Aerodynamic CFD Simulations in the Advania Data Centers HPCFLOW Cloud

An UberCloud Experiment

MANTIUM CAE

advania data centers

With Support From:

UberCloud

Hewlett Packard Enterprise

intel

UberCloud Case Study 204

http://www.TheUberCloud.com

July 17, 2018

Welcome!

The UberCloud* Experiment started in July 2012, with a discussion about cloud adoption in technical computing and a list of technical and cloud computing challenges and potential solutions. We decided to explore these challenges further, hands-on, and the idea of the UberCloud Experiment was born, and since then generously supported by Hewlett Packard Enterprise and INTEL.

We found that especially small and medium enterprises in digital manufacturing would strongly benefit from technical computing in HPC centers and in the cloud. By gaining access on demand from their desktop workstations to additional and more powerful computing resources in the cloud, their major benefits became clear: the agility gained by shortening product design cycles through shorter simulation times; the superior quality achieved by simulating more sophisticated geometries and physics and by running many more iterations to look for the best product design; and the **cost** benefit by only paying for what is really used. These are benefits that obviously increase a company's innovation and competitiveness.

Tangible benefits like these make computing - and more specifically technical computing as a service in the cloud - very attractive. But how far are we from an ideal cloud model for engineers and scientists? At first we didn't know. We were facing challenges like security, privacy, and trust; traditional software licensing models; slow data transfer; uncertain cost & ROI; lack of standardization, transparency, cloud expertise. However, in the course of this experiment, as we followed each of the 200 teams closely and monitored their challenges and progress, we've got an excellent insight into these roadblocks, how our teams have tackled them, and how we are now able to reduce or even fully resolve them.

The aim of UberCloud Experiment #204 was to demonstrate how ADC's HPCFLOW computing resources allowed MantiumCAE to create a CFD simulation quickly and efficiently for the Silvermine 11SR sportscar. MantiumCAE set up a CAE computing environment in Advania's HPCFLOW cloud where simulations have been carried out quickly and efficiently. A typical external vehicle aerodynamics simulation needs between 2.000 and 10.000 CPU core hours to be processed which would take weeks to run on a 16-core workstation, but by using the HPCFLOW cloud, MantiumCAE is able to deliver results within one business day.

We want to thank all team members for their continuous commitment and contribution to this exciting project. And we want to thank our main sponsors **Hewlett Packard Enterprise** and **INTEL** for generously supporting all the 204 UberCloud experiments.

Now, enjoy reading!
Wolfgang Gentzsch and Burak Yenier

) UberCloud is the online community & marketplace where engineers and scientists discover, try, and buy Computing Power as a Service, on demand. Engineers and scientists can explore and discuss how to use this computing power to solve their demanding problems, and to identify the roadblocks and solutions, with a crowd-sourcing approach, jointly with our engineering and scientific community. Learn more about UberCloud **HERE.*

Team 204

Aerodynamic CFD Simulations using Advania Data Centers' HPCFLOW Technology

"After logging into the Advania Data Centers cloud, running a CFD case created by MantiumFlow is just a matter of starting it. This makes engineers' life really easy."

MEET THE TEAM

End-User/CFD Expert: Andre Zimmer, Managing Director, MantiumCAE
Resource Provider: Aegir Magnusson, Staffan Hansson, Hans Rickardt, Elizabeth Sargent, Advania Data Centers
Cloud Expert: Hilal Zitouni, Fetican Coskuner, Ender Guler, Burak Yenier, The UberCloud.

ABOUT MANTIUMCAE

Based in Germany, MantiumCAE is an engineering consulting firm dedicated to computational fluid dynamics (CFD) simulations, with a particular focus on aerodynamics, optimization and CFD process automation. They assist manufacturing clients in establishing, enhancing, and optimizing their CFD capabilities and work to create products with greater aerodynamic performance.

As a specialized computer-aided engineering (CAE) consultant, MantiumCAE experiences both large and fluctuating computational demands to work on challenging projects. While browsing for on-demand HPC providers on Cloud 28+, MantiumCAE discovered Advania Data Centers (ADC) and learned about their HPCFLOW cloud service. MantiumCAE reached out to ADC's HPC experts and consulted with them, and subsequently determined that the best approach was to execute a hybrid approach to cloud-based HPC. This allowed them to combine their existing in-house HPC infrastructure with on-demand HPC resources from ADC. The result is a flexible approach which allowed MantiumCAE to make the most out of its existing HPC investments while increasing its ability to scale up HPC resources quickly and efficiently for its customers.

ABOUT ADVANIA DATA CENTERS

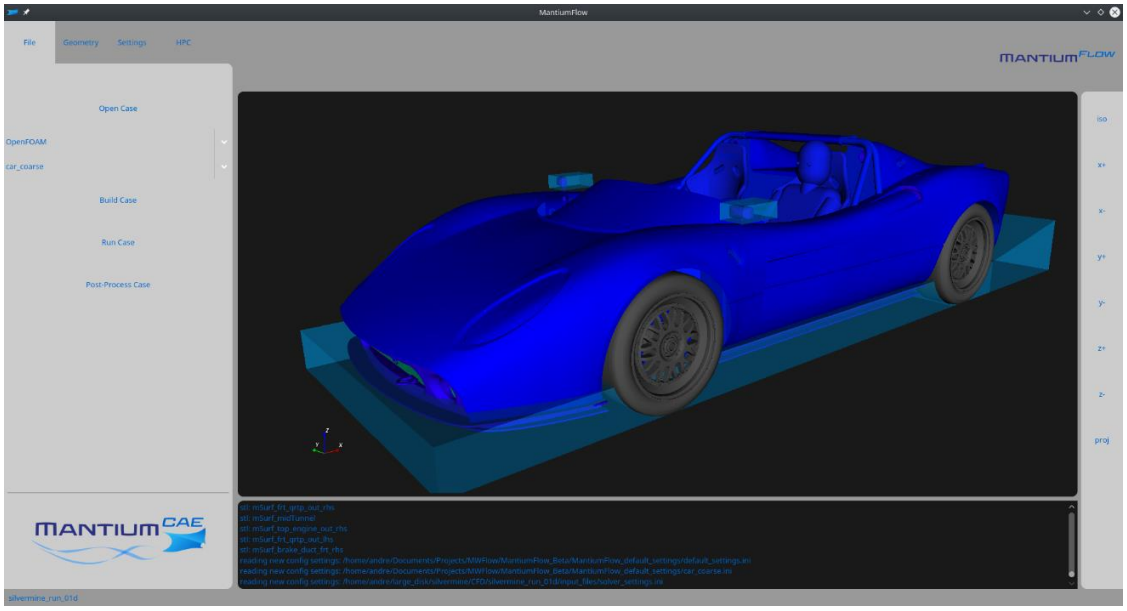
Advania Data Centers is a high-density computing technology company headquartered in Reykjavik, Iceland with operations in Sweden, Norway, Germany and the United Kingdom. Through extreme growth, Advania Data Centers now operate one of Europe's largest datacenter

campuses in Iceland that is tailor made for high density hosting such as High Performance Computing, blockchain technology and high-density compute, all powered by renewable energy. Advania's HPC team consists of experts that oversee the operation of HPC environments and HPC Jobs of their customers, globally leading organizations in manufacturing, technology, science among other industries. Advania partners with industry leaders in HPC such as Hewlett Packard Enterprise, Intel, Nvidia, and UberCloud to deliver next generation HPC environments such as HPCFLOW – Advania's Bare Metal HPC Cloud, where HPC operators can execute in a fast and efficient manner.

USE CASE

This case study shows how ADC's HPCFLOW computing resources allowed MantiumCAE to create a CFD simulation quickly and efficiently for the Silvermine 11SR sportscar. To achieve this, MantiumCAE set up a CAE computing environment in Advania's HPCFLOW cloud where simulations could be carried out quickly and efficiently.

A typical external vehicle aerodynamics simulation needs between 2.000 and 10.000 CPU core hours to be processed. Processing this simulation would take weeks to run on a 16-core workstation, but by using the HPCFLOW cloud environment together with MantiumFlow, MantiumCAE is able to deliver results within one business day.



METHOD

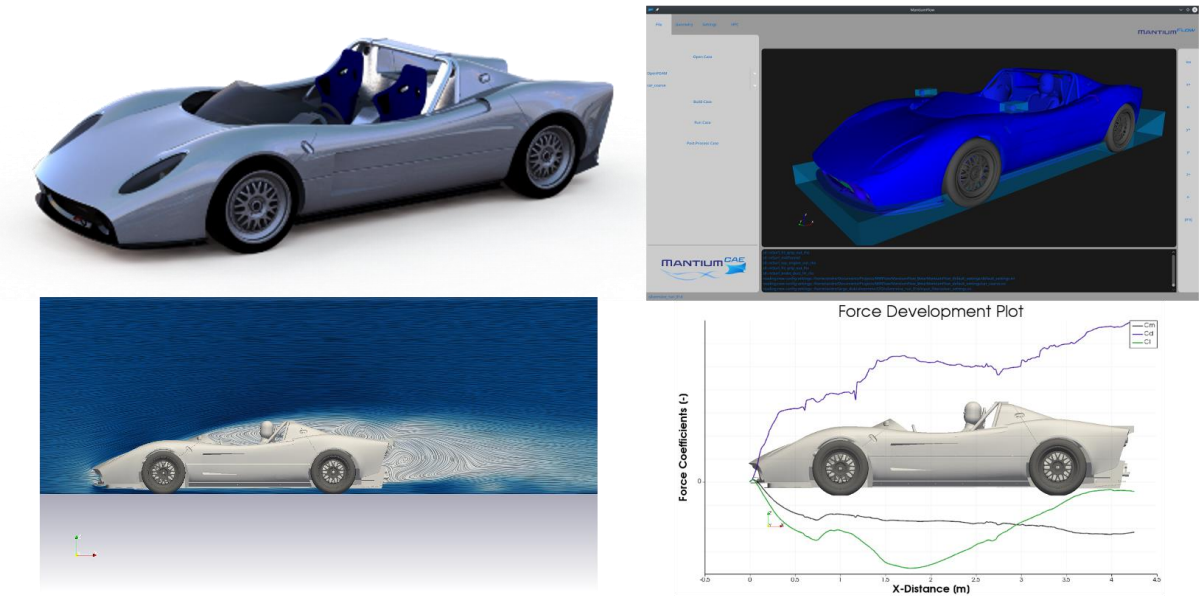
In order to successfully create and carry out the CFD simulations for the Silvermine 11SR, MantiumCAE needed the following:

- CFD Engineer with a workstation
- MantiumFlow for the CFD setup
- HPC computing power from ADC

- MantiumFlow for post-processing

The process for running the CFD simulation using HPCFLOW is very straight forward. First, the engineer creates the CFD case using MantiumFlow, which automates the setup process and uploads it to ADC's HPCFLOW environment.

The engineer then runs the CFD simulations with a script created by MantiumFlow on the ADC environment.



Afterwards a report containing a series of plots and images is automatically created by MantiumFlow. The almost fully automated approach minimizes user error and ensures that simulations can be repeated. Everything is executed using a desktop-like environment which is easy to use and navigate.

BUSINESS BENEFITS AND NEXT STEPS

By successfully using ADC's HPCFLOW technology, MantiumCAE was able to execute HPC CAE projects on a scale that was previously unattainable, and with a flexibility that allowed them to serve their clients' needs better and faster. This was done without any upfront investment in computers or facilities. MantiumCAE benefitted greatly from the flexibility of the HPCFLOW service, which allowed it to scale its use of HPC resources up and down to meet its changing demands and pay only for what was needed. ADC's HPC nodes proved to be well-suited to CFD (RAM per CPU core) and were able to process workloads quickly and efficiently.

By giving MantiumCAE access to a dedicated HPC engineer for technical support throughout the project process, ADC ensured that there was always someone available to answer questions or troubleshoot problems. They listened to MantiumCAE's needs and provided an excellent level of

service and support. This, combined with ADC's low cost per hour, made the experience very positive.

As a result of its work with Advania Data Centers, MantiumCAE's has greatly strengthened its ability to compete more competitively for challenging projects without high initial investments and high cost of on-demand resources. This has secured their existing business, opened new markets and positioned them well for future growth.

Case Study Authors – Andre Zimmer and Elizabeth Sargent

Thank you for your interest in our free and voluntary UberCloud Experiment!

If you, as an end-user, would like to participate in an UberCloud Experiment to explore hands-on the end-to-end process of on-demand Technical Computing as a Service, in the Cloud, for your business then please register at: http://www.theubercloud.com/hpc-experiment/.

If you, as a service provider, are interested in building a SaaS solution and promoting your services on the UberCloud Marketplace then please send us a message at https://www.theubercloud.com/help/.

2013 Compendium of case studies: https://www.theubercloud.com/ubercloud-compendium-2013/
2014 Compendium of case studies: https://www.theubercloud.com/ubercloud-compendium-2014/
2015 Compendium of case studies: https://www.theubercloud.com/ubercloud-compendium-2015/
2016 Compendium of case studies: https://www.theubercloud.com/ubercloud-compendium-2016/
2018 Compendium of case studies: https://www.theubercloud.com/ubercloud-compendium-2018/

The UberCloud Experiments and Teams received several prestigious international Awards, among other:

- HPCwire Readers Choice Award 2013: http://www.hpcwire.com/off-the-wire/ubercloud-receives-top-honors-2013-hpcwire-readers-choice-awards/
- HPCwire Readers Choice Award 2014: https://www.theubercloud.com/ubercloud-receives-top-honors-2014-hpcwire-readers-choice-award/
- Gartner Cool Vendor Award 2015: http://www.digitaleng.news/de/ubercloud-names-cool-vendor-for-oil-gas-industries/
- HPCwire Editors Award 2017: https://www.hpcwire.com/2017-hpcwire-awards-readers-editors-choice/
- IDC/Hyperion Research Innovation Excellence Award 2017: https://www.hpcwire.com/off-the-wire/hyperion-research-announces-hpc-innovation-excellence-award-winners-2/

If you wish to be informed about the latest developments in technical computing in the cloud, then please **register at http://www.theubercloud.com/** and you will get our free monthly newsletter.

MANTIUM CAE

advania data centers

With Support From:

UberCloud

Hewlett Packard Enterprise

intel