



# PIK speeds insight into the ecologic, economic and social impact of global climate change

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Potsdam Institute for Climate Impact Research (PIK) is a research organization based in Germany that studies global change and its impacts on ecological, economic and social systems. The organization's 320 scientists develop models and devise strategies for the sustainable development of humankind and nature.

Karsten Kramer, Head of IT, Potsdam Institute for Climate Impact Research, says: "At the core of our research, we analyze vast amounts of data about diverse topics ranging from the Atlantic ice sheets to European emissions trading. This enables us to develop reliable scenarios for climate change that are used by decision-makers in politics and business. Creating, testing and refining these multidimensional systems of equations that simulate processes in the real world means integrating and evaluating more and more data points, requiring immense processing power and storage capacities."

## Complex computer-aided modeling

To be able to understand long-term processes that have an impact on our planet, the researchers at PIK rely heavily on fast data storage and data processing clusters. Models and simulations run by the organization include complex interactions between atmosphere, oceans, land and ice sheets.

## Overview

The Potsdam Institute for Climate Impact Research (PIK) studies global climate change and its ecological, economic and social effects. To ensure its scientists can analyze and evaluate huge volumes of data efficiently, PIK needed to grow its high performance computing capacities considerably. With a new Lenovo supercomputer, PIK can run complex data simulations and models up to nine times faster – helping scientists in their quest to gain a deeper understanding of climate change and devise strategies for a sustainable development of humankind and nature.

**"Our new Lenovo system is among the 400 fastest supercomputers in the world."**

— **Karsten Kramer**,  
Head of IT,  
Potsdam Institute for Climate Impact  
Research



Karsten Kramer, Head of IT at PIK, explains: “For our research, we constantly collect all kinds of data from around the globe and process it to gain meaningful insights. To ensure that our scientists could analyze and evaluate these large amounts of data efficiently, we needed to grow our high-performance computing capacities substantially.”

Using comprehensive multi-factor models spanning different disciplines and with inputs from economic, social and environmental systems, PIK wanted to continue to lead global research efforts through its applied and solution-oriented approach, ultimately helping to facilitate the transition towards a CO<sub>2</sub>-neutral economy.

### Finding and deploying the best solution

PIK launched an open, transparent and Europe-wide tender to replace its existing high-performance computing environment with a faster and more powerful system. After multiple rounds of negotiations with different vendors, PIK awarded to contract to a joint bid from Lenovo and IBM.

Lenovo, IBM and PIK installed the system and completed the subsequent setup and configuration quickly. The team deployed a Lenovo NeXtScale System M5 comprising 312 NeXtScale nx360 M5 Water Cool Technology high-density compute nodes based on Intel® Xeon® E5-2667v3 processors and Mellanox Infiniband FDR14 switches with an innovative direct water-cooling design, and six NeXtScale nx360 M5 compute nodes with NVIDIA Tesla K40 GPU Accelerators in combination with two Lenovo Solution for GPFS Storage Server systems. All 5,088 processor cores run the SUSE Linux Enterprise Server operating system.

### Solution components

#### Hardware

- Lenovo NeXtScale nx360 M5
- Lenovo NeXtScale n1200
- Lenovo GPFS Storage Server
- Lenovo System x3650 M5
- Lenovo System x3550 M5
- Mellanox Infiniband FDR14

#### Software

- xCat Resource Manager
- IBM Spectrum Scale (IBM GPFS)
- Icinga
- Mellanox Open Fabrics
- SLURM Workload Manager
- SUSE Linux Enterprise Server



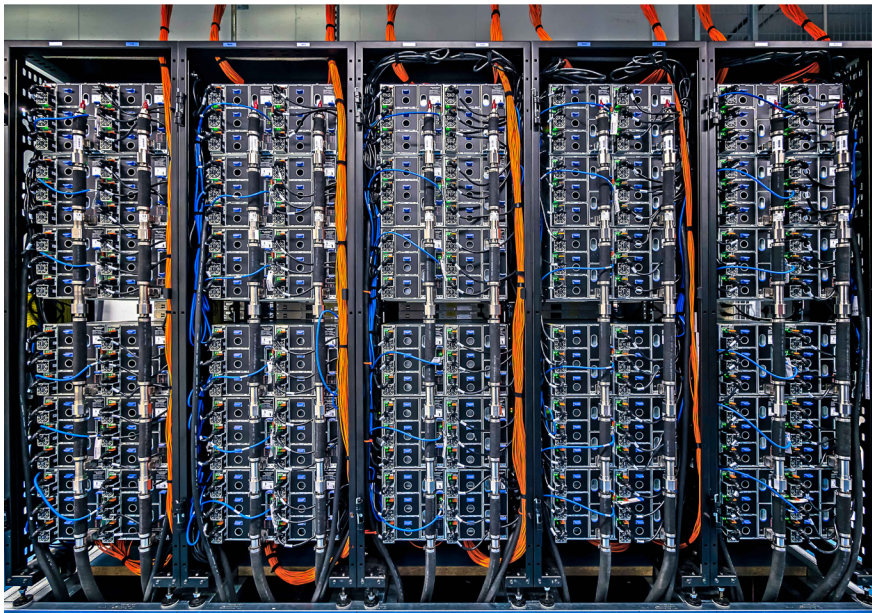
View of pipes that form part of the water-cooling technology of the Lenovo NeXtScale systems.

Photo courtesy of Lothar Lindenhan.



Lenovo System x3650 M5 and x3550 M5 servers were implemented to provide management and backup services. Running IBM Spectrum Scale (IBM GPFS) PIK gained an integrated, easily-scalable storage and backup system. “Migrating data from our old system was very easy,” says Karsten Kramer. “What’s more, we are now capable of scaling up our storage capacity in steps of 1PB without any disruptive downtime.”

Karsten Kramer comments: “We have been working with high-performance computing systems for a number of years, but still it was remarkable how much we benefitted from the stellar competency of the implementation team – from integrating the system into our new building, to setting up all management tools including the Extreme Cluster/Cloud Administration Toolkit (xCAT), and the monitoring solution Icinga, to tuning the whole environment for optimal performance for our workloads.”



View of PIK supercomputer powered by Lenovo NeXtScale systems. Photo courtesy of Lothar Lindenhan.

### High-performance meets efficiency

PIK successfully integrated the Lenovo solution into its new research building while reducing its own emissions. Karsten Kramer says: “It was crucial for us – considering our climate impact research – to deliver a highly energy-efficient solution. By running our cluster at high temperatures with water-cooling technology, we reduced energy costs significantly.”

The solution is not only energy-efficient, it also puts PIK 354th in the TOP500 list of the most powerful supercomputers in the world, and 105th in the list of energy-efficient supercomputers. Karsten Kramer remarks: “Our new system is among the 400 fastest supercomputers in the world – despite being optimized for our own research workloads rather than for artificial performance benchmarks. The

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With the amount of data growing quickly, PIK relies not only on increased processing performance, but also on very fast and extensible data storage. Karsten Kramer says: “With the Lenovo Solution for GPFS Storage Server based on IBM Spectrum Scale technology, we can flexibly add more capacity to our 2PB as needed – without any downtime for our researchers. This is a major advantage, as it helps us to grow continuously without compromising performance and availability.”

Karsten Kramer concludes: “We are very happy with our new Lenovo supercomputer – it helps us remain an attractive destination for the world’s brightest and best researchers, and it helps our scientists to better understand the complex dynamics of our planet, so that they can support decision-makers around the world with even better recommendations.”

### 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 Potsdam Institute for Climate Impact Research, visit: [www.pik-potsdam.de](http://www.pik-potsdam.de) or connect with @PIK\_Climate

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