Call for Proposal for Co-Design Projects

First letter of intent deadline: February 1, 2013 First submission deadline: March 1, 2013 Next submission deadlines: September 1, 2013; March 1, 2014

1. Context and goals

The Swiss Platform for Advanced Scientific Computing (PASC) is a structuring project jointly supported by the Swiss University Conference (SUK) and the Council of Federal Institutes of Technology (ETH Rat). PASC is coordinated by the Università della Svizzera italiana (USI) in collaboration with CSCS, the Swiss National Supercomputing Center of the Swiss Federal Institute of Technology in Zurich, and with the other Swiss universities and the EPFL.

The platform's overarching goal is to position Swiss computational sciences in the emerging exascale-era. It is complementary to the supercomputing-hardware-focused elements of the Swiss High-Performance and Networking (HPCN) initiative. The PASC consolidates and builds on the achievements of the current High-Performance and High-Productivity Computing (HP2C) project that will be completed in early 2013 (see www.hp2c.ch).

The goals of PASC will be pursued with a distributed application support network as well as co-design projects. The latter aim at bringing together the development of scientific models, application codes, as well as the numerical and system software environment needed in order to optimally exploit emerging supercomputing computing platforms for high-end simulations of the future. These supercomputing platforms will have tens of thousands of nodes interconnected by advanced high-performance networks. Nodes will likely have heterogeneous memory (e.g. traditional low latency RAM, graphic memory that supports very high memory bandwidth, non-volatile on-node storage, etc.) with deep hierarchies, as well as multiple functional units (e.g. latency optimized cores with high single thread performance, throughput optimized processors with many and very large SIMT or SIMD units, etc.), in order to support heterogeneous workloads. New storage and I/O systems might emerge that support data streams and in-situ data analysis.

Based on an open and peer reviewed call in Fall 2012, the HP2C steering committee selected and provided eight months of financing for five domain science networks to build the first communities served by PASC. The domain science networks are the following: biology, (quantum) materials science, physics, climate/meteorology, and geoscience. PASC may be extended to incorporate other networks in the future. The networks are charged with developing the application support for their communities. Furthermore they are expected to define ambitious scientific agendas with associated roadmaps in their respective domains that are beyond the horizon of even the best individual research groups, but can be accomplished with appropriate interdisciplinary efforts within five to six years, assuming the development of disruptive supercomputing technologies.

2. Call for co-design projects

In response to this call, members of the domain science networks can propose co-design projects to realize essential components of the scientific roadmaps of the PASC networks. Co-design projects can cross multiple domains and cover needs of multiple communities. These co-design projects along with the development of new and emerging supercomputing systems at CSCS, to which the co-design project have to relate to, are meant to provide the simulation infrastructure needed to realize the scientific roadmaps of the PASC networks.

Applicants who are not already participating in one of the PASC domain science networks are welcome to submit a proposal that relates to one of the respective domains, but should contact the principal investigator of the network (see contact section in this document).

Projects outside the scientific scope of the existing networks and their roadmaps are also possible, but require the formation of a new agenda and associated roadmap that have comparable quality and community support as the present networks.

Furthermore, projects that develop basic (software) infrastructure needed for sustained implementation of the scientific agendas of the networks will be supported under this call as well.

Moreover, proposals are expected to address one or more of the following priorities for optimal exploitation of CSCS' new and emerging supercomputing platforms:

- Refactoring of key application codes that have or will have significant impact on CSCS' user program and re-engineering of their algorithms.
- Development of numerical libraries and their integration into application codes.
- Incorporations of innovative sub-systems (e.g. I/O, data streams, etc.) into existing simulation codes in order to support novel workflows needed for future high-end simulations.
- Development of programming environments or components thereof, performance tuning and analysis/monitoring tools.

Project teams should be interdisciplinary, consisting of researchers from application domains, computational science and applied mathematics, and computer science. The organization of the interaction between project members of the various disciplines and participating institutions should be clearly described in the project proposal.

2.1 Eligible applicants

Researchers with tenured positions at Swiss universities and institutes of the ETH Domain are eligible to submit co-design project proposals as principal investigator (PI). SNSF rules for personnel eligibility apply.

Researchers from other institutions, including private companies and colleges of applied sciences (Fachhochschulen), as well as non-Swiss universities and

research institutes can participate in co-design projects. Typically investigators from such other institutions bear their own cost; the PASC steering committee might approve exceptions in justified cases.

2.2 CSCS Contribution

CSCS will make available the following resources in order to facilitate the codesign projects:

- Information about targeted new technologies.
- Access to supercomputing platforms and prototypes for development and testing purposes.
- Coordinate necessary interactions between co-design project teams and manufacturers of supercomputing systems and system components.
- Consultancy, expertise and training in key aspects of emerging technologies and high-performance software development.

2.3 Financial scope and duration

Projects will start on July 1, 2013 at the earliest and will have to be concluded by December 31, 2016. Expected project duration will be two to three years.

The entire budget for co-design project within PASC is 10.6 million CHF (6.6 million for cantonal universities and 4 million for institutes of the ETH domain). PASC expects to support between 15 and 20 co-design projects.

Typical total budget of a project is expected to be in the range of 300'000 to 700'000 CHF; larger budgets will have to be well justified. Following regulations of the Swiss University Conference, each project has to provide matching funds. These can be in-kind and must be at least equal in values at the funds request from PASC.

2.4 Eligible costs

The following costs will be eligible for support from PASC:

- Research and technical staff including post-doctoral and PhD students. SNSF regulations concerning salaries and employment conditions will apply.
- Assistant professors positions will be funded only under a written confirmation of the hosting university, as well as a substantial share of co-funding by the university. Professorial staff members employed by the host university at the time of submission are not eligible.
- Networking and dissemination activities, as well as participation in international activities and conferences in the field.
- Stay of researchers at CSCS for joint activities.

2.5 Reporting and documentation

The PI of a supported project is expected to submit annual progress reports. PIs and/or co-PIs are expected to participate in and give oral presentations at

PASC project review meetings. Detailed guidelines with scientific requirements and notifications of the reporting deadlines will be given to PIs an co-PIs at least three months in advance.

3. Submission and proposal format

3.1 Timeline of the call

The present call will remain open through 2014.

Proposals will be accepted at all times while the call is open, but they will subject to one of the bi-annual panel reviews. Deadline for the panel reviews are as follows:

- 1. March 1, 2013 for earliest project start on July 1, 2013
- 2. September 1, 2013 for earliest project start on January 1, 2014
- 3. March 1, 2014 for earliest project start on July 1, 2014

The PASC steering committee may establish further deadlines or decide on launching additional focused calls in the future, depending on the needs of the program.

3.2 Letter of intent

A letter, in which the intent for submitting a co-design project proposal is expressed, should be submitted in PDF format to projectoffice@hp2c.ch at the latest one month before prior to a review deadline. The letter should include: (1) a preliminary title of the co-design project; (2) a brief description of the project ideas and the domains science network (roadmaps or applications) it relates to; (3) the contact information of the PI and co-PIs; (4) suggestions for referees (following the usual SNSF rules for conflicts of interests).

3.3 Proposal submission

Complete project proposals must be submitted in PDF format via email to projectoffice@hp2c.ch. Applicants are requested to submit the following information:

- 1. The proposal narrative (see section 3.4 for content and format).
- 2. The budget forms (see template).
- 3. The CV of the principal investigator (PI) and co-PIs.
- 4. The list of five relevant publications in the domain of the PI and co-PIs.

Templates for submission will be available on the HP2C website (www.hp2c.ch). All documents have to be submitted in PDF format.

As confirmation of their submission, applicants will receive a summary form with the key data of the application, which has to be signed and sent back to the program secretariat within five working days from the submission deadline.

3.4 Format of proposal narrative

Proposal narrative shall be structured as follows:

- 1. Cover page including basic project data (see template).
- 2. Project summary (max 2 pages).
- 3. International standing of applicants.
- 4. Proposal narrative (max 15 pages) including the following sections:
 - Background and significance.
 - Proposed research: goals, justification, and description of research/development tasks.
 - Required resources, including personnel, prototype hardware / software, as well as resources to support outreach activities.
 - Timeline and milestones.
 - Project organization, including a description of interaction between software developers and domain scientists (developers of models and methods as well as anticipated users of the software stack).
 - Expected results and their impact on the scientific roadmap of the PASC domain science networks as well as CSCS' new and emerging supercomputing platforms.
- 5. References.

3.5 Evaluation

Submitted proposals will first be subject to eligibility check by the program secretariat. Proposals will then be evaluated by external reviewers and then ranked by the PASC Scientific Advisory Committee.

Final decision on funding will be adopted by the PASC Steering Committee on proposition of the PASC director.

4. Contacts

PASC Director

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PASC Secretariat

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CSCS Contact

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PASC domain science networks

Solid earth dynamics

Dr. Tarje Nissen-Meyer, Institute of Geophysics, Seismology and Geodynamics, ETH Zurich, phone +41 44 633 3154, email: tarjen@ethz.ch.

Materials simulations

Prof. Dr. Nicola Marzari, Theory and Simulation of Materials, EPFL, phone +41 21 693 11 29; email: nicola.marzari@epfl.ch.

Plasma physics, astrophysics, and multiscale fluid dynamics

Prof. Dr. Ben Moore, Institute for Theoretical Physics, University of Zurich, phone +41 44 635 5818, email moore@physik.uzh.ch.

Biology across scales

Prof. Dr. Petros Koumoutsakos, Dep. of Mechanical and Process Engineering, ETH Zurich; phone: +41 44 632 52 58, email: petros@ethz.ch

Climate and atmospheric modeling

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