

“The Fujitsu system is so efficient that we were awarded fifth place on the Green500 list in November 2016. Energy efficiency and cost efficiency mean that we can deliver more science for our money.”

Professor Tilo Wettig  
University of Regensburg

For the QPACE3 supercomputer and its complex simulations, Fujitsu created a cluster of powerful and efficient PRIMERGY CX600 servers.

#### At a glance

Country: Germany  
Industry: Education  
Founded: 1962  
Website: [ur.de](http://ur.de)



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#### Challenge

The Universities of Regensburg and Wuppertal and the Jülich Supercomputing Centre (JSC) use the QPACE3 supercomputer to run numerical simulations for the SFB/TRR-55 research programme in the field of quantum chromodynamics (QCD). One of the project's main aims is to determine what the state of the universe was immediately after the Big Bang.

#### Solution

The project needed high levels of computing power packed into a small space and with minimal energy consumption. The team therefore installed FUJITSU Server PRIMERGY CX600, equipped with Intel® Xeon Phi™ processors, with a combination of direct liquid and air cooling. The 672 server nodes are mounted in eight Fujitsu PRIMECENTER racks.

#### Benefit

- Very compact system
- High energy-efficiency achieved using direct liquid cooling
- Optimal computing power per server node, providing the most economical solution for the customer's planned budget
- The system was fully checked, including leak testing, and was assembled in advance





## Customer

The University of Regensburg is a modern campus university. It covers a wide range of subjects and is known for both its favorable student-teacher ratio and excellent infrastructure. Originally planned as a regional university in the mid-20th century, in the new millennium it has developed into a renowned, internationally-oriented center for research and teaching. Its physics department specializes in numerical simulations in the field of quantum chromodynamics.

## Products and services

- 672 FUJITSU Server PRIMERGY CX1640 M1 server nodes
- 8 Fujitsu PRIMECENTER Liquid Cooling (LC) racks
- Intel® Xeon Phi™ processors
- Omni-Path Interconnect
- Asetek direct liquid cooling
- Manufacturing, integration, and testing at the Fujitsu plant in Augsburg, Germany

## High-performance cluster based on FUJITSU Server PRIMERGY CX600

One of the things researchers in the SFB/TRR-55 project want to understand more clearly is how matter behaved at the high densities and temperatures that were present immediately after the Big Bang. To do this, they run complex numerical simulations on high-performance computers. They recently began using the QPACE3 supercomputer, which provides the necessary computing power, deployed in two phases in December 2016 and July 2017. Its central element is a high-performance computing cluster based on the FUJITSU Server PRIMERGY CX600 equipped with Intel® Xeon Phi™ processors. It was purchased in a joint venture by the Universities of Regensburg and Wuppertal as part of the SFB/TR-55 research project, and is installed at the Jülich Supercomputing Centre (JSC). Another important factor in this research project is to use particularly energy efficient supercomputers.

### Impressive efficiency and power density

The QPACE project team worked with Fujitsu to configure the HPC cluster. The FUJITSU Server PRIMERGY CX600 boasts impressive levels of cost-efficiency, power density, and energy-efficiency, which is partly due to its direct liquid cooling system. QPACE3's 672 server nodes are fitted with 64-core Intel® Xeon Phi™ 7210 CPUs. These are optimized for use with highly-parallelized applications, which are required for both numerical simulations and deep learning. These CPUs are especially suited to the needs of research departments in companies that carry out simulations, as well as universities using such highly-parallelized scientific applications. The first stage of the QPACE3 expansion, which took place in December 2016, was part of the early shipment programme for Intel's brand-new Xeon Phi™ processors. The close relationship between Fujitsu and Intel made it possible to develop a good and stable solution despite this early stage of development. Regensburg's researchers were impressed with not only the sheer computing power and stability, but also the low energy consumption of the entire system. This is an important aspect of their international reputation. "The Fujitsu system is so efficient that we were awarded fifth place on the Green500 list in November 2016. Energy efficiency and cost efficiency mean that we can deliver more science for our money," explains Professor Tilo Wettig.

## Fujitsu praised for high levels of flexibility

It wasn't only the technology that received the researchers' positive feedback at the end of the project phase, but also the service and support. "For us, the flexibility of the Fujitsu team and the trusting relationship we built with them made for a very positive experience," says Professor Wettig. One factor in this was that three of the four racks for the first phase of QPACE3 were initially installed and tested in Fujitsu's Augsburg data center. "This meant that we could carry out performance and power consumption tests in time for the Green500 list deadline," explains Wettig. This pre-installation phase in the Augsburg data center also benefitted researchers in that the system could be fully tested, including for leaks, before arriving on-site. "This meant that the servers could be installed very quickly," adds Wettig. Another benefit is that the direct liquid cooling system enables servers to use less energy by cooling the CPUs with a special liquid. Furthermore, at the JSC, the heat exchangers in the racks are cooled with water from the facility, which can in turn be cooled outside of the building using air. This combination of liquid and outside air cooling has enabled the site to move away from much more energy-intensive air cooling in its computer rooms. One final advantage is the high-power density and compact size of the Fujitsu servers, with all 672 server nodes fitting into just eight racks.

## FUJITSU

Get in contact with a sales representative at: [cic@ts.fujitsu.com](mailto:cic@ts.fujitsu.com)

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