Case Study

HPC in the Cloud
Intel® Xeon® Scalable Processors
Intel® Select Solutions for HPC & AI Converged Clusters
Intel® Omni-Path Architecture
Intel® Optane™ SSDs

intel.

NUMECA International Delivers a Turnkey HPCaaS Solution for the World's Most Complex CFD Workloads

Intel Select Solutions for HPC & AI Converged Clusters featuring Intel Xeon Scalable 9200 processors optimize the performance of NUMECA's Next-Generation software running atop Advania Data Centers' hosted, cloud-based HPC instances.

> "We have built high performance computing as a service from the ground up. We have been working with the best technologies on the market, using Intel Xeon processors to build state-of-the-art HPC. This is ideal for HPC as a Service so that companies like NUMECA can focus on customers instead of worrying about the data center aspects."
>
> **— Guy D'Hauwers, regional director, Europe, Advania Data Centers**

Executive Summary

A joint effort between NUMECA and Advania Data Centers will deliver with an end-to-end, hosted high performance computing (HPC) solution for Numeca's clients' most challenging simulation and modeling workloads. NUMECA's innovative computational fluid dynamics (CFD) solution will help companies and researchers to design next-generation ships, aircraft, and cars that are faster, safer, and more fuel-efficient. The Independent Software Vendor (ISV) chose Advania Data Centers' hosted solutions because they offer several benefits that enable NUMECA to optimize their CFD applications that require excellent scalability, end-to-end security, and configuration flexibility. Advania Data Centers' backend HPC infrastructure includes Hewlett Packard Enterprise's (HPE) Apollo server hardware powered by Intel Select Solutions for HPC & AI Converged Clusters [Magpie] which features 2nd Generation Intel Xeon Platinum 9200 processors with Intel® Deep Learning Boost (Intel® DL Boost) to accelerate CFD workloads.

Challenge

ISVs like NUMECA International need isolated and fully-configurable HPCaaS clusters to enable their innovative CFD software. The complexity of the application requires an elastic and extremely-performant HPC-in-the-Cloud solution upon which to develop and test their latest solution.
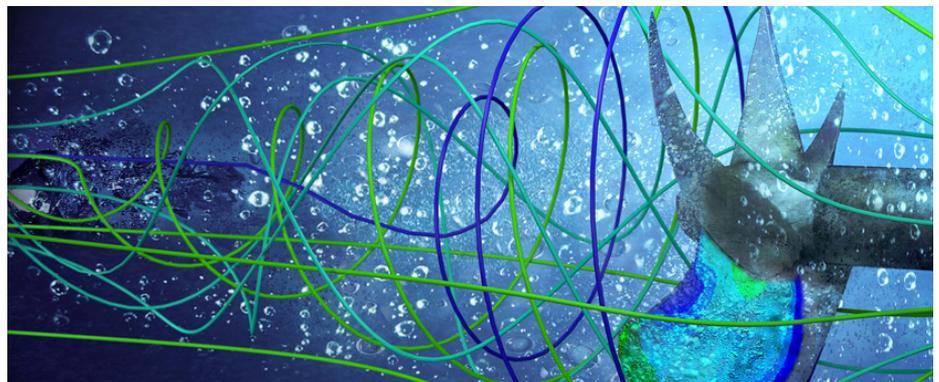
NUMECA's FINE/Turbo is a CFD suite that provides an Integrated Environment for rotating and non-rotating flow analysis in external and internal turbomachinery applications.

Numeca provides CFD software for a variety of disciplines, including naval architects and marine engineers.

Once deployed on an Advania Data Centers HPCaaS solution, NUMECA's next-generation CFD application will offer NUMECA's end-customers a holistic and turnkey solution for their workloads.

Solution

Advania Data Centers' choice of Intel processors and Apollo HPE server hardware offer the performance characteristics to speed HPCaaS instances. Their CPU choice offers native DDR4 memory bandwidth, twelve memory lanes, and up to 112 cores in a two-socket system. Additional Intel technologies include SSDs and memory with Intel Optane technology, and Intel® Software and Performance Profiling tools. Because Advania Data Centers' HPCaaS solutions are configurable

Spotlight on Advania Data Centers

Based in Iceland and Sweden, Advania Data Centers specializes in HPCaaS offerings tailored for multiple industries like life sciences, finance, telecommunications, security, and other commercial applications. Advania Data Centers' customers rely on HPCaaS to address their needs for data-intense workloads like simulation, blockchain technology, computer-aided engineering, fluid dynamics, and more. In addition to the performance, security, and elasticity Advania Data Centers' solutions offer, all their data center facilities run on 100% renewable energy. By avoiding energy sources with carbon content, Advania Data Centers' co-location facilities are extremely power efficient offering customers savings on AI and HPC operations. Advania Data Centers are a part of the Advania brand that employs around 1,200 people in 25 locations in Sweden, Iceland, Norway, Finland, and Denmark. www.advaniadc.com

Spotlight on NUMECA International

NUMECA is globally recognized today for its Computational Fluid Dynamics (CFD) and multiphysics design, analysis, and optimization solutions that support the world's leading industries. NUMECA's application-driven features and interface provide optimal solutions including high quality automatic full hex meshing, accurate and fast CFD solvers, multi-physics and acoustics, robust design, and optimization with uncertainty quantification. With creative teams and offices around the globe, NUMECA offers customers exceptional software, R&D, support, and services. www.NUMECA.com

down to the bare metal level, NUMECA can configure every aspect of its dedicated cluster. In turn, NUMECA can optimize that cluster for their proprietary CFD application and ensure their end-customers have a tested solution for workloads in the cloud. According to Advania Data Centers and NUMECA, the CFD software package runs significantly faster on the Intel Xeon Platinum 9200 HPC platform than on other Advania Data Centers instances. The combination of processor speed and multiple memory channels reduce barriers often associated with memory-bound applications on different hardware platforms.

Results

Advania Data Centers is the first cloud provider to offer its customers like NUMECA AI-ready HPC instances based upon the Intel Select Solutions for HPC & AI Converged Clusters [Magpie] featuring 2nd Generation Intel Xeon Platinum 9200 processors. The processors powering Apollo HPE server hardware offer features like unprecedented native DDR4 memory bandwidth, twelve memory lanes, and up to 112 cores in a two-socket system.

Proven underlying technologies provide reliable and fast HPC infrastructure with numerous benefits:

- A flexible cloud-based platform on which to test and optimize NUMECA solutions
- A solution capable of hosting future NUMECA CFD solutions, creating joint business opportunities
- Extreme performance and scalability for NUMECA's memory-intense CFD applications
- A turnkey platform for CFD on HPCaaS, enabling a complete solution for end-customers, and new revenue streams for both NUMECA and Advania Data Centers
- Built-in security with encryption
- Energy-efficient hardware supports a green data center powered by Iceland's fully-renewable energy sources.
- 24/7 support in the unlikely event of component failure

HPCaaS Enables Breakthroughs in Science and Industry

Advania Data Centers supports a broad user base. While their customer use cases vary widely, typical workloads include machine learning, deep learning, simulation, modeling, and more. In combination with NUMECA software systems, those corporations creating next-generation ships, aircraft, and cars will have a cutting-edge CFD solution to help create more fuel-efficient, safer, and faster designs.

Ingredients for Advania Data Centers' HPCaaS Solution

- Hewlett Packard Enterprise (HPE) Apollo Servers
- Intel Select Solutions for HPC & AI Converged Clusters [Magpie]
- Intel Xeon Platinum 9242 Processor (71.5 M Cache, 2.30 GHz)
- Intel Omni-Path Host Fabric Interface Adapter 100 Series 1 Port PCIe x16
- Intel® Ethernet Network Adapter XXV710-DA2
- Intel® Server System S9248WK2HAC Compute Module
- Intel® SSD D3-S4510 Series (240GB, M.2 80mm SATA 6Gb/s, 3D2, TLC)
- Intel Optane SSD DC P4800X Series (750GB, M.2 110MM PCIe x4, 3D XPoint™)

Lessons Learned

Key takeaways from NUMECA's CFD software deployment on the Advania Data Centers HPCaaS platform:

- Advania Data Centers seek to differentiate itself by providing customizable HPCaaS clusters. Advania Data Centers offer its user base fully-isolated systems coupled with end-to-end data encryption.
- The virtualized HPC solution provides NUMECA a scalable and performant foundation upon which to build their CFD application and host their end-customers' CFD workloads.
- By basing its data centers in Iceland, the combination of cold weather, and available geothermal and hydroelectric power allows the Advania Data Centers-NUMECA CFD solution to run on 100% renewable energy.
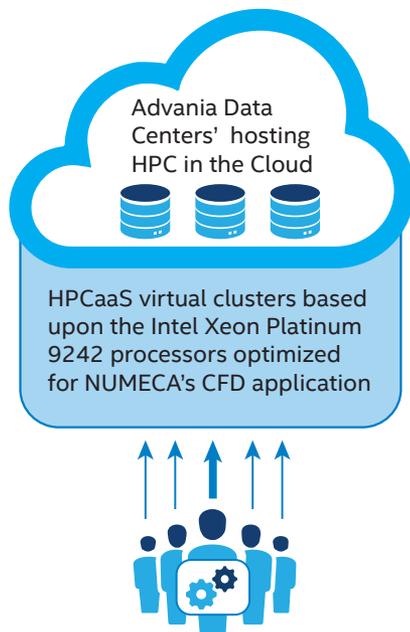
Intel Xeon Platinum 9200 processors are architected to deliver performance leadership across a broad range of demanding workloads. 2nd Generation Xeon Scalable processors are the only data center CPU with AI acceleration built-in. They also offer unprecedented native DDR4 memory bandwidth and more memory channels than any other Intel Xeon processor. The Intel Xeon Platinum 9200 processor delivers exceptional performance scaling up to 112 cores in a two-socket system with 24 channels of memory representing approximately 400GB/sec of memory bandwidth.[1]

Intel Select Solutions for HPC & AI Converged Clusters [Magpie]

Intel Select Solutions for high performance computing (HPC) offer validated and quick-to-deploy infrastructure optimized for analytics clusters and HPC applications to help accelerate time to breakthrough, actionable insight, and new product design. Intel Select Solutions for HPC & AI Converged Clusters efficiently run AI workloads within an HPC environment. The architecture enables partners to build upon existing HPC investments, supporting HPC batch schedulers to run workloads like simulation and modeling, big data analytics, and AI on common HPC infrastructure.

Learn More

Gain more insight about Intel Select Solutions for HPC & AI Converged Clusters [Magpie]

Find out more about the Intel Xeon Scalable processor family

Learn more about Advania Data Centers' HPCaaS solutions

Read additional information about NUMECA solutions

Find the HPCaaS solution that is right for your organization. Contact your Intel representative or visit www.intel.com.

Advania Data Centers' hosting HPC in the Cloud

HPCaaS virtual clusters based upon the Intel Xeon Platinum 9242 processors optimized for NUMECA's CFD application

End-customers running their CFD workloads on NUMECA's application

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