PRACE
Success Stories

THE PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

Scientists and researchers from academia and industry are addressing society's grand challenges by carrying out complex experiments and simulations using HPC resources offered by PRACE, the Partnership for Advanced Computing in Europe. By year-end 2013 PRACE had showcased a total of ten success stories in life sciences, materials research, engineering, particle physics, plasma physics, astrophysics, and climate research. The number of research success stories in academia has continues to grow, and, in recent years, has been complemented by industrial projects funded by SHAPE, the Small and Medium Enterprises (SMEs) Adopting Programme in Europe.

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PRACE Success Stories

Three outstanding research results achieved with the help of PRACE reached the headlines in 2015:

- A cooperative European effort achieved a breakthrough in physics with the help of the JUQUEEN supercomputer at the Juelich Research Centre in Germany, supported by the Leibnitz Rechenzentrum (LRZ) and Höchstleistungsrechenzentrum Stuttgart (HLRS) in Germany and Centre National de la Recherche Scientifique (CNRS) and Genci grand Équipement National de Calcul Intensif (GENCI) in France. The research focussed on the minute difference in mass between protons and neutrons, a phenomenon which was experimentally measured. Using new simulation techniques that took into account the effects of electromagnetic interaction between elementary particles, the researchers were able to calculate the mass difference, and show how it arises.
- One of the challenges in materials research – and in other computer-aided research areas, too – is to combine different size and time scales in one model. In a project supported by PRACE, materials researchers at University College London have shown through simulation what happens when polymers and clay are mixed together. Although it has been known since the 1980s that reinforcing polymers with clay gives a significantly improved material for use in the automotive industry, just why those material properties improve was unknown. Such multiscale models can pave the way for discovering and producing new materials in the future.
- Another breakthrough in materials research was made recently by researchers at Commissariat à l'Énergie Atomique (CEA), Saclay in collaboration with CNRS and the University of Lyon. They were able to show that, contrary to expectations, the crystal structures of similar metals (titanium and zirconium) show differences in plastic deformation. The reason for this was found to be that dislocations of the crystal lattice, which occur during bending, glide continuously in zirconium but intermittently in titanium. Such findings are crucial for the production of new, promising alloys for the technology industry.

These are examples of industrial success stories to date:

- The Scottish company Albatern, with the help of simulations performed on the supercomputer at the Edinburgh Parallel Computing Centre (EPCC), developed the optimal structure and the hydraulic and electric system for a steel construction to extract energy from undulating ocean waves.
- French company Nexio Simulation, with support from the computer infrastructure of the Barcelona Supercomputing Centre (BSC), developed simulation software to study the behaviour of electromagnetic fields. For example, how radiation from antennas on aircraft, automobiles and ships interacts with the object on which they are mounted. For this they were honoured with the ICD Award for outstanding application of HPC.
- Irish company NSilico joined forces with computer experts from the Centre Informatique National de l'Enseignement Supérieur (CINES, France) and the Irish Centre for High Performance Computing (ICHEC) to tackle a key issue in rapidly arranging short DNA sequences against their associated genomes, using novel HPC many-core hardware such as Intel Xeon Phi co-processors. As a result, NSilico has gained experience with PRACE Tier-0 systems and important know-how in many-core technology. The project has also produced new codes that can be readily deployed for future many-core technology, keeping pace with the revolution in high-throughput DNA sequencing technology which is set to transform the life sciences.

Find Out More

PRACE Industry Access
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