

German supercomputer is a world champion in saving energy

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The Saudi Arabian computer SANAM, also developed in Frankfurt and Darmstadt, reached second place on the "Green500" list.

The new "L-CSC" supercomputer at the GSI Helmholtz Centre for Heavy Ion Research is ranked as the world's most energy-efficient supercomputer. The new supercomputer reached first place on the "Green500" list published in New Orleans on Thursday, comparing the energy efficiency of the fastest supercomputers around the world. With

a computing power of 5.27 gigaflops per watt, the "L-CSC" has also set a new world record for energy efficiency among supercomputers. Second and third place on the new list are held by two Japanese supercomputers (Suiren, Tsukuba and Tsubame-KFC, Tokyo).

"L-CSC" was developed at the Frankfurt Institute for Advanced Studies (FIAS) and the Goethe University Frankfurt. The supercomputer was financed by the GSI Helmholtz Centre for Heavy Ion Research in Darmstadt, where it is used for simulations and calculations in basic physics research. It is also slated to prepare experiments at the large international accelerator centre FAIR (Facility for Antiproton and Ion Research), which is currently under development in Darmstadt. The super-fast and energy-saving supercomputer was developed by the Frankfurt computer sciences professor Volker Lindenstruth and his team. It primarily uses efficient cooling and conventional [graphics cards](#), in order to reduce the energy consumption and investment cost for the supercomputer.

Obtaining the world champion title for the "L-CSC" is already the third success for the FIAS scientists within four years on the worldwide who's-who list of green supercomputers: in 2010, the Frankfurt supercomputer "LOEWE-CSC" at Goethe University reached eighth place as Europe's most environmentally-friendly supercomputer. Two years later, the Saudi Arabian computer "SANAM", developed in Frankfurt and Darmstadt, reached second place on the "Green500" list. The world record crowns this series. The list is based on an assessment of how many [floating point](#) operations per second a supercomputer optimized for speed achieves with one watt of power.

"L-CSC" is still under construction. At the moment, 56 out of a total of 160 servers are installed. This already makes the computer in Darmstadt one of the world's fastest. On the worldwide "Top500" ranking – which is based purely on speed – it currently holds 168th place with 316.7

trillion floating point operations per second – about three thousand times faster than a normal office PC. And it will perform calculations about three times faster once it is completed in the coming weeks.

"L-CSC" was developed on the basis of the "LOEWE-CSC" and "SANAM" supercomputers, and relies even more heavily on graphics cards for its computing power. Its name is based on its predecessor. However, "L-CSC" performs computations considerably more quickly than its four-year-old predecessor "LOEWE-CSC" and achieves over seven times the computing power with the same amount of energy. This was achieved by using more optimized high speed graphics chips and improved software developed at the FIAS.

The investment costs for "L-CSC" are around two million Euros. When it comes to supercomputers, saving energy isn't just a question of protecting the environment, but is also important in saving on the electricity bill. Thus "L-CSC" runs with significantly lower operating costs than less energy-efficient supercomputers which are just as fast.

The person who developed the "L-CSC", Chairman of the Board at FIAS, IT Director at GSI and professor for high-performance computing architecture at the Goethe-Universität Frankfurt, Volker Lindenstruth, feels that the top ranking of his supercomputer confirms the long-standing [energy efficiency](#) efforts: "We are also making a contribution which will allow supercomputers to be used increasingly in industry, because society also requires more and more computing power, whether for technical developments, big data applications, cloud computing or other things."

From a technical point of view, "L-CSC" is a computing cluster, a network of connected computers. Upon completion, the computer is slated to consist of a total of 160 servers (ASUS ESC4000 G2S/FDR), with 1,600 processor cores, each of which contains two Intel-Ivy-Bridge

processors and four AMD FirePro graphics cards. Every server has 256 Gigabytes of working memory. The servers are connected through an FDR Infiniband network. In theory, "L-CSC" is capable of providing a peak [computing power](#) of 1.7 petaflops with double precision, so 1.7 quadrillion floating [point operations](#) per second in this configuration. This makes it the fourth-fastest [supercomputer](#) in Germany.

Provided by Goethe University Frankfurt am Main

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