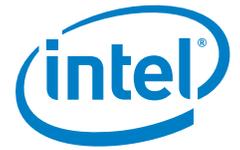


CASE STUDY

Dos Pueblos Engineering Academy



Boost Computer-Aided Design Efficiency with PCIe*-Based Intel® 3D NAND SSDs with Intel® CAS

Intel® Cache Acceleration Software

“Using Intel® CAS has given students improved access to our Solidworks* assemblies, and more importantly, Intel CAS has allowed the IT department to focus less on data traversal and more on supporting the daily needs of our students and enterprise-class network.”

– **Matthew Berg,**
DPEA IT department manager
and team leader

Introduction

Computer-aided design (CAD) market trends continue evolving to larger and more complex models, which focus primarily on 3D modeling and 2D drafting. Concurrent engineering—the ability for multiple users to update and collaborate on a project—has demonstrated numerous benefits while conversely presenting significant performance challenges.¹

The combination of Intel® Cache Acceleration Software (Intel® CAS) 3.1 for Windows Enterprise* and Intel® SSD DC P3520 Series, a new PCIe*-based Intel® 3D NAND Solid State Drive with Non-Volatile Memory Express* (NVMe*), has enabled Dos Pueblos Engineering Academy (DPEA) to deliver increased student and teacher creativity and productivity. DPEA is a public high school engineering academy that uses Solidworks* CAD software and Workgroup PDM (product data management) to enable a class of 100 students to work collaboratively. These students design and fabricate large installations and interactive exhibits for a wide range of audiences in museums, private galleries, and public venues.

DPEA stores the roaming user profiles of the students, along with complex projects—consisting of over 10,000 parts—on the server. Using the Intel® SSD DC P3520 Series as the caching device dramatically reduces the time it takes for each student to logon to the systems and load the assemblies and parts onto the client machines; this enables more efficient assembly read and write times. This powerful combination can greatly increase the performance and productivity across an entire collaborative design team. Students experience fast logon and load times, and teachers and mentors are able to reap the time-saving benefits by not having to wait for loading and syncing of files during edits. This allows them to attend to more students and make it an effective and efficient teaching experience. During the building of kinetic installations, processes which previously took an engineering team of teachers, mentors and students a week to accomplish can now be completed in a just few days.

Close Collaboration Leads to Outstanding Results

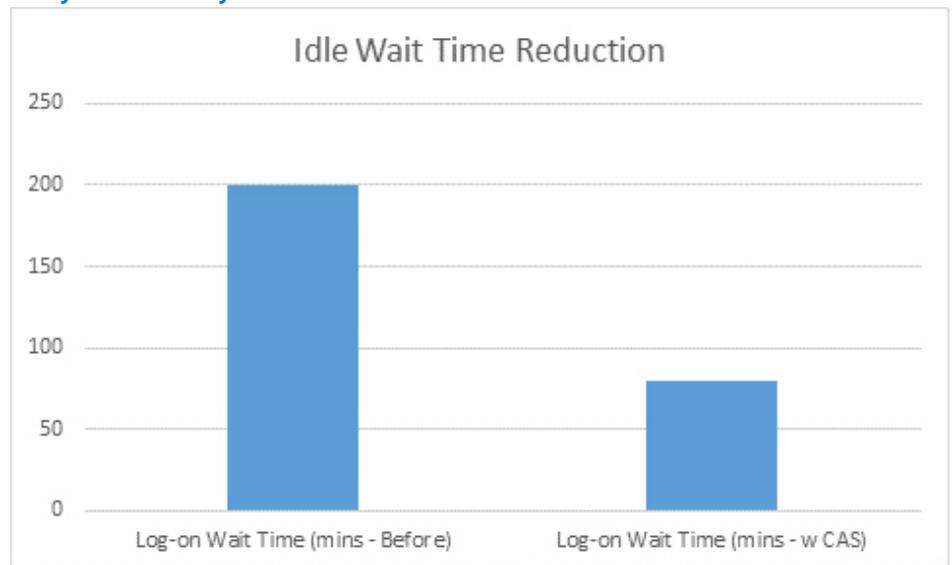
DPEA employs Intel CAS on their high-volume data server. This low-latency, powerful fileserver stores nearly one-hundred roaming user profiles, DPEA educational templates, and Solidworks Workgroup PDM. DPEA has up to 100 students, initiating separate logon sessions each and every day; on over 60 workstations, in three workspaces. Utilizing Intel CAS on the central file server, with their user profiles

“Working with Intel on this project has been a great experience. Intel CAS has greatly improved the student’s user experience when interfacing with the Solidworks PDM Server, which in turn has significantly improved the quality of our senior-level Solidworks curriculum.”

– Lyle Harlow,
DPEA IT department director
and lead CAD teacher

cached on the Intel® SSD, drastically minimizes logon/logoff times.² DPEA previously encountered a significant lag in the application when the number of users logging on exceeded 20. A typical day in the school consists of eight 60 minute periods, with an average of over 40 students logging on each period. By accelerating the file server and storing all the user profiles on the caching PCIe NVMe SSD, a typical logon time of 5 minutes was reduced to 2 minutes per student. The total logon time for 40 students was reduced from 200 minutes (3.33 hours) to 80 minutes (1.33 hours). Time saved waiting for logon at the start of each period meant more time for the teachers and mentors to teach. They had approximately 337 users (students and teachers) logging on per day, and the significant reduction in logon times resulted in increased productivity for everyone.

Daily Productivity Increase 2.5X with Intel SSD DC P3520 with Intel CAS



Dos Pueblos Engineering Academy uses Dassault Systèmes Solidworks 2016 as their CAD workstation application to model and design projects, and the Dassault Systèmes Solidworks Workgroup PDM 2016 Server to centralize the storage and maintenance of their production-grade parts and assemblies on the server. The Solidworks PDM Server software serves as a database for revision control, centralized part management, and most importantly, the Solidworks PDM Server software allows students to “check-in” and “check-out” their assemblies. Assemblies can range from a few hundred parts to well over two-thousand parts; with the Solidworks PDM Server software sending assembly data to client computers and Intel CAS caching the transaction, network and local storage bottlenecks are alleviated.

One of the more challenging aspects in accessing network assemblies is the idea of ownership. During the period of time that a student takes ownership of an assembly to edit it, the server checks at regular and frequent intervals to determine what changes have been performed to the assembly. The server then applies these changes to all users accessing the assembly. In essence, there are millions of CAD micro-transactions every minute. Every time a feature is changed (for example, when a user changes the thread count on a fastener), that change could be applied dozens of times to multiple client computers, using the server as the modification and distribution point of this revision. The assemblies themselves are medium to large assemblies (usually not larger than 500 MB), and holding the data in cache can

speed up these micro-transactions considerably as network bandwidth and storage bandwidth bottlenecks impact productivity across the entire IT infrastructure. Lastly, they have found the Intel CAS intelligently caches the most frequently accessed parts (usually common parts such as fasteners and mounting plates) without further administrator configuration. Using Intel CAS, efficiency of assembly check-ins and check-outs is greatly improved.

DPEA worked with Intel to test Intel CAS 3.1 and Intel SSD DC P3250—an Intel PCIe-based SSD for the data center—to accelerate Solidworks Workgroup PDM with approximately 60 users and a large database. In the backend they used 8 GBs Ethernet on the server to connect to 60 1GB clients. By caching the entire database, Intel CAS 3.1 improved read and write times to Solidworks Workgroup PDM by 25%.³ This set up worked well with up to 60 concurrent Solidworks users with high PDM activity—checking in and checking out files, with no lagging or crashing.

Once DPEA completed the trial and was no longer using Intel CAS, they recognized the significant performance loss in speed-of-access to networked CAD assemblies. The Intel CAS team then worked with DPEA's IT department to obtain a fully licensed copy of Intel CAS software. Intel collaborated with the customer on a case study with six Solidworks assemblies ranging from approximately 1000-2500 parts, each 100-400 MB in size, and DPEA recorded the load times for accessing this data with and without cache. The load time for checking out assemblies without Intel CAS was approximately 50-120 seconds; using Intel CAS load time was reduced by 20%. Previously the load times for checking in files without further part modification was approximately 60-180 seconds; caching the frequently used parts and assemblies using Intel CAS dramatically reduced check-in time by 25%.³

Intel CAS 3.1 is specifically optimized for the NVMe storage interface standard of the Intel® SSD Data Center Family for PCIe. Intel internal testing has shown that Intel's NVMe SSDs provide excellent throughput and low latency when compared to both hard disk drives (HDDs) and SATA solid state drives (SSDs).

DPEA performed comparative testing with the Intel® SSD 750 Series and the Intel SSD DC P3520 Series, both with Intel CAS. DPEA selected the Intel SSD DC P3520 Series for their production environment due to its data center quality and reliability features; ability to sustain heavy write workloads of a multi-user collaborative environment. Built on Intel 3D NAND, the DC P3520 Series is optimized for high density data center/enterprise configurations utilizing the low latency and high bandwidth of the NVMe specification. The DC P3520 Series is built with data integrity, drive reliability, and performance consistency.

Conclusion

DPEA experienced significant improvement using Intel CAS for Windows* Enterprise with the DC P3520 Series. With Intel CAS, DPEA experienced an increase in productivity and improved performance of about 20% for read time of Solidworks assemblies and approximately 20% for writes of these assemblies to the server.³ Coupled with logon and logoff time improvements, DPEA gained approximately a 2x productivity improvement. These productivity gains, when scaled across a multiple user environment, create a compounding effect.

Schools, universities, and enterprises are experiencing exponential increases in demand for storage and a growing need to efficiently collaborate across entire CAD design teams. This growth is driving the constant seeking of opportunities to increase productivity and reduce costs. As shown through the collaboration with DPEA, Intel CAS 3.1 on Intel's PCIe-based SSDs with NVMe can deliver dramatic improvements in performance, without the need for a costly infrastructure overhaul.

Intel Cache Acceleration Software 3.1 (Intel CAS 3.1)

Intel CAS 3.1 provides an intelligent, performance optimized Enterprise caching solution to improve application performance impacted by data bottlenecks from remote network based storage, or slower local direct attach storage. Other benefits of Intel CAS include:

- Transparent to users and applications
- Extra performance for key applications at critical times
- Several caching modes and capabilities that enable specific workloads and environment optimization

Benefits of Non-Volatile Memory Express* (NVMe)

Intel led the industry in creating NVMe, a standardized, high-performance software interface of the Intel® SSDs for PCI Express*. NVMe was architected from the ground up to overcome the performance limitations of SAS and SATA SSDs and make SSDs more efficient, scalable, and manageable. Features include a streamlined protocol and more efficient queuing mechanism to scale for multi-core CPUs and deliver low clock cycles per I/O.

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About DPEA

The Dos Pueblos Engineering Academy (DPEA) has provided high school students with a real-world, interdisciplinary, project- and design-based approach to learning, balancing theory and application. Educational, business and governmental leaders from around the country come to DPEA to learn about our new and effective learning environment. The DPEA student body is gender balanced and virtually all students move on to colleges and universities, many entering the country's top learning institutions.

DPEA was featured on the PBS NOVA special, School of the Future:
<http://www.pbs.org/wgbh/nova/body/school-of-the-future.html>



For more information on Intel CAS, visit www.intel.com/cas

1 <http://www.business-advantage.com/blog/cad-trends-2016-results-of-worldwide-survey/>

2 Specification for student workstations: HP* Z620 & Z640 (E5-1620v3, 8-16GB DDR4, 1TB 7200RPM Seagate* Drive, Quadro* K600 or Kepler 4000 Graphics cards).

3 System Configuration: Solidworks PDM* Server software runs on a Dell Power Edge* R720. CPU: 2x Intel* Xeon* E5-2620 processors @ 2.00 GHZ, 96GB RAM, 4 G/B Teamed Network Connection, and a 4TB RAID 10 array (formed from x8 1.2TB 10K SAS drives).

Testing comparisons using Intel* CAS Windows Enterprise* ver 3.1, 400GB Intel* SSD 750 Series, 2TB Intel* SSD DC P3520 Series.

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Tests were run by Dos Pueblos Engineering Academy. Intel does not control or audit third party benchmark data.

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