

# Topic 16

## Integrated Problem Solving Environments

Daniela di Serafino, Elias Houstis, Peter Sloot, and Domenico Talia

Topic Chairs

Problem Solving Environments (PSEs) can be defined as integrated computing environments for developing, executing and analysing applications in a specific domain. They provide a set of user-friendly mechanisms and tools that allow to “compose” an application, by gluing together, using some kind of problem-oriented language, different building blocks. Such building blocks range from libraries and application codes, to tools for I/O, data visualization and analysis, and interactive steering. PSEs may also incorporate some form of knowledge, in order to assist the users in formulating, solving and analysing their problems. The main motivation for developing PSEs is that they enable to build applications without dealing with most of the details related to hardware and software architectures, to solution algorithms and their implementations, and to analysis and monitoring tools, thus allowing end-users to concentrate on the application problems to be solved. PSEs can be used for different purposes, such as modelling and simulation, design optimisation, rapid prototyping, and decision support.

Developing fully integrated PSEs requires different expertise and a huge amount of programming effort. A significant evolution in the design, development and application of PSEs took place in the last decade, pushed by the rapid changes in hardware and software and by the requirements of applications. Nevertheless, more research is needed to realise fully integrated PSEs, enabling more complex simulations, higher levels of abstraction and more effective cooperation among multiple users in distributed collaborative environments. The exploitation of technologies such as parallel and distributed computing, component-based software engineering, advanced interactive visualization, and Grid computing plays a fundamental role in pursuing this goal.

Six papers were submitted to the topic Integrated Problem Solving Environments and each one received three reviews. Three regular papers were selected, dealing with different aspects of the PSE research. The paper by C. Gomes et al., “Pattern/Operator based Problem Solving Environments”, presents an approach for extending PSEs and Grid Computing Environments with Design Patterns and Operators, that allow to manage the composition and the execution of the collection of components available within such environments. A prototype implementation of this approach is also described. The paper by Z. Jiao et al., “Databases, Workflows and the Grid in a Service Oriented Environment”, discusses a toolkit which combines a Grid-enabled database-driven repository with a workflow system, in order to assist users in Engineering Design Search and Optimisation processes. Finally, the paper by M. Lettere et al., “A Parallel Programming Tool for SAR Processors”, describes a parallel programming model

for developing image processing algorithms, which is based on structured parallelism and object-oriented abstractions. A sample implementation of this model is also presented.

We wish to thank the people who submitted their contributions, the reviewers who helped us in selecting the papers and the Euro-Par 2004 Organizing Committee, for making this topic possible.