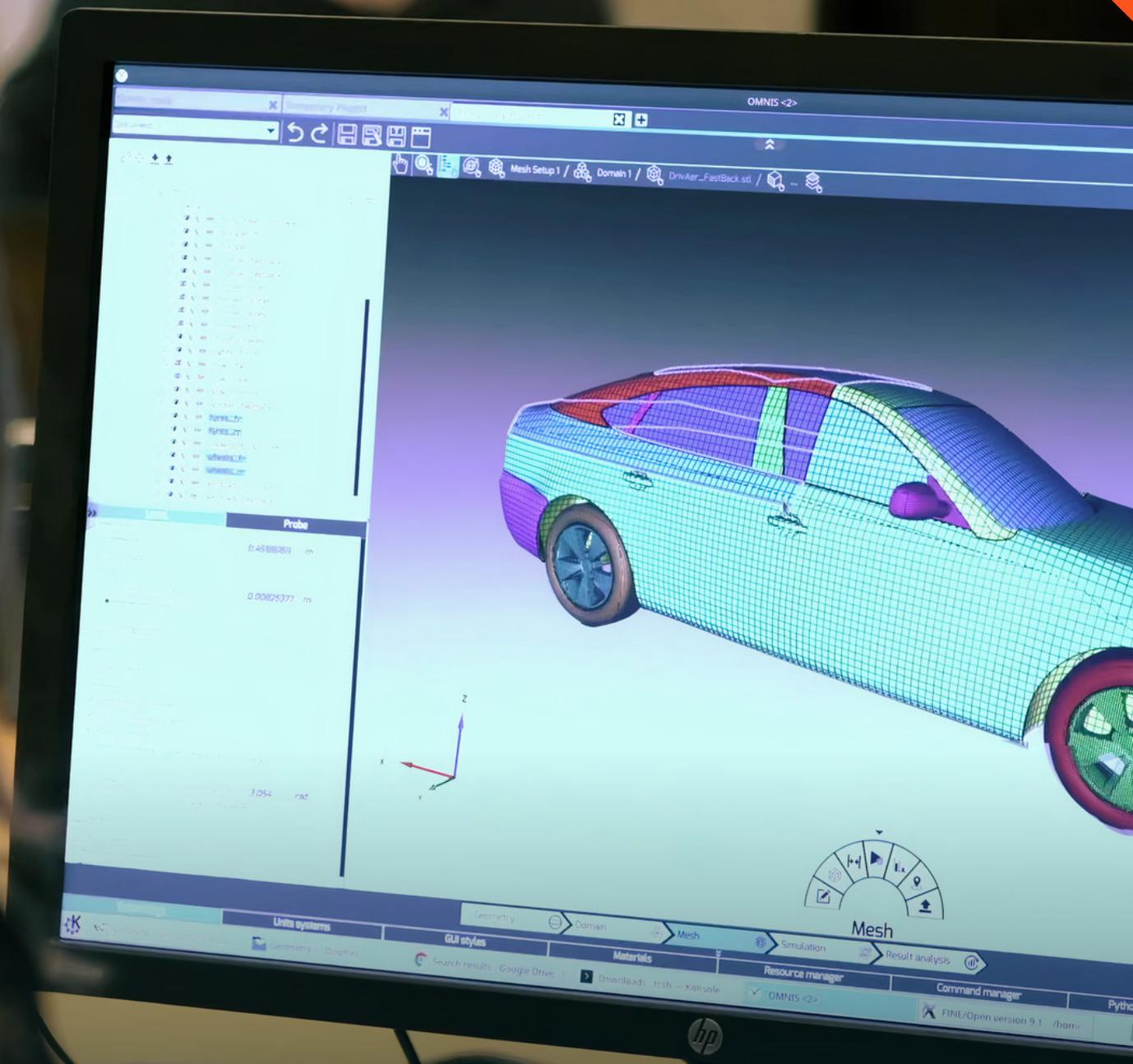


Accelerating complex physics simulations on a global HPC-as-a-Service platform



“There is a trend towards high-fidelity simulation, and it requires a very large amount of compute resources.”

Professor Charles Hirsch,
Cadence Design Systems

Cadence Design Systems, a leader in flow and physics simulation, eliminates infrastructure burden and capex investment with low-latency, fully managed HPC delivered from atNorth Nordic data centers.

Computational fluid dynamics (CFD) has become one of the most important use cases in high-performance computing (HPC) systems, and a critical technology for design engineers in the aerospace, automotive, energy, naval and defense industries. CFD involves digital simulation of how the physical properties of an object – like a car, ship or an airplane – affect the flow of fluids, such as water and air, around them. CFD simulations are used to test the performance and safety of product designs, and to iterate on those designs to improve business outcomes.

Engineering software and clustered HPC system performance therefore directly impacts the competitiveness of computer aided engineering (CAE) teams today. Faster HPC solutions can run more simulations, at greater speed, and with higher accuracy levels. This allows engineers to produce more design iterations and achieve higher product quality, safety, and efficiency.

Cadence Design Systems is a worldwide leader in electronic design, with more than 30 years of computational software expertise and around 9,000 employees working in 23 countries.

The company’s European CFD software division (formerly known as NUMECA International) develops tools that enable its customers to explore and push their designs to the limit, safely, quickly and with precision. With innovation at its core, the division sought to develop the next generation of HPC tools, which would leverage cloud technologies to streamline the user experience.

“We were considering a strategy to relieve the industry of the burden of managing infrastructure, by offering access to HPC software and hardware as a service,”

says Professor Charles Hirsch, Cadence Design Systems.

“We have to realize that many industrial systems, like aviation, marine micro dynamics, energy transformation, are all based on the properties of fluids. And there is a trend towards high-fidelity simulation, which reproduces with much higher accuracy, the behavior of fluids. That objective requires us to model turbulence with all its fluctuating details.”



Making HPC simpler and more agile

Driving the shift towards an HPC-as-a-service strategy, were business challenges that many organizations working with CFD simulations face, including:

Complex and time-consuming management

Traditional on-premise HPC systems are complex to manage and must be provisioned and tuned for each workload. This requires specialist resources and can pull skilled engineers away from their real roles.

High cost of staying competitive

Purchasing, scaling, and upgrading on-premise HPC systems requires significant capital investment, making it costly to stay at the cutting edge of technology.

Difficulty in leveraging the cloud

While other workloads are benefitting from the "as-a-service" experience of public cloud, CFD workloads are more difficult to migrate because they require low-latency performance and high levels of compute power. For organizations with teams in multiple countries, building a unified HPC infrastructure is difficult.

"We needed a powerful, flexible HPC platform that would free our development team to focus on creating solutions that transform industrial CAE workflows,"

says Marc Tombroff, Vice President of R&D, Cadence Design Systems.

"Speed and simplicity are vital for our own teams and our customers. The less time we can spend waiting for simulations and visualizations, or managing different systems and tools, the more effectively we can help customers to innovate."

“We evaluated many different providers in the search for the right HPC solution, and atNorth delivered record-breaking performance in our tests”

Marc Tombroff,
Vice President of R&D,
Cadence Design Systems

The solution

Cadence partnered with atNorth to develop a global HPC-as-a-Service platform that solved these challenges. Built on the atNorth HPCFLOW HPC as a Service platform and delivered from our sustainable data centers in Iceland, the solution has delivered record-breaking simulation performance, eliminated HPC management and investment burdens, and provided a single managed infrastructure that is being consumed by Cadence teams in Europe, North America, and Asia, as well as the company's own customers.

Fully managed HPC with HPCFLOW

atNorth's HPCFLOW cloud platform provides management, orchestration, and decommissioning of HPC resources, in a fully-managed cluster. Management and support are provided 24/7 by the dedicated atNorth HPC & AI engineering team, while a REST API allows Cadence to integrate with 3rd-party services and applications easily. Designed for large-capacity projects and ready to scale up and down, HPCFLOW provides the simplicity and flexibility Cadence needs to deliver HPC as a service for its teams and world class engineering solutions to its customers.

Industry-leading technologies

The HPC clusters at atNorth data centers provide industry-leading performance to accelerate Cadence's compute and GPU-intensive workloads, including CFD simulations and data visualization.

Clusters are made up of HPE Apollo servers featuring:

Intel® Xeon® Scalable processors with Intel Deep Learning Boost, which accelerates inference workloads by up to 100%¹

NVIDIA V100 Tensor Core GPUs, the most advanced data center GPU designed to accelerate HPC and data science and reduce the time engineers spend optimizing memory usage²

High-performance shared storage that leverages BeeGFS, the award-winning parallel file system that supports thousands of large-scale enterprise HPC deployments worldwide

¹ <https://www.intel.com/content/www/us/en/artificial-intelligence/deep-learning-boost.html>

² <https://www.nvidia.com/en-us/data-center/v100/>



OMNISTM 3D visualizations across the globe

3D data visualization is a key workload for Cadence teams. Rapid visualization of models improves productivity by enabling engineers to see the effect of design changes and iterate faster.

Visualizations are split into two kinds of workload:

- **pre-processing**, in which calculations required to create the model are run
- **post-processing**, which includes rendering and display of 3D visualizations

By combining the power of industry-leading Intel and NVIDIA processors and the speed of fiber optic network routes, Cadence users on three different continents can visualize their design work in real-time.

Low-latency for users everywhere

atNorth Nordic data centers are connected to key geographies by sub-sea fiber optic routes, which provide high-throughput and low-latency networking. Performance is fast enough to deliver a real-time responsive desktop experience for Cadence users in Europe, America, and in Asia.

“We evaluated a range of providers in the search for the right HPC solution, and atNorth delivered an unmatched price / performance in our tests,”

says Marc Tombroff.

"We're in the best place on earth to run HPC, because we can leverage natural free air cooling and use 100%-renewable energy"

Guy D'Hauwers,
Vice President of
HPC and AI, atNorth

Unparalleled sustainability

The atNorth HPC solution supports Cadence's sustainability goals and provides reduced TCO by using ultra-efficient, 100% green energy.

atNorth's green initiatives include:



Use of geothermal energy at the Mjöllnir DC data center in Iceland, an HPC optimized data center



Natural air cooling, made possible by the Nordic region's cool climate, which significantly reduces powered cooling costs



Commitment to the circular economy, which is set to deliver a better-than-net-zero carbon emissions by removing carbon dioxide from the atmosphere

"Iceland is one of the best places on earth to run HPC,"
says Guy D'Hauwers, Vice President of HPC and AI, atNorth.

"Because we can leverage natural free air cooling, and we have access to 100%-renewable energy, it's ideal for power-hungry HPC clusters."

Business outcomes

Following its introduction by Cadence's European CFD division, the atNorth HPC-as-a-Service solution has been adopted by a number of the company's teams in North America and Asia. The platform was used in development of the company's next-generation OMNIS software, which provides a streamlined CAE workflow for multidisciplinary design and optimization.

Cadence is using the atNorth solution to provide HPC as a service to its customers, enabling them to run their CFD simulations in the cloud with greater speed and detail.

Cadence has benefited from:

Improved productivity

With powerful HPC infrastructure delivered as a fully managed service, Cadence teams are free to focus on their customers and business projects.

More financial flexibility

The company's HPC costs are more predictable and are aligned to service consumption, thanks to atNorth's opex-based, monthly-billed financial model

Rapid scalability

Cadence can provision additional HPC resources to serve new customers or projects, and scale back down when projects end, without making a large capital investment or enduring long lead times. atNorth HPC-as-a-Service clusters offer additional capacity, ready to be switched on.

New technologies on demand

atNorth HPC-as-a-Service clusters are continuously evolving with new technologies from partners including HPE, Intel and NVIDIA. Whereas traditional on-premise infrastructure typically follows a 3 to 5-year buy and refresh budget cycle, Cadence can access the newest technologies available from atNorth on demand.

"HPC is a crucial element of our business, and atNorth-powered HPC is today essential to our team in supporting the development of the next generation of fluid dynamics software and applications."

Marc Tombroff,
Vice President of R&D,
Cadence Design Systems

Ready for the next generation

When Cadence Design Systems set out to overcome the limits of traditional infrastructure, and deliver greater performance and flexibility for its teams and customers, atNorth HPC-as-a-Service enabled the company to realize its strategy.

"HPC is a crucial element of our business,"
says Marc Tombroff.

"atNorth-powered HPC has become essential to our team in supporting the development of the next generation of fluid dynamics software and applications. atNorth has also enabled us to expand into software-as-a-service offerings, where we can use atNorth to host our customers' simulations and accelerate their insights and time to market."

Learn more at
atnorth.com/hpc/hpcaas

For more information about Cadence Design Systems
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