FLSmidth

AMD × Uber Cloud

together we advance_

High-Performance Cloud Computing Accelerates FLSmidth's MissionZero Sustainability Initiative

Innovation is the lifeblood of Danish manufacturing technology company FLSmidth, which relies on globally dispersed teams serving mining and cement customers around the world.

With its digital transformation, FLSmidth found the perfect vehicle for optimizing the engineering simulation platforms that depend on high-performance computing (HPC). The company adopted the UberCloud Engineering Simulation Platform, based on AMD EPYC™ HBv3 virtual machines (VMs) from Microsoft Azure, and optimized for leading engineering applications. UberCloud, AMD, and Microsoft collaborated with a team of FLSmidth engineers, bringing to life the performance and collaboration gains they need for continuing success.

When mining and cement companies around the world need sustainable, cutting-edge technology and services, they turn to FLSmidth, the Danish multinational company that sets the pace for sustainable innovation in "hard-to-abate" sectors.

As the world is increasingly commits to sustainable development to drive growth and prosperity, the mining and cement industries are a vital part of the green energy transition. Mining provides the minerals and metals needed for growth and innovation, while cement is a key ingredient of society's infrastructure. But while they are key to the future, the two industries combined generate 10-12% of global CO2 emissions, currently making them the third-largest emitting source. Increasingly, mining and cement companies are looking to future-proof their operations, not only by reducing emissions, energy consumption and water waste, but also by ensuring they meet their ethical obligations.

For FLSmidth, founded in 1882 and now with operations in 60 countries around the world, helping customers improve their operations, while addressing their environmental, social and governance (ESG) challenges, is key to its strategy. This is articulated in its "MissionZero" sustainability program, which is fully embedded in the 11,000-person global company and aims to accelerate sustainability in the mining and cement industries. Encompassing research and development, innovation and partnerships, MissionZero provides a pathway to developing and implementing technologies that are needed to build a more sustainable future.

Engineering simulations play a crucial role in accelerating the development of sustainable solutions, for example creating mining flowsheets for critical minerals and developing new cement technologies that reduce fuel consumption and maximize use of alternative fuels. They offer a virtual platform for visualizing, validating and optimizing processes, as well as aiding in equipment selection and sizing, predicting performance metrics and conducting reliability tests. Furthermore, simulations evaluate environmental impact, assess safety risks and facilitate scenario planning for various operational conditions.

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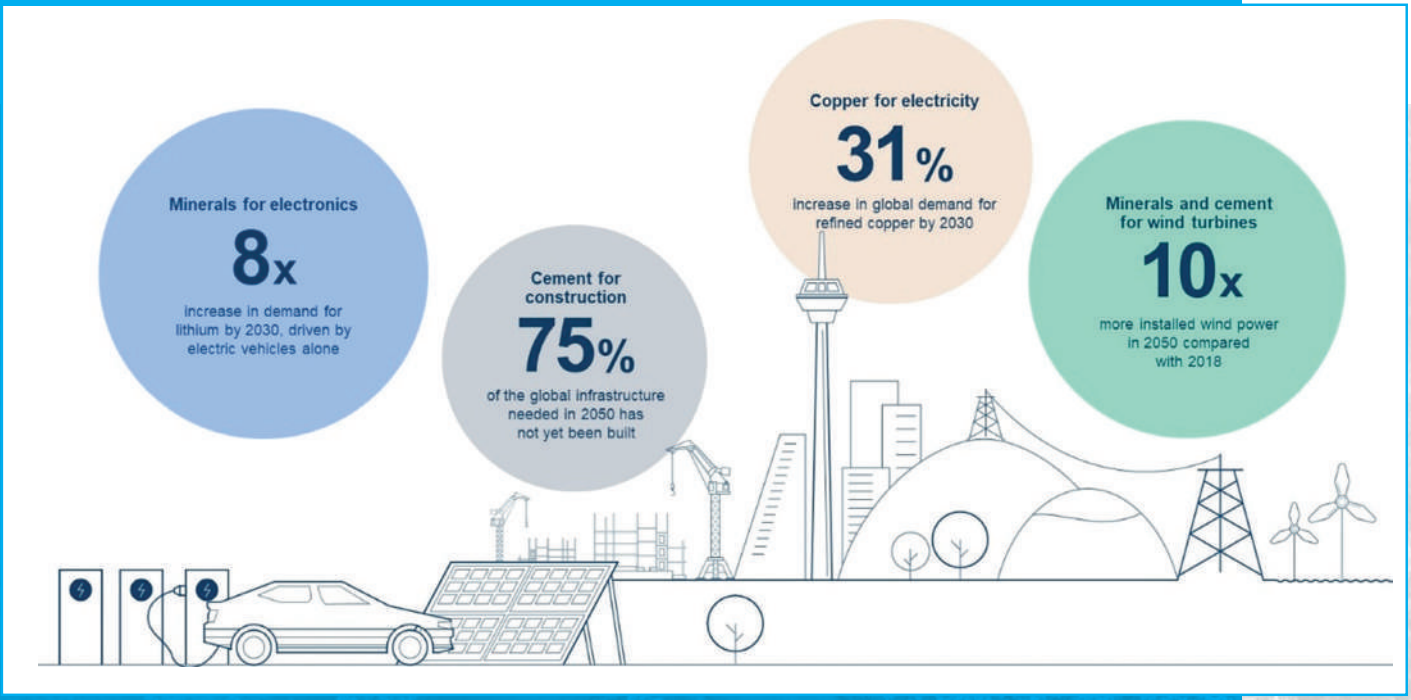
Holger Kirketerp
Head of Cloud Center of Excellence, FLSmidth

The FLSmidth engineer of today applies the same ingenuity that characterized the company founders, but the scope of the problems that today's engineers solve calls for enormous quantities of computing power to support sophisticated modelling. That's why the company engaged with UberCloud that provides an automated, self-service cloud simulation platform for engineers, choosing Microsoft Azure (HPC) and AMD technologies to achieve the agility, scalability, and performance it needs to deliver the best possible results. Like FLSmidth, AMD has committed itself to advancing sustainability, specifically to deliver 30x more energy efficiency in terms of performance per watt for HPC and AI servers by 2025, and it is on track and ahead of broader industry advances as of mid-2023.



Global economic development and the green transition are increasing the demand for minerals and cement. For this development to be sustainable, the environmental impact from the production of these materials must be cut drastically.

Challenging itself to deliver sustainable, cutting-edge solutions

Computer-aided engineering (CAE) software is a boon to engineering teams, who use it to simulate the real-life phenomena that will affect their designs. Those simulations require massive amounts of computing power and powerful engineering workstations. Simulations that are run on-premises can quickly bump up against compute limitations—at the cost of speed and performance. Initially, the company depended on a single central HPC cluster in its Copenhagen datacenter. The distance between the datacenter and remote FLSmidth offices in India and other locations slowed performance for those teams.

Engineers at FLSmidth thrive on challenge. What they didn't enjoy was waiting for finite access to compute time or dealing with the constraints on performance brought about by the limits of workstations and servers. And engineers at the company's remote offices chafed at the latency and performance issues that came with the distance from the Copenhagen datacenter, where the on-premises HPC system resided. The need to allocate central processing unit (CPU) resources worsened the problem. "We had a resource management system on our HPC platform that queued simulation jobs," explains one Computational Fluid Dynamics (CFD) specialist at FLSmidth. "We had issues with scenarios that demand elasticity—if we had a sudden large requirement for a project that depended on a lot of CPUs, our only option was to stop all the other jobs on the CPUs we needed, or we had to compromise on the CPU amount we would use which affected the quality of the simulation results."

Neither did the on-premises model play well with advances in technology. On-premises users who didn't have desktop workstations with high-performance (and expensive) graphics processing units (GPUs) couldn't access innovations in engineering applications that relied on GPUs.

Servers were nearing end of life. "We were at a sticking point in terms of devices," recalls the CFD specialist. "We had to decide whether to continue capital expenditure investment in an aging system or opt for the cloud."

But solving those issues with the software as a service (SaaS) approach initially raised questions at FLSmidth. Concerns about data safety, legal issues, and compliance with data sovereignty were investigated and addressed together with Microsoft and UberCloud. Weighing ongoing costs for an on-premises solution that was beginning to show its age against the possibilities of newer technology, the company revisited cloud computing in 2018.

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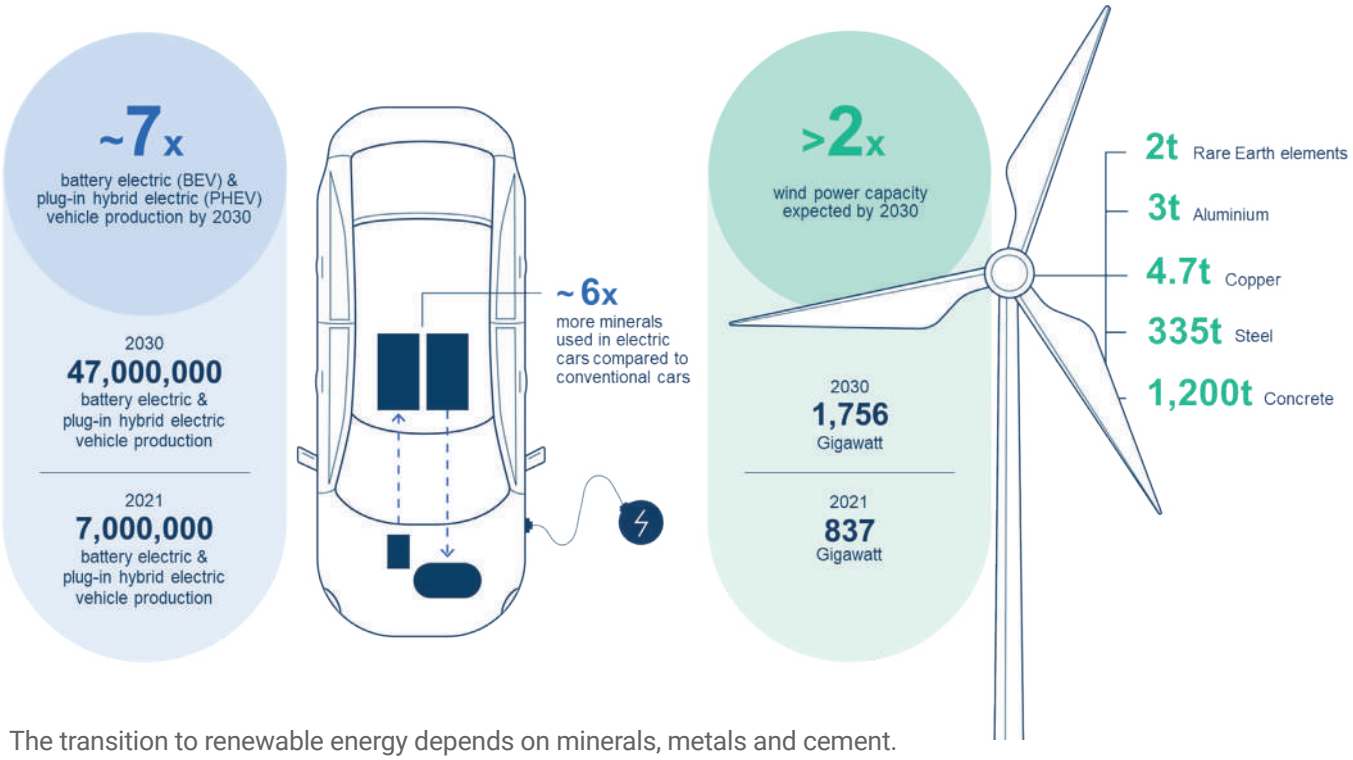
Johan Mikkelä
Head of Engineering Application and PLM architecture
FLSmidth



The transition to renewable energy depends on minerals, metals and cement.

Threading digital transformation throughout the company

Having historically teamed simulation engineers and IT specialists to explore HPC solutions, it was found that cloud technology advances and the FLSmidth innovative drive had sparked the same inspiration for both groups. "We want to transform digitally," explains Holger Kirketerp, Head of Cloud Center of Excellence at FLSmidth. "And as part of our alignment with the business side of the company, we wanted to support our engineers with a system that offered improved performance and flexibility."

Kirketerp cites the usual reasons for cloud migration: simplifying infrastructure to reduce both hardware costs and management time, redeploying operations staff to more value-added roles, and boosting collaboration alongside performance. "The possibilities we can access with the cloud are incomparable to what we had with on-premises platforms," he says. Of course, some applications need to be adjusted for optimal cloud migration, and the IT team also had to contend with business systems and engineering staff spread across the globe. The company decided to re-evaluate its decentralized business applications together with its engineering software and create a unified cloud strategy that would enhance productivity for everyone. The way forward: a proof of concept (POC) based on the engineering team requirements. Choosing the vendor was the all-important first step.

Finding the perfect vendor duo for a specialized need

A long-time Microsoft customer, FLSmidth relied on Azure for data storage for some systems and on Microsoft 365 apps for knowledge worker productivity. Choosing a Microsoft partner that specialized in HPC for engineering applications was the obvious course. “It was a natural next step to work with Microsoft to assess HPC for our engineering simulation needs,” explains the CFD specialist. “We contacted UberCloud and created a POC on its engineering simulation cloud platform.”

From a corporate IT perspective, that decision resonated with Kirketerp. “We’ve tried other cloud providers, but nothing has ever matched Azure capabilities,” he says. “When we briefly switched our POC to another cloud in the middle of our selection period as a possible cost-saving strategy, we found that the level of support wasn’t up to that of UberCloud. We switched back.”

He and his IT team worked with simulation experts and the UberCloud team to establish the POC. FLSmidth engineering teams in India, South Africa, and Brazil worked with the Copenhagen team to define requirements. The HPC solution would have to support specialized engineering simulation software, or solvers, notably Siemens Simcenter STAR CCM+, Rocky DEM, and Ansys CFX, Ansys Fluent, and Ansys Mechanical.

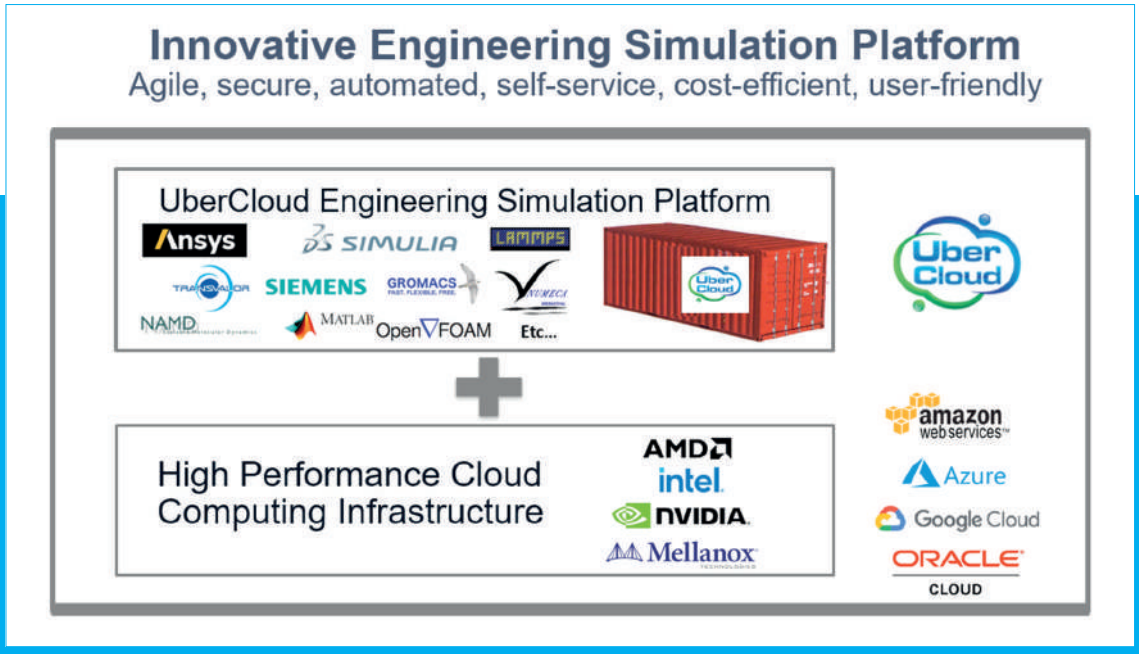
The highly successful POC marked the signpost toward full implementation. The project team’s deployment plans then accelerated as a key server approached its end of life. With engineering productivity to safeguard, the blended UberCloud and FLSmidth teams doubled down on their timeline.

Building a better mousetrap–
with Azure as a base for the UberCloud solution

The UberCloud team began by helping the FLSmidth engineering teams move their engineering simulation workloads to Azure. Kirketerp's IT team from FLSmidth closely collaborated with the engineers, plus the UberCloud team. Together, they implemented the UberCloud HPC platform in just two months. "We owe our quick deployment in part to the expertise of the UberCloud team," says Kirketerp.

The combination of FLSmidth IT staff and engineers with the UberCloud team and Microsoft Global Black Belt technical professionals (highly trained Microsoft experts) proved a highly effective trifecta. "The Microsoft solution architects and Global Black Belt team were key to our success because our platform sits on top of Azure," says Erik Bornhöft, Sales Director Europe at UberCloud. "We collaborated with them to design an optimal architecture for the best possible performance. And that architecture relies on a full range of Azure solutions beyond HPC—including storage, archiving, monitoring, and reporting."

The UberCloud solution uses Azure as the base for the flexible HPC cluster architecture at FLSmidth. Engineering data resides in Azure NetApp Files and Azure Files storage, with AMD EPYC HBv3 based compute instances. Looking at Ansys Fluent, for example, HBv3-series VMs powered by AMD EPYC 3rd Gen processors with 3D v-cache provide up to 96% improved performance over the previous generation HBv2-series VMs and over 2.5xthe performance of an older HPC VM (HC-series) equivalent to many on-premises HPC servers. With performance per dollar in mind, HBv3 provides up to 2.1x improvement over HC-series VMs. Further, UberCloud's solution for and visualization performance optimized virtual machines (VMs) for GPU , usesing NVIDIA V100 GPUs. In factAll together, since the switch to Azure, FLSmidth engineers realize 10 times faster results from their Rocky DEM solver.



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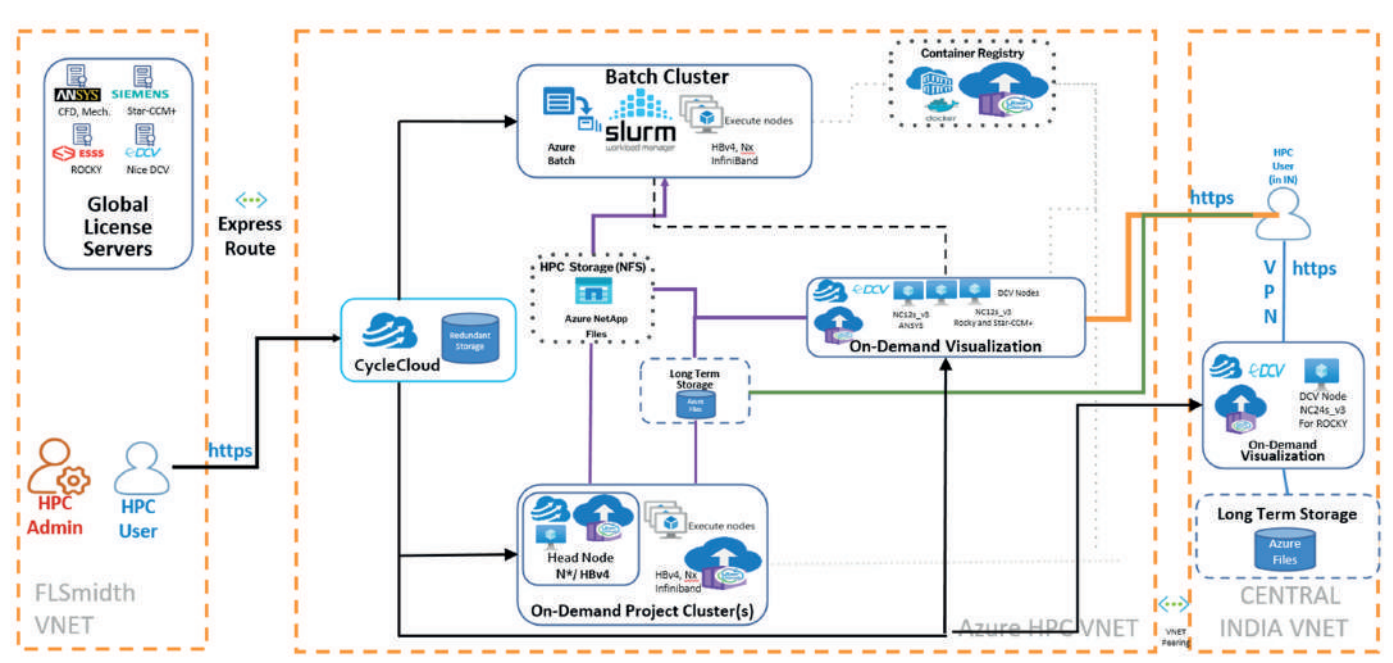
Engineering teams like to focus on the challenge of bringing innovative solutions to life rather than on the work of creating and managing HPC clusters. The management simplicity built into Azure makes it easy for FLSmidth engineers to optimize HPC regardless of scale. "It only takes a couple of quick steps for an engineer to access a cluster. Within minutes, they have new resources available to them—and it reduces overhead on IT to provision resources," says Pär Persson Mattsson, Product Manager at UberCloud.

FLSmidth engineering teams experienced a smooth transition. "We've had a very positive experience with the cutover to the new system and the enhanced usability," says the CFD specialist from FLSmidth. "The interface for our new Azure-based system is virtually the same as the one our engineers used on-premises. They simply sign in to remote sessions on the UberCloud containers."



UberCloud/Azure/AMD architecture for FLSmidth's multi-region engineering cloud.

"UberCloud, Azure, and AMD have grown in tandem, creating greater value through continually higher performance for our customers."

Pär Persson Mattsson
Product Manager at UberCloud

Democratizing HPC management

HPC solutions require specialized support that usually lies outside of an enterprise IT department. Having fallen into essentially a support role, the CFD specialist was concerned about single-handedly meeting that need for his team. As the person with the deepest experience with HPC systems, he didn't want to be a bottleneck for his fellow engineers—ultimately about 2,000 people who need to stay productive—and he worried about project delays, should he be unavailable. The fusion of Azure technology with UberCloud negated that concern. "As soon as we began using Azure and UberCloud for our HPC applications, we had a democratized platform," he says. "It may sound like I'm quoting taglines, but it's true that as soon as you move a complex system into an enterprise platform like UberCloud, it becomes a lot easier for IT to understand it. And by the same token, it's easier for engineers to access it."

That cloud benefit also translates to breaking down the functionality and licensing silos inherent to on-premises hardware. Free from the restrictions imposed by device-based licensing, FLSmidth engineering teams have greater access to their specialized simulation software, and the ensuing performance gains heighten efficiency. "Our cloud-optimized applications run much better and faster in the cloud," says Kirketerp. "And they're more reliable. Obviously, now that we've moved to Azure, we move data fast because of the massive backbones Microsoft has created," he says. "Our engineers no longer experience latency issues because they have the network availability they need to support their work."

Facing the future
with a flexibility-first platform

FLSmidth regarded the project as an opportunity to optimize its systems for growth, and the cloud offers the freedom it needs to respond to a changing world. “There were so many arguments in favor of moving to Cloud,” says Kirketerp. “The engineering teams can work in a more dynamic, flexible way. Meanwhile, from an IT point of view, we are free from managing more hardware. And when FLSmidth acquires new companies, we know that there will be a nearby Cloud datacenter, wherever that company is.”

Although his engineering colleagues are famously taciturn, they can attest to their satisfaction with the solution. “Our engineering team likes the versatility of the cloud,” he says. “We can access different instances as we need to, and our colleagues in India now experience low latency for their visualizations. We’re very happy with the cloud experience.”
The success of the cloud migration sparked interest from business application users in the FLSmidth ecosystem. “We share competencies all over the globe,” says Kirketerp. “Although it wasn’t originally in our scope, we are supporting their migrations. They’re excited about the cloud because they see the advantages of that environment.”

For both engineering and IT teams, the migration met every goal. “The Azure platform powered by AMD technology has been an excellent match for our needs,” concludes Kirketerp. “The capabilities we have and the results we’re achieving show us that we made the right decision in choosing it.”