

HOPSA

Key innovation

To maximise the scientific output of a high-performance computing system, different stakeholders pursue different strategies. While individual application developers are trying to shorten the time to solution by optimising their codes, system administrators are tuning the configuration of the overall system to increase its throughput. Yet, the complexity of today's machines with their strong interrelationship between application and system performance presents serious challenges to achieving these goals.

The HOPSA project (HOListic Performance System Analysis) therefore sets out to create an integrated diagnostic infrastructure for combined application and system tuning. Starting from system-wide basic performance screening of individual jobs, an automated workflow will route findings on potential bottlenecks either to application developers or system administrators with recommendations on how to identify their root cause using more powerful diagnostic tools. Developers can choose from a variety of mature performance-analysis tools developed by our consortium. Within this project, the tools will be further integrated and enhanced with respect to scalability, depth of analysis, and support for asynchronous tasking, a node-level paradigm playing an increasingly important role in hybrid programs on emerging hierarchical and heterogeneous systems.

Technical approach

The work in HOPSA is carried out by two coordinated projects funded by the EU under call FP7-ICT-2011-EU-Russia and the Russian Ministry of Education and Sciences. Its objective is the integration of application tuning with overall system diagnosis and tuning to maximise the scientific output of our HPC infrastructures. While the Russian consortium will focus on the system aspect, the EU consortium will focus on the application aspect. At the interface between these two facets of our holistic approach, which is illustrated in the Figure below, will be the system-wide performance screening of individual jobs, pointing at both inefficiencies of individual applications and system-related performance issues.

Contract number

277463

Project coordinator (EU part)

Forschungszentrum
Jülich GmbH

Project coordinator (RU part)

Moscow State University

Contact person

Dr.-Ing. Bernd Mohr

Jülich Supercomputing Centre

Forschungszentrum Jülich GmbH

52425 Jülich, Germany

Tel: +49 2461 613218

Fax: +49 2461 616656

b.mohr@fz-juelich.de

Project website

www.hopsa-project.eu

Community contribution to the project

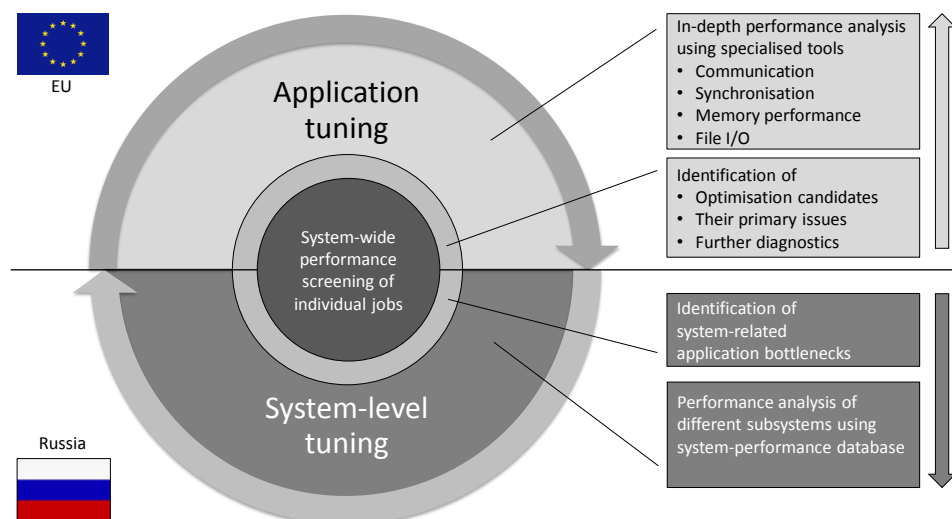
1.4 Mio Euro

Project start date

1 February 2011

Duration

24 months



Demonstration and use

The HOPSA project will deliver an innovative holistic and integrated tool suite for the optimization of HPC applications integrated with system-level monitoring. The tools will be available as a combination of open-source offerings (Extrac/Paraver, Dimemas, Scalasca, CUBE, VampirTrace) and commercial products (Vampir, ThreadSpotter). A single unified installation package for all tools will be provided.

Scientific, economic and societal impact

With the HOPSA infrastructure, the scientific output rate of a HPC system will be increased in three ways: First, the enhanced tool suite will lead to better optimisation results, expanding the potential of the codes to which they are applied. Second, integrating the tools into an automated diagnostic workflow will ensure that they are used both (i) more frequently and (ii) more effectively, further multiplying their benefit. Finally, our holistic approach will lead to a more targeted optimisation of the interactions between application and system.

EU project partners

Country	
DE	Forschungszentrum Jülich GmbH
ES	Barcelona Supercomputing Center
DE	German Research School for Simulation Sciences GmbH
SE	Rogue Wave Software AB
DE	Technische Universität Dresden

Country

Russian project partners

Moscow State University
T-Platforms
Russian Academy of Science
Southern Federal University

Key features

Holistic Performance System Analysis
 =
 integrated diagnostic infrastructure for combined
system-level performance analysis
 +
application-level performance analysis
 of parallel applications on an HPC system