



MINES ParisTech and Transvalor

Helping enterprises take off with cost-efficient fluid dynamics simulations in the cloud from Aeromines

Overview

The need

With many small and midsize enterprises unable to access cost-efficient HPC resources, Transvalor and MINES ParisTech saw an opportunity to provide tailor-made environments at a much lower price point.

The solution

Working with partners in industry and education, MINES ParisTech and Transvalor created Aeromines, an HPC solution based on IBM® Platform Computing Cloud Service, enabling rapid, pay-as-you-go access to cluster resources.

The benefit

Aeromines enables clients to set up secure clusters with customized software stacks in the cloud within one month—reducing simulation lead times by 91 percent and providing cost-effective HPC services.

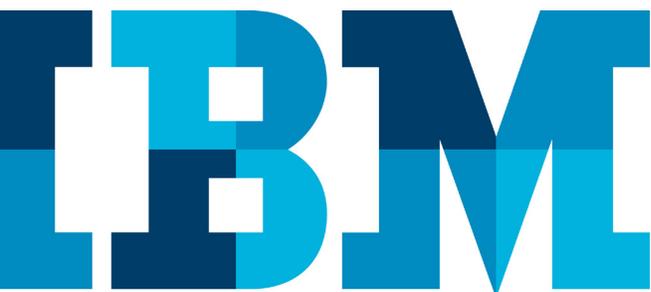
Wind-tunnel simulations are an essential tool for students and engineers designing new solutions in fields such as aerospace, automotive and energy. High-performance computing—combined with advanced software for modelling physical systems—offers valuable wind-tunnel data without the costs of real-world simulations. And because of the comparatively low cost of digital simulations, it's not just engineers who benefit—students and researchers can see abstract fluid dynamics equations brought vividly to life.

Lowering barriers for entry into HPC

Researchers at Transvalor and engineering school MINES ParisTech recognized that many of the enterprises and education institutions they encountered in the course of their work faced a common challenge.

Elie Hachem, Founder of Aeromines and Head of the Computing and Fluids Research Group at CEMEF, MINES ParisTech, explains: “Previously, if a small or midsize engineering company needed to perform a digital wind-tunnel simulation on a component they were developing, there were essentially two options. Either the company could make the substantial investment in designing, purchasing and maintaining its own HPC cluster on site, or rent the resources to run the job from a third-party organization such as a university or private company.”

“For our new HPC solution to be a success, we needed a partner with domain expertise, a robust, bare-metal cloud platform and intelligent job scheduling capabilities. Many of the vendors we considered could offer one or two of these ingredients—but only IBM could deliver on all three, and provide secure environments for clients,” says Romain Klein, Cloud Architect at Transvalor.



Solution components

Services

- IBM® Platform Computing Cloud Service
-

Elie Hachem continues: “The challenge with building a HPC cluster from scratch is that this requires an extremely large investment of time, effort and technical expertise. When complete, a cluster must run jobs 24/7 to deliver any meaningful return on investment—and many enterprises do not run a sufficient amount of simulations each year to make the in-house option commercially viable.

“For these reasons, enterprises may turn to the second option, and rent compute resources on an existing cluster. However, preparing, optimizing and running an advanced simulation requires domain expertise in the architecture of the cluster and its software stack, which most enterprises do not possess.

“Crucially, the costs for any organization running a cluster—and therefore the price for enterprises to rent capacity—are high. On top of that, enterprises must purchase yearly licenses for the software running on the cluster, even if it is only to be used for a handful of simulations. In either case—building a cluster or renting one—the outlay of time and capital is substantial.”

Designing a pay-as-you-go solution

To solve the challenge, Transvalor, MINES Paristech and organizations from industry and education decided to collaborate to bring a new HPC offering to market: Aeromines. The venture—named for the suite of simulation software designed and developed by staff at both institutions—would offer a pay-as-you-go model to make advanced simulations accessible for subject matter experts.

Romain Klein, Cloud Architect at Transvalor, takes up the story: “The vision for Aeromines was to create a secure, cloud-based service to help people to utilize supercomputing resources quickly and cost-effectively. To deliver high performance without driving up the cost for the target end users, we looked for a cloud-based HPC environment.”

Selecting a cost-efficient environment

After reviewing proposals from a number of different vendors, Transvalor selected the IBM Platform Computing Cloud Service running on SoftLayer® infrastructure—a versatile, application-ready cluster in the cloud for organizations that need to quickly, securely and economically add computing capacity.

“Thanks to the IBM Platform Computing Cloud Service, Aeromines is realizing our vision of offering secure, cost-effective access to HPC resources.”

— Elie Hachem, Founder of Aeromines and Head of the Computing and Fluids Research Group at CEMEF, MINES ParisTech

“For our new HPC solution to be a success, we needed a partner with domain expertise, a robust, bare-metal cloud platform and intelligent job scheduling capabilities,” says Romain Klein. “Many of the vendors we considered could offer one or two of these ingredients—but only IBM could deliver on all three, and provide secure environments for clients.

“Additionally, IBM offered built-in job scheduling via IBM Platform LSF® software, which enables us to create intelligent, policy-based schedules to optimize both performance and capacity utilization on the cluster.”

Today, Transvalor utilizes the IBM Platform Computing Cloud Service as its primary environment for commercial simulation workloads. Based on the same low-latency InfiniBand networking technology as its in-house cluster, the IBM cloud environment now crunches terabytes of data for Aeromines users.

Romain Klein comments: “With the Aeromines service, we don’t just provide compute capacity—we also work closely with clients to design environments tailored to specific requirements. The teams involved in the process include PhD students from the CEMEF laboratory at the MINES Paristech, who gain deep experience in developing and optimizing code on the cluster. As well as helping to refine and develop the Aeromines service, the PhD students working with the cutting-edge HPC environment gain valuable transferable skills around the commercial applications of fluid dynamics.”

To ensure tight security for confidential and commercially sensitive data, the client clusters running on the Aeromines platform are not accessible directly over the web but only via VPNs or dedicated lines. Most clients use a partitioned shared cluster, but Aeromines also enables clients with particularly stringent security requirements to deploy clusters on dedicated hardware.

Complex simulations, lower costs

With the IBM Platform Computing Cloud Service driving its business, Transvalor can offer unprecedented levels of flexibility for its clients.

“Rather than requiring clients to purchase software licenses for an entire year, we can now offer a pay-as-you-go model based on the number of cores and amount of data required for each individual simulation,” says Elie Hachem.

“For those clients who have a relatively small number of jobs to run each year, the cloud approach minimizes the overheads associated with HPC clusters.”

— Elie Hachem, Founder of Aeromines and
Head of the Computing and Fluids Research
Group at CEMEF, MINES ParisTech

“For those clients who have a relatively small number of jobs to run each year, it is significantly more cost-efficient to adopt the cloud approach because it minimizes the overheads associated with HPC clusters.

“Commercial and education institutions are for the most part unable to achieve the economies of scale that the IBM cloud platform offers. The result is that many clients can complete simulation jobs with Aeromines at a lower cost than renting the equivalent HPC capacity. This could enable some clients to use the same budget to fund multiple simulations—potentially offering deeper insight into the fluid dynamics problems under study.”

The flexible nature of the Aeromines platform means that clients can start with a small environment and expand it precisely in line with their needs—rather than being forced to invest in unused future capacity from the outset of their projects.

The IBM solution does more than improve the cost-effectiveness of HPC computing—it also shrinks the lead time for beginning new projects.

“If a business decides to create its own dedicated HPC cluster, it can take up to twelve months to deploy the physical infrastructure, migrate the simulation data and configure the environment,” says Romain Klein. “Using our IBM solution, we can get a new Aeromines job up and running within just one month—shortening the lead time by 91 percent.

“Moreover, because we have experts constantly developing the Aeromines solutions, we can build and test a new client’s workload on our in-house cluster while IBM provisions the HPC environment in the cloud. This approach means that jobs are more likely to run as expected on the first attempt, which helps our clients to further avoid costs associated with repeating their jobs.”

Elie Hachem concludes: “Thanks to the IBM Platform Computing Cloud Service, Aeromines is realizing our vision of offering cost-effective access to HPC resources. By continuing our collaboration with our partners in industry and education, we plan to build on this success to further lower the barriers to entry into advanced HPC simulations.”

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For more information

To learn more about IBM Platform solutions, contact your IBM representative or IBM Business Partner, or visit the following website: ibm.com/platformcomputing

About Aeromines

Started in 2012 as a joint project involving researchers and experts in fluid dynamics simulation from the CEMEF laboratory at the MINES Paristech school of engineering and developers at Transvalor, Aeromines provides high-performance computing (HPC) services on demand for challenging simulations.

To learn more about Aeromines, visit: aeromines.com

About MINES Paristech

Founded in 1783 in Paris, France, MINES ParisTech is one of the country's leading engineering schools. With more than 280 research professors, 390 student researchers and 890 students, the school runs 18 research centers in major fields including earth sciences, materials engineering, economics and mathematics.

To learn more about MINES Paristech, visit: mines-paristech.eu

About Transvalor

Established in 1984 and headquartered in Sophia Antipolis, France, Transvalor is a software development company specializing in fluid dynamics simulations. The company offers an extensive suite of simulation software for solid and liquid materials, with industrial applications including aerospace, energy and automotive.

To learn more about products, services and solutions from Transvalor, please visit transvalor.com



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