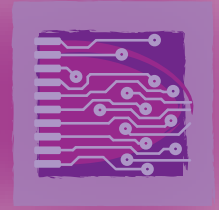




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## SCIENCE: Symbolic Computation Infrastructure for Europe

**Solving mathematical problems on a computer, a high school dream come true? Symbolic computation systems allow mathematicians to sit back and relax as their computer churns out theorems. Or do they? Building the software for symbolic computation is a mammoth task, which requires highly sophisticated algorithms to solve mathematical problems and equally sophisticated software engineering to combine them into usable and flexible systems. The SCIENCE project aims to improve integration between key world-leading developers and software packages in Symbolic Computation systems. Such systems form a vital infrastructural tool in areas of modern academic and commercial research, with important applications in mathematics, physics, chemistry, computer science, engineering and other technical disciplines. This EU-funded project involves a consortium of nine universities and companies from seven countries collaborating over a five-year period. They are developing new computational grid middleware and other technologies for symbolic computation systems.**

### ● IMPROVING YOUR EVERY CLICK

Symbolic computation is the sub-area of mathematics and computer science which solves problems on symbolic objects that can be represented on a computer. Typical examples of such objects are algebraic expressions, logical propositions and programs themselves. The problem solutions are integrated in many advanced software systems for computer algebra, computer-aided design and manufacturing, computer-supported reasoning, knowledge management and formal system specification and verification. Besides playing a fundamental role within mathematics itself, symbolic computation is a key technology in many scientific and technical areas today.

SCIENCE addresses the fragmentation of Europe's symbolic computation software infrastructure. European groups have developed many leading systems which are widely used in research, but are not composable, duplicate development effort and fail to track relevant developments in underpinning Computer Science. The project will address these issues by jointly undertaking a programme of networking, software development and research activities, complemented by a programme of transnational access to the Centre of Expertise at RISC-Linz.



### ● SYMBOLISING NEW OPPORTUNITIES

The project is improving technical cooperation between the developer and application groups; ensuring the incorporation of important developments in computer science, including modern memory management technology; allowing the construction of tools exploiting software components developed in multiple systems; and making such tools usable on the important new

infrastructure of heterogeneous computational grids.

Additional software functionality, new algorithms for symbolic computation and facilities for inter-system working using web and grid service frameworks are being exploited on a long-term scale. Most of this software is being made available under Open

Source licences, and is being further developed and supported by the participants using local funds. The team's commercial developer (Maple) is incorporating results from the project into new commercial products, such as Grid-enabled implementations of their software, as appropriate. Standards for inter-system working are also being made available freely by the consortium.

The networking activities boost technical cooperation among Symbolic Computing Software development teams. They increase awareness among those teams of state of the art developments

in relevant technologies such as memory management, programming languages implementation, new user interface technologies, web services and grid technologies, and more. In addition, networking is improving communication in both directions between symbolic software developers and current potential user communities, such as researchers in physics or computer-aided design. The activities are helping to disseminate the existing capabilities of Symbolic Computing Software, and new capabilities to be added in this project more widely. This includes both attracting new users and widening the range of facilities used by existing users.

### ● SYMBOLIC COMPUTATION INFRASTRUCTURE FOR EUROPE IN SUMMARY

**Project acronym:** SCIENCE

**Funding scheme (FP6):** Integrated Infrastructure Initiative

**EU financial contribution:** €3.2 million

**EU project officer:** Lorenza Saracco

**Project duration:** 60 months

**Start date:** 1 April 2006

**Completion date:** 31 March 2011

**Project webpage:** <http://www.symbolic-computation.org>

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