® Xeon™ W processors with Intel® Optane™ SSD 900P for storage, and found that this improved their design, simulation and render workflow dramatically with 2-5x improvement, permitting fewer assets to be locked down during the school day, and increase the overall compute-power of their computer labs.

All these factors, combined with Intel CAS, improved DPEA's performance by 2x over their previous workstation infrastructure, and under certain conditions, this multiplier increased up to 5x, depending on the size and volume of the workflow.

Conclusion

This powerful combination has enabled DPEA to greatly increase student and teacher creativity and productivity.

DPEA experienced at least 2x productivity improvement using Intel® CAS Workstation for Windows* Series. These productivity gains, when scaled across multiple user environments, create a compounding effect. Workstations powered by Intel® Xeon® W processor offer optimized performance for mainstream workstations, and SOLIDWORKS software's multicore capabilities (up to 18 cores) further enhances that performance. This multicore capability aids SOLIDWORKS Simulation, SOLIDWORKS Visualize rendering, and high single threaded performance (up to 4.5 GHz frequency) in CAD design and modeling.

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For more information visit:
- intel.com/cas
- intel.com/workstation
- DPEngineering.org

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Benchmark results were obtained prior to implementation of recent software patches and firmware updates intended to address exploits referred to as "Spectre" and "Meltdown". Implementation of these updates may make these results inapplicable to your device or system. For more information go to www.intel.com/benchmarks.

Test and System Configurations: Tests conducted by DPEA on Dell 7910*, Windows 7* x64 SP1 7601, Intel® Xeon® E5-2667 v4, 8GB Quadro M400*, 476GB Intel® SSD Pro 5400s vs. an older system running previous generation processor (Intel® Xeon® E5-1620 v3), 1GB Quadro 600*, 1TB SATA HDD; SOLIDWORKS 2016. Simulation and rendering tests were run on: Previous generation Intel® Xeon® E5-1620 v3 processor @ 3.50GHz turbo @3.6GHz, 4Core /8Threads; 1GB GPU Quadro 600; 19 x 10 Resolution; RAM 12GB DDR4 2133; 256GB SATA SSD vs. 3 Year platform refresh system - Intel® Xeon® W Customer Reference Board System, Windows 10*; Intel® Xeon® Processor W-2145 @3.8GHz turbo @4.5 GHz, 8Cores/16Threads; GPU Quadro P2000*; 19 x 10 Resolution; RAM 64GB DDR4 2133; 280GB Intel® Optane™ SSD 900P; SOLIDWORKS 2017, SOLIDWORKS Visualize 2017.

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