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CX-CMCS

Centre of Excellence for Computational Modelling of Complex Systems



Deliverable D06

Mobility and Training Plan

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Abstract: Deliverable D06 – “Mobility and Training Plan” is a public document. The deliverable includes information regarding the procedures that have been developed and implemented by the CX-CMCS project with the aim of increasing research mobility, particularly of young researchers at the Scientific Computing Laboratory, Institute of Physics Belgrade (SCL). The deliverable also presents the training plan for SCL’s young researchers, as well as the three month traineeship programs developed by SCL for young researchers from CX-CMCS local networking partners.

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Document Revision History

Date	Issue	Editor	Summary of main changes
January 5, 2007	a	Aleksandar Bogojevic, Aleksandar Belic	
August 10, 2007	b	Aleksandar Bogojevic, Aleksandar Belic	Additions to sections 2,3 and 4 dealing with the implementation of mobility and training in the project's first year.

Preface

The basic strategic objective of the CX-CMCS proposal is to transform the Scientific Computing Laboratory (SCL) into a centre of excellence, i.e. to decisively increase the quality of research conducted at SCL, and make it a preferred WB research partner for EU institutions working in the fields of simulation of complex systems and of GRID technology.

SCL is a unit of the Institute of Physics in Belgrade. The Institute contributes more than 10% of the total scientific output of Serbia and constantly ranks among the best R&D institutions in the region. SCL has 14 staff members, and participates in several international and national projects, including FP6 project SEE-GRID and Cost action P10. SCL defines the current state of the art in high performance computing in WBC with its PARADOX cluster (64+2 processors with aggregate speed $R_{max}=0.21$ Tflops).

The proposed CX-CMCS SSA aims to reinforce research capacity at SCL by: hiring young researchers, providing of training and mobility for the research staff, and upgrading the computing infrastructure. The success of this endeavour will be measured through a benchmarking exercise to be performed in the project's last year. Our networking partners (4 from EU and 3 from Serbia) have been carefully selected to provide the skills and expertise necessary to reinforce the research potential of SCL through training and joint research. The proposed equipment upgrade (storage element, high throughput switch, and upgrade of RAM) will make it possible to tackle even the most complex GRID applications allowing SCL to become a key regional player in deployment and use of emerging GRID technology. CX-CMCS plans to set up an International Advisory Board whose expertise will help SCL develop a long term strategy and facilitate integration into ERA.

CX-CMCS aims to be a living example that it is possible to bridge the "digital divide" between countries and regions having high tech ICT technologies and those that do not.

Strategic objectives

The basic strategic objective of the CX-CMCS proposal is to transform SCL into a centre of excellence, i.e. to decisively increase the quality of research conducted at SCL, and make it a preferred WB research partner for EU institutions working in the fields of simulation of complex systems and of GRID technology.

Centres of excellence do not exist in a vacuum, however. In order for SCL to achieve and maintain a status of excellence, the proposed SSA aims to positively effect the research environment in Serbia at several levels: SCL's immediate R&D environment (the national partners in this proposal), the high performance computing segment, and the national R&D system as a whole.

Specific objectives

The specific objectives for the current SSA proposal have been formulated through an analysis of the following key points:

- Wider developmental objectives of Serbia and Montenegro and the West Balkan region pertaining to research and development (as presented in the Action Plan adopted at the Ministerial conference in Thessaloniki in June 2003);
- Existing strengths and weaknesses at SCL in the high performance computing sector in Serbia including: professional resources, material resources, financial and organizational resources, principle impediments;
- Assessment of availability of graduate students and young researchers that could be newly employed at SCL.
- Assessment of indirect social impacts of the process of strengthening of SCL and its efficient integration into a wider European R&D effort.

The outlined analysis has resulted in the following specific objectives, each of which directly leads to a set of measurable and directly verifiable sub-objectives.

Objective 1 – Enhance quality of R&D at SCL

- **Sub-objective 1.1:** Set up an International Advisory Board for the new centre of excellence;
- **Sub-objective 1.2:** Establish a framework for more efficient management of research at SCL by developing a flexible, problem oriented R&D plan that will successfully integrate that research into a wider European effort.
- **Sub-objective 1.3:** Develop a specific set of benchmarks for tracking the quality of R&D at SCL, and perform a benchmarking exercise.
- **Sub-objective 1.4:** Devise and implement a long term strategy for achieving and maintaining research excellence.
- **Sub-objective 1.5:** Insure viability of SCL as a centre of excellence beyond the project lifetime by finding other sources of funding.

Objective 2 – Expand and mobilize human resources

- **Sub-objective 2.1:** Recruit and employ young researchers; develop explicit career plans for the newly employed researchers.
- **Sub-objective 2.2:** Enhance working conditions for young researchers by setting up an R&D environment at SCL that is integrated into ERA, providing challenging research problems, state of the art equipment, and enhanced mobility.

Objective 3 – Reinforce existing S&T capacities at SCL

- **Sub-objective 3.1:** Maintain and upgrade existing S&T equipment and high-tech infrastructure.
- **Sub-objective 3.2:** Improve the availability and reliability of SCL's computing resources, determine and implement optimal strategies for their use.

Objective 4 – Enhance mobility and integration into ERA

- **Sub-objective 4.1:** Network with EU, regional and national partner institutions through exchange of personnel, research results and joint numerical experiments; participate in joint RTD activities within these networks.
- **Sub-objective 4.2:** Host scientists from EU for training and research.
- **Sub-objective 4.3:** Organize training of graduate students and young researchers through short-term missions at EU institutions.

Objective 5 – Contribute to the reinforcing of ICT capacities at the national level

- **Sub-objective 5.1:** Reinforce the quality of research in SCL's immediate R&D environment, by strengthening their human capacity through stipends, yearly visits, and by conducting joint research activities.
- **Sub-objective 5.2:** Reinforce human capacity in Serbia's high performance computing sector by training young researchers to be employed at national research institutions and hi-tech companies.
- **Sub-objective 5.3:** Contribute to the national R&D system by developing a set of recommendations for policy makers at national and local levels for fostering growth of research excellence in a rapidly changing high-tech environment.

The three year CX-CMCS project kicked-off on July 1, 2006. The project plans to issue the following deliverables:

Deliverable No	Deliverable title	Delivery date	Nature	Dissemination level
D01	CX-CMCS Web site	M1	R	PU
D02	Career development plan for newly employed young researchers	M2	R	CO
D03	CX-CMCS International Advisory Board	M3	O	PU
D04	Equipment tendering and procurement report	M3	R	PU
D05	Inauguration meeting report	M4	R	PU
D06	Mobility and training plan	M6	R	PU
D07	CX-CMCS Brochure	M6	R	PU
D08	12M Progress reports	M12, M24	R	PU
D09	CX-CMCS Promotional video material	M15	O	PU
D10	Benchmark procedures for quality assessment of RTD centres of excellence	M18	R	PU
D11	SCL research quality assessment	M24	R	PU
D12	Proceedings of International dissemination workshop	M30	R	PU
D13	Strategy of long term sustainable growth of research excellence in transition	M30	R	PU
D14	Scientific computing landscape of Serbia	M33	R	PU
D15	Presentation of policy papers to decision makers	M34	R	PU
D16	Final project report	M36	R	PU

Legend: R = Report, O = Other, PU = Public, CO = Confidential (only for members of the consortium incl. EC).

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- [1] Project CX-CMCS – 026343 – Annex I – Description of Work

Executive summary

What is the focus of this Deliverable?

The focus of this deliverable is the presentation of the CX-CMCS project researcher mobility and training plans.

What is next in the process to deliver the CX-CMCS results?

The deliverable and workflow progress is described in the project Annex-I – Description of Work [1]

What are the deliverable contents?

The present deliverable presents the project mobility plan and gives a detailed exposition of the implementation of that plan in the first year of the project. The document then presents the training activities as well as the traineeship program implemented for young researchers from SCL networking partners.

Conclusions

The presented mobility and training plans give a good basis for a crucial part of the CX-CMCS goal of reinforcing human capital at SCL. The presented implementations of these plans in the project's first year show that the plans were realistic.

1. Introduction

Mobility, training and networking activities, as foreseen by the CX-CMCS project, consist of the exchange of personnel, research results, and the setting up and performing of joint numerical experiments. Exchange of personnel is planned in advance at the beginning of each year of implementation. The young researchers hired by SCL participate in extensive training activity through enhanced training, mobility and networking with both EU and national partner institutions. During the course of the project two of them will spend 3 months each at leading EU RTD institutions. In addition, SCL staff will have a total of 16 short visits (seven days each) to EU partner institutions. During the project's implementation 6 leading EU researchers will make training visits (two weeks duration) to SCL. These exchanges make up the principle part of the project's mobility and training activities.

In addition, young researchers from the projects national partners will present another facet of the training and mobility program. This exchange of young researchers is a key factor of cohesion of local networking partners. That cohesion will be further developed through the organizing of joint conference with national partners and of 6 week-long visits to SCL of their senior staff. Aside from the training given, the chief and direct benefit of this mobility and networking, both at the European and national levels, will be the setting up of joint RTD activities.

The CX-CMCS project proposal anticipated that the increased visibility of SCL during the implementation of the project would make it possible to expand the network of institutions and individuals in EU and WBC to collaborate with. SCL will, therefore, during the whole length of the project actively seek to identify such additional outstanding partners and make ties to them. In addition, SCL will actively seek additional sources of funding to finance these extended activities.

SCL and its national partners have expressed intent to each employ one young researcher after the completion of the proposed project, thus guaranteeing continuity of their research careers. The mobility and training program is designed to strongly benefit the chosen young researchers' scientific developments, as well as to reinforce the knowledge base and human capital of SCL as a centre of excellence. During the project, SCL will also exchange further young staff between local partner institutions giving the best of them tri-monthly stipends to work in the laboratory. These young people will also benefit from the training and, indirectly, from the increased mobility and networking to EU.



**Figure 1 – SCL students at ICTP/Democritos workshop in Trieste, Italy (2006) (left);
Neda Svrika at FZK's GridKa school in Karlsruhe, Germany (2006) (right)**

2. Mobility plan and its implementation

Objective 4 of the CX-CMCS project deals with the enhancing of mobility and the integration of SCL's research development into ERA. Sub-objective 4.1 plans for **networking with other research centres in Member States or Associated States (including Associated Candidate Countries) and WBC** as well as for **organising exchange of personnel and of research results and joint numerical experiments**. Sub-objectives 4.2 and 4.3 deal with two important aspects of researcher mobility: **hosting of scientists from EU for teaching, training and research**, on the one hand, and **training of graduate students and young researchers through short-term missions at EU institutions**. Extended networking to national, WBC and EU institutions, two way exchange of researchers, training of graduate students and young researchers at EU institutions will be extremely beneficial for: integrating the SCL into ERA; **for preparing cooperative activities and/or joint RTD proposals**; for further enhancing of the quality of research at SCL and, thereby, **reinforcing its S&T potential**; for **disseminating scientific information as well as the results of research**.

By networking with other quality R&D institutions in the region and in Europe CX-CMCS will demonstrate selected applications within the Pan-European Framework. In this way the centre will be facilitating communication between centres having similar scientific interest. At the same time the concept of equity will be promoted in the WBC region, expressing the willingness of EU to enable equal research opportunities as well as equal access to information sources for all habitants of the continent. The European research, academic and industrial community, on the other hand, will benefit from having easier access to CX-CMCS's user base: highly qualified ICT researchers and professionals from Serbia.

The first step in effectively implementing mobility was to design and set in motion a mobility and training plan tailored to the needs of young researchers newly employed at SCL and the developmental needs of SCL as a centre of excellence. Such a plan needs to organize and execute all three levels of mobility and training envisaged by the CX-CMCS project:

- Organizing and implementing of three month long scientific missions for young researchers working at SCL in EU partner institutions.
- Organizing and implementing of seven day research visits of SCL staff to EU partner institutions with a goal of complementing research expertise and of setting up joint RTD activities and joint numerical experiments using (in part) SCL's existing high-performance computing infrastructure and GRID middleware.
- Organizing and implementing of two week training visits of leading researchers from EU partner institutions to SCL, exchange of research results and plan of joint activities and enhanced visibility of research conducted at SCL.

The mobility and training plan also facilitates networking with national (and regional) partner institutions through short ad-hoc visits to SCL (up to one week) and the organizing of yearly conferences.

The mobility and training plan allows for the exchange of young staff between local partner institutions, keeping a high turnover rate in order to foster competitiveness, achieve a steep learning curve, and enhance interaction and synergy with local partner institutions.

Finally, the plan allows for SCL to become a highly visible point of attraction for researchers returning from abroad (turning brain-drain into brain-gain).

Mobility and training plan

The CX-CMCS mobility plan determines both incoming mobility of EU experts to SCL, outgoing mobility and training of SCL researchers in EU institutions, as well as the mobility and training of local networking partners to and from SCL. The initial mobility and training plan for the three year project is as follows:

- The project will provide all travel and stay expenses for two senior graduate students working at SCL to spend three months each at an EU RTD institution. The exact time of the visits, the choice of students to go as well as of the EU institutions will be made by the project coordinator after consultations with the senior researchers at SCL. The decisions will be made based on the assessments of research performance and technological competence, compatibility of research with that of SCL, optimal time in a given students research career for such a visit.
- The project will also provide all travel and stay expenses for six incoming visits of top EU researchers to SCL of an average duration of two weeks. The visitors will spend their time at SCL giving training to SCL's younger researchers (in the form of seminars and mini-courses on specific pre determined advanced topics) and investigating concrete ways to plan and implement joint research as well as the writing of joint project proposals. These visits are over and above what is planned for the regular activities and visits of the experts making up the International Advisory Board (IAB). The choice of visitors and training topics will be determined by SCL's senior researchers in consultation with those experts. The project coordinator will also base his determination on consultations with IAB members.
- The CX-CMCS project will provide travel and stay expenses (and appropriate fees) related to sixteen short-term visits of SCL researchers (both senior and young researchers) to EU institutions including visits to conferences, workshops and advanced schools. The average duration of the visits will be one week. The choice of researchers and destinations of these short term visits will be made by the project coordinator after consultations with the senior researchers at SCL.
- The project will, during its implementation, pay for travel and stay expenses for 6 week long ad-hoc visits of local partners to SCL. The aim of these visits is to open up new avenues of joint research effort, work on joint project proposals, conduct important experiments and simulations on SCL infrastructure, implement advanced level training exercises.
- The mobility and training activities within the CX-CMCS project also provide for the organizing and implementing of 3 small one-day workshops bringing around 10 people from SCL's local networking partners to the laboratory.
- SCL will offer three traineeships of three month duration to young scientists from local networking partners. The choice of people, training topics and the times of the visits will be determined by the project coordinator in consultation with SCL senior researchers and the representatives of the local networking partners. The trainees will be paid monthly stipends by CX-CMCS during their stay at SCL. They will be given the same working conditions and access to research infrastructure as SCL's own young researcher.

The above mobility and training plan does not cover activities of IAB members. It goes without saying that IAB members will themselves be top level researchers from EU institutions and that during their IAB related stays at SCL it may be possible to have them conduct some form of training. SCL is counting on this, however, these activities are not covered within the Mobility and Training work package (WP3) but rather under the Benchmarking and Policy Development work package (WP5). As a result these activities are not a part of the mobility and training plan.

The mobility and training plan does not have a detailed dynamic associated with it. The timing of all visits will be determined so as to optimally complement other activities at SCL as well as the optimal course of implementation of work within given research topics. It is to be expected that the level of mobility activities will gradually pick up as the project progresses.

The projected level of mobility presented in the above plan is based on the initial project estimate of the number of new young researchers coming to SCL (four) as well as on the size of the project budget that covers mobility and training activities. As such, the explicated level of mobility is a rough estimate of the minimal level of such activities that will take place at SCL during the CX-CMCS project's implementation. SCL will do everything possible to find other sources of funding to extend the above level of mobility (particularly for young researchers). These sources will be sought from national, bilateral, regional and other EU projects. A certain level of added funding for mobility has already been found from SCL's participation in FP6 project SEE-GRID (Grid related training), COST action P10 (study of complex systems from the standpoint of the

physics of risc), SCL's bilateral project with the complex networks group at the Josef Stefan Institute in Slovenia (for simulation and analysis of complex networks).

Implementation of mobility in the project's first year

As has already been stated, the principle facet of SCL mobility that CX-CMCS aims to reinforce is the mobility of young researchers working in the laboratory. The following list of short term visits by the students to conferences, workshops, and training events documents the scope of mobility that the first year of CX-CMCS has made possible.

The mobility of SCL's senior researchers in the project's first year was completely covered by other sources. The incoming mobility activities were not carried out in the first year. Instead, several week-long visits to SCL of researchers from EU and US institutions were organized and covered by SCL from projects other than CX-CMCS. For this reason these activities are not listed in this report. They have been, however, quite fruitful and will be the basis of the incoming mobility activities in the second and third year of CX-CMCS.

Marija Mitrovic

- Talk and poster presentation at Marie Curie Workshop Celebrating the birth of Nikola Tesla, Zagreb & Belgrade (2006)
- Poster presentation at COST Workshop, Networks: Topology, dynamics and risk, Belgrade, Serbia, (2007)
- ICTP/Democritos Joint Workshop on Tools for Computational Physics, Trieste, Italy (2006)
- Teaching assistant at Advanced School in High Performance Computing Tools for eScience, ICTP, Trieste, Italy (2007)

Jelena Grujic

- Talk and poster presentation at Marie Curie Workshop Celebrating the birth of Nikola Tesla, Zagreb & Belgrade (2006)
- Poster presentation at COST Workshop, Networks: Topology, dynamics and risk, Belgrade, Serbia, (2007)
- Talk and paper at Four seas conference, Iasi, Romania, (2007)
- ICTP/Democritos Joint Workshop on Tools for Computational Physics - Trieste, Italy (2006)
- Summer school - "Statistical physics of Gene regulation" - Bremen, Germany (2007)

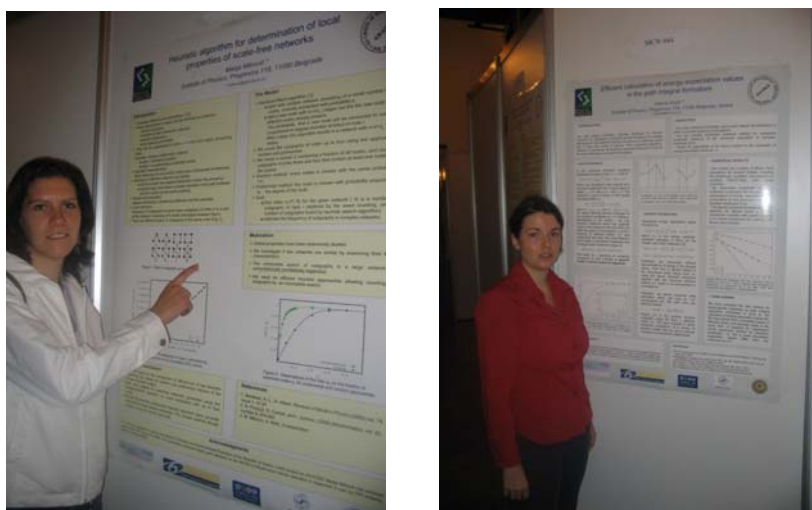


Figure 2 – Marija Mitrovic (left) and Jelena Grujic (right) present posters at Tesla conference in Zagreb, Croatia (2006)



Figure 3 – Monte Carlo training event at the Institute of Physics Belgrade, Serbia (2006)

Danica Stojiljkovic

- ICTP/Democritos Joint Workshop on Tools for Computational Physics - Trieste, Italy (2006)
- GridKa School in 2006, Forschungszentrum Karlsruhe, Germany (2006)
- Teaching assistant at
Advanced School in High Performance Computing Tools for eScience, ICTP, Trieste, Italy (2007)
- Talk and paper at
6th INDEL Symposium, Banjaluka, Bosnia and Herzegovina (2006)
- Talk and paper at
5th International Symposium on Quantum Theory and Symmetries, Valladolid, Spain (2007)

Ivana Vidanovic

- Talk and paper at
5th International Symposium on Quantum Theory and Symmetries, Valladolid, Spain (2007)
- Advanced School in High Performance Computing Tools for eScience, ICTP, Trieste, Italy (2007)

Zlatko Papic

- Advanced School in High Performance Computing Tools for eScience, ICTP, Trieste, Italy (2007)
- Talk at Scuola Normale Superiore, Pisa, Italy (2007)



Figure 4 – Ivana Vidanovic gives a talk at QTS-5 in Valladolid, Spain (2007)

Neda Svraka

- Talk and paper at INDEL Conference, Banjaluka, Bosnia and Herzegovina (2006)
- Talk and paper at INFOTEH Conference, Jahorina, Bosnia and Herzegovina (2007)
- Gridka School on Grid computing at Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft, Karlsruhe, Germany (2006)
- Participation and talk at Advanced School in High Performance Computing Tools for e-Science, ICTP, Trieste, Italy (2007)
- EGEE and SEEGRID training, Kragujevac, Serbia (2006)
- EGEE and AEGIS user training, Novi Sad, Serbia (2007)



Figure 5 – Bosiljka Tadic (Josef Stefan Institute, Slovenia) visits SCL and gives a talk on complex networks (2007)

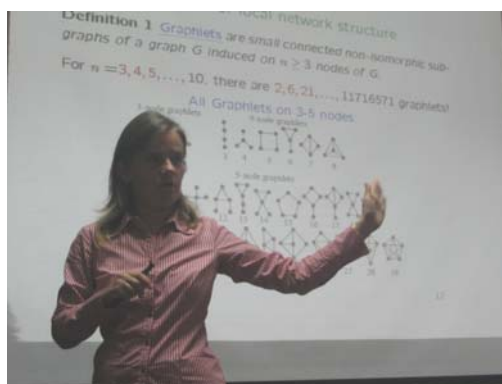
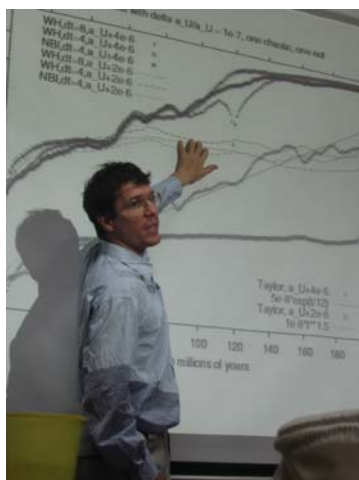


Figure 6 – Wayne Hayes (left) and Natasa Przulj (right) from UC Irvine visit SCL and give talks (2006)

Branimir Ackovic¹

- Basic Concepts of Grid technologies, Faculty of Electronic Engineering, Nis, Serbia (2006)
- Grid computing training, Nis, Serbia (2006)
- Concepts of Grid technologies, Astronomical Observatory Belgrade, Belgrade, Serbia (2006)
- EGEE glite training, Kragujevac, Serbia (2006)
- EGEE and AEGIS Grid training, Novi Sad, Serbia (2007)
- Free Scientific Computing, Petnica Science Center, Valjevo, Serbia (2007)
- EGEE and AEGIS grid training, Astronomical Observatory Belgrade, Belgrade, Serbia (2007)
- Grid computing, Petnica Science Center, Valjevo, Serbia (2007)

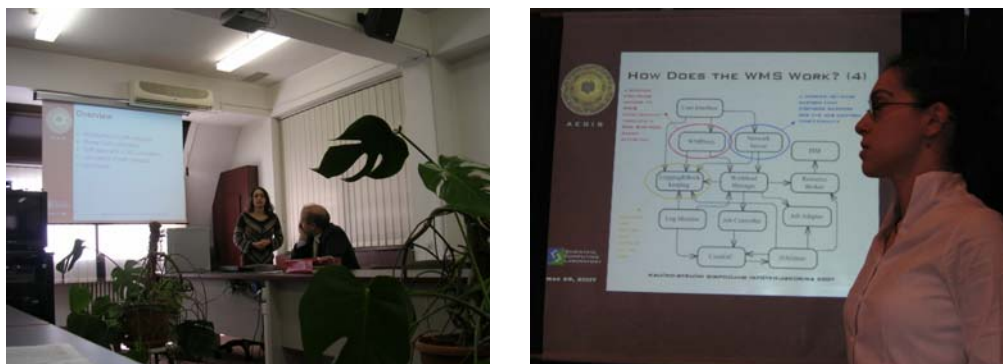


Figure 7 – Danica Stojilkovic gives a talk at INDEL, Banjaluka, Bosnia and Herzegovina (2006); Neda Svraka at INFOTEH, Jahorina, Bosnia and Herzegovina (2007)

To recapitulate, in the first year of the CX-CMCS project SCL has conducted an extensive mobility program. The program was of greater scope than envisaged in the project proposal. The principle reason for this is that SCL has already procured additional funds for mobility, chiefly through its participation in regional (SEE-GRID, SEE-GRID-2) and EU-wide (EGEE-II) eInfrastructure projects.

In the past year the young researchers working at SCL have participated in 20 meetings abroad (conferences, workshops, schools), actively contributing to 13 of these. Altogether at these meetings they presented 5 papers, 4 posters and gave a total of 17 lectures. These mobility and training activities were held in 6 different countries from the EU and the region (Italy, Germany, Spain, Romania, Croatia, Bosnia and Herzegovina). In addition, these same young researchers took part in 12 training events held at various research institutions in five cities throughout Serbia (Belgrade, Novi Sad, Nis, Kragujevac, Valjevo). All of these events were organized by SCL and represented a wide front of national Grid training events held through the active participation of most of SCL's young researchers.

¹ The mobility associated with the training events listed for Branimir Ackovic has been funded by eInfrastructure projects SEE-GRID, SEE-GRID-2 and EGEE. The AEGIS training events have been funded by Serbian research grant OI141035.



Figure 8 – Antun Balaz gives a presentation in Qatar (2006);



Figure 9 – Grid training in Kragujevac, Serbia (2007)

Mobility plans for the second and third year of CX-CMCS

SCL plans to continue the scope of student mobility seen in the first year of the project's implementation. On three fronts we plan to make substantial new extensions of mobility:

1. Participation in EU Grid projects makes it possible to find additional funds to extend the mobility and training associated with this field of research (setting up Grid sites, training of Grid users, administering of Grid site, Grid security, development of Grid applications). This participation has already forged strong ties between SCL and all the key Grid sites not only in Europe but all over the world. In the first year of CX-CMCS these ties were being set up, in the following years they will be a basis for setting up joint research activities, as well as for applying jointly for new projects. Two new projects of this type in which SCL is an important partner are in the final phases of application for FP7 funding (EGGE-III, SEE-GRID-SCI). SCL has also applied with partners from Bulgaria and Albania for related regional projects within SEE-ERA.NET.
2. Mobility and training in the field of modelling and analysis of complex networks will be qualitatively changed and enhanced in the following year. SCL has extended its bilateral project on complex networks with the Josef Stefan Institute in Slovenia. Within this project two SCL students (Marija Mitrovic, Jelena Grujic) will spent several months in Slovenia working with the group lead by Prof. Bosiljka Tadic. This mobility will directly tie in the research activities of SCL with that of the JSI group.

3. In a series of papers in 2005 and 2006 the SCL group working on Monte Carlo evaluation of path integrals has developed a new systematic scheme for substantial speedup of generic path integral calculations. This work has now initiated the first contacts between this group and other groups throughout Europe. Two SCL students will soon be going to Germany to present the newly obtained results and to initiate future contacts and joint research. The expenses for these visits will be covered by the German side. We plan to use CX-CMCS mobility funds from year two in a crucial way to bring several senior EU researchers working in the field of numerical simulations of path integrals to Belgrade for shorter visits. It is our belief that this will make possible the setting up of longer term joint research efforts and longer term mobility and training in this field of research.

As may be seen, first year mobility was almost exclusively concentrated on the young researchers. All the mobility and networking of senior SCL researchers was funded through other projects (national, bilateral, or through other EU projects). The following two years will continue to centre SCL mobility coming from CX-CMCS on the young researchers. However, these funds will now also be used for initiating networking and mobility of senior researchers in several key research areas in which SCL is seeking to expand its competencies and in which it currently has no other means of procuring funds (e.g. granular systems, socio- and econo-physics).

A key facet of the mobility and training in the next two years will be the incoming mobility of EU researchers to SCL. Assuming that the positive trend of procuring funds for mobility from more sources continues SCL will be in a position to substantially enhance the planned incoming mobility just as it already has enhanced the level of outgoing mobility both of its young researchers and senior scientists

3. Young researcher training

From the start of CX-CMCS the following young researchers have been working at SCL (given in the order of their arrival at the lab):

1. Ivan Stanic
2. Ljubica Davidovic
3. Marija Mitrovic
4. Jelena Grujic
5. Danica Stojiljkovic
6. Ivana Vidanovic
7. Zlatko Papic
8. Milan Radonjic

Ivan Stanic's stay at SCL had only a brief overlap with the time-frame of CX-CMCS. Several months after the start of the project he obtained his MSc degree at SCL and went on to Yale University in the US to continue his graduate education. Similarly, Milan Radonjic, the last on the above list, is just starting his engagement at SCL. All the other young researchers are at various stages of realization of their Masters degree programs in physics. Their principle obligations are completing their graduate courses (with top scores if they are to remain in good standing at SCL), and conducting their physics research under the supervision of their thesis advisor. All of these young people work on various aspects of simulations of complex systems. As such they all have expertise in key ICT areas, and as a result have secondary obligations at SCL related to the upgrading, maintaining and running of SCL's high performance computing infrastructure. The type of secondary engagement is determined by their existing expertise and interest. The level of engagement is monitored by their thesis advisor so as not to clash with their primary objectives.

Complementary to the above young physicists are SCL's young researchers from the fields of computer science and electrical engineering. They form the lab's system and networking administrator staff. Their principle engagement is as administrators of the laboratory's Grid site. This role puts them at the forefront of modern ICT research dealing with distributed computing platforms. As a result, they are rather easily trained and engaged in one of several infrastructure projects that SCL is a partner in, most notably FP6 projects SEE-GRID, SEE-GRID-2, EGEE-II. The added

funding from these projects is an important facet of sustainability of research effort at SCL. Their secondary engagement is to conduct various aspects of Grid-related research. The level of this engagement is monitored by SCL's computing infrastructure supervisor Antun Balaz. The level is set so as not to disturb their primary objectives. The young researchers currently making up SCL's computer science staff are:

1. Branimir Ackovic
2. Neda Svraka
3. Andrija Zaric
4. Dusan Vudragovic

At the moment of the writing of this report Andrija Zaric is just beginning his appointment at SCL. Dusan Vudragovic is a particularly good example of a young researcher poised precisely between physics and computer science. He is finishing up his PhD in experimental particle physics while at the same time completing a one year stint at CERN's Grid facility. He will return to SCL within a few months.

In the first year of CX-CMCS the mobility and training was mainly concentrated in the fields of Grid computing and, to a somewhat lesser extent, to Monte Carlo simulations of path integrals. As already presented, these areas have substantially strengthened in the past year and are on the way of finding adequate funding from other sources for extended mobility and training. This allows us to tailor the training plan for years two and three towards new directions within the planned area of SCL's research competency.

Key directions for these new competencies, and hence for the new training, are in the fields of distributed computing security, visualization of complex systems, development of robust applications working on distributed platforms, data mining. The choices of who undergoes which training will be made based on personal preferences and past expertise, on the one hand, as well as on the base of the assessment of the computing infrastructure supervisor, thesis advisor and head of SCL. The goal is to extend as far as possible the key competencies of each individual student without jeopardizing that persons principle research tasks. To be successful, such a program needs to necessarily be flexible and tailored to each individual. An example of this in the previous year has been Danica Stojiljkovic. As the year progressed it became apparent that her interests had somewhat drifted from a curriculum and research plan centered on path integrals to a two-track approach that equally balances computer science and physics. As a result of talks with her and relevant senior staff here personal training plan was appropriately modified. The first results are encouraging.

4. Young scientist traineeship at SCL

Nikola Ojkic (University of Novi Sad) and Ana Lalovic (Astronomical Observatory Belgrade) have already completed their three month training stints at SCL and have returned to their home institutions (SCL networking partners within the CX-CMCS project).

Similar training stints are being planned for one or two young researchers from the supercomputing centre at the University of Kragujevac. The first contact with this research group was made during the setting up of Serbia's National Grid Initiative AEGIS (Academic and Educational Grid Initiative of Serbia). This was followed up by several Grid training events held by SCL in Kragujevac, as well as by the addition of the Kragujevac group as third new partner in the regional project SEE-GRID-2. The traineeship at SCL will make it possible to build on the created ties and to exchange crucial expertise. For SCL it would be very important to get the know-how related to their Virtual Bloodstream project.

Our experience so far with the three-month traineeship program has been excellent. We hope to expand the number of such traineeships to young researchers from other relevant Serbian research institutions, but also to young researchers from other countries. CX-CMCS mobility and training funds give excellent seed money to pay for this. The expansion of the program will be done if it is possible to procure appropriate matching funds from other sources.

In addition to the formal three-month traineeship, SCL constantly emphasizes its open-door policy to all interested researchers. This policy of offering excellent working conditions and a vibrant environment with many young researchers of the highest quality is already paying off. As a result at a given time one can find one or two young visitors at SCL. The youngest of these have been advance high school students that have come to our attention through the activities of the Petnica Science Center. Among them Marina Radulaski, Uros Delic and Djordje Radicevic have, with the help of SCL staff and students, done some exceptional work. All three have as a result enrolled in physics programs at top level universities. The ties that bind them to SCL are very strong and we expect that one or more of them will in a few years make our new graduate students. Important ties of this type have been made with several foreign researchers who have visited IPB. Several of them are now regular visitors to SCL during the summer months. We expect to be using CX-CMCS mobility and training funds in the next two years to organize return visits of our students abroad.