Enable cutting-edge computer science and large scale computational science with HPC training, networking, and user support.
The High Performance Computing Center of Stuttgart (HLRS) of the University of Stuttgart is the first National Supercomputing Center in Germany and is offering services to both academic users and industry. Apart from the operation of supercomputers, HLRS activities include teaching and training in distributed systems, software engineering and programming models, as well as development of new technologies. HLRS is an active player in the European research arena with special focus on Scientific Excellence and Industrial Leadership initiatives.

Our Network: HLRS is tightly connected to academia and industry through long term partnerships with global market players such as Porsche and T-Systems, as well as worldwide companies, HPC centres and Universities. Particular attention is given to collaboration with Small and Medium Enterprises (SMEs).

Our Infrastructure: HLRS operates a CRAY XC40 supercomputer (peak performance > 7 PetaFlops), as well as a variety of smaller systems, reaching from clusters to cloud resources.
Our Experience: HLRS has been at the forefront of regional, national and European research and innovation over the last 20 years. During this time, HLRS has participated successfully in more than 90 European research and innovation projects.

Our Expertise: HLRS is a leading innovation center, applying software engineering methods to HPC and Cloud for the benefit of multiple application domains such as automotive, engineering, health, mobility, security, and energy. Thanks to the close interaction with industry, the center’s capabilities and expertise support the whole lifecycle of simulation covering research aspects, pre-competitive development and preparation for production. The HLRS innovation group, which actively examines and tests new technologies, can bring into projects expertise on leading edge technologies hardware and scale up data analysis techniques.

Director HLRS
Prof. Dr. Michael Resch
In any field, deep knowledge and good practice is of no use if it isn’t shared, spread, and applied. In the case of high-performance computing (HPC), many potential beneficiaries are either not aware of its existence or lack the knowledge for using the required highly efficient systems and the associated software and tools. Additionally, with the changing HPC landscape and application areas expanding into fields such as life science, data analytics, and machine/deep learning, it has become increasingly challenging to recruit young talents and train them with the necessary skills. In order to remain a world-leader for cutting-edge computer science and enabler for large-scale computational science applications, the High-Performance Computing Center Stuttgart (HLRS) continually works on improving scientific training and support of businesses within the scope of science projects, networks, and day-to-day operations. With small and medium-sized enterprises (SMEs) being the economic backbone in the region of Baden-Württemberg, HLRS supports their competitive positions, among other aspects, through the EU-funded project Fortissimo and the company SICOS BW GmbH, co-founded by the University of Stuttgart. These actions work to lower the barriers for SMEs to use HPC facilities at HLRS. Being a European leader in HPC training for industrial and scientific users, HLRS continuously strengthens this position by taking part in European networks for HPC staff exchange and training such as HPC-Europa 3, the PRACE advanced training center (PATC), the ESF-MoeWe-project, and much more. With this brochure, we invite you to learn more about the HLRS portfolio in HPC-related and customer-oriented services.
Project Overview

- POP - Performance Optimisation and Productivity (A Centre of Excellence in Computing Applications) Page 8
- MoeWE - Modular Training Programme on High Performance Computing for Professionals Page 10
- HPC-Europa 3 - Transnational Access Programme for a Pan-European Network of HPC Research Infrastructures and Laboratories for scientific computing Page 12
- FORTISSIMO 2 - Factories of the Future Resources, Technology, Infrastructure and Services for Simulation and Modelling 2 Page 14
- CoeGSS - Centre of excellence for Global Systems Science Page 16
High performance computing is a fundamental tool for the progress of science and engineering and as such for the economic competitiveness. The growing complexity of parallel computers is leading to a situation where code owners and users are not aware of the detailed issues affecting the performance of their applications. The result is often an inefficient use of computing resources. Code developers often do not have sufficient insight in its detailed causes in order to address the problem properly.

The objective of POP is to operate a Center of Excellence in performance optimisation and productivity and to share our expertise in the field with the computing community. In particular, POP will offer the service of precisely assessing the performance of computing applications of any sort, from a few hundred to many thousands of processors. Also, POP will show users the specific issues affecting the performance of their code and the best way to alleviate them. POP will target and offer such services to code owners and users from all domains, including infrastructure operators, academic and industrial users. The estimated population of such applications in Europe is 1500.
and within the project lifetime POP has the ambition of serving over 150 such codes. The Added Value of POP’s services is the savings generated in the operation and use of a code, which will result in a significant Return on Investment (fixing a code costs less than running it below its optimal levels) by employing best-in-class services and release capacity for resolving other priority issues. POP will be a best-in-class centre. By bringing together the European world-class expertise in the area and combining excellent academic resources with a practical, hand-on approach, it will improve the access to computing applications, thus allowing European researchers and industry to be more competitive.

**Project Partners**
- Barcelona Supercomputing Center, Spain
- Numerical Algorithm Group, UK
- RWTH Aachen
- HLRS
- Teratec, FR
- Forschungszentrum Jülich

**Project Information**
- Funding Organisation: EU-H2020
- Runtime: 10.2015 - 03.2018

**Contact**
Dr. José Gracia  
Christoph Niethammer

Phone: +49 (0) 711/ 685-87208  
+49 (0) 711/ 685 87203
E-Mail: gracia@hlrs.de  
niethammer@hlrs.de

**Further Information**
www.pop-coe.eu
The HLRS cooperates with the Universities of Ulm and Freiburg as well as the SICOS BW to design up-to-date training courses for IT-experts. The demand for high performance computing experts in the area of simulation, modeling and programming as well as performance optimization is high and will continue to grow with the further expansion of digitization. In order to meet the long-term needs and to provide employees professional developmental opportunities besides their work and personal life, MoeWE offers a modular and flexible training to become a high performance computing expert. The training concept is based on a blended learning concept which combines e-learning and face-to-face learning. The approach takes advantage of both learning forms. Therefore, the participants are flexible to study when and where it best suits their work and family life.

The training program is structured into modules which meets the needs of different high performance computing expert profiles

- resource manager
- software developer
- high performance computing user

The training covers the areas

- parallel Programming (IT-languages, tools and libraries, scheduling and libraries)
- simulation
- visualization
- optimization
- cluster, cloud and high performance computing
- business issues, ecology and economy
- data management
- plus introduction to IT
Project Information

- Funding Organisation: The European Social Fund (ESF) and the Ministry of Science, Research and the Arts of the state of Baden-Württemberg.
- Runtime: 07.2016-12.2020

Interested in joining the MoeWE training program?
Please send an e-mail (contact details below) and you will be provided with further information.

Contact
Dr. Jutta Oexle
Phone: +49 (0) 711 / 685-87207
E-Mail: oexle@hlrs.de

Further Information
www.hlrs.de/moewe/
With the first initiative that goes back to 2002, HPC-Europa project has proved a successful EU-instrument to support Pan-European collaboration on HPC-related topics. After a short break, in May 2017 eight European HPC centres launched the 3rd edition of the EC-funded initiative “Transnational Access Programme for a Pan-European Network of HPC Research Infrastructures and Laboratories for scientific computing” project, abbreviated as HPC-Europa 3. Similar to the beginning of the initiative, HLRS remains a key HPC access and technology partner. Similar to its predecessors, HPC-Europa 3 will be offering grants to junior researchers from all EU states who are dealing with HPC-specific topics such as applications, tools and benchmarks. The participating HPC centers and their partners hosting transnational visits are: CINECA in Italy, EPCC in the UK, BSC in Spain, HLRS in Germany, SARA in France, CSC in Finland, GRNET in Greece, and KTH in Sweden.

Role of HLRS in HPC-Europa 3

HLRS as one of the participating HPC centers is planning to provide up to 150 young scientists with access to the systems, in a dimension of 4.2 Million compute hours. Also the German researchers will get the opportunity to visit HPC centers outside of Germany – within the duration of HPC-Europa 3, the participating centers are planning to host 1220 junior researchers and provide a dimension of about 100 Million compute hours. Access to all participating European HPC centers will be provided free of charge and via a single application approach to diminish the administrative burden. The visitors
will be also provided with travel grants to the chosen EU-destination. Also the Small and Medium Enterprises (SME) get the opportunity to apply for an HPC-Europa 3 grant.

Project Partners
- CINECA (Italy) – Coordinator
- EPCC (United Kingdom)
- BSC (Spain)
- HLRS (Germany)
- SURFsara (Netherlands)
- CSC (Finland)
- GRNET (Greece)
- KTH-PDC (Sweden)
- NUIG-ICHEC (Ireland)
- CNRS (France)

Project Information
- Runtime: 05.2017 – 04.2021
- Funding Organisation: EU H2020

Contact
Dr. Alexey Cheptsov
Phone: +49 (0) 711/ 685-60470
E-Mail: cheptsov@hlrs.de

Further Information
www.hpc-europa.eu
With the advent of computer-aided engineering, small or medium-sized enterprises (SMEs) have started to use simulations in order to help their engineers develop innovations as well as create products more cost efficiently. Nevertheless, these complex simulations need High-Performance Computing (HPC) resources to obtain results in a reasonable time, which have not been easily affordable for SMEs so far.

Within its logical predecessor – the FORTISSIMO project – the objective was not only to enable European SMEs to be more competitive by using simulation services running on an HPC cloud infrastructure. The project also offers its stakeholders a “one stop shop” – the FORTISSIMO Marketplace – that allows convenient access to such HPC cloud infrastructure and to additional services that are one click away, such as expert support, third-party applications, tools, and helpdesk.

In the FORTISSIMO 2 project, the FORTISSIMO Marketplace is enhanced with advanced HPC cloud services based on High-Performance Data Analytics (HPDA) and coupled HPC simulations. Sensor networks, like weather or traffic flow control, continuously produce high amounts of data. Somewhere in this data lies valuable information, but in order to manage and analyze them in a reasonable time, HPDA becomes indispensable. Coupled HPC simulations are used to study complex models in science, for example, a heart and a blood flow simulation running together for a better understanding of the human circulatory system. But those simulations generate data, which need to be analyzed to obtain value and thus knowledge and expertise.

The National High-Performance Computing Center Stuttgart (HLRS) is in charge of the FORTISSIMO Marketplace development and operations. This includes extending the Marketplace based on upcoming requirements of the new experiments in FORTISSIMO 2. The project is coordinated by the Uni-
University of Edinburgh and involves 13 core partners: University of Edinburgh, Scapos, University of Stuttgart, Sicos BW, Intel, Actur, XLAB, CESGA, Gompute, Bull, Atos, SURFsara and CINECA.

**Project Information**
Funding Agency: EU – H2020
EU-Funding: € 10 Million

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**THE MARKETPLACE**

*Are you a manufacturing SME?*

The Fortissimo Marketplace will provide one-stop, pay-per-use, on-demand access to advanced simulation and modelling resources including software, hardware and expertise. The marketplace will help you find novel solutions to your challenges, discover new opportunities and bring together all necessary actors to construct the exact solution that meets your business requirements.

- On-demand access to advanced simulation and modelling resources
- Access to state-of-the-at HPC facilities
- Matchmaking services
- Access to a Capability register advertising and promoting services
- Run simulations in hours rather than days
- Access to best-practice guides

**Contact**
Michael Gienger
Dr. Bastian Koller
Phone: +49 (0) 711 / 685-63824
        +49 (0) 711 / 685-65891
E-Mail: gienger@hlrs.de
        koller@hlrs.de

**Further Information**
FORTISSIMO Marketplace:
www.fortissimo-project.eu

i4MS projects webpage:
www.i4ms.eu/projects
The globalisation of humanity’s social and industrial activities, as observed over the past decades, has caused a growing need to address the related global risks and opportunities. The relations and interactions amongst the global population increase day-to-day, so that the following challenges are of utmost importance:

- **The global health risks** – from diabetes to pandemics – caused by the spread of unhealthy social habits offers the opportunity to achieve major global health improvements through healthy behaviour.

- **The global diffusion of green growth initiatives**, including policy initiatives, business strategies and lifestyle changes for successful and inefficient pathways.

- **The challenges of global urbanisation**, with special focus on the impact of infrastructure decisions regarding indicators like congestion, real estate prices and greenhouse gas emissions.

Approaches that address the above-mentioned challenges are investigated by a newly-emerging research area: Global Systems Science (GSS). However, with these transdisciplinary problems the demand for compute performance due to data and processing time constraints increases drastically so that the assistance of High Performance Computing (HPC) is mandatory. Therefore, the main outcomes of the CoeGSS project are the development of the technology and the environment for successful collaboration between the stakeholders dealing with global challenges and the High Performance Computing institutions that provide the mandatory capabilities to address those complex challenges at the required scale.
The project consortium consists of High Performance Computing and Global Systems Science experts from all over Europe:
- University of Potsdam – Germany
- Global Climate Forum – Germany
- University of Stuttgart, HLRS – Germany
- Poznan Supercomputing and Networking Center – Poland
- Institute for Scientific Interchange – Italy
- IMT School for Advanced Studies Lucca – Italy
- Chalmers University of Technology – Sweden
- Atos Spain SA – Spain
- TOP-IX Consortium – Italy
- The CoSMo Company – France
- DIALOGIK – Germany
- CSP s.c.a r.l. – Italy

Project Information
- Runtime: 10.2015-09.2018
- Funding Organisation: EU H2020

Contact
Michael Gienger
Phone: +49 (0) 711 / 685-63824
E-Mail: gienger@hlrs.de

Further Information
www.coegss.eu