# AMDZ STORIES

# UNIVERSITY OF ULM BOOSTS ACADEMIC CLOUD PERFORMANCE WITH AMD EPYC<sup>TM</sup>

AMD EPYC single socket processors transform cloud computing platform for research and education

#### CUSTOMER



#### INDUSTRY

Cloud computing and IT services

#### CHALLENGES

To improve performance and application scalability within the bwCloud infrastructure, helping drive better outcomes for students, teachers and researchers.

#### SOLUTION

Deployment of AMD EPYC processorpowered single socket servers.

#### RESULTS

Improved scalability and performance at a lower price point.

#### AMD TECHNOLOGY AT A GLANCE

AMD EPYC<sup>™</sup> 7351P processor with up 16 cores

#### PARTNER



Baden-Württemberg, the scenic southwestern German state nestled next to France and Switzerland, is well-known for its rich automotive history and wealth of universities. The research conducted within this active academic community is rigorous and computationally demanding.

Recently, turning to servers powered by AMD EPYC<sup>™</sup> processors, the region's nine universities as well as all twenty-six of Germany's universities for applied science experienced a dramatic improvement in the performance and scale of one of their shared academic clouds.

Performance is key. To succeed academically, students and researchers need access not only to the powerful computing capabilities to perform the necessary scientific modeling and big data analytics but also to secure, reliable, and highly available general computing resources. To access these computing services, the university community in Baden-Württemberg and beyond relies heavily on two separate cloud services.

One of those clouds is a high-performance computing (HPC) cluster that provides students and researchers the ability to run complex quantum chemistry and quantum physics calculations.

The second cloud is bwCloud (Baden-Württemberg Cloud) that provides university faculty, students, and researchers access to the computing resources they need for operations, projects, instructional work, and applications such as data mining and machine learning. This cloud also runs educational software such as MATLAB-the numerical computing environment and mathematical programming language-and workloads that tackle electrochemistry modeling, with a special focus on future battery technology research. Yet the bwCloud needed improved processing power-power that would soon be found in the industry-leading technology of AMD EPYC processors.

#### BREAKING HIGH CLOUD DEMAND BOTTLENECKS

Students and faculty across the nearly three dozen German universities rely on bwCloud to enhance learning, foster collaboration, and conduct research. The bwCloud also serves as a flexible IT infrastructure optimized for researchers and students. With 112 nodes and a total storage capacity of 2.5 petabytes, bwCloud today provides scalable computing availability for thousands of virtual machines.

However, before AMD EPYC processors were deployed, bwCloud didn't always perform as reliably as needed. As Dr. Stephan Wesner, director of communications for IT services at the University of UIm and a bwCloud administrator, explained, the initial bwCloud proved too small and too slow to meet the robust user demand. Wesner and the bwCloud team realized that the considerable memory bandwidth required by larger applications was slowing down performance because the systems were being forced to rely on storage external to the server.

"With EPYC and its many memory channels, you could perhaps run applications completely within memory. The performance gain would be significant."

Dr. Stephan Wesner, Director of Communications for IT Services at University of UIm and an Administrator for bwCloud



Wesner and the bwCloud team recognized that they needed CPU capability that would meet their users' demands. This included providing ample CPU memory management and storage capacity in the cloud servers. As Wesner explained, local disk storage and memory capacity size were very important for the type of research and academic work conducted on bwCloud. For instance, some scientific applications exceed 200 petabytes of memory. They needed CPUs that could support large banks of memory and effectively manage that memory for these demanding applications.

# **CLOSING THE CPU PERFORMANCE GAP**

While attending a supercomputing conference in<br/>the United States, Wesner and his colleagues learned<br/>about the powerful AMD EPYC line of processors.<br/>The powerful single core performance and industry-<br/>leading number of memory channels provided by<br/>AMD EPYC processors caught the attention of<br/>Wesner and the team. These enhancements, they<br/>hoped, would provide significantly improved application<br/>performance and help improve the user experience for everyone who<br/>depends on bwCloud.clea<br/>clea<br/>Dr<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Director<br/>Di

Before making any decisions, they wanted to test how well the EPYC processor would perform against the competition. The team tested an EPYC single socket system with 16 cores against a number of processors from other manufacturers. To evaluate performance, Wesner used conventional specifications that measure speed and reliability but also included factors that related directly to the work on bwCloud, such as the maximum number of deployable virtual machines. Wesner and his team chose to run a number of their key applications and input data during their tests to identify which processors could perform more jobs per day. In terms of universal benchmarks, such as energy consumption and performance, AMD proved itself superior.

When the testing was complete, the performance of AMD EPYC surpassed that of the competition. Wesner said EPYC processors tested "quite reliably" overall and added that the additional memory bandwidth set AMD apart. "For us, the additional memory is the key benefit," Wesner said.

Implementing systems the size of Prof. Wesner's bwCloud project would require significant expertise, and for this deployment MEGWARE was selected as the partner for system integration. With a long history of meeting challenging customer demands, MEGWARE confirmed Prof. Wesner's choice of AMD's new EPYC processor as the best selection for bwCloud's workloads and environment. In addition, MEGWARE saw it as the starting point for the implementation of many more HPC, AI, and cloud systems based on AMD EPYC processors.

"In our analysis AMD was clearly the best option." Dr. Stephan Wesner, Director of Communications for IT Services at University of Ulm and an Administrator for bwCloud

### EPYC POWERS NO-COMPROMISE SINGLE SOCKET SERVERS AT LOWER COST

When deployed within bwCloud, Wesner believed EPYC-powered high-performance servers with a single socket installation would unlock significant performance gains and cost savings compared to the competing dual socket processors. "In our analysis AMD was clearly the best option," Wesner said.

Thanks to AMD's powerful single socket performance, bwCloud was able

to lower its cost per node while increasing its total number of nodes—ultimately creating a scalable cloud providing the performance researchers and students need at a cost that makes sense. Most importantly, these performance gains enable students to learn more quickly and removed technical hurdles in the classroom. In addition, the researchers got the high-performance tools they need for their cutting-edge work within one of Germany's primary industry and innovation hubs.

Data centers and clouds everywhere, just like bwCloud, require more memory and more I/O throughput. Servers based on EPYC technology enable cloud environments, such as bwCloud, to increase their scale and performance and further consolidate hardware while also delivering improved performance with virtual workloads for today's demanding environments seeking to quickly and successfully analyze larger data sets.

# HIGHER PERFORMANCE ENHANCES COLLABORATION

Following the recent deployment of AMD's unique single socket EPYC technology, bwCloud is now delivering superior performance and user experiences while putting the power of HPC in the hands of students and academics. The EPYC processor-powered bwCloud has made the benefits of a flexible and collaborative remote system more accessible to all members of the local research and academic community.

"Usage is continuously growing, and we have many projects running already," Wesner said, adding that bwCloud has proven itself a significant plus for smaller institutions that lack their own dedicated IT infrastructure. "They must rely on remote IT systems, so this is a big step forward for them," he said.

With bwCloud now optimized with the power of EPYC, the team may consider another important area for its deployment: its highperformance cluster dedicated to quantum chemistry and quantum physics computations. "With EPYC and its many memory channels, you could perhaps run applications completely within memory," Wesner said. "The performance gain would be significant."

#### ABOUT BWCLOUD

The Baden-Württemberg Cloud (bwCloud) is a flexible, scalable infrastructure-as-a-service (IaaS) cloud computing platform providing virtual machines (servers) for university faculty, students and other members of science and research institutions in Baden-Württemberg and beyond. The bwCloud is currently managed by four sites in Baden-Württemberg: the universities of Freiburg, Karlsruhe, Mannheim, and Ulm. For more information visit <u>bw-cloud.org</u>.

## ABOUT THE UNIVERSITY OF ULM

Founded in 1967, the University of Ulm is a leading German research university in the state of Baden-Württemberg. The university has more than 10,000 students and 60 study programs. Situated in Ulm, one of the world's most advanced centers of energy research, the university is noted for its pioneering research into electrochemistry and related disciplines. For more information visit uni-ulm.de/en.

# ABOUT MEGWARE COMPUTER VERTRIEB UND SERVICE GMBH

For more than 25 years, MEGWARE Computer Vertrieb und Service GmbH has been developing and distributing innovative hardware and software solutions for HPC applications. The MEGWARE team of around 50 experts focuses on architecting tailormade concepts for complex computing challenges. it offers a full range of services, from consultancy and initial solution validation through manufacturing and testing, to turnkey installation and after-sales support. For more information visit <u>megware.com/en.html</u>.

#### **ABOUT AMD**

For more than 45 years AMD has driven innovation in high-performance computing, graphics, and visualization technologies-the building blocks for gaming, immersive platforms, and the data center. Hundreds of millions of consumers, leading Fortune 500 businesses, and cutting-edge scientific research facilities around the world rely on AMD technology daily to improve how they live, work, and play. AMD employees around the world are focused on building great products that push the boundaries of what is possible. For more information about how AMD is enabling today and inspiring tomorrow, visit amd.com/epvc.

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