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Case study

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FACULTY OF INFORMATION TECHNOLOGY CTU IN PRAGUE

Co-financed by the Connecting Europe Facility of the European Union

Industry
Public sector and education

Objective
Support the faculty's growing computing needs for scientific research and teaching

Approach
Implement a powerful, scalable, single-system solution to meet the faculty's current and future computing requirements

IT matters
- Achieves fast and smooth deployment to end users
- Provides computing resources on demand without straining the infrastructure
- Scales seamlessly to meet capacity demand due to the system's modular architecture
- Allows the faculty to eventually upgrade its system to power critical applications
- Lays the foundations for high availability

Business matters
- Meets researchers' urgent need for computing resources and unlimited capacity
- Accelerates research and helps scientists achieve robust results
- Delivers up to 30% cost savings by deploying a single-system solution
- Supports the faculty's teaching platform with more capacity and virtual servers

CTU IN PRAGUE POWERS UP RESEARCH CAPACITY

The university strengthens its research capabilities and expands computing resources with HPE Superdome Flex

The Czech Technical University (CTU) in Prague's Faculty of Information Technology needed a powerful and scalable solution to support a growing demand for high-performance computing, particularly from its scientists. After considering potential solutions, the faculty selected HPE Superdome Flex to support its research and teaching platforms. Its scientists now experience almost unlimited computing power to research machine learning, robotics, computer vision, data mining, and more.

CHALLENGE

Finding a scalable system
Founded in 1707, CTU is one of the world's oldest technical universities. It has a long tradition of research and teaching in engineering and science, and is a globally recognized higher education and research institution.

One of CTU's eight faculties is the Faculty of Information Technology (FIT). The faculty has provided education in informatics and communication technology for more than 10 years. Outside of teaching, it has a strong emphasis on scientific research in machine learning, robotics, computer vision, and data mining.

FIT previously used hundreds of Supermicro servers to support the computing needs of its scientists and teaching staff. However, this made it impossible to merge or split services on one virtualization platform, since each server was on its own. This hindered the faculty's ability to increase capacity and usage.

When the faculty decided to virtualize its server environment, it acquired a Fujitsu system and a virtualization technology.

"Comparing the three solutions, we realized that HPE Superdome Flex was the best choice because of HPE's history in providing a reliable solution. Superdome Flex was very scalable with the lowest deployment time, and had the capabilities to meet our existing and future needs."

– Martin Vaňko, Head of the Department of ICT Services, Faculty of Information Technology, Czech Technical University in Prague

"We then realized that the high-end Fujitsu server wasn't enough to meet our needs for scientific research and teaching," says Martin Vaňko, Head of the faculty's Department of ICT Services. "So we looked for a more powerful solution that could meet our needs in terms of scalability and reliability."

In particular, FIT wanted a single infrastructure that could simulate its existing smaller systems.

It was around this time the faculty needed to support a research project called BigCode by one of its leading scientists, Professor Jan Vítek. Funded by the European Union, BigCode analyzes large databases using novel programing language techniques and statistical machine learning. The project accelerated the faculty's search for a high-performance system that could carry out complex calculations, and Vaňko's team started considering solutions from HPE, Huawei, and Bull Atos Technologies.

"Comparing the three solutions, we realized that HPE Superdome Flex was the best choice because of HPE's history in providing a reliable solution," says Vaňko. "Superdome Flex was very scalable with the lowest deployment time, and had the capabilities to meet our existing and future needs."

SOLUTION

All in one place

In 2019, the faculty implemented an HPE Superdome Flex system with 16 sockets. The solution includes 16 Intel® Xeon® Gold 6254 processors and four NVIDIA® Tesla V100 graphical processing units (GPUs). It also comes with six 6.4 terabyte NVMe PCIe cards and six terabytes of memory (RAM). Using its existing cloud platform, the faculty deployed the new system to users just two days after installing it at its data center.

"With Superdome Flex, we can create virtual servers for users and develop support services. We can offer this solution to researchers with higher needs for resources, such as RAM and GPUs," says Vaňko. "If a researcher comes asking for computational support with 500 CPUs and five terabytes of memory, we can provide that instantly."

The system also powers FIT's teaching platform. Each lecturer requires up to about five virtual servers to support classroom teaching, and they need to be constantly available.

Seamless scalability

One of the biggest advantages Vaňko sees in using HPE Superdome Flex is the ability to seamlessly scale when the faculty needs more computing power to support new virtual servers. Scalability is crucial to the faculty because of its frequently changing requirements.

"If we used another technology, it would be a dead end for us because we wouldn't be able to scale up," says Vaňko.

HPE Superdome Flex's high level of integration—with compute, memory, and virtualization all in one place—makes it significantly easier to manage the system. It requires no additional staff and allows Vaňko's office to focus on providing better services to users.

And with HPE Superdome Flex's unique modular building block architecture, the faculty will not need to spend on extra power capacity, cables, and other infrastructure costs when it decides to scale up. It can simply add capacity as its needs change.

BENEFITS

Meeting the needs for higher capacity
The greatest benefit to the faculty has been the ability to meet researchers' needs for high-performance computing and memory without delay or capacity limits.

In the past, researchers would develop programs on their computers but run computations on a computer cluster in another faculty or outside the university to access additional resources. This required them to rewrite their code for the cluster—and then change it again for their own computers.

"With Superdome Flex, researchers write their code on their PCs and simply copy it to the same environment running on the Superdome Flex platform, using more resources. We don't require them to change their code or programs," says Vaňko. This saves valuable research time and accelerates results.

The system's shared pool of memory allows FIT to give researchers up to six terabytes of RAM at no additional technology or operating cost. With its ability to support research and teaching platforms, the faculty believes the system can enhance teaching quality and accelerate research—and as a result, help improve its global rankings.

"We have good scientists, but if they don't have good technology, they might not be able to achieve robust results," says Vaňko.

These results are critical for the faculty as it aims to produce research outputs that are comparable to those from leading IT faculties in Europe.

Importantly, it can now support researchers as they strive to address some of the world's biggest challenges. For example, FIT has donated computing power to the Folding@home project to run computer simulations to improve our understanding of COVID-19 proteins. Based at Stanford University in the United States, Folding@home is a distributed computing project that simulates protein dynamics. It hopes to find a way to develop treatment therapies for the coronavirus by simulating protein folding.

Achieving cost-effectiveness and upgrading the system
From an operational perspective, acquiring HPE Superdome Flex has helped the faculty bring down its costs, since it now utilizes a single system to support its research and teaching platforms. Vaňko says that the faculty has reduced its annual technology and operating costs by up to 30% when compared to its former systems.

While its HPE system does not currently power critical applications, the faculty plans to consider turning it into a mission critical platform in 2021.

"The advantage of Superdome Flex is that we can just add capacity to it and turn our computational system into a mission critical one," says Vaňko.

"We now have an opportunity to create a high-availability data center, thanks to Superdome Flex," he adds. "If we decide to migrate our systems or rebuild our data center, we can do that and run all of them on our Superdome Flex platform."

Expanding the infrastructure
Seeing how scalable its HPE Superdome Flex system is, FIT plans to acquire up to 10,000 virtual servers for students using containers. The faculty estimates it could provide students with two servers each without impacting its infrastructure.

An even bigger plan is to integrate all faculty systems and run them on HPE Superdome Flex.

"This should bring us only one large computational resource," says Vaňko. "We expect to incur practically zero additional staff cost in the maintenance and operations of computational servers."

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Customer at a glance

Hardware
- HPE Superdome Flex Server

Service
- HPE Foundation Care

FIT's use of HPE Superdome Flex now serves as a proof of concept for other faculties, the rest of CTU, and beyond. The system is currently one of the most advanced supercomputers in the Czech Republic.

"Other faculties and universities are trying to see if we succeed in using Superdome Flex. They can also change their mind in terms of their system supporting operations, teaching, and research like we did," says Vaňko.

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