

SPECIAL DIGITAL
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AI-POWERED ENGINEERING



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Welcome AI in Focus

The Advanced Product Development Resource Center (APDRC) is an ever-growing repository of information to help design engineering teams take advantage of new and innovative technologies that help them create better designs faster.



Artificial intelligence (AI) has rapidly risen to the top of the priority list for most enterprises, and engineering organizations are no different. In simulation, AI can potentially optimize and accelerate analysis, while helping to improve design productivity.

Both NVIDIA and Dell Technologies are at the forefront of AI development, particularly in the engineering space.

In this Special Digital Issue from APDRC, we take a look at how artificial intelligence is being incorporated into simulation and design workflows, as well as how NVIDIA and Dell are driving this transformation.

You can learn more by visiting the resource center at [APDRC.com](https://www.apdrc.com) for the latest developments on technological advances, videos, white papers and more from *Digital Engineering*, Dell and NVIDIA. We hope you enjoy the digital issue.

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Dell Technologies delivers the most powerful and reliable workstations, designed and optimized specifically for scientific, engineering and manufacturing workflows to drive the performance of the leading professional software applications across industries.

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GPUs Drive HPC-Powered CAE and Machine Learning

JPR reports evolving CAE landscape



Image courtesy of JPR.

The Graphics Processing Unit (GPU) was once specialized hardware to boost visualization, prized especially by gamers. But with the introduction of general GPU computing, championed by NVIDIA, it expanded its role. Today it still makes in-game explosions and firefights much more realistic with its real-time rendering. But it has also become a way to accelerate engineering simulation, AI and machine learning. Industry analyst [Jon Peddie Research's \(JPR\)](#) report [“Accelerating and Advancing Computer Aided Engineering Workflows”](#) shines a spotlight on how the GPU is changing simulation-led engineering. The book is authored by JPR analysts Kathleen Maher and Jon Peddie, sponsored by NVIDIA, as a free download.

In Part I, the report focuses on how GPU computing changes the workstation-based CAE practices and applications. JPR notes, “The users can run larger simulations faster on their desktop workstations, and as a result, they can optimize their designs with more iterations.” In Part I, JPR concludes:

- GPUs can achieve 5x or more throughput for the same cost of a CPU.
- They can achieve lower cost and power consumption for the same throughput as the CPU.

especially with the proliferation of servers outfitted with multiple high-performance data center GPUs. This combination allows simulation software users to consider models that were previously impractical to study and scenarios that were previously impossible to simulate.

Some, such as Ansys Discovery, are written from the ground up to take advantage of the cloud and GPU. “It was designed as a tool to enable engineers and designers to perform more upfront

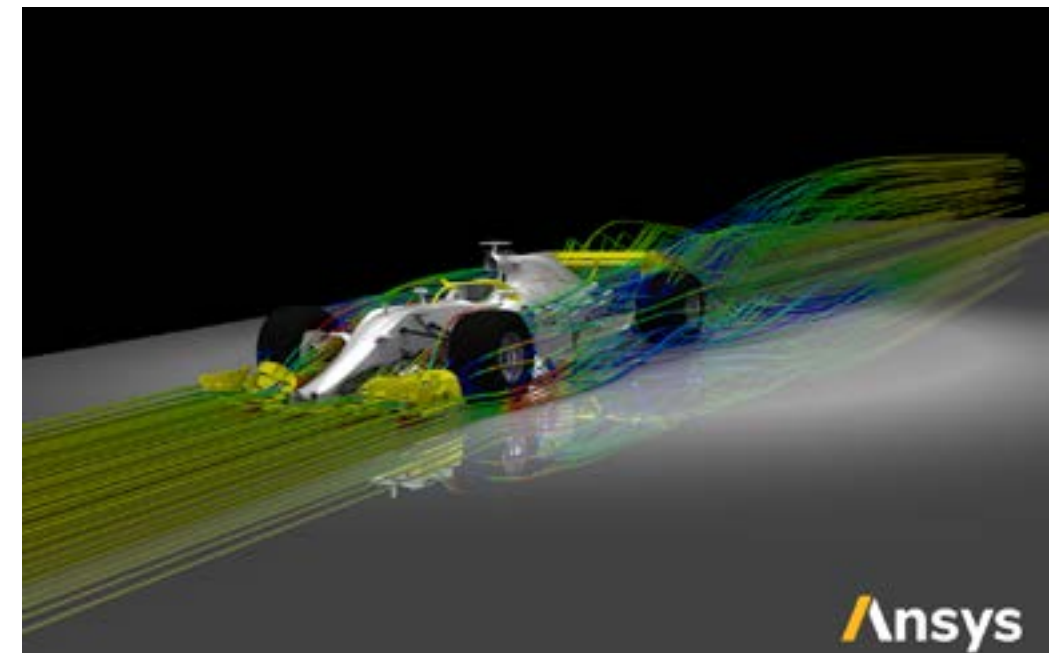


Image courtesy of Ansys

Part II expands the coverage to include High Performance Computing (HPC) and private data center and private Cloud-based resources, as well as Public cloud-based resources for running large engineering simulations from vendors such as Microsoft Azure, Rescale and ISV-specific cloud services.. The report draws from examples in software tools from Altair, Ansys, Cadence, Dassault Systèmes, and Siemens.

CAE at a Higher Scale

A growing number of simulation software programs have refined their code to take advantage of the GPU. Many have also added tools and options to draw on on-demand HPC,

simulations on their local workstations. Ansys Fellow Dipankar Choudhury described Ansys’ development of Discovery as a multi-physics simulation product for design engineers,” JPR writes.

Siemens’ Simcenter Cloud HPC and STAR-CCM+ have also joined the list of ISV-specific Cloud HPC solutions leveraging GPUs. Last June, Daniele Obiso, Simcenter STAR-CCM+ Technical Product Manager for Siemens, [wrote in a blog post](#), “The coupled solver in Simcenter STAR-CCM+ is a very robust and efficient density-based solver that has been for years the best practice for several industrial applications, amongst which: automotive vehicle external

aerodynamics, aerospace aerodynamics, turbomachinery aero performance and Conjugate Heat Transfer (CHT) blade cooling ... In Simcenter STAR-CCM+ 2306 all this will be available on GPU, providing you with a solution for faster turnaround time and lower costs per simulation. Moreover, we ensure CPU-equivalent flow solutions by maintaining a unified codebase, hence providing a seamless user experience and consistent results irrespective of the hardware technology used.”

CFD Benefits from GPU

Computational Fluid Dynamics (CFD) generally puts a heavy demand on the hardware, but it's also shown to benefit greatly from GPU acceleration. JPR writes, “Traditional CPU-based solvers require lengthy processing times, sometimes spanning days for just a few seconds of real-world activity. GPU-accelerated CFD solvers have been available but faced limitations in feature parity and model size constraints. Altair’s CFD Lattice Boltzmann Method (LBM) solver, ultraFluidX, has changed the landscape with its efficient GPU-based implementation, making it ideal for high-fidelity aerodynamic and aero-acoustic simulations.”

JPR singles out the introduction of NVIDIA’s H100 Tensor Core GPU as the watershed moment for CFD simulation. The report says, “[It] has brought about a revolution in demanding CFD workloads. With up to 18,432 FP32 CUDA cores and various configurations, it enables efficient production-scale CFD simulations with remarkable performance improvements.”

The NVIDIA RTX 6000 Ada GPU also has 18,176 CUDA cores, making workstations equipped with the GPU viable in this space as well.

AI Gold Mine

In the last decade, NVIDIA has also been able to pivot its GPUs as the preferred processors for highly compute-intensive machine learning and AI algorithm development. In May 2023, The Wall Street Journal reported, “[Nvidia Joins \\$1 Trillion Club, Fueled by AI’s Rise.](#)” Since their introduction, NVIDIA RTX GPUs have included integrated Tensor Cores for accelerating AI and machine processing routines, so the same GPUs customers are currently using for general compute acceleration can also provide a significant boost for emerging AI-backed features in engineering software.

JPR sees AI as another catalyst to drive CAE. “Employing AI and machine learning in CAE not only enables process automation but also accelerates the development of simulation tools accessible to non-experts, enabling a new level of democratization in CAE. New business models are emerging to transform product development processes.”

Altair has integrated their geometric deep learning engine, [Altair® physicsAI™](#) into user-native simulation environments

like Altair® HyperWorks®. PhysicsAI leverages historical CAE and CAD data to predict outcomes for any physics up to 1000x faster than traditional solver simulation. This saves organizations time and cost as engineers can test more design variations than ever before without the limits of parametric studies or the need to build new simulation models.

According to benchmark data from Altair and NVIDIA, using an NVIDIA RTX™ A4000 GPU provided an 8-times speedup for training physicsAI models compared to an 8-core laptop CPU

This January, Ansys launched Ansys SimAI, described as “a physics-agnostic, software as a service (SaaS) application that combines the predictive accuracy of Ansys simulation with the speed of generative AI.” In its announcement, the company writes, “Instead of relying on geometric parameters to define a design, Ansys SimAI uses the shape of a design

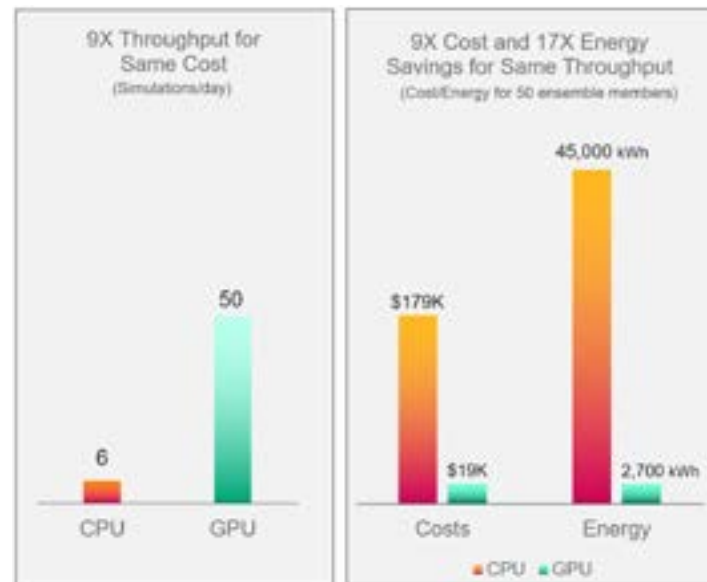


Image courtesy Cadence

itself as the input, facilitating broader design exploration even if the structure of the shape is inconsistent across the training data. The application can boost the prediction of model performance across all design phases by 10-100X for computation-heavy projects. Customers can train the AI using previously generated Ansys or non-Ansys data. Training and predictions are hosted on a state-of-the-art cloud infrastructure to ensure that user data is secure and kept private.”

The approach can potentially catch on, prompting other CAE software vendors to introduce tools and features based on the same principle. JPR writes, “[It] is now possible to train AI on a large dataset of CAE simulations enabling evaluations beyond a component or a single design. For example, it’s now possible to evaluate how a variety of models may interact with a variety of environments. Complexity can increase exponentially.”



Image Courtesy of Koenigsegg

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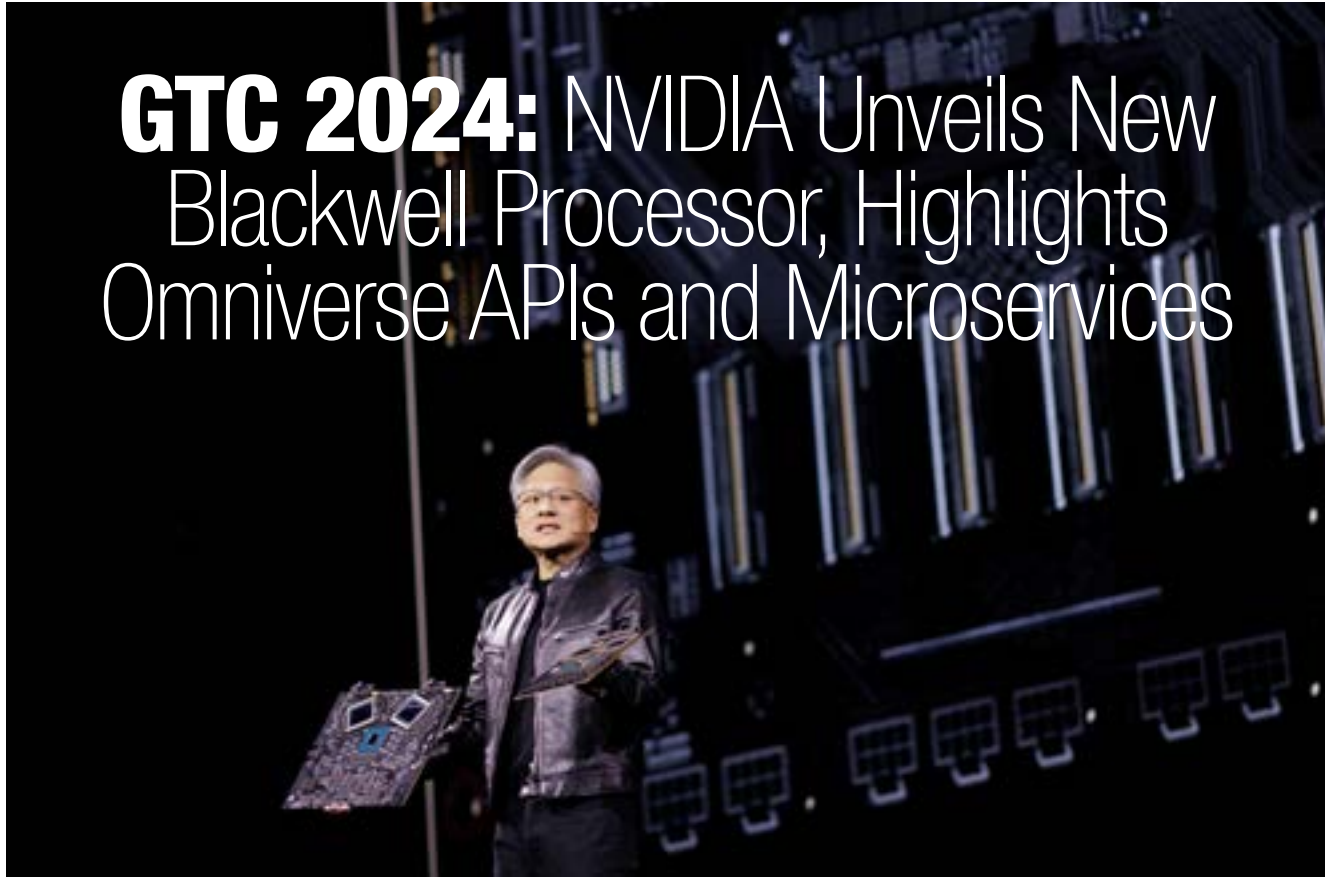
Enhanced with the latest advancements in AI, ray tracing, and physics simulation, NVIDIA RTX™ technology enables incredible 3D designs, and photorealistic visualizations that were once unimaginable.

From grappling with complex simulations to crafting immersive product experiences and more, RTX gives you the power to tackle your most demanding workloads with speed and precision.

Learn how you can accelerate your workflows and bring your innovations to life at [nvidia.com/eng-sim](https://www.nvidia.com/eng-sim)



GTC 2024: NVIDIA Unveils New Blackwell Processor, Highlights Omniverse APIs and Microservices



NVIDIA GTC, NVIDIA CEO Jensen Huang shows off Blackwell superchips combined with the HPC-targeted Grace CPU. Image courtesy of NVIDIA

GTC ushers in new AI era with HPC chip and on-demand services.

In March, the 17,000-seat SAP center in San Jose, California, was filled to the brim, not by a hockey match or a concert, but by NVIDIA GPU Technology Conference (GTC). Over the last decade, as NVIDIA expands its focus beyond graphics processing to general purpose GPU computing and then to AI, GTC itself has also evolved to become the premiere AI conference. This year, NVIDIA CEO Jensen Huang stepped up to the podium for another big reveal—the unveiling of the new [NVIDIA Blackwell chip for AI workloads](#).

The Blackwell Era

It's misleading to call Blackwell a "chip," because it's meant to function as the heart of a supercomputing system—"a platform," in Huang's words. "People think we make GPUs, and we do, but GPUs don't look the way they used to," he said. "Generative AI is the defining technology of our time. Blackwell is the engine to power this new industrial revolution. Working with the most dynamic companies in the world, we will realize the promise of AI for every industry."

The new Blackwell GPU comprises "208 billion transistors," Huang proudly revealed. "Two dies are abutted together in such a way so they

think of themselves as one chip. Ten Terabytes of data per second flows between them. There's no memory issue, no cache issue. They function as one giant chip." NVLink switches further streamline the data flow within the Blackwell systems.

The Blackwell dies are connected to an [NVIDIA Grace CPU](#), built on Arm architecture. In 2021, NVIDIA announced its plan to build its own HPC-targeted CPU, called Grace.

AWS is planning to build one of the first Blackwell systems, capable of processing 222 exaFLOPS per second, Huang revealed. Others looking to build Blackwell systems include Microsoft and Oracle, according to Huang.

In March, as NVIDIA got ready to release its Blackwell chip, Michael Dell, founder and CEO of Dell Technologies, said, "Dell Technologies and NVIDIA are working together to shape the future of technology. With the launch of Blackwell, we will continue to deliver the next-generation of accelerated products and services to our customers, providing them with the tools they need to drive innovation across industries." Dell is collaborating with NVIDIA to offer a next-generation compute platform based on the NVIDIA hybrid Grace ARM CPU with on-chip Blackwell microarchitecture B200 GPUs.

Partnership with PLM, EDA and CAE Vendors

In his keynote, Huang celebrated a number of partnerships with leading software vendors: Cadence, Siemens, and Ansys, to name but a few. Software vendors are looking to augment and infuse compute-intensive simulation tools based on Finite Element Analysis (FEA) and Computational Fluid Dynamics methods with surrogate models and machine learning to accelerate their solutions. The new method speeds up simulation but demands GPU-powered machine learning to develop the necessary surrogate models.

In March, Ansys announced it will use NVIDIA Blackwell GPUs, Hopper architecture-based GPUs, and GB200 Grace Blackwell Superchips to scale up and accelerate existing solutions. It also joined the [Alliance for OpenUSD \(AOUSD\)](#), joining NVIDIA and others to promote the use of OpenUSD 3D data interchange and framework. The format is the visual language of the NVIDIA Omniverse development platform. NVIDIA is also bolstering Omniverse's natural language processing to remove technical barriers from potential users with NVIDIA ChatUSD and DeepSearch NIMs (NVIDIA Inference Microservices). "You can speak to [Omniverse] in English, and it would directly generate USD and talk back in USD," Huang said.

NVIDIA announced it's disaggregating the Omniverse platform, making its core technologies available as cloud API. "With these APIs, you're going to have magical digital-twin capability," Huang said. The ability to use natural language as prompts to generate 3D objects could significantly improve the user experience in CAD programs and quicken adoption. Therefore, CAD vendors are expected to explore these APIs.

During GTC, [Siemens announced](#), "In the next phase

of our collaboration with NVIDIA, the company will release a new product later this year—powered by NVIDIA Omniverse Cloud APIs—for Teamcenter X, our industry-leading cloud-based product lifecycle management (PLM) software, part of the Siemens Xcelerator platform."

NVIDIA NIM Inference Microservices

During GTC, NVIDIA launched [NVIDIA NIM](#), a set of easy-to-use microservices for developers to create enterprise generative AI applications. The company describes them as "Cloud endpoints for pretrained AI models optimized to run on hundreds of millions of CUDA-enabled GPUs across clouds, data centers, workstations, and PCs." Adobe, Cadence, Getty Images, and SAP are listed as the earliest firms to access these services, included in the NVIDIA AI Enterprise 5.0 portfolio.



During GTC, NX CAD and simulation software maker Siemens announces its plan to incorporate Omniverse APIs into its Xcelerator portfolio of products. Image courtesy of NVIDIA.

"These NIMs are going to help you create new types of applications for the future—not ones that you write completely from scratch, but you're going to integrate them like teams to create these applications," Huang said.

Humanoid Robotics

During the keynote's closing minutes, Huang was flanked by a row of robots, from dwarfish ones to life-size ones. Huang said, "In the future, everything that moves will be robotics. And these robotic systems, whether they are humanoid, AMRs (autonomous mobile robots), self-driving cars, forklifts, or manipulating arms, they will all need one thing—a digital twin platform. We call it Omniverse."

NVIDIA offers [Isaac Sim](#), a virtual robot training system. The system uses NVIDIA Omniverse's immersive 3D environment to replicate the robot's operations in the real world. The rise of robotics, Huang expects, would boost demand for Omniverse.

Dell Boosts Enterprise AI Capabilities

New Dell Technologies workstations powered by NVIDIA AI solutions unlock more engineering potential.



The new Dell Precision 3280 CFF and accessories. Image courtesy of Dell Technologies.

Artificial intelligence (AI) is rapidly being woven into engineering workflows and other types of applications. In order to effectively utilize the technology, organizations will need to be able to corral large amounts of data and run complex algorithms. Professional engineering workstations will play a key role in this process. At the recent Mobile World Congress event in February and NVIDIA GTC conference in March, Dell Technologies announced new professional-grade Precision workstations and AI-based offerings that are designed to help engineering organizations make this transition.

“Every company that wants to remain competitive will have to implement AI in some way, and AI PCs will be central to that,” said Sam Burd, president, Client Solutions Group, Dell Technologies, in a [press release](#). “From running complex AI workloads on workstations to using day-to-day AI-powered applications on laptops, the AI PC will be an important investment that pays dividends in productivity and paves the way to a smarter, more efficient future. Dell’s advantage starts with offering more AI PCs across the commercial portfolio from day one, giving customers the ability to start future proofing for AI today.”

At the Mobile World Congress in Barcelona, Dell announced the latest versions of both its tower and mobile workstations that can run complex AI workloads.

The new workstations include:

- The Dell Precision 3280 Compact Form Factor workstation, which the company says is the world’s smallest workstation that supports Tensor Core GPUs. It supports up to the Intel Core i9, NVIDIA RTX™ 4000 Ada Generation GPU, 64GB of DDR5 memory, and up

to 8TB of RAID storage.

- The Dell Precision 3680 Tower Workstation, which supports up to the 14th Gen Intel Core i9K CPU, up to 128GB of memory, and up to 28TB of storage. On the GPU front, it supports up to the NVIDIA RTX 6000 Ada Generation GPU.
- Dell also introduced the Precision 3490 (14-in.), 3590 (15-in.), and 3591 (15-in.) mobile workstations. The 3490 and 3590 models support the new NVIDIA RTX 500 Ada Generation Laptop GPU, while the 3591 supports the NVIDIA RTX 500, RTX 1000, and RTX 2000 Ada Generation Laptop GPUs.
- The Dell Precision 5490 (14-in.) and 5690 (16-in.) mobile workstations support up to the Intel Ultra 9 185H processor (16 cores), and the 5490 supports the NVIDIA RTX 1000, 2000 and 3000 Ada Generation Laptop GPUs. The Precision 5690 is available with the NVIDIA RTX 1000, RTX 2000, RTX 3500, RTX 4000, and RTX 5000 Ada

Generation Laptop GPUs.

All of the new devices include the Dell Optimizer for Precision AI-based software that enhances and improves application and device performance based on user workflows.

According to a [blog](#) written by Charlie Walker, Dell Senior Director and General Manager of the Precision and rugged product lines, the new NVIDIA RTX™ 500 and 1000 Ada Generation laptop GPUs provide the new mobile workstations with powerful AI, ray tracing and graphics capabilities. You can learn more about the new NVIDIA RTX laptop GPUs in this [NVIDIA blog](#).

Both the 3000 and 5000 Series mobile workstations “boast a combined integrated multi-processor package of Central Processing Unit (CPU), Neural Processing Unit (NPU) and Graphics Processing Unit (GPU), designed to enhance the performance of AI features in more than

According to the company, Dell AI Factory with NVIDIA is an “end-to-end AI enterprise solution that integrates Dell’s compute, storage, client device, software and services capabilities with NVIDIA’s AI infrastructure and software suite, all underpinned by a high-speed networking fabric.”

With the new Dell AI solutions, the company claims its clients will be able to more effectively and efficiently integrate AI into a wide variety of workflows.

The Dell AI Factory with NVIDIA supports a variety of AI use cases and applications including model creation and tuning, augmentation and inferencing. The solution can also be enhanced with professional services to help customers with data preparation, implementation and adoption of AI Factory.

In addition, Dell announced Dell Generative AI



The Dell Precision 5490 workstation. Image courtesy of Dell Technologies.

100 applications, enabling them to operate with optimized speed and power efficiency.”

According to the Dell blog, this combination of processors can reduce power consumption in the laptops and improve performance of media-intensive AI workloads.

New AI Tools

A few weeks later at the NVIDIA GTC event, Dell announced that it is expanding its generation AI solutions to include the new [Dell AI Factory with NVIDIA](#).


“Our enterprise customers are looking for an easy way to implement AI solutions – that is exactly what Dell Technologies and NVIDIA are delivering,” said Michael Dell, founder and CEO, Dell Technologies, as part of the announcement. “Through our combined efforts, organizations can seamlessly integrate data with their own use cases and streamline the development of customized GenAI models.”

Solutions with NVIDIA – Retrieval-Augmented Generation (RAG), which leverages new microservices in [NVIDIA AI Enterprise](#) to offer what the company describes as a pre-validated, full-stack solution to speed enterprise AI adoption with RAG, and improve GenAI model quality. Dell is also offering a full-stack solution powered by NVIDIA for building custom, domain-specific AI models, and a Dell Data Lakehouse for analyzing data across hybrid and multi cloud environments.

At GTC, Dell also announced it was working with NVIDIA to introduce a rack-scale, high-density, liquid-cooled architecture based on the NVIDIA Grace Blackwell Superchip, and that its Dell PowerEdge XE9680 servers will support new NVIDIA Blackwell GPUs as well as H200 Tensor Core GPUs and NVIDIA Quantum-2 InfiniBand and Spectrum-X Ethernet networking platforms.

BlankAI, one of many technologies that comprise Autodesk AI, will debut in the automotive design studio, enabling designers to quickly generate concepts using AI functions. Image courtesy of Autodesk



 **Blend different concepts together**

Autodesk AI Takes Center Stage at AU

Design and simulation workflows poised to benefit from AI integration

The annual Autodesk user conference, Autodesk University, was back in full swing at its usual site, The Venetian in Las Vegas, Nevada, in November. On Day One, product designers, movie makers, game makers, and civil engineers hurried past the flashing slot machines and roulette tables and streamed into the Venetian Ballroom to hear Autodesk CEO Andrew Anagnost's keynote. His message might be summed up by the following line. "For better or worse, AI has arrived," said Anagnost. "We've been working to get you excited about AI for years. But now we're moving from talking about it to actually changing your businesses," added Anagnost.

The change began with a change in Autodesk's product lineup. As Anagnost spoke, [Autodesk's new website for Autodesk AI went live](#). The company writes, "Autodesk AI is available to augment creative problem-solving and exploration, automate tedious and repetitive work, and give individuals and teams access to powerful analysis tools to inform decision-making."

Anagnost said, "AI is the future of design and make, and Autodesk is pioneering this transition. We sit at the junction of many of the most creative and impactful industries in the world. We'll continue to invest in AI because of its transformational potential to drive better outcomes for our customers' businesses and the world."

Automate the Mundane, the Routine

By now, many have heard, seen, and even used Autodesk Generative Design, part of Autodesk Fusion. Autodesk AI may be viewed as a more powerful, more comprehensive, cross-industry approach to AI, bolstered partially by Autodesk's recent acquisition of BlankAI, among many other things.

In Day Two's keynote, Jeff Kinder, Autodesk Executive VP of Product Development and Manufacturing, said, "Debuting in our automotive design studio next year, BlankAI will allow you to pull from your historical library of design work, then use it to rapidly generate new concepts that build on your existing design style."

According to Autodesk, BlankAI enables product designers to:

- easily generate and edit proportional 3D models
- customize their development process with semantic control
- incorporate their brands' design DNA
- dynamically navigate the data in their design portfolio

In addition, Kinder also said, "By the end of the year, we will launch Automated Drawings in Fusion to translate 3D models into fully dimensioned drawings with the click of a button."

Autodesk recently acquired FlexSim, which develops factory logistics and analysis software. Kinder gave sneak peeks of it as part of the Autodesk Portfolio. "FlexSim powers a key link between factory design data and operational data. It helps with everything from planning and designing to building and operating a digital factory. Autodesk brings together strengths in factory operations, building design, and construction solutions," he said.

Autodesk also highlighted its partnership with Cadence, a leading electronic system design company, to streamline smart product development by improving collaboration across electronics and mechanical design teams.

Kinder said, "Our integration as part of the Autodesk Platform ecosystem connects Cadence's PCB design capabilities directly to Fusion, enabling data to flow in both directions."

AI Speeds Up Toolpath Generation

During the keynote, Kinder highlighted CloudNC, an Autodesk partner that develops CNC automation software. "CloudNC add-in for AI-powered CNC toolpath automation. CloudNC sees customers reduce tool programming times by up to 80%," said Kinder.

Theo Saville, CEO of CloudNC, said, "As a CNC

programmer, you will be given a great starting point far more quickly. You're not going to need to create everything from scratch every single time; you're going to start at 80-90% of the way, and you're going to make tweaks, make adjustments."

Training Using Proprietary Data

In an excerpt from the upcoming [Autodesk State of Design & Make Spotlight on AI report](#), Autodesk states, "66% of industry leaders predict that AI will be an integral part of their business within 2-3 years." Many AI-based design and simulation software makers are looking at giving users a way to further refine the algorithms using proprietary data. Autodesk is also heading in the same direction, though the exact mechanism to facilitate it, remains unclear.

In his Q&A with the industry press, Anagnost said, "At some point, as some of these capabilities get to a level of automation, we may actually license a model to a particular customer and they can train and improve that model on top of their capabilities. That's the business model that Microsoft is using right now for some of their tools. I think it's a very robust model."

Hardware for AI Workloads

The use of AI/ML to train and refine algorithms can be data- and compute-intensive. At AU, partner hardware makers like Dell showcased their latest hardware targeting such workloads.

The latest Dell Precision 7960 Tower, on display at AU, is the idea platform for AI development as it offers a very scalable architecture starting at 12 and going up to 56 cores on the 4th Generation Xeon W CPUs with Advanced Matrix Extensions for AI acceleration. The Precision 7960 Tower with the expanded chassis, as compared to the previous generation Precision 7920 Tower, can support from 1 to 4 double-wide GPUs, including the NVIDIA RTX 6000 Ada generation for maximum GPU compute performance. Fourth-generation Tensor Cores provide faster AI compute performance, delivering more than 2X the performance of the previous generation GPUs.

According to Scott Hamilton, Senior Industry Strategist, Dell, "The extreme configurability provides ideal options for high-end Visualization, like VRED and Omniverse use cases, and Artificial Intelligence development and inferencing applications."

For more, watch the [DE video report](#) from the AU Exhibit Hall here.



AI Drives Robotics and Automotive Configurators at CES 2024

NVIDIA delivers special address at the Consumer Electronics Show

At this year's International CES (Consumer Electronics Show, Las Vegas, Nevada, Jan. 9-12), NVIDIA made a [special address](#), highlighting technology that the company says will usher in a new wave of AI-ready hardware and applications.

"Today, NVIDIA is at the center of the latest technology transformation: generative AI," said Jeff Fisher, senior VP for GeForce, NVIDIA. "NVIDIA's RTX™ GPUs, with more than 100 million units shipped, are pivotal in the burgeoning field of generative AI, exemplified by innovations like ChatGPT and Stable Diffusion."

While CES caters to the consumer crowd, NVIDIA's consumer-targeted initiatives are often precursors to what's coming down the pike in the professional portfolios.

The company points out, "Mobile workstations with RTX GPUs can run NVIDIA AI Enterprise software, including NVIDIA TensorRT™ and NVIDIA RAPIDS™ for simplified, secure generative AI and data science development. A three-year license for NVIDIA AI Enterprise is included with every NVIDIA A800 40GB Active GPU, providing an ideal workstation development platform for AI and data science."

AI's Impact on Robotics

One area where NVIDIA expects AI-powered natural language processing to accelerate developments is in the field of robotics. Deepu Talla, VP of Robotics and Edge Computing, NVIDIA, believes the tipping point for a robotic transformation is coming soon.

He said, "Generative AI models achieve higher accuracy while generalizing rather well. And applications are built using natural language prompts or texts. Given these attributes, generative AI is well-suited for robotics." The same AI model, he added, could also help generate synthetic data to augment the collected data.

NVIDIA's platform for training and developing autonomous robots is [NVIDIA Isaac Sim™](#), a robotic simulation platform. For robotic training, in addition to the model of the robot itself, users usually need to create a replica of the environment where the robot operates, such

as warehouses and factory floors. The use of natural language is already starting to transform how users create and populate these dynamic environments.

Talla said, "Starting with [NVIDIA PICASSO](#), you can use a text-to-object generative AI model to generate new assets and place them in the scene. With a text prompt, generative AI can add rain, water, rust, and more to existing environments. Tasks that typically take an artist days, can be completed in minutes."

Cobots and robots performing tasks alongside human operators are expected to meet regulatory requirements, which set the safety protocols: for example, the speed and velocity with which they move. Gerard Andrews, Senior Product Manager for Robotics, NVIDIA, said, "We have active engagement with a number of regulatory bodies. We look at proactive safety, reactive safety, and predictive safety. We are participating in efforts to drive the three concepts and are pushing for a number of safety standards."

materials, boosting customer engagement through customized content," NVIDIA points out in its announcement. When running on [NVIDIA Graphics Delivery Network](#), the automotive configurators can be easily published at scale and streamed to most devices around the world."

(You can read more about one of these configurator applications in our previous coverage [here](#).)

NVIDIA also spotlighted in particular Mercedes-Benz, Polestar, Kodiak, and Pebble as automakers who have infused AI-powered features in their vehicle lines and are showcasing them at the conference.

"Mercedes-Benz is also using digital twins for production with help from NVIDIA Omniverse, a platform for developing applications to design, collaborate, plan and operate manufacturing and assembly facilities ... Kodiak is exhibiting an autonomous truck, which relies on NVIDIA RTX GPUs for high-performance compute to process the



In robotic training, the use of natural language prompts is expected to accelerate the design and creation of dynamic environments. Image courtesy of NVIDIA.

Omniverse-Powered Car Configurators

NVIDIA is also promoting its immersive 3D simulation platform [NVIDIA Omniverse™](#) to automakers at CES. This time, the attraction is the Omniverse-powered car configurators, developed and marketed by BITONE, Brickland, Configit, Katana Studio Ltd., WPP, ZeroLight, and other partners.

"OEMs benefit from a unified asset pipeline that simplifies the integration of design and engineering data for marketing purposes. Omniverse's enhanced tools also allow them to quickly produce diverse marketing

enormous quantities of data it collects from its cameras, radar and lidar sensors," NVIDIA announced.

In a briefing with the industry press, Danny Shapiro, VP of Automotive, NVIDIA, said, "With Omniverse-powered configurators, consumers can experience the car exactly as they want. They can customize the leather, the trim, the wheels, and then take the car out for a virtual test drive. For developers, they can even simulate the software that runs inside the car."

You can learn more in blogs that NVIDIA published during CES about its [robotics](#) and [automotive](#) capabilities.



SOLIDWORKS CEO Manish Kumar outlines his vision for how to integrate AI into the design and simulation products. Image courtesy of Dassault Systemes.

AI on Tap at 3DEXPERIENCE World 2024

Artificial intelligence to become the driving force behind SOLIDWORKS.



The Dell Precision 3680. Image courtesy of Dell.

generate parametric models from picture or text input, and that's what we are focusing on," said Shrikant Savant, AI and Machine Learning Expert, DS. In the first release of AI-based SOLIDWORKS, "What we want to do is give users a generative AI model that works out of the box, but we also understand that customers would like to further customize the model by training it on their own data. We're keeping it in our mind."

Purchase options for SOLIDWORKS users are, as Kumar put it, "with the platform, or on the platform." The platform is DS's 3DEXPERIENCE, which includes complementary apps in the [3DEXPERIENCE Works](#) suite. The platform is activated once a customer begins to use content from the suite.

Kumar said, "Initially, there were customers who purchased SOLIDWORKS but would not activate the platform. Now, we're seeing many of them activating it within two days. It means they're getting more and more value from it."

The key difference is an "on the platform" license is a cloud-hosted browser-based SOLIDWORKS license, allowing you to save your data to the cloud but not to your local desktop. "With the platform" means 3DEXPERIENCE apps come with a locally installed SOLIDWORKS copy, so you can save your data to both your local drive and the cloud.

Bernard Charles, DS Executive Chairman of the Board, also made a cameo appearance during the keynote. Charles oversaw DS's acquisition of SOLIDWORKS in 1997. At the time, SOLIDWORKS was a pioneer in Windows PC-based parametric CAD software.

"Bringing MODSIM (Modeling and Simulation) and AI together is an unparalleled opportunity to bring life to shapes," he said. "Generative AI is an intrinsic part of the fabric of the [3DEXPERIENCE] platform."

GPU Accelerating AI Workloads

At 3DEXPERIENCE World, NVIDIA announced the [NVIDIA RTX™ 2000 Ada Generation GPU](#), designed for AI-enhanced multi-application workflows. This new [GPU](#) brings cutting-edge AI, graphics

and compute capabilities in a compact form factor, offering up to 1.5x faster performance compared to the previous-generation RTX A2000 12GB in professional workflows. And packing 16GB of GPU memory, the RTX 2000 Ada allows professionals to handle demanding professional workflows with ease, from using AI-powered tools to driving multi-display setups to creating high-resolution content.

NVIDIA's benchmark showcases that the RTX GPUs significantly improve performance across a variety of tasks in SOLIDWORKS, including anti-aliasing, immersive collaboration with virtual reality (VR) models, and ray-tracing operations in SOLIDWORKS Visualize. NVIDIA has published the updated SOLIDWORKS benchmarks here: [NVIDIA RTX Accelerates SOLIDWORKS](#).

"The new NVIDIA RTX 2000—with its higher-efficiency, next-generation architecture, low power consumption, and large frame buffer—will benefit SOLIDWORKS users," said Olivier Zegdoun, Graphics Applications Research and Development Director for SOLIDWORKS, DS. "It delivers excellent performance



The NVIDIA RTX 2000 Ada Generation GPU. Image courtesy of NVIDIA.

for designers and engineers to accelerate the development of innovative product experiences with full-model fidelity, even with larger datasets."

A New Dell Machine

In the exhibit hall, Dell showcased the Dell Precision 3680 desktop tower, a recently-announced workstation targeting SOLIDWORKS users. Matthew Allard, Director of Alliances and Solutions, Dell, said, "This is a follow-up to our popular Dell Precision 3660. One of the exciting things about this machine is that it includes NVIDIA's newly released RTX 2000 GPU. With an increase in video RAM (16GBs), you can now load larger assemblies and more complex parts."

Allard also pointed out, "Increasingly, you'll see more AI-powered features in CAD programs like SOLIDWORKS. If these features are running locally, they will accelerate on RTX GPUs because they have Tensor processor cores targeting AI features."

To learn more about configuring a workstation for SOLIDWORKS, see our guide [here](#).

In February, at the annual 3DEXPERIENCE World Conference (February 11-14, Dallas, Texas) hosted by Dassault Systèmes (DS), SOLIDWORKS users came together to trade tips, network, and learn the latest features in their beloved software. The biggest takeaway was that AI would become the backbone of SOLIDWORKS, their market-leading mechanical CAD program, and other DS products. Both Dell Technologies and NVIDIA were also on hand with new professional-grade GPUs and workstations that can handle these AI-driven workloads.

AI-Powered PCB Tools for SOLIDWORKS

During his keynote, SOLIDWORKS CEO Manish Kumar invited Michael Jackson, Corporate VP of EDA (Electronic Design Automation) software maker Cadence Design Systems, to join him on stage. Together, the two announced a partnership, bringing [Cadence's AI-powered PCB \(Printed Circuit Board\) design tools to SOLIDWORKS users](#).

"SOLIDWORKS users are shifting from product-centric thinking to experience-centric thinking. The change is driving the demand for electromechanical devices. So today, Cadence and DS are unveiling the first cloud-based collaborative electromechanical product, purpose-built for SOLIDWORKS," said Kumar.

According to the press release, the partnership will enable "collaboration for continuous development across PCB, 3D mechanical design, and simulation. The cloud-enabled integration offers joint customers an easy-to-use, end-to-end solution for next-generation product development, enabling an up-to-5X reduction in design turnaround time." Jackson said Cadence is launching the new tool in July.

AI as the Backbone of 3DEXPERIENCE

Kumar reminded the attendees that, long before ChatGPT became headline news, SOLIDWORKS had been gradually introducing AI-driven productivity tools, such as Mate Helper, Selection Helper, and Sketch Helper. But going forward, generative AI tools for model creation would take on a greater role in the design workflow.

"Imagine you want to create a bookshelf. All you have to do is provide a bounding box, and the Generative AI will create a bookshelf that fits within that box," said Kumar. He also revealed, "To the same AI program, we fed models of coffee tables. Now, the program could create coffee tables without manual intervention."

For SOLIDWORKS and other CAD software makers, the challenge is to teach the AI program manufacturing constraints. Unlike consumer-targeted 2D text-to-image AI programs (such as Midjourney), mechanical CAD programs like SOLIDWORKS need to limit the generated 3D objects to manufacturable topology.

"There is no company right now that can



Ansys CTO Prith Banerjee discusses the integration of hardware, software, and electronics in future products. Photo by Kenneth Wong, DE 24/7.

OzenCon Keynotes Highlight AI-Powered Simulation, Digital Twins, More

Conference examines the role of AI in future product development.

OzenCon, the simulation user conference hosted by Ansys reseller Ozen Engineering Inc., took place at the Computer History Museum (Mountain View, California) on February 22. Dr. Prith Banerjee, CTO of Ansys, joined the conference as the keynote speaker. His talk entitled “The Future of Digital Engineering,” acknowledged that while the use of simulation and test to develop products had been the norm for the past 50 years or so, a sea change was rapidly approaching, according to him.

“Digital engineering is how you engineer future products, which include hardware, mechanical and electronics parts, as well as software. Typically, these things are done in a siloed way, with different teams doing different things ... Ansys is preparing engineers to use requirements, written in languages like SysML, to use a system architecture modeling tool called SAM, and to connect that with our accurate 3D solvers like Ansys Mechanical, LS-DYNA, Ansys Fluent,

and so on,” said Banerjee.

Merging ECAD and MCAD

The silos between electrical and mechanical are evaporating, due in large part to partnerships between ECAD and MCAD vendors, as well as from industry consolidation. In January, [Synopsys signed a deal to acquire Ansys for \\$35 billion](#). Reuters reported, “The transaction will create a massive new player in a sector of the business

software industry that is already highly consolidated ... The deal would bring together Synopsys’ semiconductor electronic design automation (EDA) tools with Ansys’ simulation and analysis portfolio.”

A few weeks before OzenCon, at the [3DEXPERIENCE World event in Las Vegas](#), Synopsys’s rival Cadence announced a partnership with popular CAD software maker SOLIDWORKS to bring their solutions together. These acquisitions and partnerships foretell future corporate handshakes that will bring chip design and mechanical design closer than ever.

Ansys is also injecting AI into its simulation tools, aiming to make them run faster and become easier to use. “We just announced a tool earlier this year called Ansys SimAI, which lets you take any of our black-box solvers and train an AI model. Once trained, it will run simulation hundreds of times faster,” said Banerjee.

Different Twins for Different Needs

Teresa Alberts, CEO of ITficient, was another keynote speaker at OzenCon. Her talk was titled, “Applications and Benefits of Digital Twin for the Manufacturing Industry.” Alberts said, “Where the digital twin brings value depends on the product and what the customer’s pain points are. If they can identify the pain points, then the digital twin can help address them, and bring added value.”

Alberts highlighted the case of several power plant operators in her presentation. “They use digital twins to ensure the plants’ availability, to see the condition of the critical components, to get forecasts about the remaining lifetimes of the critical components, and to service them in advance.”

For digital twin owners and operators, the amount of data collected from sensors would be a significant data analysis burden. Ansys anticipates its tool can fill a need. “By integrating AI-based data analytics with simulation, you can create what we call hybrid digital twins.”

AI-Ready Hardware

Many of the AI workloads, such as using machine learning to perform data analysis or object recognition, are expected to drive up the demand for computing power, often beyond what’s normally available in a personal workstation. Most likely, engineering simulation in the future will require a mix of on-premise hardware and on-demand computing.

This month, Dell announced the new Dell Precision 3680 desktop tower, the latest

workstation targeting CAD users. It can be configured with the full range of NVIDIA professional GPUs, including NVIDIA’s newly released RTX 2000 Ada GPU, based on the NVIDIA Ada Lovelace GPU architecture, featuring 16GB of high performance GPU memory.

Manufacturing workflows typically include design and simulation for virtual prototyping that require desktop workstations with GPUs for quick and realistic visualization of intricate geometries and for rapid computations.

Zihan Wang, High-Tech Strategy and Operations manager for NVIDIA, said, “If you want to simulate the motion of granular materials in the mining industry, like particles on a conveyor belt in a mixer, double-precision GPUs are required to speed up the simulation. We have the NVIDIA RTX A800 40GB Active GPU for that type of simulation. It’s a workstation GPU so you can embed it into your Dell Precision workstation ... For simulations where single precision provides the required accuracy, NVIDIA RTX Ada Generation GPUs will provide incredible performance.”

As AI speeds up processing, Wang expects engineers to expand the use of simulation. “With AI-embedded HPC, you can process more data points to make a better decision,” he said.



Teresa Alberts, CEO of ITficient, discusses the reason different people use digital twins. Photo by Kenneth Wong, DE 24/7.