

Faster Computations with HOPSA

Experts from Russia and the EU are collaborating in a new project to boost the performance of supercomputers

Barcelona, 21 June 2011 – Whether analysing complex molecules, searching for new medically active substances, calculating the global climate or modelling astronomical events – computer simulations are becoming an indispensable tool in an increasing number of scientific fields. New more powerful supercomputers enable more realistic and more detailed simulations of complex global processes, whereas at the same time it is becoming more and more difficult for researchers to monitor program execution and to identify sources of error or performance bottlenecks. Today the fastest supercomputers have tens or hundreds of thousands of processors working in parallel which, if possible, have to be utilized uniformly during the course of a simulation. In order to help users optimize performance more easily, Russian and European experts have established a new project which will for the first time consider all aspects in a performance analysis – ranging from running applications down to the hardware actually used.

The HOPSA project (“HOListic Performance System Analysis”) is being funded for two years as part of the EU’s Seventh Framework Programme (FP7) and by the Russian Ministry of Education and Science in a special EU–Russia funding programme. The Russian research groups and developers are concentrating on tools for controlling and optimizing system performance while the European teams are contributing their know-how for developing and monitoring parallel applications in the project.

“The combination and integration of measured data as well as all tools at both levels permits a new holistic analysis of any possible performance bottlenecks in computer simulations and will thus considerably simplify and improve optimization measures,” explains Bernd Mohr from Jülich Supercomputing Centre (JSC). From his base at Forschungszentrum Jülich, home to the fastest supercomputer in Germany, he coordinates the collaboration of the European partners. The Russian project coordinator, Vladimir Voevodin from the Research Computing Center (RCC) of Moscow State University, with the most powerful supercomputer in Russia, also expects increased efficiency: “The HOPSA Project will help scientists to find faster and more efficient solutions to their problems.”

From the Barcelona Supercomputing Center, the Director at the Computer Science department, Jesús Labarta, emphasizes: “The whole world of computing is undergoing the revolution originated by multicore processors. Developing programs for these machines becomes a challenge and performance analysis tools are the instruments required. The HOPSA project will integrate well-known tools to interoperate on a common analysis that would help users to successfully develop programs capable of efficiently use the systems ahead of us.”

The HOPSA Project brings together all the leading experts from Russia and the EU in the field of optimizing parallel programs. The Russian systems vendor T-Platforms, producer of the MSU RCC supercomputers, will integrate its HPC cluster monitoring software ClustrX with the European application optimization tools. Scientists at Moscow State University are developing the system-wide analysis software that will in future process the collected data both for system administrators and also for application programmers. The team at the Joint Supercomputer Center of the Russian Academy of Sciences is responsible for testing and validating the HOPSA software. The Scientific Research Institute of Multiprocessor Computer Systems at the Southern Federal University is contributing its experience with field-programmable gate arrays (FPGAs), which are programmable chips ideal for the requirements of parallel computing.

The EU partners are integrating their world-class tools for optimizing parallel application software into the HOPSA software environment. Rogue Wave Software AB (formerly Acumem) is providing the performance optimization product, ThreadSpotter. The graphical analysis frameworks for representing performance data, Vampir from Dresden University of Technology and Paraver from Barcelona Supercomputing Center are also being used, as well as Scalasca, a software tool for scalable performance optimization developed at Jülich Supercomputing Centre in cooperation with the German Research School for Simulation Sciences in Aachen.

The latest results from the HOPSA Project are being showcased from 19 to 23 June at this year's International Supercomputing Conference (ISC) in Hamburg, the leading European supercomputing fair. Many of the project partners will be presenting their products there.

About BSC

The Barcelona Supercomputing Center (BSC, www.bsc.es) houses MareNostrum, which is installed in a former chapel and is one of the smartest supercomputers in the world. Its mission is to research, develop and manage information technology in order to facilitate scientific progress. With this objective, special attention has been paid to research in areas such as Computer Sciences, Life Sciences, Earth Sciences and Computational Applications in Science and Engineering. In the context of this multi-disciplinary approach, the BSC has a large number of researchers and experts in HPC (High-Performing Computing), which facilitates scientific progress together with state-of-the-art supercomputing resources. At BSC, more than 350 people work in research, 100 of them from outside Spain.

This Spanish multi-disciplinary supercomputing center was established by a consortium made up of the current Ministry of Science and Innovation (MICINN), the Ministry of Economy and Knowledge of the Catalonia local authority and the Universitat Politècnica de Catalunya (UPC), and headed up by Professor Mateo Valero.

Further information:

<http://www.hopsa-project.eu>

Russian Project Partners (HOPSA-RU)

Moscow State University (RU Coordinator)
Research Computing Center

T-Platforms

Russian Academy of Sciences
Joint Supercomputer Center

Southern Federal University
Scientific Research Institute of Multiprocessor Computer Systems

EU Project Partners (HOPSA-EU)

Forschungszentrum Jülich (EU Coordinator)
Jülich Supercomputing Centre

Barcelona Supercomputing Center
Computer Sciences Department

German Research School for Simulation Sciences
Laboratory for Parallel Programming

Rogue Wave Software AB
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The HOPSA Project Team at the kick-off meeting for the project on 25 May 2011 on the campus of Lomonosov Moscow State University.