

# Leibniz Supercomputing Centre enables ground-breaking research with pioneering technology



The Leibniz Supercomputing Centre (LRZ) of the Bavarian Academy of Science and Humanities is one of the largest academic data centers in Europe. The organization provides high-performance computing resources to researchers from across the continent as part of PRACE, the Partnership for Advanced Computing in Europe, through the Gauss Centre for Supercomputing (GCS), and is the central IT service provider to two universities in Munich, Germany.

Dr. Herbert Huber, Head of High Performance Systems at the Leibniz Supercomputing Centre, begins: “In complex research projects in physics, cosmology or the life sciences, more and more compute performance is needed to push boundaries further and gain new insights. Our mission is to provide high performance computing resources at a low cost: as such, our choice of underlying infrastructure is a critical one. To remain a leading hub in the European HPC community, we knew it was time to invest in extending our capabilities.”

## More with less

To be able to provide the faster performance required to support more complex simulations cost-efficiently, the organization had to find a way to minimize energy costs and lower the cooling bill of its supercomputer.

## Overview

Leibniz Supercomputing Centre (LRZ) wanted to remain a leading hub within the HPC community, which means providing compute resources that combine industry-leading performance and energy efficiency. The organization implemented its SuperMUC Phase 2 supercomputer based on 3,072 Lenovo NeXtScale nx360 M5 WCT compute nodes. Researchers can run larger simulations than ever before with up to 1 quadrillion cells, increasing resolution for molecular simulations by a factor of 100, while LRZ saves 35 percent in operating costs compared to air-cooled systems.

**“Researchers get better results faster with the Lenovo solution.”**

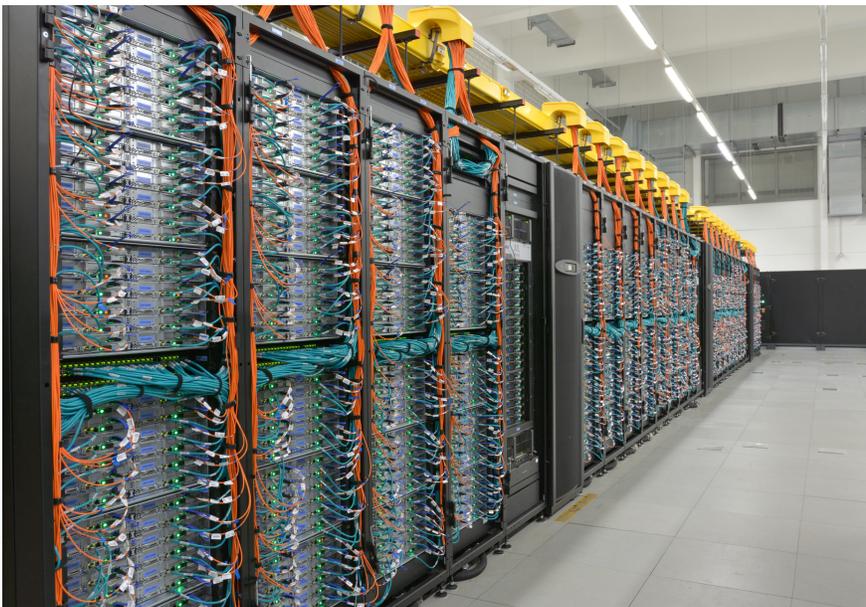
—**Dr. Herbert Huber**,  
Head of High Performance Systems,  
Leibniz Supercomputing Centre



Dr. Herbert Huber explains: “Today’s supercomputers require a lot of cooling, with new generations producing more and more heat. To grow the performance we can provide to researchers without costs skyrocketing, we needed to find innovative cooling solutions that would work effectively on-site.”

### Finding the right fit

As the heart of its new SuperMUC Phase 2 supercomputer, LRZ selected a Lenovo NeXtScale System M5 with Water Cool Technology. Working closely with Lenovo and IBM, the organization implemented 3,072 Lenovo NeXtScale nx360 M5 WCT compute nodes with Intel® Xeon® E5-2697 v3 processors and Mellanox Infiniband FDR14 networking switches. LRZ runs SUSE Linux Enterprise Server on all 3,072 compute nodes.



View of SuperMUC Phase 2 powered by Lenovo NeXtScale systems.

Dr. Herbert Huber recalls: “What particularly attracted us to the NeXtScale System was its direct water-cooling design. The Lenovo solution offers modular direct liquid-cooling design, which allows us to easily add additional compute capacity if needed.”



Close-up view of pipe that forms part of the system’s direct water-cooling design.

### Solution components

#### Hardware

Lenovo NeXtScale System M5

Lenovo NeXtScale nx360 M5

compute nodes with Water Cool  
Technology (WCT)

Lenovo Solution for GPFS Storage  
Server (GSS26)

Mellanox InfiniBand FDR14 Switches

#### Software

IBM Spectrum Scale (IBM GPFS)

SUSE Linux Enterprise Server

#### Services

IBM Global Services

Lenovo Enterprise Solution Services,

HPC Intelligent Cluster

Implementation



## Turbo-charged research

Equipped with the Lenovo solution, researchers can run larger simulations than ever before with up to 1 quadrillion cells, increasing the resolution for molecular simulations by a factor of 100. “The world’s largest simulation of cosmological turbulences was run on our SuperMUC Phase 2 supercomputer,” says Dr. Herbert Huber. “This is the largest pseudo-spectral simulation of interstellar turbulence to date.”



View of SuperMUC Phase 2 powered by Lenovo NeXtScale systems.

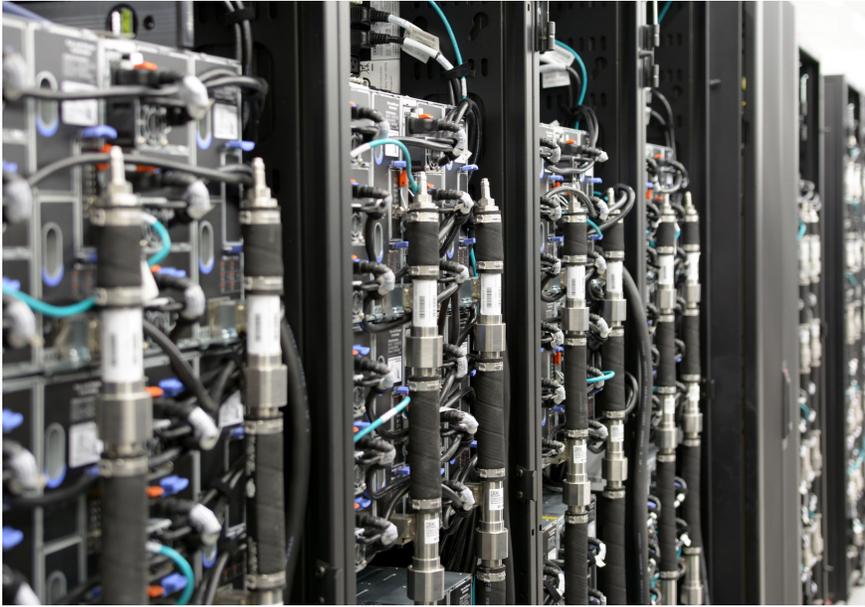
“With the Lenovo solution, we can offer researchers exceptionally high performance computing resources. Another ground-breaking research project conducted on SuperMUC Phase 2 was a cosmology simulation showing 10 percent of the visible universe. The same simulation would not have been able to run efficiently on our previous system. Similarly, a seismic reconstruction problem took just 55 seconds, compared to 16 hours in the past – a 99.9 percent improvement. Researchers get better results faster with the Lenovo solution, accelerating projects and enabling them to gain greater insight into how the universe works.”

The solution does not only provide improved compute performance, but helps LRZ reduce operational costs compared to air-cooled systems. Dr. Herbert Huber elaborates: “As well as being a highly reliable, stable system, the Lenovo solution is very energy-efficient. With the direct water-cooling design, we reduced energy costs by 35 percent. Since we are also using waste heat from SuperMUC Phase 2 to keep offices warm in the winter, the energy efficiency of the solution is improved further.”

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Head of High Performance Systems,  
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View of pipes that form part of the system's direct water-cooling design.

He concludes: "Users are highly satisfied with the performance and reliability the Lenovo supercomputer offers, which helps us to cater for growing demand for compute power, to keep attracting top academics from across Europe and to support trailblazing research."

### For more information

To learn more about Lenovo Enterprise Systems contact your Lenovo Sales Representative or Lenovo Business Partner, or visit: [lenovo.com/systems](http://lenovo.com/systems)

For more information about Leibniz Supercomputing Centre, visit: [www.lrz.de/english](http://www.lrz.de/english) or connect with [presse@lrz.de](mailto:presse@lrz.de)

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