

The ParMA Project

Nowadays, programmers can no longer rely on performance improvements due to the processors' increasing clock-speeds. In contrary, all of today's common processor architectures employ multiple "slower" cores on one die. As a consequence, we are heading towards a parallel future, which is a challenging task to application developers and requires adequate programming methods and tools.

The ParMA project (Parallel Programming for Multi-core Architectures) aims at fully exploiting the power of multi-threading on multi-core architectures for conventional HPC applications, but also for embedded applications on Multi-Processor System-on-a-Chip (MPSoC) architectures. The consortium comprises 17 leading partners from four European countries, namely Bull, CAPS-Entreprise, UVSQ, DA, INT and CEA-LIST from France, HLRS, FZJ-ZAM, TUD-ZIH, GWT-TUD, RECOM Services, GNS and MAGMA from Germany, UAB, Indra and Robotiker from Spain, and Allinea from UK. Their Kick-off Meeting takes place in Dresden right before ISC 2007.

The project has been approved by ITEA2 and is being funded by the corresponding national Public Authorities, e.g. the German BMBF. The overall project will be managed by Bull, with the seven German partners being co-ordinated by HLRS.

The main achievements of ParMA will consist in:

- Evolving design and programming models to develop and restructure parallel applications in an easy and efficient way for multi-core/multi-threaded systems and MPSoCs
- Extending existing parallel tools for performance analysis and debugging (Kojak, Vampir, OPT, DDT, Marmot, Open MPI/Peruse) to support different flavours of parallelism (MPI, OpenMP, hybrid OpenMP/MPI, threads) and the latest features thereof. To offer a user-friendly and powerful environment to application developers, the integration of these tools in a common framework is envisioned

- Developing and optimizing parallel applications from diverse domains, e.g. avionics applications, for multi-core architectures. Among the German partners, GNS, MAGMA, and RECOM will study metal forming or casting process simulations, to be used e.g. in the automobile industry, or combustion simulation

- Optimizing numerical libraries for multi-threaded architectures and enhancing the underlying Linux Operating System, e.g. to better utilize hierarchical NUMA systems.

HPC platforms for experimentation will be provided by Bull, while embedded systems will be provided and investigated by other French and Spanish partners.

Overall, the application developers will be supported in all steps of the development cycle. The new concepts and tools developed within ParMA will enable them to give birth to a new generation of (embedded) applications that could not be envisaged so far, to significantly speed-up their applications, and to consider much more complex models.

Contact Point at HLRS:
Bettina Krammer

Links:
<http://www.parma-itea2.org>
<http://www.itea2.org>

German Partners:
HLRS, <http://www.hlrs.de>
TUD-ZIH, <http://www.tu-dresden.de/zih>
FZJ-ZAM, <http://www.fz-juelich.de/zam>
RECOM Services, <http://www.recom-services.de>
GWT-TUD, <http://www.gwt-online.de>
GNS, <http://www.gns-systems.de>
MAGMA, <http://www.magma-soft.de>

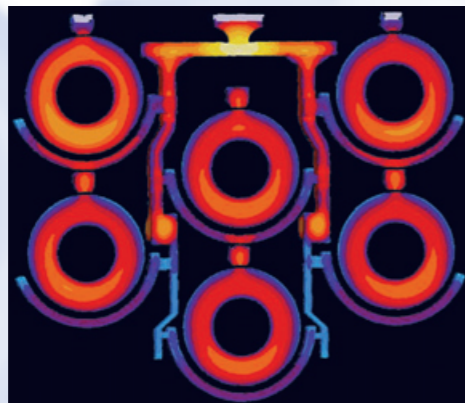
French Partners:
Bull, <http://www.bull.com>
CAPS-Entreprise, <http://www.caps-entreprise.com>
UVSQ, <http://www.uvsq.fr>
INT, <http://www.int-evry.fr>
DA, <http://www.dassault-aviation.com>
CEA-LIST, <http://www-list.cea.fr>

Spanish Partners:
UAB, <http://www.uab.es>
Robotiker, <http://www.robotiker.es>
Indra, <http://www.indra.es>

UK Partners:
Allinea, <http://www.allinea.com>

- Bettina Krammer
- Rainer Keller

Höchstleistungsrechenzentrum
Stuttgart



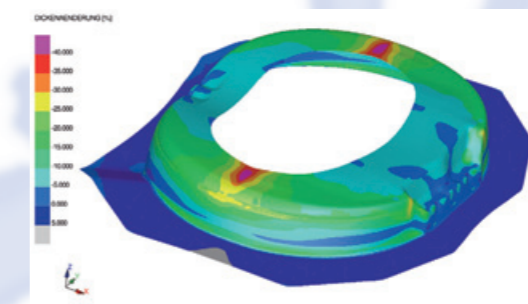
Solidification of a break disc pattern



Computer-aided analysis of flame interactions in a 300 MWe combustion chamber in the Virtual Reality



Visualizing correctness checking results using a performance analysis framework



Deep drawing simulation of a wheel arch on a Linux cluster with 16 nodes