MAKING THE CASE FOR

Engineering Workstation Upgrades

Advanced Engineering Workflows Require Powerful Workstations

Design engineering workflows have evolved over the past several years from heavily siloed systems in which designers passed CAD models to simulation, analysis, and rendering specialists, to scenarios in which designers perform simulations throughout the design cycle. As a result, design engineers increasingly need access to much more powerful compute resources.

What has changed? Increasingly, designers are asked to produce more iterations on a compressed timeline in order for their firms to remain competitive by accelerating time to value with stakeholders and clients. Models are much larger and more complex, and engineers are often tasked with creating photo-realistic renders for client reviews, marketing, and other purposes much earlier in the process. In addition, CAD and engineering simulation tools have become much more advanced, leveraging artificial intelligence (AI), GPU-accelerated computing like real-time ray tracing, solvers, and other advancements to unleash creativity with less and less technical constraints.

These new workflows require more powerful professional engineering workstations, equipped with the latest CPUs and NVIDIA GPUs that are optimized to increase efficiency and deliver high productivity. But the need for more computing power is not the only factor affecting hardware requirements.

The COVID-19 pandemic rapidly altered the work environment for most professionals. While many are returning to their offices, most firms have adopted some type of hybrid work strategy in which engineers may work from home at times, or work remotely from client sites at other times.

This means that engineers also need to be able to remotely access levels of computing power similar to what they have at their desk on demand. Moreover, secure remote access workstation power can be effectively leveraged through the data center and enterprise infrastructure easier than ever with flexibility and choice.

Fortunately, modern workstations are up to the task of enabling these workflows. Lenovo has upgraded its P Series ThinkStation portfolio of professional workstations to include the latest processors from Intel and advanced GPUs from NVIDIA that can support GPU acceleration and real-time ray tracing capabilities on the most popular engineering and design software. The Lenovo P Series ThinkStation workstations also provide more powerful and energy-efficient designs, providing professional users with the right tool for the job no matter how or where they work. These new performance tower units are now as powerful as data center servers of just a few years ago.

Upgrading professional workstations is not an inexpensive endeavor. However, there is a strong business case for refreshing engineering workstations, given the evolution of these devices over the past several years and the productivity and performance benefits that they can enable.

In this paper, we will outline how upgrading to the latest generation of professional workstations can provide a return on investment through increased engineering efficiency and greater flexibility.

Fast & Flexible
Benefits of an Engineering Workstation Upgrade

Because of the recent advancements available via the latest processors, engineering users that upgrade their hardware from units that are just a few years old can still see significant improvements in modeling, simulation, rendering and other tasks. Potential benefits include:

Faster Performance: The latest Intel Xeon and Core business-class processors along with ISV-certified NVIDIA RTX professional GPUs provide faster processing speeds and more cores, which can improve performance for both single-threaded and parallel processing workflows. The latest releases of leading engineering software prod-

ucts from SolidWorks, Ansys, Siemens, and others also take advantage of GPU acceleration, which can be further boosted by the use of the most recent GPUs optimized with the latest PCIe Gen4 standard. This allows for faster and more frequent simulations, as well as faster rendering for a seamless, unbridled creative workflow. Furthermore, Lenovo's philosophy on performance is underscored by reliability and stability underscored by an improved tri-channel cooling technology co-designed with Aston Martin Lagonda that not only cools critical componentry, but also provides for an industry-leading user experience with quieter acoustics based on this patented design.

Energy Efficiency: Performance is indeed paramount, and it also happens to yield a dual benefit of efficiency in workflow since less time spent iterating designs due to accelerated performance over previous platforms naturally means less energy consumption. Further, Lenovo's new workstations boast improved energy utilization and thermal management from Energy Star and 80 PLUS-certified power supplies. That means the cost to operate and cool the computers has been reduced (which improves the return on investment calculation), while the workstations can also contribute to meeting sustainability goals.

Multitasking: In addition to CAD, CAE and rendering applications requiring more compute resources, basic business applications have also become much more compute- and memory-hungry. Engineers are also likely running collaboration software like Microsoft Teams, Slack or Zoom, word processing or spreadsheet programs, and other software that requires more and more concurrent resource use. With older hardware, users may need to shut down multiple applications in order to manipulate large models. These newer, more powerful workstations allow a level of unprecedented multitasking. In fact, with the higher-end systems, users can run simulations or rendering in the background while continuing to do their CAD work, and still run other applications at the same time.

Flexible Configurations: The Lenovo ThinkStation P Series line of professional workstations is highly configurable and upgradeable for future-proofing needs, with some models that are natively rackable for use in data center environments. Engineering organizations can examine their use of simulation, rendering and other compute-intensive workflows, and deploy a mix of individual workstations in a shared hardware implementation. For example, an organization can equip a single Lenovo ThinkStation P7 or PX with multiple NVIDIA GPUs, high core count processors, and a large amount of memory so that it can be deployed in the data center and shared across the team for simulation or rendering tasks. At the desktop or mobility level, they could invest in a more mainstream workhorse desktop workstation like the Lenovo ThinkStation P5, entry P3 Tower or ThinkPad P1 mobile workstation for day-to-day CAD work. This would not only save money, but make engineers more efficient by letting them offload intensive rendering or simulation tasks to another piece of hardware.

Workstation Power in the Data Center: In addition, by utilizing a rackable workstation such as the ThinkStation P7 or PX as a shared computing resource, engineering organizations can simplify their IT infrastructure and save costs. This can be a less expensive and less complicated alternative to deploying a dedicated server for simulation and rendering – the workstation can run standard applications on the client operating system without the need for virtualization, specialized server graphics cards or complex licensing.

The Lenovo P Series ThinkStation

The new performance tower portfolio of Lenovo P Series ThinkStations has a fully redesigned chassis, with the latest processor technology from Intel (ranging up to 120 cores in the PX, the most density in a professional client workstation) and support for up to four NVIDIA RTX 6000 Ada Generation professional GPUs.

Luxury sports car manufacturer Aston Martin, a Lenovo customer, worked directly with the company to improve on the tool-less chassis design for improved flexibility and ergonomics – in fact, the chassis' 3D grill is directly inspired by Aston Martin's DBS grand tourer. Redesigned air baffles and larger 3D hex ventilation openings, along with Lenovo's patented tri-channel cooling system and dedicated chambered cooling approach, allow for unobstructed airflow to maximize the performance of CPUs, GPUs, memory, and storage.

Additionally, all three of the new workstations have a modular design with front access drives for easy serviceability and upgrade flexibility all accentuated by bold red touch points and accents.

These all-new chassis were designed to meet the ever-increasing demands for more power performance, reliability, and use-ability described earlier in this paper, and in a way that is truly scalable and while addressing specific workflow needs garnered directly from customer insights.

Lenovo also worked closely with NVIDIA on the design of the new workstations, utilizing the NVIDIA Omniverse Enterprise platform to build a digital twin of the ThinkStation PX through the design process to both visualize and simulate how they would look and behave in the real world to enable fine tuning of thermal performance across a distributed design and engineering team around the globe. Omniverse Enterprise is NVIDIA's metaverse platform, a fully virtual

> *"The design collaboration of Lenovo's new ThinkStation chassis has been an amazing three-year journey," said Cathal Loughnane, director of Aston Martin Partnerships. "As Lenovo workstation customers ourselves this project was a unique opportunity to craft a high-performance system that we will use to design and develop our high-performance vehicles."*

collaboration environment that allows stakeholders using different software tools and systems to design, simulate and visualize new products regardless of their location. Lenovo and Aston Martin team members in different countries were able to create digital twins of the new ThinkStation units to see how they would look in the real world, and to fine-tune their thermal performance. (You can learn more about how Lenovo leveraged Omniverse Enterprise in this video.)

Lenovo also designed the new workstations with flexibility in mind. The ThinkStation PX and P7 include features and management tools that make them truly data center-ready with the use of the baseboard management controller (BMC) and onboard ThinkStation diagnostics 3.0 for maximum uptime.

The Intel 4th Gen Xeon processors and 13th Gen Intel Core processors offer more cores and faster performance (as well as support for PCIe 5.0, which enables faster data transfers). The P Series ThinkStation line also supports NVIDIA RTX 6000 GPUs based on the all-new Ada Lovelace architecture loaded with Gen4 Ray Tracing cores and Gen3 Tensor cores. These new GPUs feature 2X the throughput of the previous generation, and can concurrently run ray tracing with shading or denoising capabilities. They also feature a massive 48GB of ECC memory, which allows them to effortlessly handle large 3D models, render photo-realistic images in real time, and accelerate simulation and complex AI datasets.

The units are also highly configurable and upgradeable (with optional redundant PSUs available on the ThinkStation PX and optional hot-swappable storage available on the full performance tower lineup) and feature more versatile mounting options to support diverse deployments.

ThinkStation PX

The powerhouse of the ThinkStation line, the PX features 4th Gen Intel Xeon Scalable processors (with up to a 53% average performance gain), up to 120 cores, up to 2TB of DDR5 ECC memory, and support for up to four NVIDIA RTX 6000 GPUs. It is rack-optimized and can be deployed both in the data center and or as a desktop system. It is designed for the most intensive workflows, including deep learning and other AI development and complex rendering and simulation.

ThinkStation P7

The ThinkStation P7 features an all-new chassis with new compute architecture with Intel Xeon W processors, supporting up to 56 cores in a super single socket for expert users. The ThinkStation P7 is also rack-optimized for use in a variety of desktop and data center environments in a 4U enclosure. With support for up to three NVIDIA RTX 6000 GPUs, this machine is ideal for content creators, architects, designers, engineers and data scientists.

Lenovo ThinkVision P Series:
A Better View with Professional Monitors

Modern workstations offer powerful graphics capabilities that can greatly enhance engineering workflows. As such, they should be paired with the right professional-grade monitor in order to take advantage of those capabilities while removing the guesswork from the creative technical workflows.

The correct workstation monitor can greatly enhance the user experience. Outdated monitors can create eye strain, are less likely to be color-accurate (a must for rendering and design evaluation), lack modern connectivity options, and are less ergonomic. Lenovo ThinkVision P Series monitors are built with advanced technology that take engineering performance to the next level.

Acting as a hub, ThinkVision monitors can support any smart device via a single USB-C cable, reducing desktop clutter. Many models provide secure network access; support multi-display setups; and can display 1.07 billion colors with true-to-life accuracy. ThinkVision monitors are available in a range of screen sizes (24-in. to 44-in.), resolution (FHD to 4K UHD) and aspect ratio (16:9 to 32:10). They also offer advanced power management and are highly customizable.

You can learn more here.

ThinkStation P5

The ThinkStation P5 features an updated chassis powered by the latest Intel Xeon W processors, which offer up to 24 cores, and support for up to two NVIDIA RTX professional graphics cards. It is tailored for solid modeling and compute-intensive tasks including BIM, complex 3D CAD, reality capture and geospatial visualization, visual effects, and edge deployments.

ThinkStation P3

The ThinkStation P3 family of accessible workstation performance is available in Tower, Ultra Small Form Factor, and Tiny configurations. The ThinkStation P3 Tiny is the smallest in the industry and offers 13th Gen Intel Core processors and up to an NVIDIA T1000 8GB GPU supporting up to 7 total independent displays. Despite its small footprint (7.2-in. x 7-in. x 1.5-in.), the mighty ThinkStation P3 Tiny includes up to 64GB of memory, 4TB of fast PCIe storage, and includes a variety of ports. It is a perfect productivity machine for CAD, BIM, and GIS applications. The Tower version includes a 13th Gen Intel Core processor, up to 128GB of memory, and supports up to an NVIDIA RTX A5500 24GB GPU. The P3 Ultra Small Form Factor
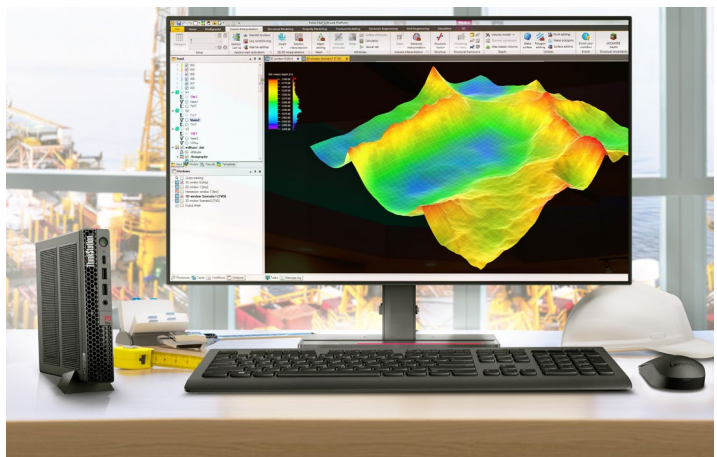
packs class-leading performance into just a 4-liter chassis that features a 13th Gen Intel Core processor, support for the NVIDIA RTX A5500 24GB or A2000 12GB, dual ThunderBolt 4 and dual Ethernet standard with up to 128GB of memory.
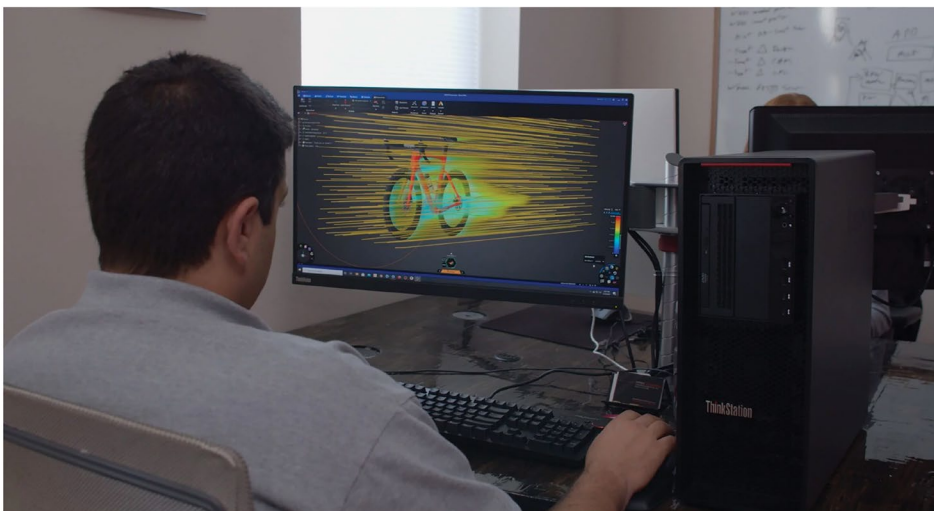
Case Study: Predator Cycling

Predator Cycling, a manufacturer and designer of high-end custom carbon fiber bicycles, is leveraging Lenovo professional workstations to power its frame design, simulation, rendering and manufacturing processes.

The development of its new RF20 frame posed a number of challenges, from material cost to design complexity. With the performance and efficiency gains enabled by updated Lenovo workstations, Predator Cycling was able to introduce the new bike at a competitive price.

Using Lenovo ThinkStation workstations equipped with the NVIDIA RTX A6000 GPU, the company was able to accelerate its simulation and design workflows, as well as provide photo-realistic renders in Luxion KeyShot so that customers can see a realistic representation of what their bike will look like before it is built. These accelerated workflows have saved the company between 12 to 16 weeks in their go-to-market timelines.

The company has also been able to improve internal workflows on simulations, with performance gains of 2x to 6x across a number of the key applications, including Luxion KeyShot, Ansys Discovery, Ansys Mechanical, Ansys Fluent, and Autodesk Fusion 360. Additionally, the company is now able to validate and test their designs more efficiently.

In the future, the company hopes to leverage the powerful Lenovo ThinkStation to integrate digital twins into their design workflows, utilize generative design and 3D printed parts into their production processes, and edit their own 6K video footage for marketing.

You can learn more here.

Conclusion

Engineering workflows have become more complex and require increasingly larger amounts of computing power in order to ensure efficiency in the design cycle. With updated workstations such as the new Lenovo P Series ThinkStation portfolio of professional workstations, engineers can leverage the latest Intel Xeon and business class processors, NVIDIA RTX professional GPUs, easily scalable and upgradeable storage and memory, and optimized energy and thermal management technologies to accelerate their workflows. A desktop workstation upgrade to the redesigned P Series ThinkStation provides benefits across the organization.

For Engineers: With more powerful processors and advanced GPUs, engineers can tackle complex models, simulation and rendering at faster speeds. They can also run multiple applications at the same time, which further enhances their own productivity.

For the IT Department: The ThinkStation P Series offers ease-of-use flexibility with tool-less designs, onboard diagnostics, flexible deployment models, with rackable workstations that can be deployed in the data center as a shared resource, and at a lower cost than installing a specialized server.

For Management: As engineers become more productive, organizations can accelerate design iterations, reduce time-to-market cycles, and provide better results to clients while freeing up cycles to take on and complete more projects. With flexible deployment options, the ThinkStation P Series also supports hybrid work environments, streamlines workflows, and reduces costs.

Learn more about the Lenovo ThinkStation P-Series workstations here.

Watch the Lenovo Webinar -
Matching Workstations to the Product Development Workflow

Learn more about the Lenovo collaboration with Aston Martin (video).