High-performance computing strengthens Switzerland as a centre of business and scientific research

The ETH Board's HPCN strategy enters a new phase

The new supercomputing infrastructure at CSCS (Swiss National Supercomputing Centre) in Ticino is being developed to operate as a long-term scientific user laboratory. ETH Zurich is thus continuing the ETH Board's National Strategic Plan for High-Performance Computing and Networking (HPCN Strategy) at CSCS on behalf of the Swiss Confederation.

High-performance computing (HPC) is a new key technology for both science and business, enabling new solution models for complex research issues (see box). In 2007, the ETH Board developed Switzerland's National Strategic Plan for High-Performance Computing and Networking (HPCN Strategy) on behalf of the Swiss Confederation. Resolutions adopted in 2009 by the Federal Council and Parliament gave the go-ahead to launch the plan. Today, the ETH Board is already preparing to implement the second phase of its HPCN Strategy for 2013–2016 at the CSCS (Swiss National Supercomputing Centre).

2009–2012: Establishment of petaflops supercomputing infrastructure

The HPCN Strategy calls for supercomputing capacity in the petaflop performance class to be provided in Switzerland by establishing a new supercomputing infrastructure at the CSCS in Ticino. Swiss scientists will henceforth have access to a computing system of the highest performance class. By 2013, the supercomputer will be able to execute over one petaflops – a quadrillion computing steps per second. It was to ensure the best possible computing performance in terms of energy and cost-efficiency that the new building in Lugano-Cornaredo was brought into operation in 2012.

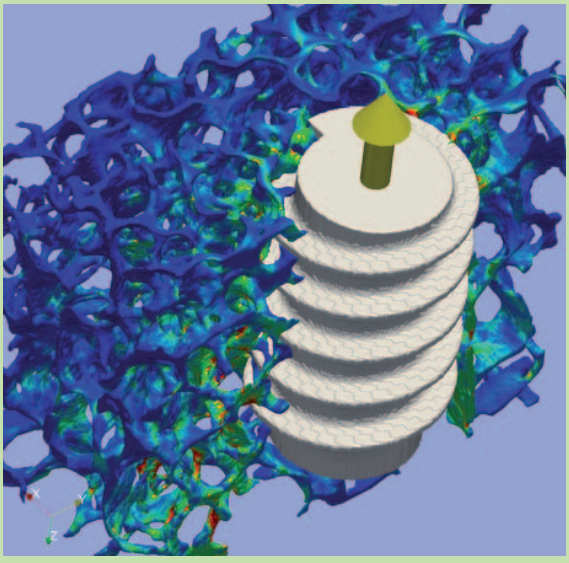
In parallel with the construction of the new building, CSCS launched the internationally acclaimed research platform HP2C in 2009. In an interdisciplinary effort in collaboration with hardware vendors, the software for the supercomputing infrastructure is being developed along with specialised algorithms tailored to the needs of Swiss researchers. Scientists from fields such as chemistry, astronomy, medicine, climate research, biology and mathematics are involved. ETH Zurich (represented by CSCS) is responsible for project management of the platform, in close cooperation with the

High-performance computing for complex research issues

Whether for modelling climate change or simulating financial market behaviour, many problems that previously would have taken months or even been impossible to solve can now be processed by a supercomputer in just a few days. In many fields, modelling and simulation has become the third pillar of scientific enquiry next to theoretical and experimental methods.

Benefits to science and society…
Simulation-aided forecasting allows researchers to gain an insight into fundamental processes in fields such as chemistry, solid-state physics or the nanosciences, and aids the development of new materials. Computer modelling provides the geosciences, for instance, with new insights into natural hazards such as earthquakes, landslides and avalanches, and is useful for weather and climate forecasting. In biomedicine, it enables individualised development of hearing aids and improved diagnostics for heart disease.

…and a cornerstone of Swiss research
The user laboratory built around the CSCS supercomputing infrastructure will be accessible to Swiss researchers and all Swiss institutions that require supercomputing capacity. The laboratory meets the highest requirements and will benefit numerous experiments, including major strategic projects in the ETH Domain. The X-ray free-electron laser SwissFEL and the neuroinformatics project Blue Brain would not be possible without high-performance computing. They will benefit from the basic infrastructure and expertise of CSCS.



Bone implants in the treatment of osteoporosis: CSCS's current supercomputer simulates how implants affect bone tissue, thereby delivering new knowledge for developing medical implants. (Image: Institute for Biomechanics, ETH Zurich)

University of Lugano and EPFL. The new numerical procedures developed for the supercomputing infrastructure benefit from current advancements achieved across a wide range of scientific enquiry, such as cardiovascular diagnostics and seismic simulation.

CSCS already operates a service organisation offering computing services to researchers, the Swiss Confederation (MeteoSwiss), business and industry, and other organisations.

2013–2016: Operation as a scientific user laboratory

CSCS's new supercomputing infrastructure will essentially be available from 2013 onwards as a user laboratory for research projects undertaken by any Swiss university or research institute. Scientists can apply for computing time and execute their projects with expert support. To enable allocation of available computing time to high-quality and highly innovative projects, these projects will be selected on the basis of independent peer review. PSI has been successfully practicing this user laboratory concept within the ETH Domain for years.

Under certain conditions, major strategic research projects will also be able to use the CSCS building infrastructure. In mid-2012, an agreement was signed between ETH Zurich and EPFL on behalf of the ETH Board governing the operation of high-performance computers at CSCS for the neuroinformatics project Blue Brain.

Broad financial support

The ETH Board's HPCN Strategy enjoys wide financial backing. The investment costs up to 2014 amount to 172.5m CHF, including the HP2C platform which is co-financed by the cantons. In 2009, the Federal Council and Parliament approved an initial financing package of 72m CHF. Another 60m CHF are to be invested in the supercomputing infrastructure during the 2012–2014 period. The Canton of Ticino contributed 5m CHF towards the construction of the new supercomputing centre, and the city of Lugano granted the building lease on the land for the new building. The operating costs of the supercomputing centre will be borne by ETH Zurich.

To ensure that the supercomputing infrastructure can also be used as a user laboratory beyond 2014, in 2011 the ETH Board added an extra 30m CHF to its planned funding for ETH Zurich, making a total investment of 26m CHF in 2015/2016. A follow-on project for the HP2C research platform aims to continue promoting optimum usage of the next generation of the supercomputing infrastructure. As part of its coordination and innovation projects and the Swiss Universities Conference programmes, the ETH Board is contributing a total of 4m CHF for the 2013–2016 period.

Links to further information

www.cscs.ch

www.ethboard.com/en/supercomputing

Published by
ETH Board
Dr Fritz Schiesser, President
Häldeliweg 15, CH-8092 Zurich
Switzerland
Phone +41 (0)44 632 23 67

Enquiries
Professor Thomas Schulthess, Director of CSCS
Via Trevano 131, CH-6900 Lugano
Switzerland
Phone +41 (0)91 610 82 01

Zurich and Berne, August 2012, ar/KB/SU