SNF SCOPES Project No 7 IP 65642

Minutes of the Fall 2002 project Meeting in Zürich

List of participants:

ETH, Inst. of Scientific Computing	Prof. Dr. Walter Gander
	Dr. Peter Arbenz
	Prof. Dr. Kai Nagel
	Oscar Chinellato
	Christian Gut
ETH, Seminar for Applied Mathematics	Prof. Dr. Rolf Jeltsch
	Dr. Wesley Petersen
ETH, Inst. of Fluid Dynamics	Dr. Steffen Stolz
ETH, Inst. of Atmospheric & Climate Science	Olivier Fuhrer
ETH, Computational Science Laboratory	Prof. Petros Koumoutsakos
ETH, Inst. of Theoretical Physics	Prof. Dr. Matthias Troyer
BAS, COSE Center	Dr. Evgenija Popova
	Prof. Dr.Sci. Stefan Dodunekov
BAS, Institute of Mathematics and Informatics	Prof. Dr. Svetoslav Markov
BAS, Central Laboratory of Parallel Processing	Prof. Dr. Svetozar Margenov
SWU, Dept. Informatics	Prof. Dr. Peter Milanov
	Prof. Dr. Borislav Yurukov
TU Gabrovo, Dept. Mathematics	Prof. Dr. Stojan Kapralov
	Prof. Dr. Rumen Daskalov
UKIM, Dept. Mathematics	Prof. Dr. Smile Markovski
UKIM	Prof. Dr. Vanco Kusakatov
UKIM, Faculty of Mechanical Engineering	Prof. Dr. Tomislav Zlatanovski
	Ana Lazarevska

The fall meeting of the SCOPES project on "Establishing Computational and Scientific Engineering (CSE) in Bulgaria and Macedonia was hosted by the Institute of Scientific Computing of ETH Zurich. The meeting took place on Monday September 30 and Tuesday October 1.

On Sunday prior to the meeting, we made an excursion to the public diary in Stein in the canton Appenzell Innerrhoden, to the historic towns of Appenzell and St. Gallen where we had a guided tour to the cathedral and the library of the monastery, a UNESCO world heritage. The excursion was completed with a visit of the Rhine falls close to Schaffhausen and a dinner at Rossberg above Winterthur.

The meeting was divided in two parts, the actual project meeting and a workshop on scientific computing. Each of the two parts lasted about a day. The precise agenda and the list of workshop speakers can be found in the appendix. Copies of some of the slides of the talks are found at the project's web site at `http://www.math.bas.bg/~bio/CSE/`

The topics of the project meeting were

- **Presentation of progress reports**

  Evgenija Popova informed about the newly installed COSE server at BAS. This 1.6 GHz Pentium IV PC with 1GB of main memory will be used as the *web server of the project*. The operating system is Linux 2.4.18. The machine is connected to the Internet by a fast 1.5 Mbit/s line. The intention is that the other project partners will acquire similar machines.

The first CSE action on the COSE server was the installation of Mathematica 4.2 and *webMathematica*. webMathematica is used as the interface to *webComputing* that was developed in previous years at IMI-BAS for experimenting with applications using interval arithmetics. webComputing can be accessed via the web site of the COSE center: `http://cose.math.bas.bg/`

Svetoslav Markov presented the progress report of the working group at BAS, see `http://www.math.bas.bg/~bio/CSE/M2/Reports/Sofia.html`

Walter Gander talked on the CSE study at ETH. Presently the CSE study starts in the third year after the completion of the two years dedicated to fundamental studies. With the transition to the Bachelor-Master framework it will be possible to study CSE from the after a first basic year. Rolf Jeltsch continued this discussion on Tuesday afternoon.

Stefan Dodunekov informed that IMI-BAS has organized Master programs jointly with two Bulgarian universities (Veliko Tarnovo University and Economics Academy "D.A.Tsenov"– Svishtov) which comprise courses with elements of CSE.

IMI-BAS proposes to host an ETH Master program on CSE. Courses would be given in English with lecturers both from ETH and BAS. Successful completion of the program would be certified by an ETH master degree and a complementary degree from IMI-BAS). The program should be financed by tuitions. Such a project would be a subject of an agreement between the leading authorities of ETH and IMI-BAS.

Regarding such a joint program S. Dodunekov referred to a similar program that was established 1990 at TU-Sofia based on an agreement between Germany and Bulgaria. The details are regulated in an agreement between DAAD and TU-Sofia. From the German side two universities are involved, the Technical Universities of Karlsruhe and of Braunschweig. The overall model is German (i.e. the documentation, including the diploma). Teaching is in German with German and Bulgarian lecturers. Information is available at URL `http://194.141.67.111/`

Smile Markovski presented the curriculum in Computer Science at University Saints Cyril and Methodius (UKIM) in Skopje. The basic 2.5 years in computer science and mathematics are equal. Then specialized courses can be taken. The subjects closest to CSE are the courses 'industrial mathematics' and 'software engineering' in the program 'applied informatics'. The progress report is available at
`http://www.math.bas.bg/~bio/CSE/M2/Reports/iiSkopje.html`.

Peter Milanov presented the curricula in computer science at SWU Blagoevgrad for getting bachelor and master degrees, see
`http://www.math.bas.bg/~bio/CSE/M2/Reports/SWU.html`. The master program comprises elective courses in computational biology and chemistry.

Tomislav Zlatanovski presented the progress report of the working group at the faculty of Mechanical Engineering University Saints Cyril and Methodius (UKIM) in Skopje (`http://www.math.bas.bg/~bio/CSE/M2/Reports/meSkopje.html`). The curriculum is traditional. The commercial code FLUENT, version 6, is used in teaching and research of computational fluid dynamics. The code ADAMS, also commercial, is used for dealing with the dynamics of multi-particle systems. The UKIM is quite well equipped with computer hardware. However, licensed software for symbolic and numeric computations and simulations are still lacking.

Stojan Kapralov presented the progress report of the working group at the Department of Mathematics at the Faculty for Mechanical Engineering and Instrument Design of the TU Gabrovo (`http://www.math.bas.bg/~bio/CSE/M2/Reports/Gabrovo.html`). At this faculty students in Electrical Engineering and Electronics attend lab courses in Derive in

their second year. Derive is presently being replaced by Maple. The Mechanical and Precision Engineering students learn Matlab instead of Maple. Matlab version 6 is currently used.

Several groups presented offers for a computer at their institutes. They differed considerably in their content. It was agreed that according to the 'rule of the game' distributed by email on September 3, 2002, that in order to get their compute server approved

1. A concept on how to use the server in teaching and for research in CSE has to be presented. It is not the intention of the project to provide hardware or software for the individual use of the persons involved in the project. All project participants must be able to use the infrastructure to be purchased through the Internet.
2. A concept on how the software that will be employed in courses and lectures. To avoid illegal use of copied software we either use public domain software or buy program packages for the machines that are involved in the SCOPES project. In order that developed software, courses, etc. can be used everywhere the machines should be configured as identical as possible.
3. A proposition for the hardware needed to that end.

- **Discussion of CSE core courses and of domain-specific courses**

  On Tuesday afternoon Rolf Jeltsch introduced and discussed the CSE curriculum that was presented to the rector of ETH at the occurrence of the transition to the Bachelor-Master education system. This curriculum is the result of several years' experience of teaching CSE at ETH. It was agreed upon that this curriculum cannot be adopted right-away in Bulgaria or Macedonia. In particular, getting the involvement of several departments is a difficult and time-consuming task.

  We therefore came to the conclusion, that it is necessary to make *local* proposition for education in CSE. It was suggested to try to involve just a few (two or three) departments and develop courses that teach how to execute computationally intensive tasks in the respective areas. Several of the involved institutes have already established some connections in this direction. Such a procedure will be potentially more successful than trying to establish a complete CSE curriculum.

- **The next activities**

  According to and enhancing the above discussions the following activities are to take place in the next months:

  1. A local solution for education in CSE shall be proposed.
  2. A proposition for establishing a master program shall be made. The proposed new ETH curriculum may serve as a guideline.
  3. Proposition for modernizing traditional courses to incorporate means of CSE shall be made.
  4. Each group will prepare a local concept concerning necessary equipment (compute server etc.) necessary for the promotion of CSE and reaching the global goals of the project.
  5. Each group will prepare and contribute course materials suitable for education in CSE. In particular, good examples (case studies) of CSE problems suited for teaching shall be collected. The aim is to have at least three examples per group.

The next meeting will take place in Ohrid, MK, in March 8-12, 2003.

Agenda of the Fall 2002 SCOPES project Meeting

Location: ETH Zentrum RZ F21, Sept 30 – Oct 1, 2002

MONDAY, SEPTEMBER 30

9:00-12:30 **SCOPES Meeting (Part 1)**

- Presentation of progress reports

14:00-18:00 **Workshop on Computational Science and Engineering (Part 1)**

14:00-14:25 Prof Svetozar Margenov (Central Laboratory for Parallel Processing, BAS):
Optimal multilevel preconditioners with respect to both problem and discretization parameters

14:30-14:55 Oscar Chinellato (Institute of Scientific Computing, ETHZ):
Accurate computation of FE matrices with axisymmetric domains

15:00-15:25 Prof Evgenija D. Popova (Institute of Mathematics and Informatics, BAS):
Solving linear parametric problems involving uncertainties

15:30-15:55 Prof Svetoslav Markov (Institute of Mathematics and Informatics, BAS):
"Numerical" computations with certain nonnumeric objects

16:00-16:30 Coffee break

16:30-16:55 Prof Kai Nagel (Institute of Scientific Computing, ETHZ):
Large Agent-Based Traffic Simulation

17:00-17:25 Dr Steffen Stolz (Institute of Fluid Dynamics, ETHZ):
Numerical simulation of turbulent flows

17:30-17:55 Olivier Fuhrer (Institute for Atmospheric and Climate Science, ETHZ):
Towards high-resolution numerical weather prediction

TUESDAY, OCTOBER 1

9:00-12:30 **Workshop on Computational Science and Engineering (Part 2)**

9:00- 9:25 Prof Walter Gander (Institute of Scientific Computing, ETHZ):
Least Squares Fit with Piecewise Functions

9:30- 9:55 Dr Wesley Petersen (Seminar of Applied Mathematics, ETHZ):
Solving Poisson's equation in high dimensions

10:00-10:25 Prof Petros Koumoutsakos (Computational Science Laboratory, ETHZ):
Stochastic Optimization

10:30-11:00 Coffee break

11:00-11:25 Christian Gut (Institute of Scientific Computing, ETHZ):
Web-Based Interactive Learning in Scientific Computing

11:30-11:55 Prof Matthias Troyer (Institute of Theoretical Physics, ETHZ):
How to buy, build and run a Beowulf - Cluster

12:00-12:25 Prof Rolf Jeltsch (Seminar of Applied Mathematics, ETHZ):
The CSE curriculum at ETH

14:00-18:00 **SCOPES Meeting (Part 2)**

- Discussion of CSE core courses
- Discussion of domain-specific courses
- Discussion of next activities