

# Ninth Graders Designed Flying Boats in ANSYS Discovery Live in the Azure Cloud

An UberCloud Experiment



With Support From:



## UberCloud Case Study 208

<http://www.TheUberCloud.com>

October 19, 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 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 this UberCloud Experiment #208 is to demonstrate how 9th-grade 14-year old students from Torsdad Middle School in Sandvika, Norway, design flying boats in ANSYS Discovery Live on Azure's GPU instances, 3D-print them, and 'crowning' their 3-month tech course with a final competition for the best flying boat. Help was also given by their physics teacher Ole Nordhaug, engineer Håkon Bull Hove from ANSYS channel partner EDRMedeso, and HPC Cloud service & technology provider UberCloud. The students implemented ANSYS Discovery Live on Microsoft Azure NV6 compute instances, each equipped with an NVIDIA Tesla M60 GPU. This project is just another demonstration of the trend towards easy-to-use application software (also recently called 'appification') and the seamless access to HPC cloud resources, as demonstrated by 14-year old middle school students!

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 213 UberCloud experiments so far.

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](#).*

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## Team 208

# Ninth Graders Designed Flying Boats in ANSYS Discovery Live in the Azure Cloud

This case study appeared as a feature story in HPCwire on October 19, 2018



*“The students learned the ANSYS software extremely fast. It was really inspiring to see the many concepts they came up with.”*

*“To see such a spirit among the students was the most inspiring moment in the entire project.”*

### MEET THE TEAM

**End-Users:** 25 9th-grade students from Torsdad Middle School in Sandvika, Norway

**Software Provider:** Scott Gilmore, ANSYS Director of Business Development, with ANSYS Discovery Live

**Cloud Provider:** Microsoft Azure and the UberCloud

**HPC Expert and Service Provider:** Ender Guler and Ronald Zilkovski, UberCloud.

### USE CASE

This UberCloud project #208 has been collaboratively performed by a class of 25 9<sup>th</sup>-grade students from Torsdad Middle School in Sandvika, Norway. Help was also given by their physics teacher Ole Nordhaug, engineer Håkon Bull Hove from ANSYS channel partner EDRMedeso, and HPC Cloud service provider UberCloud. They implemented ANSYS Discovery Live on Microsoft Azure NV6 compute instances, each equipped with an NVIDIA Tesla M60 GPU.

The students used ANSYS Discovery Live, released in the first quarter of 2018, which provides instantaneous 3D simulation, tightly coupled with direct geometry modeling, to enable interactive design exploration and rapid product innovation. It is an interactive, multiple physics simulation environment in which users can manipulate geometry, material types, or physics inputs, and instantaneously see changes in performance. It allows users to test more design iterations in a much shorter amount of time, perform feasibility studies on new concepts and bring products to market faster. It is a great tool for CAD engineers who can check the physics of their different designs on demand.

### Hired by fictional company “FlyBoat”

Through a course called "Research in Practice" the students got a taste of the work of an engineer. They were told that a fictional company called "FlyBoat" was planning to develop a combination of a boat and a sea plane. FlyBoat had hired them to do a concept study. Within some given parameters, like a predefined height, width and length, the students were free to innovate. Eventually, FlyBoat would pick

one of the concepts for their design. To win the competition, the students had to come up with the best overall design, which required attention to many different aspects of boat and plane design. At the end of the semester, all the boats were 3D-printed, and the students held sales presentations to convince a panel that their concept was indeed the best.



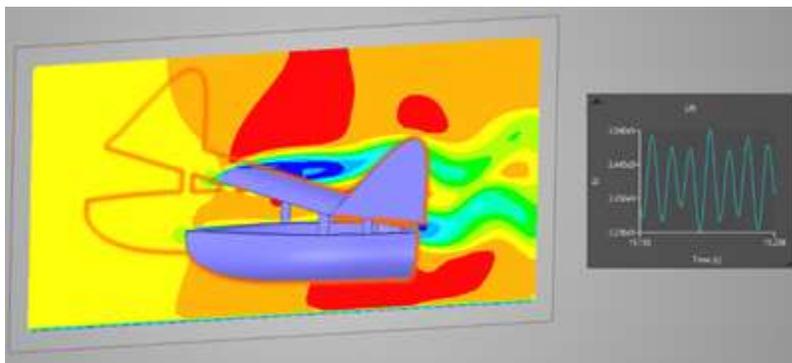
**Figure 2: The winners from Torsdad Middle School in Sandvika, Norway, and their flying boat.**

### 3D MODELLING IN ANSYS DISCOVERY LIVE

The students designed a 3D model of the boat in ANSYS Discovery Live. None of the students had prior experience with CAD modelling nor simulations, but they took the challenge head-on. *“The students learned the software impressively quickly. It was really inspiring to see what concepts they came up with”*, says Håkon Bull Hove, engineer at EDRMedeso. Together with teacher Ole Nordhaug, he demonstrated Discovery Live to the students and helped them with their simulations.

Perhaps the most challenging task of the project was to prove that the flying boats could indeed fly. To do this, the students performed aerodynamic analyses of the wing in ANSYS Discovery Live, examining both lift and drag. Their simulations did not only prove that the wings had enough lift, but provided excellent visualization of the physics as well.

*“It is much easier to understand foil theory when you see it live on your screen,”* says enthusiastic teacher Ole Nordhaug. *“To see such a spirit among the students was the most inspiring moment in the entire project.”*



**Figure 3: Students model their designs and use simulations to prove their boats can fly.**

### USING UBERCLOUD ON MICROSOFT AZURE

During the whole course of the design and simulation project – from March to June this year – the students have been supported by UberCloud which provided – every Wednesday – ten ANSYS Discovery Live environments sitting on ten Azure NV6 Windows compute nodes, each equipped with 6 Intel Xeon E5 compute cores, 56 GB, and an NVIDIA Tesla M60 GPU for accelerating compute and real-time remote

visualization. Cloud resources were located in Microsoft’s Azure datacenter in Amsterdam which the students accessed instantly, with login and password, through their web browser.

At the beginning of the project, data traffic between the cloud and the students’ low-end Chromebooks was quite slow. To further speed up remote visualization during students’ interactive work, NICE DCV software has been used for accelerating the rendering of visual elements and sending the rendered elements to the students’ web browser as compressed data. With this technology the network bandwidth and the overall user experience was very satisfactory, even with the low screen resolution of the students’ Chromebooks.

## UberCloud's Cloud Ready ANSYS Discovery Live Solution

	Tooling for cloud ready ANSYS Discovery Live solution creation
	<b>ANSYS Discovery Live</b>
<b>This instant, interactive simulation environment allows engineers — at all levels and in every discipline — to explore their concepts and designs</b>	
	 <i>desktop cloud visualization</i>
	<b>Azure VM with NVIDIA M60 GPU</b>
Standard NV6 VM Windows Server 2016	

## CONCLUSION

This middle school project with 14-year old students and their physics teacher in Norway is just another impressive demonstration of the current trend towards more user-friendly application software, combined with extremely fast HPC Cloud infrastructure (equipped with GPUs) available for everyone at their fingertips; a big step forward towards “democratizing” high performance computing and engineering simulation.

## ADDITIONAL PICTURES



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*Case Study Author – Håkon Bull Hove and Wolfgang Gentsch*

## 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/>

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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/>

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