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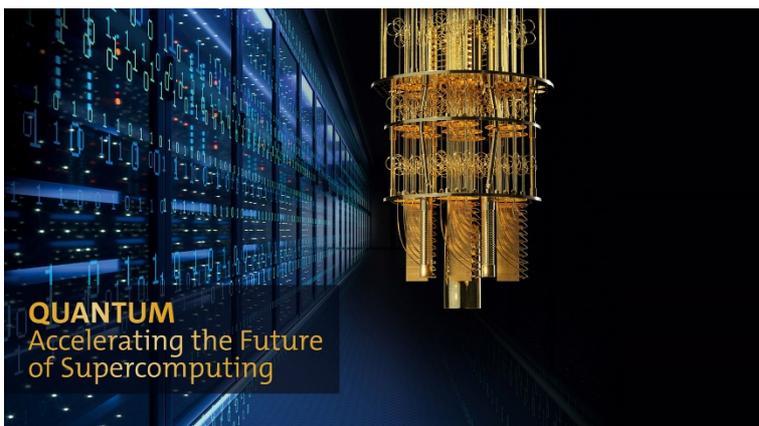
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NEWS

A quantum computer inside a high-performance system

Bringing [quantum computing](#) into everyday research and work: This is the goal the Leibniz Supercomputing Centre (LRZ) is working towards together with many other research institutions and private companies. One of the plans entails embedding a quantum processor (QPU) from the Finnish-German start-up [IQM Quantum Computers](#) in the LRZ's supercomputers, thus making it possible



to develop the still missing control and monitoring functions for future technology. In their [white paper "Bringing Quantum Acceleration to Supercomputers"](#), specialists from IQM and LRZ describe which steps are necessary and how hybrid computing will work in the future: "Accelerators are the key to developing more energy-efficient systems that enable exa-scale supercomputers," the authors state. They add that "quantum computers are among the most promising accelerators because they represent a different computational paradigm."

Integration will strongly change the architecture of and work with a supercomputer: "In high-performance computing, this means rethinking the entire simulation pipeline, starting with the mathematical model." Hybrid computing requires standardised interfaces as well as new scheduling tools that distribute

computing jobs to the appropriate resources. This, in turn, will also influence the development of algorithms: "Software that has been developed over the years by the HPC community must be carefully analysed in order to take advantage of quantum computing. The [whitepaper about the the changes in supercomputing](#) brought about by quantum processors.

"A programme must work"

Understanding software, simplifying code changes, automating the writing and verification of programmes: This is the research focus of computer scientist [Dr. Julia Lawall](#): "In general, I am interested in languages and ways of functioning of hardware and software, or rather, I am concerned with the question of how we programme, how we can programme better or how we can get more efficient code," she says. At the end of July, the renowned scientist from the [French Institut national de recherche en science et technologies du numeriques \(Inria\)](#) was a guest at the Leibniz Supercomputing Centre to design joint projects. In her lecture, she presented the great potential of [Coccinelle](#), a tool that makes C codes easier to change and adapt: This is now becoming important because the Linux kernel, which is programmed in C, is to be realigned. In the [interview on LRZ's website](#), Lawall explains her work and also recommends useful programming languages.



All the best

A minister who helped unpack new computers and who was happy about Bavaria's first quantum computer. Scientists who demonstrated the meaning of supercomputing in the context of their respective research projects. And many guests from politics, academia as well as civil society who marvelled at the computer simulations: On 14 July, the Leibniz Supercomputing Centre (LRZ) celebrated its [60th birthday](#). The live recording of the celebratory speech by Markus Blume, Bavarian Minister of State for Science and the Arts, and many lectures on excellence research, which the LRZ supports with its (super)computers, experience and knowledge, [can be viewed online](#).



Among the guests was [Dr. Wolfgang Heubisch](#) (photo next page top) member of the Bavarian Parliament and a predecessor of Blume. His term of office coincided with the applications for the LRZ's first warm-water-cooled supercomputer as well as the centre's 50th anniversary in 2012. "There was an unparalleled spirit of optimism then, as there is today, and everywhere you could feel that we are now

entering a new era," recalls the dentist with a doctorate and a degree in business administration: "In principle, there was never any doubt that science needs computer technology and that it is therefore also necessary to invest in the LRZ's equipment." In this interview, Heubisch tells how he was convinced of the benefits of supercomputing and how he negotiated the funding for the LRZ. "The LRZ is still doing a great job defending and expanding its top position today," Heubisch said, and he added: "Scientists and academic researchers should therefore always demand from our political representatives that things stay this way." Read the [entire interview on the LRZ60 site](#)



Programming and optimising processors

Another guest at the birthday party of the Leibniz Computing Centre was the young computer scientist [Pascal Jungblut](#). He is part of the Munich Network Management Team at Ludwig-Maximilians-Universität and at the [Chair of Communication Systems and System Programming](#) he is researching new types of processors known as field programmable gate arrays (FPGA): "These are more flexible than known processors", he says. "The circuits of these chips can be configured and changed again and again, even if they are already built into a computer or device." The programmable components could therefore also drive forward and accelerate supercomputing. Pascal Jungblut is exploring configuration concepts and comparing different FPGAs for this purpose. He not only presented his work in a [short lecture of three times 60 seconds](#), but afterwards he answered our questions about what drives him and what he wants to achieve. You can find the [portrait of this highly congenial and up-and-coming scientist](#) on the LRZ's website.

Alternatives to the familiar online search

[According to Statista](#), Google reaches about 80 percent of computer users worldwide, Bing more than 10 percent, Yandex just under 5 %, Yahoo and Baidu about 2 %: There is a clear imbalance in the search engine marketplace. There are only a few providers, some of which dominate the market. Not only does this limit access to information for all users, it also stifles innovation and competition in one of the most important areas of the Internet. The European Union decided to counter this development and fund the [OpenWebSearch.EU project](#) with 8.5 million euros as part of the Horizon Europe research programme. Over the next three years, 75 researchers from various universities and organisations will build an open web index that will form a basis for alternatives to established search engines and enable new internet services or even business. In addition to the universities of Weimar, Passau, Nijmegen and Graz, as well as the Webis research group and the German Aerospace Centre (DLR), the [Leibniz Supercomputing Centre \(LRZ\)](#) is also participating in this ambitious project: »Free, open and unbiased access to information – we have lost these core principles in web search and we urgently need to restore them", Professor Michael Granitzer from the Chair Data Science at the University of Passau says. He coordinates OpenWebSearch.EU: "This is why the project openwebsearch.eu will create an open European infrastructure for internet search, based on European values and jurisdiction."



WORKSHOPS & EVENTS

Introduction to LRZ systems and flow simulations

Simulating gases, liquids, flows: These are tasks that are carried out particularly frequently on SuperMUC-NG and the LRZ's High Performance Computers (HPC). On **10 August 2022**, Master's students and doctoral candidates can get an idea of the possibilities, get to know the Linux cluster, the LRZ supercomputer and software and algorithms for computational fluid mechanics or computational fluid dynamics. And of course it's also about the workflows - how to access and use the resources and plan or organise your own work. [Information and registration](#)

Using Iterative Solvers at HPC

The parallel programming models MPI and OpenMP, the middleware PETSc as well as iterative and parallel solvers: The four-day compact course from **August 29 to September 2, 2022** in presence at the Leibniz Supercomputing Center (LRZ) in Garching focuses on scientific computing and programming. Krylov subspace methods (CG, GMRES, BiCGSTAB ...), efficient preconditioning techniques will be introduced and knowledge will be practiced in practical programming exercises (using C, Fortran and Python). The goal is to get to know the functionality of iterative solvers, to deal with the Message Passing Interface (MPI) as well as the shared memory directives of OpenMP (in C and Fortran). The course is organized by the LRZ in cooperation with the University of Kassel, the High Performance Computing Center Stuttgart (HLRS) and the IAG. [Registration and information](#)

The Olympic Games of 1972 in photos

The photo exhibition "The Olympic Games 72 in Images" will be continue **until 4 September 2022** at the Bavarian State Library. On display are 140 photographs, among others from the Stern Archive and other photo collections of the State Library, from the period between 1965 and 1972. They show how Munich changed with the first underground lines and the modern, architecturally still interesting Olympic Centre, the joyful atmosphere of the Games, but also the shock caused by the assassination attempt on Israel's team in the Olympic village. Worth seeing. [Information.](#)

Energie efficiency und climate neutrality

According to the European Union, data centers should be climate-neutral by 2030. Will this be achieved? And how? That's the topic of the Data Center Dialog in Berlin on **September 8, 2022**. Data center specialists from all over Germany will present their strategies for reducing energy requirements, utilizing waste heat and energy-efficient cooling of IT and computer resources. For the LRZ, Laura Schulz, responsible for strategies and partnerships as well as for the quantum computing department, will talk about hot water cooling, but also about innovative methods to accelerate supercomputing for research. [Information and registration](#)

Researching and computing with Trilinos codes

The European Trilinos User Group (EuroTUG) is a workshop from **12 to 14 September 2022** for scientists and researchers who use software and libraries of the [Trilinos Project](#). The workshop will focus on applications in linear algebra, linear equation solvers, non-linear solution methods, discretisation techniques for partial differential equations and optimisation methods. This year, Dr. Alexander Heinlein from TU Delft, developer of the Trilinos package "FROSch" and Dr. Matthias Mayr from the University of the Federal Armed Forces Munich, developer of the package "MueLu" are organising the workshop. The workshop will probably take place hybrid, i.e. in presence and online. On 12 September, a preliminary course will introduce the basics of Trilinos (especially sparse linear algebra using Tpetra). On the other days, there will be talks on the Trilinos project, for example by Mike Heroux, Sandia National Laboratories. [Information & registration](#)

Programming with C++

Programming languages like C++ are tools that help to plan work processes systematically, logically and consistently. In a three-day workshop from **21 to 23 September 2022**, participants will learn the tricks and tips for handling and programming with C++. As with many other modern programming languages, the difficulty in writing C++ code lies in making decisions, such as which functions to use and how. The workshop will therefore focus on programming, functions, but also project management and debugging. If you are already planning a research project with C++, please bring your concept, ideas or preliminary work with you. Otherwise, you will learn with application examples from the natural sciences and mathematics. [Information and registration](#)

Improving and transforming Websearch

Open, transparent Internet search without tracking will be the focus of the fourth, international Open Search Symposium #OSSYM2022, **October 10-12, 2022**, at the CERN supercomputing center in Switzerland. The event will be broadcast online and will bring together specialists from around the world who want to improve the way information is searched for online. In addition to presentations on search algorithms, the program will address ethical issues surrounding search and the business done with the data collected from it, as well as educating students and citizens about the Internet and search. This is currently being compiled.. [Information und registration](#)

Téchné Summerschool at LRZ

Data scientists will meet for the Téchné Summer School from **October 10 to 14, 2022** at the LRZ and will focus on language data. Workshops and lectures will show how to filter out sentiments or other important topics, and there will also be lots of advice on describing and storing research results using language data. Lectures will discuss issues related to copyright and open licenses. And of course, participants can visit the LRZ's supercomputers and virtual reality and visualization center and learn about other (data) projects. The Summerschool is organized by the Campus Network for Digital Social Sciences and Humanities of the Ludwig-Maimilians-University Munich, the University of Regensburg and the Friedrich-Alexander-University Erlangen, [Information und Anmeldung](#)

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Programming Software with C++

Object-oriented (OO) software design with the C++ programming language: **This October 26-28, 2022** training focuses on the essential principles, concepts, idioms for software development, and also presents best practices on professional, high-quality code. The course is aimed at advanced users and provides rules and guidelines for developing mature and robust C++ code that can also be maintained and adapted to new requirements. [Registration and information](#)

ANSYS Fluent for Computational Fluid Dynamics

Consisting of 13 lectures and about 6 practical exercises, this seminar, which runs from **October 27 to December 8, 2022**, introduces the use of the fluid dynamics software package ANSYS Fluent. This supports computations and simulations of computational fluid dynamics in particular. Participants will learn about typical CFD workflows for ANSYS and application examples. In addition, they learn how ANSYS works and is integrated on the LRZ Linux cluster. For this they will receive the Linux Primer. Participants should know the basics and numerical methods of fluid mechanics and have completed first calculations. [Information & Registration](#)

Improving and accelerating supercomputing

Arrived in the exascale era: The latest supercomputers from the U.S. and Japan can already perform a trillion calculations or FLOP per second, and their performance and new exascale systems are the focus of SC2022 from **November 13 to 18, 2022**, the international conference on high-performance computing (HPC), networks, storage and data analysis, which is being held this year in Dallas. Of course, it's all about innovative supercomputing technology, but above all it's about how supercomputers can compute and work even faster with the help of quantum computing and artificial intelligence (AI) methods. Speed is also a form of energy efficiency in computing, and ways to achieve more economical cooling will also be discussed at SC2022. [Information und registration](#)

Developing algorithms with Fortran

Software design and object-oriented programming with Fortran: At the four-day online workshop from **November 21 to 24, 2022**, participants can deepen and professionalize their knowledge of Fortran. They will learn good examples of robust code, as well as the tricks of combining Fortran. programs with applications in C languages, plus how to optimize their algorithms for parallel computer systems. [Information and registration](#)

Working with OpenMP

Since its introduction, the OpenMP programming model has proven to be the driving force behind parallel programming for shared memory architectures. These are gaining relevance with the proliferation of multicore processors: Good reason to take a closer look at OpenMP and programming in the three-day course from **November 29 to December 1, 2022**. The instructors will provide theory and background in lectures, and participants will practice what they have learned in practical tasks. [Registration and information](#)

Dealing with processors and nodes

Even application developers who are familiar with OpenMP and MPI often don't know exactly how much performance their code can achieve. Parallelism is not everything for good computing performance. That's why this three-day online course from **December 5-7, 2022**, hosted by PRACE, provides the necessary understanding of how software and hardware interact and work together. Participants will learn to address the core, socket, and node levels with their codes already, and architectural features and the bottlenecks of processors and compute nodes will also be discussed. [Registration and information](#)

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USED THINGS FOR FURTHER SERVICE

The LRZ is always getting rid of used hardware and furniture - a constantly updated list of things we want to give away can be found [online](#). Here you can also read where to direct your interest. The equipment and furniture are free of charge for institutes, chairs and other research institutions.

JOB OFFERS

You will find an international and diverse team in Garching, which is constantly growing. If you don't find a suitable job profile below, please visit the [career page](#) of the Leibniz Supercomputing Centre or send an [unsolicited application](#). We are LRZ - and curious about you!

[IT-Spezialist Network Engineering](#)

[IT-Spezialist expansion hosting](#)

[DevOp for IT-Service Management Tools](#)

[IT-Spezialist / Systemengineer for developing web based User Interface](#)

[Senior Systemengineer for Storage Services](#)

[Researcher / IT Engineer for Windows server and collaborations](#)

[Researcher for development web tools frontend or fullstack](#)

[Researcher for system administration](#)

[Scientist/ engineer / computer scientists for data collection and concepts](#)

[Programming expert in High Performance and Parallel Computing for GPU-Accelerated HPC Applications](#)

[Software Engineer for astrophysical applications in High-Performance Computing](#)

[HPC software engineer for Quantum Software Stack](#)

[IT-Spezialist / system consultants for multi factor authentication](#)

[Assistant for directors and secretariat LRZ](#)

[CRM-Manager \(part time 20 hours\)](#)

[Administrator for inventory of LRZ](#)

[Administration staff for reception and clerical work](#)

[Student assistant PR Content](#)

[Student assistant for developing tools for the research data management and for Citizen Science projects](#)

[Student assistant for developing NV tools and servers](#)

[Student assistant for developing ITSM software](#)

[Student assistant for Service-Desk](#)

MORE TO READ

Here you will find links to latest information from the german-european supercomputing community and our cooperation partners

- The [newsletter](#) of the Bavarian Academy for Science and Humanities
- [Publications](#) of the Gauss Centre for Supercomputing (GCS): GCS-News und Inside
- [Infoletters](#) of the Gauß-Alliance
- Publications of PRACE: [PRACE Digest, Jahresbericht](#)

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- Current information about the LRZ and about courses and events can also be found on [Twitter](#) and [LinkedIn](#).

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Photos: E. Vittiosi/Unsplash; Bayerischer Landtag; LRZ