FP6 INCO contract No. 026343

CX-CMCS

Centre of Excellence for Computational Modelling of Complex Systems

Final Activity Report

July 1st, 2006 – December 31st, 2009

Author(s): Aleksandar Belic

Status –Version: Final – a

Date: January 10, 2010

Distribution - Type: Internal

Code: CX-CMCS-Final Activity Report

Abstract: This document is the final version of the Final Activity Report (July 1st, 2006 – December 31st, 2009) of the CX-CMCS project.

Document Revision History

Date	Issue	Editor	Summary of main changes
January 10, 2010		Aleksandar Belic	Final

Table of contents

References

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

Preface – Contents of the Final Activity Report

The Final Activity Report gives all CX-CMCS activities (July 1st, 2006 to December 31st, 2009) performed at the Scientific Computing Laboratory (SCL) of the Institute of Physics in Belgrade (IPB) within the framework of the FP6-INCO-026343-CX-CMCS Project.

The Final Activity Report includes:

A. The Publishable Executive Summary (can be used for direct publication by the Commission). The publishable executive summary includes project background, consortium description, summary description of project objectives, work performed, and results achieved so far. It contains the main elements of the publishable results, and includes the project logo and reference to the project public website.

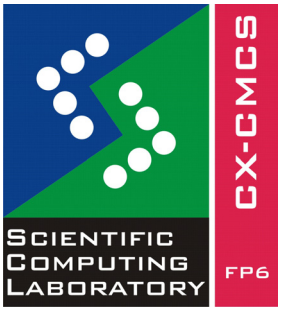
B. The **main body of the report** which contains the following information:

1. Project objectives and major achievements during the reporting period, including
   - An overview of general project objectives
   - A summary of the work performed and main achievements in the reporting period
   - The most important problems during the period including the corrective actions undertaken
   - Deviations from the project workprogramme, and corrective actions taken/suggested
2. Workpackage progress of the period, including:
   - An overview of the actions carried out in the reporting period, based on the workpackages which were active or planned to be active during the period.
   - Workpackage objectives and starting point of work at beginning of reporting period
   - Progress towards objectives – tasks worked on and achievements made, including per contractor
   - List of deliverables, including due date and actual/foreseen submission date
   - List of milestones, including due date and actual/foreseen achievement date
3. Consortium management, including:
   - Consortium management tasks and their achievement; problems which have occurred and how they were solved
   - Project timetable and status, including an updated Gantt chart.

C. An Annex presenting the **Plan for using and disseminating the knowledge**, which covers the following information:

1. Exploitable knowledge and its use which presents exploitable results and knowledge having a potential for industrial or commercial application in research activities
2. Dissemination of knowledge, including the consortium dissemination activities

Publishable Executive Summary



CX-CMCS: Centre of Excellence for Computational Modelling of Complex Systems

Background

The Scientific Computing Laboratory (SCL) is a unit of the Institute of Physics Belgrade (IPB). 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 currently 20 staff members, and a number of trainees and associates. SCL participates/participated in several international and national projects, including Framework Programme projects CX-CMCS, EGEE-II, EGEE-III, SEE-GRID, SEE-GRID-2, SEE-GRID-SCI, as well as in a NATO reintegration grant, and several bilateral projects (Switzerland, Germany, Slovenia and France).

SCL defines the current state of the art in high performance computing (HPC) in WBC with its PARADOX cluster (current configuration: around 1000 processors with aggregate speed Rmax=6 Tflops, 1 TB RAM, and 50 TB storage). SCL's HPC resources are part of the European production Grid infrastructure (EGEE projects and EGI initiative). With respect to all parameters its AEGIS01-SCL-PHY Grid site ranks among the top European Grid sites. SCL is the organizer of AEGIS, the Academic and Educational Grid Initiative of Serbia, which consolidates Serbia's total R&D effort in this emerging ICT field. Through its participation in all three phases of SEE-GRID (Grid e-Infrastructure for South East Europe) SCL has grown into a key regional player in the deployment and use of Grid technology. SCL is a member of the European supercomputing initiative PRACE, and is recognized as the National focal point for HPC eInfrastructures.

CX-CMCS has catalyzed the above successes and it has reinforced 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 was measured through a benchmarking exercise performed in the project's last period. The project's 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.

SCL is a living example that judicious use of reinforcing actions such as CX-CMCS make it possible to bridge the "digital divide" between countries and regions having high tech ICT technologies and those that do not.

Objectives

The basic **strategic objective** of CX-CMCS project 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, CX-CMCS 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.

The specific objectives for CX-CMCS have been formulated through an analysis of the following key points:

1. Wider developmental objectives of the Republic of Serbia and the West Balkan region pertaining to research and development (based on the Action Plan adopted at the Ministerial conference in Thessaloniki in June 2003);
2. Existing strengths and weaknesses at SCL an the high performance computing sector in Serbia including: professional resources, material resources, financial and organizational resources, principle impediments;
3. Assessment of availability of graduate students and young researchers that could be newly employed at SCL.
4. 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 five **specific objectives:**

1. **Enhance quality of R&D at SCL**
2. **Expand and mobilize human resources**
3. **Reinforce existing S&T capacities at SCL**
4. **Enhance mobility and integration into ERA**
5. **Contribute to the reinforcing of ICT capacities at the national level**

Planned impacts

- **Impact on technology –** Maintain and extend SCL infrastructure representing the current state of the art of computing and communication facilities in the West Balkan region; Implement latest GRID-related technologies.
- **Impact on research** – Improve research environment, human and computing capacities making it possible to study complex systems characterized with very large data sets and requiring extensive computing power. Typical applications handled at SCL include: efficient calculation of path integrals, study of granular systems, modelling the formation of Earth-like planets around other stars; study of Bose-Einstein condensation in magneto-optical traps, etc.
- **Social impact** – The brain-drain of tens of thousands of young professionals with key skills is a phenomenon of paramount social impact on a region that has until recently endured a decade of wars, social instability and economic hardship. Of those that left, many were educated in the physical sciences and engineering and their continued education in the USA coincided with the emergence of robust new research fields as well as with the birth of several new technologies. Today, West Balkan (and EU) RTD has the potential of tapping into this extremely important human resource. The key precondition for alleviating the consequences of brain-drain is in identifying of high quality research centres to serve as brain-gain focal points.
- **Impact on national RTD policy** – Develop 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.
- **Contribution to EU policies –** In particular those addressing the issue of bridging the “digital divide” between countries and regions.
- **Dissemination and exploitation of results –** Improve EU-wide visibility and future participation in ERA; Maintain leading position of SCL in Serbian research; Promote modelling of complex systems using high performance computing resources in fundamental and applied research; Enhance interest of general public in S&T by showing examples of how scientific computing research can benefit every day life; Provide relevant data and recommendations regarding scientific computing to policy makers at national and local levels.
- **Impact on related national and international research activities –** SCL is active in two overlapping research fields: investigation of complex systems and development and deployment of GRID-based technologies. As a result of its expertise in both fields SCL is a prominent participant in several international and national projects. It is the driving force of the Academic and Educational Grid Initiative of Serbia (AEGIS), and the designated host of the future National Supercomputing and Data Storage Facility “Blue Danube”.

Achieved impacts

- **Reinforced human capital –** During CX-CMCS a total of 15 new young researchers have come to SCL. Most of these talented young physicists have been recipients of prestigious Ministry of Science stipends that serve as complementary funds. As a result, CX-CMCS has more than tripled the planned number of young researchers brought to SCL.

SCL has also attracted six young people working in the field of computer sciences as its new ICT technical staff. Their primary task is related to the administering of SCL's AEGIS01-PHY-SCL and AEGIS07-PHY-ATLAS Grid sites. This state-of-the-art distributed computing platform is giving each of them a chance to conduct forefront research in several key new ICT fields. The CX-CMCS funds for the new technical staff were leveraged by funds from SCL e-Infrastructure projects SEE-GRID, SEE-GRID-2, SEE-GRID-SCI, EGEE II, and EGEE-III.

- **Enhanced mobility –** During 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 from other sources. These additional funds covered the mobility of senior SCL researchers as well as the incoming mobility of EU and US researchers coming to SCL.

  SCL students and technical staff have participated in 3 long term research visits (1 year or longer), 5 visits of medium duration (several months), and more than 100 short term visits (visits of one month or less, participation in conferences, workshops, summer schools). SCL young student mobility was conducted in 21 countries throughout Europe. In addition, these same young researchers and technical staff took part in 35 training events held at various research institutions in five cities throughout Serbia (Belgrade, Novi Sad, Nis, Kragujevac, Valjevo, Dimitrovgrad). 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.

- **Reinforced infrastructure –** SCL's high performance computing infrastructure is organized around the AEGIS01-PHY-SCL grid site, a key parts of national and regional production grid infrastructure, and an esteemed resource at regional and pan-European levels. SCL also hosts a smaller AEGIS07-PHY-ATLAS grid site, as well as the demo site AEGIS08-IPB-DEMO.

  The current configuration of these sites consists of:

  - worker nodes containing 712 + 128 CPU cores with 712 + 96 GB RAM,
  - IBM BladeCenter with three kinds of servers (two Intel Xeon E5405, two POWER6, and two IBM PowerXCell 8i processors) within H-type chassis, and one server based on latest Intel Nehalem Xeon processor with InfiniBand interconnection.
  - 40 kVA uninterrupted power supply,
  - high throughput network layer 3 switches stacked to an aggregate of 206 Gbps ports.

  The whole configuration is stored in 7 racks and cooled by a contained 170 kBTU integrated system.

- **High visibility –** On July 14, 2006 the SCL and IPB were hosts to high level delegations from EU Directorate General for Research, headed by Janez Potocnik, Commissioner for Research, and from the Ministry of Science of Serbia, headed by Aleksandar Popovic, Minister of Science. The

joint delegation included Andras Siegler, Director INCO, Giancarlo Caratti, JRC, Tania Friederichs, DG Research, Ivan Videnovic, Assistant Minister of Science, and Gradimir Milovanovic, Chairman of the National Science Council.

The main purpose of the Commissioner's visit to IPB was to get first hand information about its four laboratories that were the recipients of EU Centre of Excellence grants in the 2005 SSA call for reinforcing of research excellence in the West Balkans. Serbia's R&D centre's got 8 of the region's 10 grants, half of these went to the IPB, including the best evaluated R&D proposal in the region – CX-CMCS.

A large number (22) of high-profile visits of policy makers to the Laboratory have followed in the duration of CX-CMCS. These have included visits of: the Deputy Prime Minister of Serbia; Serbian Ministers of Science and Finance, Croatian Minister of Science, Education and Sport; Ambassadors from Spain, Japan, and Cuba; Presidents of the Academies of Science of Serbia and Bulgaria; Director-Generals of JRC, CERN, the Earth Simulator, and Dubna. In addition CX-CMCS hosted many meetings with representatives of industry: AMD, Intel, IBM, Sun Microsystems, along with the representatives of a host of smaller ICT firms. During the visits several key initiatives were launched: (1) the **National Investment Plan** (for CX-CMCS the key point of which was the inclusion of substantial upgrade of S&T infrastructure in the overall NIP effort), (2) the **National Supercomputing Initiative** (with IPB defined as the national focal point for the future development of High Performance Computing in Serbia, the central facility of NSI, the Blue Danube supercomputer, to be located on the IPB campus), (3) the start of the **Academic Partnership with IBM**. More detailed information on these and other events can be found on SCL's web site http://www.scl.rs/ which currently has about 1400 visits and 7000 page views per month.

- **Drive towards excellence –** As a result of implementation of CX-CMCS reinforcement SCL has been recognized at National, regional and EU levels as a key player in eInfrastructure development; recognized by major players in the ICT industry as a promising partner; recognized by policy makers as a trusted source of expert advice; recognized by internal quality benchmarking procedures as an aspiring center; recognized by the media as a dynamic research environment improving the presentation of research to the wider public; and, most importantly, recognized by young and upcoming professionals as an exciting arena for career development.

CX-CMCS is a project that aspires not only to reinforce the Scientific Computing Laboratory of the Institute of Physics in Belgrade turning it into a Centre of Excellence, but also to make visible social impact by becoming a brain-gain focal point for Serbia in the dynamic fields of complex systems and Grid computing. Through its high visibility and its key reports documenting the "Scientific computing landscape of Serbia" and the "Strategy of long term sustainable growth of research excellence in transition" CX-CMCS aims to contribute to national RTD policy.

1. Project objectives and major achievements during the reporting period

1.1. Project definition and objectives

The basic **strategic objective** of CX-CMCS 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, CX-CMCS 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.

The specific objectives for CX-CMCS have been formulated through an analysis of the following key points:

1. 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);
2. Existing strengths and weaknesses at SCL an the high performance computing sector in Serbia including: professional resources, material resources, financial and organizational resources, principle impediments;
3. Assessment of availability of graduate students and young researchers that could be newly employed at SCL.
4. 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

1.2. Summary of main project achievements

The main achievements of CX-CMCS project are:

WP1. Project management

- Project deliverables prepared and delivered on time; updated versions of earlier deliverables produced where appropriate
- Substantial aditional funding obtained from the National sources, constituting a major step towards sustainability of SCL.
- Success in planning, lobbying and carrying through CX-CMCS initiatives: (1) extend **National Investment Plant** so as to incorporate upgrade of capital S&T infrastructure, (2) launch of **National Supercomputing Initiative** and becoming the national focal point for the use and development of high performance computing in Serbia, as well as the location of the future Blue Danube supercomputing facility.
- Success in industrial relations: **Equipment donations from AMD and IBM**, start of **Academic Partnership with IBM**.

WP2. Reinforcing research capacity

- Two new senior researchers hired at SCL (reintegrated from abroad). One junior researcher has advanced to senior status.
- Eight young researchers hired at SCL during the project. One has subsequently gone on to an industrial position, two graduate students have continued their academic careers at institutions abroad, one graduate student has switched to a different research specialization (different research unit at IPB)
- SCL's parallel cluster significantly upgraded by a grant from the Serbia's National Investment Plan, as well as equipment donations by AMD and IBM.

WP3. Mobility and training

During the first two years of implementation, SCL's newly hired young researchers have participated

- in 3 long term research visits (1 year or longer), 5 visits of medium duration (several months)
- in more than 100 short term visits (one month or less, participation in conferences, workshops, summer schools), conducted in 21 countries throughout Europe
- in 35 training events throughout Serbia

WP4. Dissemination and visibility

SCL achieved high visibility to the general public through three years of participation in **Festival of Science** (Belgrade Science Fair) and the organization of physics exhibitions at these events (average number of yearly visits 15000), **month-long LHC Exhibition**, the year-long **"Beograd je system" (Belgrade is a system) initiative** to build a scale model of the solar system the size of Belgrade (more than 7000 members on initiatives Facebook group, several dozen interviews in print and electronic media, support of several dozen local and national institutions relevant to the realization of the project), active participation within the national events for 2009 as the **International Year of Astronomy**, co-organization of the **Cosmic Harmony** project (two month-long artistic exhibitions in Belgrade inspired by science organized in parallel with a set of popular science

lectures), creation **four leaflets and brochures**, **two posters** and **four video presentations** (on YouTube), additional presence in media (particularly on the topic of successful **reintegration to Serbia's R&D sector of key experts currently working abroad**), oranization of **TEDxBelgrade** video presentations for the general public (twice monthly) on varied topics in science, technology and art, as well as through our frequently visited **web-site**.

WP5. Benchmarking and policy development

- Benchmarking criteria for Centres of Excellence developed.
- SCL benchmarking exercise done, SCL has reached the excellence status.
- Policy paper on **"Strategy of long term sustainable growth of research excellence in transition"** completed and circulated to policy makers in a series of meetings at the Ministry of science and technological development.
- Policy paper on **"Scientific computing landscape of Serbia"** completed and circulated to policy makers in a series of meetings at the Ministry of science and technological development.
- Results of both policy papers integrated into key aspects of the **National R&D Strategy of Serbia for 2010-2015**. Strategy presented in June 29, 2009 by Deputy Prime Minister Bozidar Djelic at the EU Research Information Event "Towards Integration into the European Research Area" in Belgrade in the presence of EU Commissioner for Research Janez Potocnik.

1.3. Problems identified and corrective actions

During the 1st reporting period the project faced only one **problem** – the delay in procurement of new equipment due to factors external to the project. Getting VAT-exempt status for the CX-CMCS project has turned out to be considerably more complicated and time consuming than anticipated.

The corrective action we have attempted for this problem is to split the purchase of the equipment into two parts. The more straight-forward part of equipment (Server and memory upgrade) was procured more quickly, and is already installed. The "harder" part (Storage modules) is still outstanding, and it is expected to be concluded by Month 15.

During the 2nd reporting period the project faced severe cash-flow problems due to the late 2nd advance payment. The negative consequences of this delay have been overcome by the end of February.

The only **corrective action** available to us was to reschedule the payments in order to "wait out" the delay in prefinancing. It is an unfortunate reality of R&D centres in our region that there is no financial margin of safety, and that we all operate near the liquidity limit. Therefore, it is extremely hard to accommodate for the delays in funding. We want to stress that we fully expect the no delays in the next advanced payment are made.

The corrective actions regarding the problems encountered during the 1st reporting period as outlined in the 1st period Activity Report were completed in full during the fall of 2007.

In June 2009 the project coordinator of CX-CMCS sent a request for a six month extension of the project, stating the following reasons:

"Due to the international financial crisis the funding situation at the Institute of Physics Belgrade is such that we are experiencing difficulties in performing the remaining project tasks within the time frame of the project (30 June 2009). The requested six month extension will alleviate this problem.

In addition, the requested extension would make it possible to have the launch of the seven-year **National Supercomputing Initiative "Blue Danube"** occur within the time frame of the project, significantly improving project impact."

The sought-after extension was granted in July 2009. The CX-CMCS project was extended to December 31, 2009, with appropriate changes in the due dates of the 3rd period deliverables.

The six month extension made it possible to alleviate the above problems. CX-CMCS overlapped with the crucial starting phase of the National Supercomputing Initiative, moreover deliverable **D14 "Scientific Computing Landscape"** represented the key expert document that shaped that initiative. The result for SCL and the Institute of Physics Belgrade was of capital importance since IPB was officially designated to be host to the new **National Supercomputing and Data Storage Facility "Blue Danube"**. This appointment solves the sustainability problem for SCL research.

The NSI appeared as one of the key parts of the **National R&D Strategy of Serbia for 2010-2015** the draft of which was first presented publically by Deputy Prime Minister Bozidar Djelic at the EU Research Information Even "Towards Integration into the European Research Area" held in Belgrade on June 29, 2009. The ensuing public debate lasted for more than three months and the strategy in its final form was adopted in early December 2009.

The second half of 2009 was, therefore, a period of fundamental importance for SCL, whose full capacity was focused on capitalizing on the CX-CMCS policy deliverables and bringing to fruition the lobbying process to build a competitive supercomputing infrastructure and make it available to Serbia's R&D sector. The concerted effort was successful, and the results represent not only long-term sustainability of SCL research effort, but also the crowning achievement of the reinforcement process precipitated by CX-CMCS. Particularly important for this success were SCL dissemination activities. In order to boost them up in this direction, a decision was made to substitute the effort that was planned for holding the International Dissemination Workshop by many more smaller-scaled dissemination events targeting policy makers at National, regional and EU levels, as well as major industrial player in the field of high performance computing. These activities are detailed in deliverable **D12 – "Dissemination and Visibility of Project"** which substitutes for the originally planned document giving the Proceedings of the International Dissemination Workshop.

2. Workpackage progress

This section presents an overview of the work performed (July 1st, 2006 to December 31st, 2009) per workpackage.

2.1. WP1 – Project management

Within WP1 an efficient and lightweight project management structure was established within the first year of the project. Periodic Activity and Management Reports were produced and submitted on time. All project deliverables were prepared in time and all but one milestones met. Inauguration meeting was held (see deliverable D05 "Inauguration meeting report"). Strong liaison was established with related Grid projects SEE-GRID-2 and EGEE-II, and input was provided for preparing SEE-GRID-SCI and EGEE-III proposals. Additional sources of funding were agresively sought and found, providing additional financing for young researchers working at SCL and their mobility, as well as for hardware upgrades. Success in procuring these matching funds contributes considerably to sustainability of SCL.

In year two of the project management structure established within the first year of the project was excercised. Periodic Activity and Management Reports were produced and submitted on time. All project deliverables were prepared in time and all milestones met. Strong liaison established with related Grid projects SEE-GRID-2 and EGEE-II was carried over to the successor projects SEE-GRID-SCI and EGEE-III proposals. Additional sources of funding were agresively sought and found, providing additional financing for young researchers working at SCL, additional sources of funding for their medium and long-term training missions and mobility, as well as for hardware upgrades.

In the final we continued with the project management structure already established. Periodic and Final Activity and Management Reports were produced and submitted on time. All project deliverables were prepared in time and all milestones met. Building upon the previous connections to the relevant pan-European and regional Grid projects, strong liaisons were established with SEE-GRID-SCI and EGEE-III projects. This has been further extended by participation in successful eInfrastructure proposals PRACE-1IP, EGI-Inspire, HP-SEE, and DRIHM and by participating in several bilateral and multilateral projects, which will secure the sustainability of SCL operations in the forthcoming period.

2.2. WP2 – Reinforcing research capacity

The planned reinforcement of SCL's research capacity has two aims: human capacity building (through the hiring of young researchers), and reinforcement of existing material resources (upgrading of the existing high tech computing infrastructure). The first goal builds on SCL's strong outreach to students in physics and computer sciences. The planned hiring of 4 young researchers to work at SCL has been significantly expanded upon. This was made possible by the obtained of matching funds for students from the Ministry of Science (scholarships awarded to best students) and the earlier than expected hiring of SCL's four new young scientists at the IPB. The matching funds halved the necessary CX-CMCS contribution to individual young researcher salaries. As a result SCL was able to hire eight researchers. The resulting increase in mobility and training costs that resulted from the increase in number of hired people was covered through SCL participation in other EU projects (SEE-GRID, SEE-GRID-2, EGEE II). Finally, a key part of sustainability was that IPB and the three national networking partners within CX-CMCS had made firm committeemen's to each hire one of the planned four young researchers after the completion of CX-CMCS. This agreement stands, however it has been substantially expanded upon by the unforeseen hiring of four SCL students at IPB. The result is that all of SCL's young researchers have a permanent position after the end of CX-CMCS. The planned exchange of further young staff between local partner institutions giving the best of them tri-monthly stipends to work at SCL has proceeded well. Two such three-month traineeships have been successfully concluded in the project's first year. These young people have also benefit from the training and, indirectly, from the increased mobility and networking to EU as have the RTD institutions they have returned to.

The second goal of the capacity reinforcement work package was to upgrade the existing computing infrastructure. The CX-CMCS proposal developed a plan to reinforce the existing hi-tech infrastructure by getting rid of its three existing weaknesses: lack of adequate storage space to tackle an important array of modern GRID applications; inadequate number of stackable high throughput switches to optimally link all the existing nodes into a more versatile cluster; inadequate RAM for fine-grained applications that are difficult to parallelise (e.g. weather forecasting, fault propagation in materials, searching through distributed databases such as GRID based medical databases, human genome databases, etc.). The infrastructure upgrade has been late. The principle reason for this has to do with the implementing of new VAT tax laws in Serbia after the start of the project, as well as the long time it took to clear up how IPB can be released from paying these duties on the imported equipment. The financial transaction related to the infrastructure upgrades were finalized at the end of the first project year and the equipment is now due to arrive. For operational reasons it was not possible to delay the acquisition of the high throughput switches and their purchase was cover from different sources. The good side of the long delay is that the unit prices of the sought after components for the cluster were substantially decreased. As a result the same funds made it possible to procure substantially better upgrade both of RAM and of data storage elements.

In the second period SCL hired 3 more students. The resulting increase in mobility and training costs that resulted from the increase in number of hired people was covered through SCL participation in other EU projects (SEE-GRID-2, SEE-GRID-SCI, EGEE II, and EGEE III). The infrastructure upgrade was planned for the first half of 1st project period, but has been late due to the difficulty for IPB to achieve VAT-exempt status for the planned equipment procurement. As a result, the financial transaction related to the infrastructure upgrades were finalized at the end of the first project year and the equipment was installed and came online during the first half of the second year. At about the same time, a substantial upgrade of the SCL computing facilities was made possible by the equipment grant from Serbia's National Investment Plan, allowing for roughly ten-fold increase in available computing power.

SCL was engage 4 new students in the final period as a result of four opened up junior position (two former students continued their careers abroad; one changed specialization transferring to another IPB research unit; one younger researcher advanced to senior status). During this period SCL acquired two equipment upgrades coming from donations from AMD and IBM respectively. The Ministry of Science of the Republic of Serbia designated SCL as the National focal point for High-Performance Computing (HPC). As such, SCL is scheduled to host the future National Supercomputing and Data Storage Facility "Blue Danube". Therefore, a planned ten-fold increase in available computing power will be implemented in the forthcoming period.

2.3. WP3 – Mobility and training

The planned mobility, training and networking consist of exchange of personnel, research results, and the setting up and performing of joint numerical experiments. In the section on WP2 we have already commented on how the increase in the number of people hired did not affect mobility and training. In fact, as a result of procurement of funds from other sources, it was possible not only to broaden the mobility and training to more young researchers, but also to increase the mobility of each individual. The primary way that this was done was by finding funds from other SCL projects to cover the mobility of SCL's senior researchers as well as the incoming mobility of foreign researchers coming to SCL. As a result CX-CMCS funds were concentrated on young researcher mobility. During the first year the newly hired young researchers 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.

In the second reporting period SCL students and technical staff participated in 3 long term research visits (1 year or longer), 5 visits of medium duration (several months), and 30 short term visits (visits of one month or less, participation in conferences, workshops, summer schools). SCL young student mobility was conducted in 16 countries throughout Europe. In addition, these same young researchers and technical staff took part in 4 training events held at various research institutions throughout. All of these events were organized by SCL and represented a wide front of national Grid training events held through active participation of most of SCL's young researchers.

The extended mobility, training and networking was successfully continued through the third period. All told CX-CMCS made possible for its students 3 long term visits (one year or more), 5 medium term visits (several months duration), and more than 100 short term visits (less than one month) at R&D institutions troughout Europe (in 21 countries). The primary way that this expanded mobility was made possible was through careful planning and always looking for the possibilities to obtain additional funds and discounts.

2.4. WP4 – Dissemination and visibility

CX-CMCS puts a strong emphasis on the dissemination and visibility of the results of the performed research as well as the effort to produce a high technology centre of excellence in the WB region. To be successful in this role it was determined that the dissemination and visibility work package needed to address four distinct audiences: the EU research community; the research community in Serbia; the wider public in Serbia; the relevant policy makers at local and national levels. During the first year of CX-CMCS the researchers and students at SCL had a substantial media presence. The number of interviews given was 30, and they were distributed according to media as follows: 14 in print media, 12 TV interviews, 4 radio interviews. Of these, 24 were in non-specialist media and publications, while 6 interviews were for specialized audiences. 20 of the interviews were given to media with national coverage, while 10 were for international media.

A particularly important facet of visibility at the EU level came at the very beginning of CX-CMCS with the July 14, 2006 visit to SCL of high level delegations from EU Directorate General for Research, headed by Janez Potocnik, Commissioner for Research, and from the Ministry of Science of Serbia, headed by Aleksandar Popovic, Minister of Science. The joint delegation included Andras Siegler, Director INCO, Giancarlo Caratti, JRC, Tania Friederichs, DG Research, Ivan Videnovic, Assistant Minister of Science, and Gradimir Milovanovic, Chairman of the National Science Council. The main purpose of the Commissioner's visit to IPB was to get first hand information about its four laboratories that were the recipients of EU Centre of Excellence grants in the 2005 SSA call for reinforcing of research excellence in the West Balkans. Serbia's R&D centre's got 8 of the region's 10 grants, half of these went to the IPB, including the best evaluated R&D proposal in the region – CX-CMCS.

The key venue for obtaining information about the CX-CMCS project and the research conducted at SCL is the project's web site (http://cx-cmcs.phy.bg.ac.yu/) along with the SCL web site (http://scl.phy.bg.ac.yu). During the first project year both sites have grown into extensive repositories of publicly available documents and information about SCL research and CX-CMCS activities. The project has also generated a two-page information sheet (developed specifically for the visit of Commissioner Potocnik) and a more detailed four-page promotional brochure. Wider public outreach has also been carried out through promotions in national and local media and the organizing of two popular lectures.

During the first two years of CX-CMCS the researchers and students at SCL had a substantial media presence. The number of interviews given was 41, and they were distributed according to media as follows: 19 in print media, 14 TV interviews, 8 radio interviews. Of these, 32 were in non-specialist media and publications, while 9 interviews were for specialized audiences. 29 of the interviews were given to media with national coverage, while 12 were for international media. Several high profile visits to the Laboratory took place during the second reporting period including those by Minister of Science and Minister of Finance on the occasion of lunching Serbia's National Investment Plan, Director General of JRC, Japanese and Cuban Ambassadors, presidents of Bulgarian and Serbian Academies of Sciences. By end of year two the project generated the following promotional package: CX-CMCS info sheet, CX-CMCS core brochure, CX-CMCS core presentation, CX-CMCS logo, as well as three video presentations: Upgrade of Grid Site (3 min), Accessing Complexity (4 min), Striving for Excellence (5 min), and two posters: Lux et Scientia and Grid Computing.

The project was particularly active within WP4 in the final reporting period. During the 3rd reporting period of CX-CMCS the researchers and students at SCL had a substantial media presence, though participation in **Festival of Science**, the **month-long LHC Exhibition**, the year-long **"Beograd je system" initiative** to build a scale model of the solar system the size of Belgrade, through active participation within the national events for 2009 as the **International Year of Astronomy**, through co-organization of the **Cosmic Harmony** exhibitions and popular science lectures, through the creation of new **leaflets** and **video presentations**, through organization of **TEDxBelgrade** video presentations for the general public, as well as through our frequently visited **web-site**. During this period Serbia migrated from the .yu to the .rs internet domain. More detailed information on all SCL activities can now be found on SCL's web site http://www.scl.rs/ which currently has about 1400 visits and 7000 page views per month. Along with the SCL web site, the key additional venue for obtaining information about the CX-CMCS project is now at (http://cx-cmcs.ipb.ac.rs/).

2.5. WP5 – Benchmarking and policy development

The only activity within this work package that was planned for the first reporting period was the constituting of the CX-CMCS project International Advisory Board (IAB). This was achieved and reported in deliverable D03. The IAB represents one of the major points of the CX-CMCS project. The IAB is made up of leading researchers from EU partner institutions and their expertise, insight and recommendations is expected to help in the creation of a long-term development strategy for SCL.

During the 2nd reporting period SCL conducted two related activities within WP5. The first activity was to develop a flexible benchmarking methodology to serve as the basis for continuous quality assessment of R&D units of SCL's size. The chief purpose of such an assessment is to give a clear indication if a given R&D unit has achieved a high level of overall quality of its research activities

warranting the Centre of Excellence status. The result of this activity was the creation of CX-CMCS deliverable D10. Having developed such benchmarking procedure, SCL then focused its WP5 activity on using it to conduct extensive quality assessment of its own performance during the implementation period of the CX-CMCS project. This exercise has clearly shown that SCL has achieved levels of performance associated with a Centre of Excellence. In all 5 categories of quality indicators, SCL clearly showed that it has met, and sometimes surpassed, the required performance levels. The details regarding the quality assessment of SCL are given in CX-CMCS deliverable D11.

During the 3rd reporting period SCL conducted two related activities within **WP5**. The policy paper on **"Strategy of long term sustainable growth of research excellence in transition"** was completed and circulated to policy makers in a series of meetings at the Ministry of science and technological development. Also, the policy paper on **"Scientific computing landscape of Serbia"** was completed and circulated to policy makers in a series of meetings at the Ministry of science and technological development. The results of both policy papers were integrated into key aspects of the **National R&D Strategy of Serbia for 2010-2015**. The strategy was presented in June 29, 2009 by Deputy Prime Minister Bozidar Djelic at the EU Research Information Event "Towards Integration into the European Research Area" in Belgrade in the presence of EU Commissioner for Research Janez Potocnik.

2.6. List of deliverables

Table 1a covers all planned contractual deliverables due in the 1st reporting period as specified in the Description of Work (DoW) [1]. It indicates their name, WP under which they belong, when was it planned to deliver them and when were they actually prepared, and finally the effort used in preparing deliverables.

Since the current situation at Month 12, i.e. the end of the 1st reporting period, differs considerably from the situation at the time of preparing deliverables D02-a and D06-a, new updated versions of these deliverables, D02-b and D06-b, were produced in order to document the significant advances achieved by the Project. These extra deliverables are also shown in the table.

Furthermore, since the procurement of the equipment was not finished as anticipated at Month 3, the report D04-a that has been produced at that time does not contain the complete information pertaining to procurement and installation of new equipment. Therefore, it was decided that the new deliverable D04-b will be produced at the end of the procurement and installation procedure, which is estimated to be at Month 15. Similarly, the Internationals Advisory Board (IAB) was constituted at Month 3 (see report in D03-a), and it was not planned to schedule the site visit to SCL during the 1st reporting period. The report covering this visit will be given in new deliverable D03-b expected at Month 15. The two anticipated new deliverables D03-b and D04-b are also given in Table 1 for completeness.

Table 1a: Deliverables List (first reporting period)

Del. no.	Deliverable name	WP no.	Date due	Actual/Forecast delivery date	Estimated indicative person-months	Used indicative person-months	Lead contractor
D01	CX-CMCS Web site	WP4	M1	M1	N/A	2[1]	SCL
D02-a	Career development plan for newly employed young	WP2	M2	M2	N/A	1[2]	SCL

[1] Includes also the maintenance of the web-site

[2] Newly employed young researchers have consumed 72 person-months during the 1st reporting period

	researchers						
D03	CX-CMCS International Advisory Board	WP5	M3	M3	N/A	0[3]	SCL
D04-a	Equipment tendering and procurement report	WP2	M3	M3	N/A	2	SCL
D05	Inauguration meeting report	WP1	M4	M4	N/A	0.5	SCL
D06-a	Mobility and training plan	WP3	M6	M6	N/A	1	SCL
D07	CX-CMCS Brochure	WP4	M6	M6	N/A	2	SCL
D08-a	12M Progress reports	WP1	M12	M12	N/A	1.5	SCL
D02-b	Career development plan for newly employed young researchers	WP2	N/A	M12	N/A	1[4]	SCL
D06-b	Mobility and training plan	WP3	N/A	M12	N/A	1[4]	SCL
D04-b	Equipment tendering and procurement report	WP2	N/A	M15	N/A	2[5]	SCL

Table 1b covers all planned contractual deliverables due in the 2nd reporting period as specified in the Description of Work (DoW) [1]. It indicates their name, WP under which they belong, when was it planned to deliver them and when were they actually prepared, and finally the effort used in preparing deliverables.

Since the current situation at Month 24, i.e. the end of the 2nd reporting period, differs considerably from the situation at the time of preparing deliverables D01-a, D02-b and D06-b, new updated versions of these deliverables, D01-b, D02-c and D06-c were produced in order to document the significant advances achieved by the Project. These extra deliverables are also shown in the table.

Furthermore, since the procurement of the equipment was finished as anticipated at Month 15, the deliverable D04-b was produced at that time in order to document it.

Table 1b: Deliverables List (second reporting period)

Del. no.	Deliverable name	WP no.	Date due	Actual/Forecast delivery date	Estimated indicative person-months	Used indicative person-months	Lead contractor
D04-b	Equipment tendering and procurement report	WP2	N/A	M15	N/A	2	SCL
D09	CX-CMCS Promotional	WP4	M15	M15	N/A	6	SCL

[3] The actual effort of 0.2 person-months was covered from other sources

[4] Effort consumed in the 2nd reporting period.

[5] Estimate. To be consumed in the 2nd reporting period.

	video material						
D10	Benchmark procedures for quality assessment of RTD centres of excellence	WP5	M18	M18	N/A	4	SCL
D11	SCL research quality assessment	WP5	M24	M24	N/A	2	SCL
D01-b	CX-CMCS Web site	WP4	N/A	M24	N/A	1.75[6]	SCL
D02-c	Career development plan for newly employed young researchers	WP2	N/A	M24	N/A	1.5[7]	SCL
D06-c	Mobility and training plan	WP3	N/A	M24	N/A	2[8]	SCL
D08-b	12M Progress reports	WP1	M24	M24	N/A	2.5	M24

Table 1c covers all planned contractual deliverables for the final reporting period as specified in the Description of Work (DoW) [1]. It indicates their name, WP under which they belong, when it was planned to deliver them, when they were actually prepared, and finally the effort used in preparing deliverables. All the deliverables were prepared on time.

Table 1c: Deliverables List (final reporting period)

Del. no.	Deliverable name	WP no.	Date due	Actual/Forecast delivery date	Estimated indicative person-months	Used indicative person-months	Lead contractor
D12	Proceeedings of International Dissemination Workshop[9]	WP4	M40	M40	N/A		SCL
D13	Strategy of long-term sustainable growth of research excellence in transition	WP5	M39	M39	N/A		SCL
D14	Scientific computing landscape of Serbia	WP5	M40	M40	N/A		SCL
D15	Presentation of policy	WP5	M41	M41	N/A		SCL

[6] Includes also the maintenance of the web-site

[7] Newly employed young researchers have consumed 51 person-months during the 2nd reporting period; 1 person-month was consumed in 2nd reporting period on producing deliverable D02-b.

[8] 1 person-month was consumed in 2nd reporting period on producing deliverable D06-b

[9] The title of Deliverable D12 was changed to "Dissemination and Visibility of Project", reflecting the change of the document's scope, as discussed in sub-section 1.3 above.

	papers to decision makers						
D16	Final project report	WP1	M42	M42	N/A		SCL

2.7. List of milestones

Table 2a covers all planned contractual milestones due in the 1st reporting period as specified in the Description of Work (DoW) [1]. It indicates their name, WP under which they belong, when was it planned to achieve them and when were they actually achieved.

All milestones due in the 1st reporting period were achieved on time except the "Equipment upgraded" which is overdue due to unforeseen difficulties with import procedures and achievement of VAT-free status, and "Start of mobility and training" that was achieved considerably earlier than planned due to the opportunities that presented themselves and were seized by the Project.

Table 2a: Milestones List (first reporting period)

Milestone no.	Milestone name	Workpackage no.	Date due	Actual/Forecast delivery date	Lead contractor
N/A	New research staff employed	WP2	M02	M02	SCL
N/A	Equipment upgraded	WP2	M03	M15	SCL
N/A	IAB set up	WP5	M03	M03	SCL
N/A	Start-up phase completed	WP1	M03	M06	SCL
N/A	Start of mobility and training	WP3	M07	M03	SCL
N/A	First year completed	WP1	M12	M12	SCL

Table 2b covers all planned contractual milestones due in the 2nd reporting period as specified in the Description of Work (DoW) [1]. It indicates their name, WP under which they belong, when was it planned to achieve them and when were they actually achieved.

All milestones due in the 2nd reporting period were achieved on time. The milestone "Equipment upgraded" which was overdue from 1st project period (due to unforeseen difficulties with import procedures and achievement of VAT-exempt status) was achieved as forecasted in the 1st Periodical Activity Report.

Table 2b: Milestones List (second reporting period)

Milestone no.	Milestone name	Workpackage no.	Date due	Actual/Forecast delivery date	Lead contractor
N/A	Equipment upgraded	WP2	M03	M15	SCL
N/A	Complete promotional package available	WP4	M15	M15	SCL
N/A	Benchmark procedures for quality assessment of RTD centres of excellence	WP5	M18	M18	SCL
N/A	SCL research quality assessment	WP5	M24	M24	SCL
N/A	Second year completed	WP1	M24	M24	SCL

Table 2c covers all milestones due in the final reporting period as specified in the Description of Work (DoW) [1]. It indicates their name, WP under which they belong, when was it planned to achieve them and when were they actually achieved.

Table 2c: Milestones List (final reporting period)

Milestone no.	Milestone name	Workpackage no.	Date due	Actual/Forecast delivery date	Lead contractor
N/A	International Dissemination Workshop held	WP4	M40	N/A[10]	SCL
N/A	Policy papers presented to relevant decision makers	WP5	M41	M41	SCL

[10] As described in sub-section 1.3 above, this milestone was not pursued due to the change of focus of deliverable D12.

N/A	End of project	WP1	M42	M42	SCL

2.8. Deviations from the project's workplan

In this sub-section we give the summary of the major deviations from the project's workplan and outline the corrective actions taken.

The **deviations from the workplan during the 1st reporting period** can be summarized as follows:

1. There were no deviations in WP1, WP4, and WP5
2. In WP2 there were two deviations:
    a. Regarding the reinforcement of SCL's human capacities, there was a positive deviation, since it was possible to employ 8 young researchers instead of 4 as envisaged in DoW. Extra researchers have consumed extra person-months as shown in Table 4, but at no extra cost to the project since additional sources of financing were found to co-finance young researchers' salaries at SCL. **Corrective action**: None – we do not want to correct the good thing.
    b. Regarding the reinforcement of SCL's equipment, there was a sizeable delay in procurement procedure due to factors external to the project. The current situation differs from the one that existed during the negotiation of the project in two important ways. First, the tendering procedure is not necessary, and second, the procedure for getting VAT-exempt status has turned out to be considerably more complicated and time consuming than anticipated. Due to these factors the procurement is expected to be finished and all of the equipment installed only in Month 15. Furthermore, the price of the equipment has changed somewhat during the 18 month delay from submitting the project proposal to the receiving of pre-financing payment, resulting in somewhat higher costs. However, this overspent will be accommodated by reduction in costs in other activities, where costs are much lower than anticipated. **Corrective action:** We have tried to minimize delay by splitting the purchase of the equipment into two parts. As a result, the more straight-forward part of equipment (Server and memory upgrade) was already implemented, and the outstanding part (Storage modules) will be concluded by Month 15. We estimate that delays to the project time-line will be completely absorbed during the first half of the 2nd reporting period.
3. In WP3 there was a positive deviation, since it was possible to start with mobility and training activities much earlier then expected, therefore achieving more training during the project's time-life
   Corrective action: None.

The **deviations from the workplan during the 2nd reporting period** can be summarized as follows:

1. There were no deviations in WP1, WP3, WP4, and WP5
2. In WP2 there were two deviations:
    a. Regarding the reinforcement of SCL's human capacities, there was a positive deviation, since it was possible to engage 3 new young researchers bringing the total to 11 instead of 4 as envisaged in DoW. Extra researchers have consumed extra person-months as shown in Table 4, but at no extra cost to the project due to

procurement of additional funds to co-finance young researchers' salaries at SCL. **Corrective action**: None – we do not want to correct the good thing.

b. Regarding the reinforcement of SCL's equipment, there was a sizeable delay in procurement procedure due to factors external to the project. However, these factors were overcome, and the procurement was finished and all of the equipment installed in Month 15, as forecasted in the 1st Periodic Activity Report. **Corrective action:** The corrective actions outlined in the 1st Periodic Activity Report were carried out in full, and the delay to the project time-line was completely absorbed during the first quarter of the 2nd reporting period. No further corrective actions are envisioned.

The **deviations from the workplan during the final reporting period** can be summarized as follows:

1. There were no deviations in WP1, and WP3
2. In WP2 there was positive deviation: Regarding the reinforcement of SCL's human capacities, there was a positive deviation, since it was possible to engage 4 additional young researchers bringing the total to 15 instead of 4 as envisaged in DoW. Extra researchers have consumed extra person-months as shown in Table 4, but at no extra cost to the project due to procurement of obtaining complementary funding.

   Corrective action: None – we do not want to correct a good thing.
3. In WP4 there was a deviation (described in sub-section 1.3) that led to a change in focus of the project's dissemination activities, in view of the opportunity to push through host status for SCL and IPB within the National Supercomputing Initiative. One medium sized dissemination event was commuted to a large number of smaller events specifically targeting decision makers and representatives of industry.

   Corrective action: Instead planned deliverable giving the proceedings of the workshop we delivered a considerably larger document detailing all aspects of project dissemination activities.
4. There was no deviation in WP5, however we want to stress that the two policy papers created within this work package achieved considerably larger impact on policy makers then expected due to the fortuitous fact that the National R&D Strategy was being discussed and adopted at precisely the time these deliverables were being made available to the policy makers.

3. Consortium management

There were no changes in the CX-CMCS management:

- The project coordinator remained the same
- IAB members did not change
- Academic environment in which SCL operates (IPB) did not change its management structures
- Work breakdown structure and responsibilities of the individual SCL members remained the same

Annex 1 - Dissemination and use

4. Plan for Using and Disseminating the Knowledge

4.1. Use of Knowledge

The use of knowledge focuses on the project results in the area of applications development and deployment based on the scientific research performed throughout the project. During the first two years of CX-CMCS five applications were developed, and three of them are identified at this stage as potential ones relevant for the Use of Knowledge.

SPEEDUP application

Exploitable Knowledge (description)	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use	Patents or other IPR protection	Owner & Other Partner(s) involved
Computer Monte Carlo simulation for the calculation of path integrals in Quantum Theory	*Probability amplitudes; Energy spectra and other properties of matter*	*1. Quantum Mechanics* *2. Condensed Matter Physics* *3. Statistical Physics*			***SCL, Institute of Physics Belgrade (owner)***

Since their inception path integrals have presented an extremely compact and rich formalism for dealing with quantum theories. They have grown into powerful tools for dealing with symmetries (including gauge symmetry), for deriving non-perturbative results (e.g. solitons, instantons, symmetry breaking) and for showing connections between different theories or different sectors of the same theory (e.g. bosonization, duality). They have also consistently allowed us to extend and generalize quantization procedures to ever more complicated systems. Today, path integrals are used both analytically and numerically in many other areas of physics, chemistry and materials science. They are starting to play more prominent roles in several areas of mathematics and in modern finance.

The definition of path integrals as a limit of multiple integrals makes their numerical evaluation quite natural. The most all-around applicable numerical method for such calculations is based on Monte Carlo simulations. However, numerical integration of path integrals is notoriously demanding of computing time - so much so that specific path integral calculations serve as benchmarks for new generations of supercomputers.

In order to significantly speed up numerical procedures for calculating path integrals for a generic theory it is necessary to add new analytical input. In our investigations we have looked at the relation between different discretizations of a given theory. A result of this has been a procedure for constructing a series of effective actions $S^{(p)}$ having the same continuum limit as the starting action S, but which approach that limit as $1/N^p$. Using this we obtained explicit expressions for these effective actions up to p=12. Monte Carlo code developed and used in these investigations is SPEEDUP, and it is available on the following address:

http://www.scl.rs/modules.php?name=News&file=item&sid=292

GRANULAR application

Exploitable Knowledge (description)	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use	Patents or other IPR protection	Owner & Other Partner(s) involved
Computer simulation of the properties of granular materials	*Properties of granular materials*	*1. Condensed Matter Physics* *2. Statistical Physics*			***SCL, Institute of Physics Belgrade (owner)***

Granular materials are large assemblies of solid macroscopic particles. If they are noncohesive, the forces between them are strictly repulsive. The particles are usually surrounded by a fluid, most often air, which may play a role in the dynamics of the systems. Examples of such materials include sand, stones, soil, ores, pharmaceuticals, and variety of chemicals.

At the root of the unique status of granular materials are two characteristic: ordinary temperature plays no role, and the interactions between grains are dissipative because of static friction and the inelasticity of collisions. There are no long-range interactions between individual grains or between individual grains and the walls of a confining container. Yet despite this seeming simplicity, a granular material behaves differently from any of the other familiar forms of matter - solids, liquids, or gases. For instance one can cite internal stress fluctuations, strain localization, non-Newtonian rheology, spontaneous clusterization, size segregation or spatial pattern creations. All these phenomena have no equivalent in classical solid- or liquid-state physics. Therefore, granular material should be considered an additional state of matter in its own right.

Attempts toward understanding and controlling both static and dynamic properties of granular materials are thus of highest interest to many fields of physics, applied sciences and engineering. We are generally interested in understanding of the cooperative dynamics of powder and relationship between the macroscopic behavior of granular materials and their microstructures. Current projects under investigation by the Scientific Computing Laboratory include the following:

- Molecular dynamics simulations (MDS) of the compaction of spherical particles systems under vertical vibrations:
    - Global analysis (densification kinetics and glassy behavior): dynamics of compaction, hysteresis, aging, two-time density-density correlation functions, importance of convection in the compaction mechanisms;
    - Local analysis (structural properties): density profiles, size and volume distributions of the pores, structure and distribution of arches (bridges);
- Numerical model for compaction of anisotropic granular media under vertical tapping:
    - Reversible random sequential model (RSA) of granular compaction on triangular lattice: memory effects, symmetry effects;
    - Compaction model (RSA) of polydisperse granular mixtures;
- Fractional model for the compaction of a vertically tapped granular material;
- Granular gases: instabilities, late clustering regime, large-scale molecular dynamics simulations.

More details can be found at the following address:

http://www.scl.rs/modules.php?name=News&file=item&sid=87

SOLAR application

Exploitable Knowledge (description)	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use	Patents or other IPR protection	Owner & Other Partner(s) involved
Computer simulation of the formation of planetary systems	*Universal properties of the planetary formation process*	*1. Astrophysics* *2. Statistical Physics*			***SCL, Institute of Physics Belgrade (owner)***

In recent years there has been a large increase in the amount of available data on extra-solar planetary systems. In view of these achievements it is not surprising that a long standing problem of the detailed understanding of planet formation has received a lot of attention lately. One of the ultimate goals of such studies is to assess the likelihood of the formation of Earth-like planets. The exponential increase in computing power during the last two decades has made numerical simulation the most promising tool to achieve this goal. However, if one wants to perform a numerical *ab initio* simulation of the planetary system formation starting from a protoplanetary nebula, a large number of initial particles needs to be considered. Since the range of planetary masses in the Solar system spans four orders of magnitude, the smallest possible number of initial particles needed to resolve them with reasonable accuracy is at the very least $N=10^8$. Despite recent exceptional advances, state of the art simulations of gravitating systems are barely able to deal with this many initial particles. To make such large scale simulations feasible, we have devised an effective model of planetary accretion.

Using the model it is possible to simulate the formation of planetary systems starting from as many as $N=10^{12}$ initial particles, and to investigate properties of condensates, including the distribution of their masses and spins (angular momentum), as well as their radial distributions. It is also possible to investigate evolution of these properties during the condensation process, and to uncover sensitivity of key features of such systems on initial conditions.

The present application is command line/input file based, while the output can be either raw data, or its graphical representation (including animations of main properties evolution). Main features of the SOLAR application:

- Simplified effective model with algebraic condensation criterion and clearly defined end of accretion.
- Greatly reduced numerical complexity of the applied algorithm, from standard $O(N^3)$ to $O(N)$.
- Efficient minimization of memory requirements, from standard $O(N)$ to $O(n)$, where n is the current number of condensates.
- Visualization of the results, including animation of the evolution of distributions of all important properties of simulated systems.
- Can be executed on a single processor, MPI cluster, or distributed on a Grid.

Code developed and used in these investigations is SOLAR, and it is available on the following address:

http://www.scl.rs/modules.php?name=News&file=item&sid=61

BOSE-HUBBARD application

Exploitable Knowledge (description)	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use	Patents or other IPR protection	Owner & Other Partner(s) involved
Computer simulation of quantum systems that can be described by the Bose-Hubbard model	*Characterization of materials*	*1. Condensed matter physics*			***SCL, Institute of Physics Belgrade (owner)***

Significant progress in the electronic structure and response functions calculations of strongly correlated materials has been recently achieved using dynamical mean filed theory (DMFT). The DMFT equations are mathematically equivalent to an effective Anderson impurity problem in the conduction electron bath, which has to be calculated self-consistently. We use the continuous time quantum Monte Carlo (CTQMC) code as the impurity solver. This code is parallelized and also applied to multi-site and multi-orbital systems. To explore different physical systems and the existence of possible long-range order, we prepare the input files for the CTQMC in Python programming language, while the core part of the code is written in C++ and uses also Fortran routines for the parts of the code which needs the most of the CPU time.

4.2. Dissemination of Knowledge

4.2.1. Overview: Summary and Highlights of key Dissemination events

In the table below key dissemination events and papers published are given.

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
2006	Scientific papers/publications: J. Grujic, A. Bogojevic, A. Balaz, "Energy estimators and calculation of energy expectation values in the path integral formalism", Phys. Lett. A 360, 217 (2006)	Research & Education	All		IPB
2006	Scientific papers/publications: D. Stojiljkovic, A. Bogojevic, A. Balaz, "Efficient calculation of energy spectra using path integrals", Phys. Lett. A 360, 205 (2006)	Research & Education	All		IPB
2006	Scientific papers/publications: "Simulation Study of Granular Compaction Dynamics under vertical tapping", D. Arsenovic, S. B. Vrhovac, Z. M. Jaksic, Lj. Budinski-Petkovic, and A. Belic, Phys. Rev E 74, 061302, (2006).	Research & Education	All		IPB
2006	Scientific papers/publications: "Grid Approach to Path Integral Monte Carlo Calculations", D. Stojiljkovic, A. Balaz, A. Bogojevic, A. Belic, Proc. of INDEL 2006 Conference, Banjaluka, Bosnia and Herzegovina, 10-11 November 2006	Research & Education	All		IPB
2006	Scientific papers/publications: "gLite Workload Management System Performance Measurements", N. Svraka, A. Balaz, A. Bogojevic, A. Belic, Proc. of INDEL 2006 Conference, Banjaluka, Bosnia and Herzegovina, 10-11 November 2006	Research & Education	All		IPB
2006	Scientific papers/publications: D. Arsenovic, S. B. Vrhovac, Z. M. Jaksic, Lj. Budinski-Petkovic, and A. Belic, "Simulation Study of Granular Compaction Dynamics under vertical tapping", *Phys. Rev* E 74, 061302, (2006).	Research & Education	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
2006	Scientific papers/publications: S. B. Vrhovac, Z. M. Jaksic, Lj. Budinski-Petkovic, and A. Belic, "Linear kinetic equation: Long-time behavior of one-particle distribution function", *Eur. Phys. J.* B 53, 225 (2006)	Research & Education	All		IPB
2006	Scientific papers/publications: Budinski-Petkovic, M. Petkovic, Z. M. Jaksic, and S. B. Vrhovac, "Compaction of anisotropic granular materials: symmetry effects", *Mat. Sci. Forum* 518, 355 (2006)	Research & Education	All		IPB
2006	Scientific papers/publications: A. Bogojevic, A. Lalovic, and B. Ackovic, "Model of Binary System Formation", *Publ. Astronomical Observatory Belgrade* no 80 , 123-127 (2006)	Research & Education	All		IPB
2006	Scientific papers/publications: A. Bogojevic, A. Balaz, and A. Belic, "Spacing of Planets in an Effective Gravitational Accretion Model", *Publ. Astronomical Observatory Belgrade* no 80 , 149-153 (2006)	Research & Education	All		IPB
2006	Scientific papers/publications: A. Bogojevic, A. Balaz, and A. Belic, "Linearized Gaussian Halving in d=1", *Physics of Low-Dimensional Structures* no 1 , 52 (2006)	Research & Education	All		IPB
2006	Scientific papers/publications: A. Bogojevic, A. Balaz, and A. Belic, "Gaussian Halving of Path Integrals in d=1", *Physics of Low-Dimensional Structures* no 1, 49 (2006)	Research & Education	All		IPB
2006	Scientific papers/publications: A. Bogojević, A. Balaž and A. Belić, "Euler Summation Formula for Path Integrals", *Facta Universitatis* **4**, 219-232. (2006).	Research & Education	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
2006	Scientific papers/publications: A. Bogojević, A. Balaž, and A. Belić, "The Use of Path Integral Ideals: Deriving the Euler Summation Formula for Path Integrals", 2nd International Conference on p-Adic Mathematical Physics, AIP Conference Proceedings Volume **826**, 320-329 (2006).	Research & Education	All		IPB
2006	Scientific papers/publications: A. Bogojević, A. Balaž and A. Belić, "Path integrals and Euler summation formula", Proceedings of LT-6 Workshop, Sofia, 205-210 (2006).	Research & Education	All		IPB
2006	Scientific papers/publications: M. Mitrović, "Heuristic algorithm for determination of local properties of scale-free networks", Marie Curie Workshop 2006 in Croatia and Serbia, Zagreb and Belgrade, 45 (2006).	Research & Education	All		IPB
2006	Scientific papers/publications: M. V. Milovanović and A. Petković, "Meron and Haldane-Shastry Spin Chain States in Quantum Dots", APS March Meeting, Baltimore, B23.00014, 2006.	Research & Education	All		IPB
July 2006	Promotion package: CX-CMCS info sheet	General Public	All	1,000	IPB
July 2006	CX-CMCS Inauguration Event	Research & Education	Serbia	50	IPB
July 2006	Media activity: Press release regarding the CX-CMCS project kick-off	General Public	All	500	IPB
July 2006	Media activity: Press release regarding the visit of EU Commissioner Potocnik	General Public	All	500	IPB
September 2006	Media activity: EGEE Newsletter points to SCL activity, September 2006	Grid community	All	1,000	IPB
December	Promotion package:	General	All	1,000	IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
2006 / January 2007	CX-CMCS Brochure	Public			
2007	Scientific papers/publications: J. Grujić, "Efficient Calculation of Energy Expectation Values in the Path Integral Formalism", Marie Curie Workshop 2006 in Croatia and Serbia, Zagreb and Belgrade, 44 (2006).	Research & Education	All		IPB
2007	Scientific papers/publications: A. Petkovic and M. V. Milovanovic, "Fractionalization into Merons in Quantum Dots", *Phys. Rev. Lett.* **98**, 066808 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: M. V. Milovanovic, "Wavefunctional Approach to the Bilayer nu = 1 System and a Possibility for a Double Non-Chiral Pseudospin Liquid", *Phys. Rev. B* **75**, 035314 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: Z. Papic and M.V. Milovanovic, "Quantum Disordering of the 111 State and the Compressible - Incompressible Transition in Quantum Hall Bilayer Systems", *Phys. Rev. B* **75**, 195304 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: D. Arsenovic, B. Vrhovac, Z. M. Jaksic, Lj. Budinski-Petkovic, and A. Belic, "Simulation Study of Granular Compaction Dynamics Under Vertical Tapping", *Mat. Sci. Forum* **555**, 107 (2007)	Research & Education	All		IPB
2007	Scientific papers/publications: I. Lončarević, Lj. Budinski-Petković, and S. B. Vrhovac, "Simulation study of random sequential adsorption of mixtures on a triangular lattice", *Eur. Phys. J. E* **24**, 19-26 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: I. Lončarević, Lj. Budinski-Petković, and S. B. Vrhovac,	Research & Education	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	"Reversible random sequential adsorption of mixtures on a triangular lattice", *Phys. Rev. E* **76**, 031104-031104-9 (2007).				
2007	Scientific papers/publications: A. Belić, "Large-scale simulations of complex physical systems", AIP Conference Proceedings Series 899, Sixth International Conference of the Balkan Physical Union, 76-79 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: N. Švraka, A. Balaž, A. Belić, and A. Bogojević, "Stability and Performance of gLite Workload Management System", INFOTEH 2007, Sarajevo, E-III-6 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: A. Balaž, A. Bogojević, I. Vidanović, A. Belić, "Accelerated Path Integral Calculations via Effective Actions", Proceedings of the Path Integrals - New Trends and Perspectives conference, p. 86, Dresden, Germany, September 2007	Research & Education	All		IPB
2007	Scientific papers/publications: I. Vidanović, A. Balaž, A. Bogojević, A. Belić, "Systematic Speedup of Energy Spectra Calculations for Many-Body Systems", Proceedings of the Path Integrals - New Trends and Perspectives conference, p. 92, Dresden, Germany, September 2007	Research & Education	All		IPB
2007	Scientific papers/publications: M. V. Milovanović and Z. Papić, "Quantum Disordering of a Quantum Hall Superfluid", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 127-129 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: Z. Papić and M. V. Milovanović, "Quantum Disordering of the 111 State and the Compressible-incompressible Transition in	Research & Education	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	Quantum Hall Bilayer Systems", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 51 (2007).				
2007	Scientific papers/publications: A. Belić, A. Balaž, and A. Bogojević, "Pan-European Grid eInfrastructure for LHC Experiments at CERN - SCL's Activities in EGEE", Proceedings of FIS07, Novi Sad (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: I. Loncarević, Lj. Budinski-Petković and S. B. Vrhovac, "Irreversible Deposition of Mixtures on a Triangular Lattice", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 189-192 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: D. Tanaskovic, V. Dobrosavljevic and E. Miranda, "Spin Liquid Behavior in Electronic Griffiths Phases", *XVII National Symposium on Condensed Matter Physics (SFKM - 2007)* (2007) 122-125, *Vršac - Serbia*	Research & Education	All		IPB
2007	Scientific papers/publications: D. Arsenović, S.B. Vrhovac, Z.M. Jaksić, Lj. Budinski-Petković, A. Belić, "Simulation Study of Granular Compaction", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 193-196 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: I. Vidanović and S. Elezovic-Hadzić, "Force-Induced Desorption of a Linear Polymer Adsorbed on a Boundary of the Sierpinski Gasket Fractal", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 172-175 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: M. Mitrović and A. Belić, "Heuristic algorithm for determination of local properties of scale-free networks",	Research & Education	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 181-184 (2007).				
2007	Scientific papers/publications: J. Grujić, A. Bogojević, A. Balaž, "Efficient Calculation of Energy Expectation Values in the Path Integral Formalism", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 114 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: J. Grujić, A. Bogojević, and A. Balaž, "Efficient calculation of energy expectation values in the path integral formalism", Proceedings of 5th International Student Conference of the Balkan Physical Union, 80 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: I. Vidanović, A. Bogojević, and A. Balaž, "Efficient calculation of energy expectation values in the path integral formalism", Proceedings of 5th International Student Conference of the Balkan Physical Union, 82 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: M. Mitrović "Heuristic algorithm for determination of local properties", Proceedings of 5th International Student Conference of the Balkan Physical Union, 111 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: C. Vuerli, F. Pasian, G. Taffoni, H. Kornmayer, L. Hluchý, M. Lechner, M.L. Dubernet, E. Valentijn, E. Martinez-Gonzalez, A. Belić, "Astrophysics in EGEE", Proceedings of Astronomical Data Analysis Software & Systems XVII, London, P1.024 (2007).	Research & Education	All		IPB
2007	Scientific papers/publications: I. Vidanović, A. Balaž, A. Bogojević, A. Belić, "Effective Actions for Path Integral Monte Carlo Calculations", Proceedings	Research & Education	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	of XVII National Symposium on Condensed Matter Physics, Vrsac, 201-204 (2007).				
2007	Scientific papers/publications: I. Loncarević, Lj. Budinski-Petković and S. B. Vrhovac, "Adsorption-Desorption Proccesses of Mixtures on a Triangular Lattice", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 185-188 (2007).	Research & Education	All		IPB
January 2007	Media activity: SCL's researcher guest on Serbian National TV RTS special on Brain-Drain	General Public	Serbia	100,000	IPB
February 2007	Media activity: Interview of SCL's Aleksandar Bogojevic for daily newspaper Danas	General Public	Serbia	30,000	IPB
February 2007	Media activity: Interview of SCL's Aleksandar Bogojevic in daily newspaper Glas Javnosti	General Public	Serbia	30,000	IPB
February 2007	Media activity: SCL researchers give interview for weekly newspaper Ana	General Public	Serbia	20,000	IPB
March 2007	A. Balaz: Lecture on HPC experiences in South Eastern Europe, Advanced School in High Performance Computing : Tools for e-Science at International Centre for Theoretical Physics, Trieste, Italy, March 5 – 16, 2007	Research & Education	All	50	IPB
March 2007	Media activity: A. Bogojevic gives interview to BBC Radio	General Public	All	100,000	IPB
March 2007	Media activity: SCL article "Government to Grid" in International Science Grid this Week	Grid community	All	10,000	IPB
March 2007	Media activity: SCL's Aleksandar Bogojevic interviewed on BBC Radio	General Public	All	100,000	IPB
April/May 2007	Media activity:	General	All	100,000	IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	Article about SCL and Grids on B92 Internet portal	Public			
May 2007	Media activity: Article about CX-CMCS in the weekly newspaper Vreme	General Public	Serbia	30,000	IPB
May 2007	Media activity: Interview of SCL's Aleksandar Bogojevic for magazine Standard	General Public	Serbia	30,000	IPB
May 2007	Media activity: Business & Finance profiles SCL	General Public	Serbia	20,000	IPB
June 2007	Media activity: Interview of SCL's Aleksandar Bogojevic for daily newspaper Danas	General Public	Serbia	30,000	IPB
June 2007	Media activity: SCL student Jelena Grujic in science magazine on Serbian National TV RTS	General Public	Serbia	100,000	IPB
June 2007	Media activity: SCL associate Dejan Stojkovic featured in USA Today	General Public	USA	500,000	IPB
September 2007	Media activity: SCL student Jelena Grujic interviewed on Radio Belgrade	General Public	Serbia	50,000	IPB
October 2007	Media activity: SCL student Jelena Grujic guest hosts on Radio Belgrade	General Public	Serbia	30,000	IPB
November 2007	Media activity: SCL student on Radio B92	General Public	Serbia	50,000	IPB
2008	Scientific papers/publications: A. Bogojevic, I. Vidanovic, A. Balaz, and A. Belic, "Fast convergence of path integrals for many-body systems", *Phys Lett A* 372, 3341 (2008).	Research & Education	All		IPB
2008	Scientific papers/publications: A. Bogojević, A. Balaž, and R. Karapandža, "Consequences of Life Extension on Fertility and Wealth", *Physica A* **387**, 543-550 (2008).	Research & Education	All		IPB
2008	Scientific papers/publications:	Research &	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	M. MItrovic, and B. Tadic, "Search of weighted sub-graphs on complex networks with maximum likelihood methods", LNCS 5102, 551 (2008)	Education			
2008	Scientific papers/publications: J. Dimitrijevic, A. Krmpot, M. Mijailovic, D. Arsenovic, B. Panic, Z. Grujic, and B. Jelenkovic, "Role of transferse magnetic fields in electromagnetically induced absorption for elliptically polarized light", Phys. Rev. A 77, 013814 (2008)	Research & Education	All		IPB
2008	Scientific papers/publications: M. V. Milovanovic, and Z. Papic, "Non-perturbative approach to the quantum Hall bi-layer", APS March Meeting, New Orleans, Louisiana, USA (2008)	Research & Education	All		IPB
2008	Scientific papers/publications: A. Balaz, I. Vidanovic, A. Bogojevic, and A. Pelster, "Path integrals without integrals", DPG 2008 spring conference DY-29.16, Berlin, Germany (2008)	Research & Education	All		IPB
March 2008	Media activity: SCL featured in daily newspaper Vecernje Novosti	General public	Serbia	20,000	IPB
April 2008	Media activity: SCL article appears in EGEE Newsletter	Grid community	All	1,000	IPB
April 2008	Promotional material: video: Upgrade of Grid Site	General public	All	500	IPB
April 2008	Promotional material: poster: Lux et Scientia	General public	All	500	IPB
April 2008	Promotional material: poster: Grid Computing	General public	All	500	IPB
April 2008	Promotional material: video: Accessing Complexity	General public	All	500	IPB
April 2008	Promotional material: video: Striving for Excellence	General public	All	500	IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
2008	Scientific papers/publications: Lj. Budinski-Petkovic, I. Loncarevic and S. B. Vrhovac: "Random Sequential Adsorption of Polydisperse Mixtures on Discrete Substrates", *Phys. Rev. E* **78** (2008) 061603	Research & Education	All		IPB
2008	Scientific papers/publications: Z. M. Jaksic, S. B. Vrhovac, B. Panic, Z. Nikolic and B. Jelenkovic: "Upward Penetration of Grains Through a Granular Medium", *Eur. Phys. J. E.* **27** (2008) 345	Research & Education	All		IPB
2008	Scientific papers/publications: J. Grujic: "Movies Recommendation Networks As Bipartite Graphs", *LNCS* **5102** (2008) 576-583	Research & Education	All		IPB
2008	Scientific papers/publications: D. Stojiljkovic, A. Bogojevic and A. Balaz: "Energy Levels and Expectation Values via Accelerated Path Integral Monte Carlo", *in J. Phys. Conf. Ser.* **128** (2008) 012062, *Proceedings of the QTS-5 Conference, Valladolid, Spain, 22-28 July 2007*	Research & Education	All		IPB
2008	Scientific papers/publications: A. Balaz, I. Vidanovic and A. Bogojevic: "Accelerated Path Integral Calculations for Many-body Systems", *in J. Phys. Conf. Ser.* **128** (2008) 012048, *Proceedings of the QTS-5 Conference, Valladolid, Spain, 22-28 July 2007*	Research & Education	All		IPB
September 2008	Media activity: SCL's system administrator reviews top supercomputers in an article for the B92.net science section	General Public	Serbia	50,000	IPB
September 2008	Media activity: All-day media event for the general public organized at IPB marks start of LHC at CERN; extensive coverage by print and electronic media	General Public	Serbia	300,000	IPB
2008	Scientific papers/publications:	Research &	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	I. Vidanovic, A. Balaz, A. Bogojevic and A. Pelster: "Calculation of T_c of ^{87}Rb BEC using High-order Effective Actions", *in Quo Vadis BEC? Conference* (2008) *Bad Honnef, Germany*	Education			
November 2008	A. Balaz: Lectures on HPC and Grid computing, Advanced School in High Performance and GRID Computing, International Centre for Theoretical Physics, Trieste, Italy, November 3 – 14, 2008	Research & Education	All	50	IPB
November 2008	Media activity: Extensive coverage of the visit of Serbian Deputy Prime-Minister Mr. Djelic and Spanish Ambassador to IPB at the occasion of launching Serbian National Supercomputing Initiative; Press release	General Public	Serbia	200,000	IPB
December 2008	Media activity: Interview of SCL's Antun Balaz for weekly newspaper Vreme	General Public	Serbia	30,000	IPB
2009	Scientific papers/publications: Z. Papic, M. Goerbig and N. Regnault: "Theoretical Expectations for a Fractional Quantum Hall Effect in Graphene", Solid State Comm. 149 (2009) 1056-1060	Research & Education	All		IPB
January 2009	Media activity: SCL's Dusan Vudragovic interviewed on Radio Belgrade 2	General Public	Serbia	50,000	IPB
2009	Scientific papers/publications: B. Novakovic, A. Balaz, Z. Knezevic and M. Potocnik: "Computation of Asteroid Proper Elements on the Grid", Serb. Astron. J. 179 (2009) 75	Research & Education	All		IPB
2009	Scientific papers/publications: I. Vidanovic, A. Bogojevic, A. Balaz and A. Belic: "Properties of Quantum Systems Via Diagonalization of Transition Amplitudes. II. Systematic Improvements of Short-time Propagation", Phys. Rev. E 80 (2009) 066706	Research & Education	All		IPB
April 2009	Media activity: SCL featured in SEE-GRID-SCI	Grid community	All	1,000	IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
	Newsletter				
2009	Scientific papers/publications: I. Vidanovic, A. Bogojevic and A. Belic: "Properties of Quantum Systems Via Diagonalization of Transition Amplitudes. I. Discretization Effects", Phys. Rev. E 80 (2009) 066705	Research & Education	All		IPB
May 2009	Media activity: SCL on TV Pancevo	General Public	Serbia	30,000	IPB
2009	Scientific papers/publications: M. V. Milovanovic, T. Jolicoeur and I. Vidanovic: "Modified Coulomb Gas Construction of Quantum Hall States from Nonunitary Conformal Field Theories", Phys. Rev. B 80 (2009) 155324	Research & Education	All		IPB
2009	Scientific papers/publications: I. E. Stankovic: "Towards Understanding of Influence of Restricted Geometry on Self-Diffusion in Porous Media", Acta Phys. Pol. A 116 (2009) 701	Research & Education	All		IPB
June 2009	Media activity: Media coverage of signing of the Memorandum of Understanding between IPB and IBM; Press release	General Public	Serbia	20,000	IPB
June 2009	Media activity: Weekly magazine Vreme interviews SCL's Antun Balaz	General Public	Serbia	30,000	IPB
March – July 2009	Media activity: Extensive media coverage of SCL's popularization of science initiative "Beograd je sistem" (6 daily newspapers, 2 weekly magazines, 2 TV stations, and 2 internet portals)	General Public	Serbia	500,000	IPB
2009	Scientific papers/publications: A. Balaz, A. Bogojevic, I. Vidanovic and A. Pelster: "Recursive Schrödinger Equation Approach to Faster Converging Path Integrals", Phys. Rev. E 79 (2009) 036701	Research & Education	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
2009	Scientific papers/publications: M. V. Milovanovic and Z. Papic: "Nonperturbative Approach to the Quantum Hall Bilayer", Phys. Rev. B 79 (2009) 115319	Research & Education	All		IPB
2009	Scientific papers/publications: J. Zivkovic, M. Mitrovic and B. Tadic: "Correlation Patterns in Gene Expressions Along the Cell Cycle of Yeast", Studies in Computational Intelligence (2009)	Research & Education	All		IPB
2009	Scientific papers/publications: M. V. Milovanovic, E. Dobardzic and Z. Radovic: "Meron ground states of quantum Hall droplet", Phys. Rev. B 80 (2009) 125305	Research & Education	All		IPB
2009	Scientific papers/publications: Z. Papic, G. Moller, M. V. Milovanovic, N. Regnault and M. Goerbig: "Fractional Quantum Hall State at Nu=1/4 in a Wide Quantum Well", Phys. Rev. B 79 (2009) 245325	Research & Education	All		IPB
2009	Scientific papers/publications: Z. Papic, N. Regnault and S. Das Sarma: "Interaction-tuned Compressible-to-incompressible Phase Transitions in the Quantum Hall Systems", Phys. Rev. B 80 (2009) 201303(R)	Research & Education	All		IPB
September 2009	Media activity: SCL researcher interviewed on Radio Belgrade 2	General Public	Serbia	20,000	IPB
2009	Scientific papers/publications: O. Prnjat, A. Balaz, T. Gurov, M. Kon-Popovska, I. Liabotis, G. Neagu, B. Ortakaya, C. Sener and D. Vudragovic: "National Grid Initiatives Set-up and Monitoring Guidelines", Proceedings of the First EELA-2 Conference,	Research & Education	All		IPB
2009	Scientific papers/publications: D. Vudragovic, A. Balaz, V. Slavnic and A. Belic: "Dwarf - the Framework for Authorized YUM/APT Repositories Management", INFOTEH 2009, 18-20 March 2009 (2009) 721, E-V-8, Jahorina, Bosnia and Herzegovina	Research & Education	All		IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
2009	Scientific papers/publications: A. Balaz, I. Vidanovic, A. Bogojevic and A. Pelster: "Ultrafast Converging Path Integral Approach for Rotating Ideal Bose Gases", DPG 2009 Conference (2009) Dresden, Germany, Presentation DY-1.4	Research & Education	All		IPB
2009	Scientific papers/publications: D. Vudragovic, V. Slavnic, A. Balaz and A. Belic: "WMSMON - GLite WMS Monitoring Tool", MIPRO 2009, 25-29 May 2009, GSV-02, p. 239-243, Opatia, Croatia (2009)	Research & Education	All		IPB
2009	Scientific papers/publications: A. Balaz, I. Vidanovic, A. Bogojevic and A. Pelster: "Short-time Effective Action Approach for Numerical Studies of Rotating Ideal BECs", Conference on Research Frontiers in Ultra-Cold Atoms, 4-8 May 2009 (2009) ICTP,	Research & Education	All		IPB
2009	Scientific papers/publications: V. Slavnic, B. Ackovic, D. Vudragovic, A. Balaz, A. Belic and M. Savic: "Grid Site Monitoring Tools Developed and Used at SCL", Proceedings of the SEE-GRID-SCI User Forum 2009, 09-10 December 2009, Istanbul, Turkey (2009) 123	Research & Education	All		IPB
2009	Scientific papers/publications: B. Ackovic, D. Vudragovic, A. Balaz and A. Belic: "Operational Grid Tools Developed at SCL", Proceedings of the SEE-GRID-SCI User Forum 2009, 09-10 December 2009, Istanbul, Turkey (2009) 117	Research & Education	All		IPB
2009	Scientific papers/publications: A. Balaz, D. Stojiljkovic, A. Belic and A. Bogojevic: "Optimization and Porting of the Path Integral Monte Carlo SPEEDUP Code to New Computing Architectures", Proceedings of the SEE-GRID-SCI User Forum 2009, 09-10 December 2009, Istanbul, Turkey (2009) 133	Research & Education	All		IPB
November – December	A. Balaz: Lectures on HPC and Grid computing, Advanced School in High Performance and GRID	Research & Education	All	50	IPB

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
2009	Computing, International Centre for Theoretical Physics, Trieste, Italy, November 30 – December 11, 2009				
December 2009	Media activity: SCL featured in SEE-GRID-SCI Newsletter	Grid community	All	1,000	IPB

4.2.2. Presentations

The goals and achievements of CX-CMCS were presented in the following presentations:

- A. Balaz, "Physics Research and Grid Computing at SCL", 2nd Supercomputing Day, Texas A&M University at Qatar, September 13, 2006, Doha, Qatar
- A. Balaz, "SEE-GRID Infrastructure and Grid Operations", SEE-GRID Regional Grids Concertation Workshop held during the EGEE'06 Conference, Geneva, September 28, 2006
- M. Mitrovic, "Heuristic Algorithm for Determination of Local Properties of Scale-Free Networks", Marie Curie Workshop 2006: Commemorating the 150th Anniversary of the Birth of Nikola Tesla, Zagreb and Belgrade, October 7, 2006
- J. Grujic, "Efficient Calculation of Energy Expectation Values in Path Integral Formalism", Marie Curie Workshop 2006: Commemorating the 150th Anniversary of the Birth of Nikola Tesla, Zagreb and Belgrade, October 7, 2006
- "Introduction to Grids", A. Balaz, EGEE-II/SEE-GRID-2 gLite Training Event, Podgorica, Montenegro, 2 November 2006
- "Design and Basic Services of gLite Grid Middleware", A. Balaz, EGEE-II/SEE-GRID-2 gLite Training Event, Podgorica, Montenegro, 2 November 2006
- "Grid Approach to Path Integral Monte Carlo Calculations", Danica Stojiljkovic, Antun Balaz, Aleksandar Bogojevic, Aleksandar Belic, Presented by D. Stojiljkovic at the INDEL 2006 Conference, Banjaluka, Bosnia and Herzegovina, 10-11 November 2006
- "gLite Workload Management System Performance Measurements", Neda Svraka, Antun Balaz, Aleksandar Belic, Aleksandar Bogojevic, Presented by N. Svraka at the INDEL 2006 Conference, Banjaluka, Bosnia and Herzegovina, 10-11 November 2006
- "Introduction to Clusters and Grids", A. Belic, gLite Training for Users, Novi Sad, Serbia, 19 January 2007
- "AEGIS, EGEE-II and SEE-GRID-2", A. Belic, gLite Training for Users, Novi Sad, Serbia, 19 January 2007
- "Introduction to gLite", A. Balaz, gLite Training for Users, Novi Sad, Serbia, 19 January 2007
- "gLite Basic Services", A. Balaz, gLite Training for Users, Novi Sad, Serbia, 19 January 2007

- “AEGIS, EGEE-II, and SEE-GRID-2 Infrastructure Overview”, A. Balaz, gLite Training for Users, Novi Sad, Serbia, 19 January 2007
- “Data Mangement”, N. Svraka, gLite Training for Users, Novi Sad, Serbia, 19 January 2007
- “gLite WMS”, N. Svraka, gLite Training for Users, Novi Sad, Serbia, 19 January 2007
- “Speeding up and Stabilising the CE”, A. Balaz, Presented at WLCG Operations Workshop, CERN, 25-26 January, 2007
- “Serbian NGI – AEGIS – Report”, presented by A. Balaz at the SEE-GRID-2 PSC04 Meeting on Kopaonik, Serbia, 12-13 March 2007
- “HPC Experiences in South Eastern Europe, presented by A. Balaz at the Advanced School in High Performance Computing : Tools for e-Science at International Centre for Theoretical Physics, Trieste, Italy, March 2007
- “Serbian Grid Infrastructure: AEGIS, EGEE-II, SEE-GRID-2”, presented by A. Balaz at the AEGIS dissemination event during the YUINFO06 conference on Kopaonik, Serbia, 13 March 2007
- “Grid Paradigm and Calculation of Path Integrals in Quantum Physics”, presented by A. Balaz at SEENET-MTP seminar at the Faculty of Science and Mathematics of the University of Nis, 13 April 207
- “Design and Basic Services of gLite Grid Middleware”, A. Balaz, EGEE-II/SEE-GRID-2 gLite Training Event, Astronomical Observatory Belgrade, Serbia, 17 April 2007
- “AEGIS, EGEE-II, and SEE-GRID-2 Infrastructure Overview”, A. Balaz, EGEE-II/SEE-GRID-2 gLite Training Event, Astronomical Observatory Belgrade, Serbia, 17 April 2007
- “SEE-GRID Operations”, A. Balaz, Presented at WLCG/EGEE ROC Managers phone meeting, 18 April 2007
- “Systematic Speedup of Path Integrals”, presented by A. Bogojevic on the occasion of receiving of IPB prize for scientific achievements, 4 May 2007
- “New Scientific Method”, presented by A. Bogojevic at the Gallery of the Serbian Academy of Sciences and Arts, 25 May 2007
- "Efficient calculation of energy expectation values in path integral formalism", presented by J. Grujic at the Four Seas Conference, Iasi, Romania, 29 May – 3 June 2007
- "SEE-GRID operational tools and Grid services improvements", presented by A. Balaz at the EGEE/WLCG Operations Meeting, Stockholm, Sweden, 11-15 June 2007
- “Modern Cosmology”, presented by D. Stojkovic, Kolarac National University, Belgrade, 21 June 2007
- D. Arsenovic, series of lectures on programing techniques for recent nVIDIA 8800 GPUs, July 2007
- Presentations by D. Stojiljkovic and I. Vidanovic at the QTS-5 Conference, Valladolid, Spain, 22 July 2007
- Presentations by J. Grujic, I. Vidanovic, and Marija Mitrovic at the International Student Conference of Balkan Physical Union (ISC-BPU 5), Bodrum, Turkey, 21-24 August 2007
- Presentations by A. Belic and A. Balaz at the AEGIS 2007 Annual Assembly, School of Electrical Engineering, University of Belgrade, Serbia, 7 September 2007

- Presentations by A. Balaz and I. Vidanovic at the Path Integrals - New Trends and Perspectives (PI07) Conference, Max Planck Institute for Physics of Complex Systems, Dresden, Germany, 23-28 September 2007
- Presentation by A. Belic at the FIS'07 HEP Conference, Fruska Gora, Serbia, 26 September 2007
- Presentation by A. Balaz at the Advanced School on Quantum Monte Carlo Methods in Physics and Chemistry, ICT, Trieste, Italy, 21 January - 2 February 2008
- Presentations by A. Belic and A. Balaz at the Parallel and Distributed Computing Seminar, Center for Scientific Research of SASA, University of Kragujevac, Serbia, 28 March 2008
- Presentation by M. Milovanovic at the 2008 APS March Meeting, New Orleans, Louisiana, USA, 10-14 March 2008
- Presentation by A. Balaz at the SEE-GRID-SCI Kick-off meeting, Athens, Greece, 20-23 May 2008
- Presentations by A. Balaz and D. Vudragovic at GRID Training of Meteorologists, School of Electrical Engineering, University of Belgrade, Serbia, 25 June 2008
- Presentations by A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, and B. Ackovic at the Induction Grid Training for Users, Institute of Physics Belgrade, Serbia, 19 September 2008
- Presentations by A. Balaz and I. Vidanovic at the Quo vadis BEC conference, Physikzentrum in Bad Honnef, Germany, 29-31 October 2008
- A. Balaz: Lectures on HPC and Grid computing, Advanced School in High Performance and GRID Computing, International Centre for Theoretical Physics, Trieste, Italy, November 3 – 14, 2008
- Presentations by A. Belic, D. Vudragovic and V. Slavnic at the Introduction to Cluster and Grid Computing in Mechanical Engineering, Institute of Physics Belgrade, Serbia, 18 November 2008
- Presentations by A. Belic, A. Balaz, D. Vudragovic, V. Slavnic and B. Ackovic at the AEGIS Training for Site Administrators, Institute of Physics Belgrade, Serbia, 10-11 December 2008
- Presentations by A. Belic and A. Balaz at the AEGIS 2008 Annual Assembly, Institute of Physics Belgrade, Serbia, 11 December 2008
- Presentations by A. Bogojevic and A. Balaz at the High Performance Computing in Serbia and Europe Workshop, Union University School of Computing, Serbia, 23 January 2009
- A. Balaz: Lectures on HPC and Grid computing, 2nd Workshop on High Performance Computing, held at the Institute of Research in Fundamental Sciences (IPM) and Shahid Beheshti University in Tehran, Iran, January 25 – February 4, 2009
- A. Balaz: lecture on path integral Monte Carlo, Isfahan University of Technology, Isfahan, Iran, February 3, 2009
- Presentations by A. Belic, A. Balaz, and D. Vudragovic at the Introduction to High Performance and Grid Computing Workshop, Faculty of Sciences, University of Novi Sad, Serbia, 6 February 2009
- Presentations by A. Belic, D. Vudragovic, V. Slavnic, and B. Ackovic at the Grid Training for Union University School of Computing students, Institute of Physics Belgrade, Serbia, 19 February 2009

- Presentations by A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, and B. Ackovic at the Regional SEE-GRID-SCI Training for Site Administrators, Institute of Physics Belgrade, Serbia, 5-6 March 2009
- Presentations by A. Balaz and I. Stankovic at the series of Seminars on Modern Physics, Faculty of Physics, University of Belgrade, Serbia, 11 March 2009
- Presentation by A. Balaz at the DPG 2009 Spring Meeting, Dresden, Germany, 22-27 March 2009
- Presentations by A. Balaz, D. Vudragovic, V. Slavnic, and B. Ackovic at the Grid Computing Hands On Training for Users, Faculty of Sciences, University of Novi Sad, Serbia, 25 April 2009
- Presentation by A. Balaz at the Conference on Research Frontiers in Ultra-Cold Atoms, ICTP, Trieste, Italy, 4-8 May 2009
- Presentation by V. Slavnic at the GRID and WRF-ARW Model Training, University of Banja Luka, Banja Luka, Bosnia and Herzegovina, 2-3 July 2009
- Presentation by A. Belic at the Towards Integration into the European Research Area EU Research Information Event, Belgrade, Serbia, 29 June 2009
- Presentations by I. Stankovic and D. Tanaskovic at the International Student Conference of the Balkan Physical Union, Bodrum, Turkey, 4-7 September 2009
- Presentations by V. Slavnic at the XXII International Symposium on Nuclear Electronics and Computing, Varna, Bulgaria, 7-14 September 2009
- Presentations by A. Belic, A. Balaz, and D. Vudragovic at the EGEE'09 Conference, Barcelona, Spain, 21-25 September 2009
- Presentations by V. Slavnic and B. Ackovic at the Grid training for Petnica students of Mathematics and Computing Science, Petnica Science Center, Valjevo, Serbia, 6 October 2009
- Presentations by V. Slavnic and B. Ackovic at the Grid training for Petnica students of Astronomy, Petnica Science Center, Valjevo, Serbia, 7 October 2009
- Presentations by A. Balaz and I. Vidanovic at the 2009 Arnold Sommerfeld Summer School on Condensed Matter Physics with Ultracold Quantum Gases, Ludwig-Maximilians University, Munich, Germany, 12-16 October 2009
- Presentations by B. Ackovic at the Grid training for Petnica students of Physics, Petnica Science Center, Valjevo, Serbia, 20 October 2009
- Presentation by A. Bogojevic at the CERN outreach program for physics teachers from Serbia, CERN, Geneve, Switzerland, 1 November 2009
- Presentations by A. Belic, V. Slavnic, and B. Ackovic at the Grid training for IPB Business Partners, Institute of Physics Belgrade, Serbia, 3 November 2009
- Presentation by D. Vudragovic at the High Energy Physics Exhibition and Popularization Event, Dimitrovgrad, Serbia, 28 November 2009
- A. Balaz: Lectures on HPC and Grid computing, Advanced School in High Performance and GRID Computing, International Centre for Theoretical Physics, Trieste, Italy, November 30 - December 11, 2009

- Presentations by V. Slavnic at the SEE-GRID-SCI User Forum 2009, Istanbul, Turkey, 9 December 2009

4.2.3. Scientific Papers/Publications

- J. Grujic, A. Bogojevic, A. Balaz, "Energy estimators and calculation of energy expectation values in the path integral formalism", Phys. Lett. A 360, 217 (2006)
- D. Stojiljkovic, A. Bogojevic, A. Balaz, "Efficient calculation of energy spectra using path integrals", Phys. Lett. A 360, 205 (2006)
- D. Stojiljkovic, A. Balaz, A. Bogojevic, A. Belic, “Grid Approach to Path Integral Monte Carlo Calculations”, in Proceedings of INDEL 2006 Conference, Banjaluka, Bosnia and Herzegovina, 10-11 November 2006
- N. Svraka, A. Balaz, A. Belic, A. Bogojevic, “gLite Workload Management System Performance Measurements”, in Proceedings of INDEL 2006 Conference, Banjaluka, Bosnia and Herzegovina, 10-11 November 2006
- D. Arsenovic, S. B. Vrhovac, Z. M. Jaksic, Lj. Budinski-Petkovic, and A. Belic, “Simulation Study of Granular Compaction Dynamics under vertical tapping”, *Phys. Rev* E 74, 061302, (2006).
- S. B. Vrhovac, Z. M. Jaksic, Lj. Budinski-Petkovic, and A. Belic, "Linear kinetic equation: Long-time behavior of one-particle distribution function", *Eur. Phys. J.* B 53, 225 (2006)
- Lj. Budinski-Petkovic, M. Petkovic, Z. M. Jaksic, and S. B. Vrhovac, "Compaction of anisotropic granular materials: symmetry effects", *Mat. Sci. Forum* 518, 355 (2006)
- A. Bogojevic, A. Lalovic, and B. Ackovic, "Model of Binary System Formation", *Publ. Astronomical Observatory Belgrade* no 80 , 123-127 (2006)
- A. Bogojevic, A. Balaz, and A. Belic, "Spacing of Planets in an Effective Gravitational Accretion Model", *Publ. Astronomical Observatory Belgrade* no 80 , 149-153 (2006)
- A. Bogojevic, A. Balaz, and A. Belic, "Linearized Gaussian Halving in d=1", *Physics of Low-Dimensional Structures* no 1 , 52 (2006)
- A. Bogojevic, A. Balaz, and A. Belic, "Gaussian Halving of Path Integrals in d=1", *Physics of Low-Dimensional Structures* no 1, 49 (2006)
- A. Bogojević, A. Balaž and A. Belić, "Euler Summation Formula for Path Integrals", *Facta Universitatis* **4**, 219-232. (2006).
- A. Bogojević, A. Balaž, and A. Belić, "The Use of Path Integral Ideals: Deriving the Euler Summation Formula for Path Integrals", 2nd International Conference on p-Adic Mathematical Physics, AIP Conference Proceedings Volume **826**, 320-329 (2006).
- A. Bogojević, A. Balaž and A. Belić, "Path integrals and Euler summation formula", Proceedings of LT-6 Workshop, Sofia, 205-210 (2006).
- J. Grujić, "Efficient Calculation of Energy Expectation Values in the Path Integral Formalism", Marie Curie Workshop 2006 in Croatia and Serbia, Zagreb and Belgrade, 44 (2006).
- M. Mitrović, "Heuristic algorithm for determination of local properties of scale-free networks", Marie Curie Workshop 2006 in Croatia and Serbia, Zagreb and Belgrade, 45 (2006).

- M. V. Milovanović and A. Petković, "Meron and Haldane-Shastry Spin Chain States in Quantum Dots", APS March Meeting, Baltimore, B23.00014, 2006.
- A. Petkovic and M. V. Milovanovic, "Fractionalization into Merons in Quantum Dots", *Phys. Rev. Lett.* **98**, 066808 (2007).
- M. V. Milovanovic, "Wavefunctional Approach to the Bilayer nu = 1 System and a Possibility for a Double Non-Chiral Pseudospin Liquid", *Phys. Rev. B* **75**, 035314 (2007).
- Z. Papic and M.V. Milovanovic, "Quantum Disordering of the 111 State and the Compressible - Incompressible Transition in Quantum Hall Bilayer Systems", *Phys. Rev. B* **75**, 195304 (2007).
- D. Arsenovic, B. Vrhovac, Z. M. Jaksic, Lj. Budinski-Petkovic, and A. Belic, "Simulation Study of Granular Compaction Dynamics Under Vertical Tapping", *Mat. Sci. Forum* **555**, 107 (2007)
- I. Lončarević, Lj. Budinski-Petković, and S. B. Vrhovac, "Simulation study of random sequential adsorption of mixtures on a triangular lattice", *Eur. Phys. J. E* **24**, 19-26 (2007).
- I. Lončarević, Lj. Budinski-Petković, and S. B. Vrhovac, "Reversible random sequential adsorption of mixtures on a triangular lattice", *Phys. Rev. E* **76**, 031104-031104-9 (2007).
- A. Belić, "Large-scale simulations of complex physical systems", AIP Conference Proceedings Series 899, Sixth International Conference of the Balkan Physical Union, 76-79 (2007).
- N. Švraka, A. Balaž, A. Belić, and A. Bogojević, "Stability and Performance of gLite Workload Management System", INFOTEH 2007, Sarajevo, E-III-6 (2007).
- A. Balaž, A. Bogojević, I. Vidanović, A. Belić, "Accelerated Path Integral Calculations via Effective Actions", Proceedings of the Path Integrals - New Trends and Perspectives conference, Dresden, Germany, September 2007
- I. Vidanović, A. Balaž, A. Bogojević, A. Belić, "Systematic Speedup of Energy Spectra Calculations for Many-Body Systems", Proceedings of the Path Integrals - New Trends and Perspectives conference, Dresden, Germany, September 2007
- M. V. Milovanović and Z. Papić, "Quantum Disordering of a Quantum Hall Superfluid", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 127-129 (2007).
- A. Belić, A. Balaž, and A. Bogojević, "Pan-European Grid eInfrastructure for LHC Experiments at CERN - SCL's Activities in EGEE", Proceedings of FIS07, Novi Sad (2007).
- I. Vidanović, A. Balaž, A. Bogojević, A. Belić, "Effective Actions for Path Integral Monte Carlo Calculations", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 201-204 (2007).
- I. Loncarević, Lj. Budinski-Petković and S. B. Vrhovac, "Adsorption-Desorption Proccesses of Mixtures on a Triangular Lattice", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 185-188 (2007).
- I. Loncarević, Lj. Budinski-Petković and S. B. Vrhovac, "Irreversible Deposition of Mixtures on a Triangular Lattice", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 189-192 (2007).
- D. Arsenović, S.B. Vrhovac, Z.M. Jaksić, Lj. Budinski-Petković, A. Belić, "Simulation Study of Granular Compaction", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 193-196 (2007).

- I. Vidanović and S. Elezovic-Hadzić, "Force-Induced Desorption of a Linear Polymer Adsorbed on a Boundary of the Sierpinski Gasket Fractal", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 172-175 (2007).
- M. Mitrović and A. Belić, "Heuristic algorithm for determination of local properties of scale-free networks", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 181-184 (2007).
- J. Grujić, A. Bogojević, A. Balaž, "Efficient Calculation of Energy Expectation Values in the Path Integral Formalism", Proceedings of XVII National Symposium on Condensed Matter Physics, Vrsac, 114 (2007).
- D. Tanaskovic, V. Dobrosavljevic and E. Miranda, "Spin Liquid Behavior in Electronic Griffiths Phases", *XVII National Symposium on Condensed Matter Physics (SFKM - 2007)* (2007) 122-125, *Vršac - Serbia*
- J. Grujić, A. Bogojević, and A. Balaž, "Efficient calculation of energy expectation values in the path integral formalism", Proceedings of 5th International Student Conference of the Balkan Physical Union, 80 (2007).
- I. Vidanović, A. Bogojević, and A. Balaž, "Efficient calculation of energy expectation values in the path integral formalism", Proceedings of 5th International Student Conference of the Balkan Physical Union, 82 (2007).
- M. Mitrović "Heuristic algorithm for determination of local properties", Proceedings of 5th International Student Conference of the Balkan Physical Union, 111 (2007).
- C. Vuerli, F. Pasian, G. Taffoni, H. Kornmayer, L. Hluchý, M. Lechner, M.L. Dubernet, E. Valentijn, E. Martinez-Gonzalez, A. Belić, "Astrophysics in EGEE", Proceedings of Astronomical Data Analysis Software & Systems XVII, London, P1.024 (2007).
- J. A. Sobota, D. Tanaskovic and V. Dobrosavljevic, "RKKY Interactions in the Regime of Strong Localization", *Phys. Rev. B* **76** (2007) 245106
- A. Bogojevic, I. Vidanovic, A. Balaz, and A. Belic, "Fast convergence of path integrals for many-body systems", *Phys Lett A* 372, 3341 (2008).
- A. Bogojević, A. Balaž, and R. Karapandža, "Consequences of Life Extension on Fertility and Wealth", *Physica A* **387**, 543-550 (2008).
- M. MItrovic, and B. Tadic, “Search of weighted subgraphs on complex networks with maximum likelyhood methods”, LNCS 5102, 551 (2008)
- J. Dimitrijevci, A. Krmpot, M. Mijailovic, D. Arsenovic, B. Panic, Z. Grujic, and B. Jelenkovic, “Role of transferse magnetic fields in electromagnetically induced absorption for elliptically polarized light”, Phys. Rev. A 77, 013814 (2008)
- M. V. Milovanovic, and Z. Papic, “Non-perturbative approach to the quantum Hall bi-layer”, APS March Meeting, New Orleans, Louisiana, USA (2008)
- A. Balaz, I. Vidanovic, A. Bogojevic, and A. Pelster, “Path integrals without integrals”, DPG 2008 spring conference DY-29.16, Berlin, Germany (2008)
- Lj. Budinski-Petkovic, I. Loncarevic and S. B. Vrhovac: "Random Sequential Adsorption of Polydisperse Mixtures on Discrete Substrates", Phys. Rev. E 78 (2008) 061603
- Z. M. Jaksic, S. B. Vrhovac, B. Panic, Z. Nikolic and B. Jelenkovic: "Upward Penetration of Grains Through a Granular Medium", Eur. Phys. J. E. 27 (2008) 345

- J. Grujic: "Movies Recommendation Networks As Bipartite Graphs", LNCS 5102 (2008) 576-583
- D. Stojiljkovic, A. Bogojevic and A. Balaz: "Energy Levels and Expectation Values via Accelerated Path Integral Monte Carlo", in J. Phys. Conf. Ser. 128 (2008) 012062, Proceedings of the QTS-5 Conference, Valladolid, Spain, 22-28 July 2007
- A. Balaz, I. Vidanovic and A. Bogojevic: "Accelerated Path Integral Calculations for Many-body Systems", in J. Phys. Conf. Ser. 128 (2008) 012048, Proceedings of the QTS-5 Conference, Valladolid, Spain, 22-28 July 2007
- I. Vidanovic, A. Balaz, A. Bogojevic and A. Pelster: "Calculation of Tc of 87Rb BEC using High-order Effective Actions", in Quo Vadis BEC? Conference (2008) Bad Honnef, Germany
- Z. Papic, M. Goerbig and N. Regnault: "Theoretical Expectations for a Fractional Quantum Hall Effect in Graphene", Solid State Comm. 149 (2009) 1056-1060
- B. Novakovic, A. Balaz, Z. Knezevic and M. Potocnik: "Computation of Asteroid Proper Elements on the Grid", Serb. Astron. J. 179 (2009) 75
- I. Vidanovic, A. Bogojevic, A. Balaz and A. Belic: "Properties of Quantum Systems Via Diagonalization of Transition Amplitudes. II. Systematic Improvements of Short-time Propagation", Phys. Rev. E 80 (2009) 066706
- I. Vidanovic, A. Bogojevic and A. Belic: "Properties of Quantum Systems Via Diagonalization of Transition Amplitudes. I. Discretization Effects", Phys. Rev. E 80 (2009) 066705
- M. V. Milovanovic, T. Jolicoeur and I. Vidanovic: "Modified Coulomb Gas Construction of Quantum Hall States from Nonunitary Conformal Field Theories", Phys. Rev. B 80 (2009) 155324
- I. E. Stankovic: "Towards Understanding of Influence of Restricted Geometry on Self-Diffusion in Porous Media", Acta Phys. Pol. A 116 (2009) 701
- A. Balaz, A. Bogojevic, I. Vidanovic and A. Pelster: "Recursive Schrödinger Equation Approach to Faster Converging Path Integrals", Phys. Rev. E 79 (2009) 036701
- M. V. Milovanovic and Z. Papic: "Nonperturbative Approach to the Quantum Hall Bilayer", Phys. Rev. B 79 (2009) 115319
- J. Zivkovic, M. Mitrovic and B. Tadic: "Correlation Patterns in Gene Expressions Along the Cell Cycle of Yeast", Studies in Computational Intelligence (2009)
- M. V. Milovanovic, E. Dobardzic and Z. Radovic: "Meron ground states of quantum Hall droplet", Phys. Rev. B 80 (2009) 125305
- Z. Papic, G. Moller, M. V. Milovanovic, N. Regnault and M. Goerbig: "Fractional Quantum Hall State at Nu=1/4 in a Wide Quantum Well", Phys. Rev. B 79 (2009) 245325
- Z. Papic, N. Regnault and S. Das Sarma: "Interaction-tuned Compressible-to-incompressible Phase Transitions in the Quantum Hall Systems", Phys. Rev. B 80 (2009) 201303(R)
- O. Prnjat, A. Balaz, T. Gurov, M. Kon-Popovska, I. Liabotis, G. Neagu, B. Ortakaya, C. Sener and D. Vudragovic: "National Grid Initiatives Set-up and Monitoring Guidelines", Proceedings of the First EELA-2 Conference,
- D. Vudragovic, A. Balaz, V. Slavnic and A. Belic: "Dwarf - the Framework for Authorized YUM/APT Repositories Management", INFOTEH 2009, 18-20 March 2009 (2009) 721, E-V-8, Jahorina, Bosnia and Herzegovina

- A. Balaz, I. Vidanovic, A. Bogojevic and A. Pelster: "Ultrafast Converging Path Integral Approach for Rotating Ideal Bose Gases", DPG 2009 Conference (2009) Dresden, Germany, Presentation DY-1.4
- D. Vudragovic, V. Slavnic, A. Balaz and A. Belic: "WMSMON - GLite WMS Monitoring Tool", MIPRO 2009, 25-29 May 2009, GSV-02, p. 239-243, Opatia, Croatia (2009)
- A. Balaz, I. Vidanovic, A. Bogojevic and A. Pelster: "Short-time Effective Action Approach for Numerical Studies of Rotating Ideal BECs", Conference on Research Frontiers in Ultra-Cold Atoms, 4-8 May 2009 (2009) ICTP,
- V. Slavnic, B. Ackovic, D. Vudragovic, A. Balaz, A. Belic and M. Savic: "Grid Site Monitoring Tools Developed and Used at SCL", Proceedings of the SEE-GRID-SCI User Forum 2009, 09-10 December 2009, Istanbul, Turkey (2009) 123
- B. Ackovic, D. Vudragovic, A. Balaz and A. Belic: "Operational Grid Tools Developed at SCL", Proceedings of the SEE-GRID-SCI User Forum 2009, 09-10 December 2009, Istanbul, Turkey (2009) 117
- A. Balaz, D. Stojiljkovic, A. Belic and A. Bogojevic: "Optimization and Porting of the Path Integral Monte Carlo SPEEDUP Code to New Computing Architectures", Proceedings of the SEE-GRID-SCI User Forum 2009, 09-10 December 2009, Istanbul, Turkey (2009) 133

4.2.4. Promotion package

- CX-CMCS info sheet
- CX-CMCS core brochure
- CX-CMCS core presentation
- CX-CMCS logo
- Press release regarding the CX-CMCS project kick-off, July 2006
- Press release regarding the visit of EU Commissioner Potocnik, July 2006
- SCL activities covered in the EGEE newsletter, September 2006
- SCL activities covered in the International Science Grid this Week newsletter, March 2007
- video: Upgrade of Grid Site
- poster: Lux et Scientia
- poster: Grid Computing
- SCL activities covered in the EGEE newsletter, April 2008
- video: Accessing Complexity
- video: Striving for Excellence
- Press release marking start of LHC at CERN, September 2008
- video: Blue Danube supercomputing initiative launched
- Press release on the occasion of launching of the Blue Danube supercomputing initiative
- poster: Beograd je sistem (Belgrade is system)

- SCL activities covered in the SEE-GRID-SCI newsletter, April 2009
- Press release on the occasion of signing of the Memorandum of Understanding between IPB and IBM
- SCL activities covered in the SEE-GRID-SCI newsletter, December 2009

4.2.5. Selected Articles / Newsletters

- Press release regarding the CX-CMCS project kick-off, July 2006
- Press release regarding the visit of EU Commissioner Potocnik; July 2006
- EGEE Newsletter points to SCL activity, September 2006
- SCL's researcher guest on Serbian National TV RTS special on Brain-Drain, January 2007
- Interview of SCL researchers and students for weekly newspaper Ana, February 2007
- Interview of SCL's Aleksandar Bogojevic for daily newspaper Danas, February 2007
- Interview of SCL's Aleksandar Bogojevic in daily newspaper Glas Javnosti, February 2007
- SCL article "Government to Grid" in International Science Grid this Week, March 2007
- SCL's Aleksandar Bogojevic interviewed on BBC Radio, March 2007
- Article about SCL and Grids on B92 Internet portal, April/May 2007
- Article about CX-CMCS in the weekly newspaper Vreme, May 2007
- Interview of SCL's Aleksandar Bogojevic for magazine Standard, May 2007
- Business & Finance profiles SCL, May 2007
- Interview of SCL's Aleksandar Bogojevic for daily newspaper Danas, June 2007
- SCL student Jelena Grujic in science magazine on Serbian National TV RTS, June 2007
- SCL associate Dejan Stojkovic featured in USA Today, June 2007
- SCL student Jelena Grujic interviewed on Radio Belgrade, September 2007
- SCL student Jelena Grujic guest hosts on Radio Belgrade, October 2007
- SCL student on Radio B92, November 2007
- SCL featured in daily newspaper Vecernje Novosti, March 2008
- SCL article appears in EGEE Newsletter, April 2008
- SCL article about supercomputers on the B92 web portal, September 2008
- Interview of SCL's Antun Balaz for weekly magazine Vreme, December 2008
- Article about SCL's popularization of science initiative in magazine Vreme, March 2009
- Interview of SCL's Aleksandar Bogojevic for e-Novine, March 2009
- SCL featured in daily newspaper Vecernje Novosti, March 2009
- SCL featured in SEE-GRID-SCI Newsletter, April 2009
- Interview of SCL's Antun Balaz for weekly magazine Vreme, June 2009

- SCL featured in SEE-GRID-SCI Newsletter, December 2009

4.2.6. Workshops

- A. Balaz, 2nd Supercomputing Day, Texas A&M University at Qatar, September 13, 2006, Doha, Qatar
- A. Balaz, "SEE-GRID Infrastructure and Grid Operations", SEE-GRID Regional Grids Concertation Workshop held during the EGEE'06 Conference, Geneva, September 28, 2006
- M. Mitrovic and J. Grujic, Marie Curie Workshop 2006: Commemorating the 150th Anniversary of the Birth of Nikola Tesla, Zagreb and Belgrade, October 7, 2006
- D. Stojiljkovic and N. Svraka, INDEL 2006 Conference, Banjaluka, Bosnia and Herzegovina, 10-11 November 2006
- A. Balaz participated at the Operations Workshop, part of WLCG Collaboration Workshop, 22-26 January 2007
- AEGIS dissemination event during the YUINFO06 conference on Kopaonik, Serbia, 13 March 2007
- Participation of A. Balaz as the lecturer, two SCL students as Teaching Assistants, and two SCL students as participants in the Advanced School in High Performance Computing Tools for e-Science - joint DEMOCRITOS/INFM-eLab/SISSA-ICTP activity, held in March 2007 at the International Centre for Theoretical Physics, Trieste, Italy
- A. Balaz, SEENET-MTP seminar at the Faculty of Science and Mathematics of the University of Nis, 13 April 207
- J. Grujic, Four Seas Conference, Iasi, Romania, 29 May – 3 June 2007
- A. Balaz, D. Vudragovic, EGEE/WLCG Operations Meeting, Stockholm, Sweden, 11-15 June 2007
- D. Stojiljkovic, I. Vidanovic participated in QTS-5 Conference, Valladolid, Spain, 22 July 2007
- J. Grujic participated in International Summer School "Statistical Physics of Gene Regulation: From Networks to Expression Data and Back", Jacobs University, Bremen, Germany, 16-28 July 2007
- J. Grujic, I. Vidanovic, Marija Mitrovic participated in International Student Conference of Balkan Physical Union (ISC-BPU 5), Bodrum, Turkey, 21-24 August 2007
- A. Belic, A. Balaz, N. Svraka, B. Ackovic participated in AEGIS 2007 Annual Assembly, School of Electrical Engineering, University of Belgrade, Serbia, 7 September 2007
- A. Balaz, I. Vidanovic participated in the Path Integrals - New Trends and Perspectives (PI07) Conference, Max Planck Institute for Physics of Complex Systems, Dresden, Germany, 23-28 September 2007
- A. Belic participated in FIS'07 HEP Conference, Fruska Gora, Serbia, 26 September 2007
- A. Belic, A. Bogojevic, A. Balaz participated in EGEE'07 Conference, Budapest, Hungary, 1-5 October 2007
- A. Bogojevic, B. Ackovic participated in Science Festival, Belgrade, Serbia, 1 December 2007

- A. Balaz, D. Tanaskovic participated on Advanced School on Quantum Monte Carlo Methods in Physics and Chemistry, ICT, Trieste, Italy, 21 January - 2 February 2008
- A. Belic, A. Balaz participated in Parallel and Distributed Computing Seminar, Center for Scientific Research of SASA, University of Kragujevac, Serbia, 28 March 2008
- A. Belic, A. Balaz participated in SEE-GRID-2 Events, Polytechnic University of Tirana, Albania, 31 March 2008
- M. Milovanovic participated in 2008 APS March Meeting, New Orleans, Louisiana, USA, 10-14 March 2008
- A. Belic, A. Balaz, D. Vudragovic participated in LHC Exhibition, Gallery of the Serbian Academy of Sciences and Arts, Belgrade, Serbia, 16 April 2008
- M. Mitrovic, J. Grujic participated in Workshop and Seminar on "Bio-inspired Complex Networks in Science and Technology", Max Planck Institute, Dresden, Germany, 14 April - 9 May 2008
- A. Belic, A. Balaz participated in SEE-GRID-SCI Kick-off meeting, Athens, Greece, 20-23 May 2008
- A. Balaz, D. Vudragovic participated in GRID Training of Meteorologists, School of Electrical Engineering, University of Belgrade, Serbia, 25 June 2008
- Z. Papic participated in the Exact methods in low-dimensional statistical physics and quantum computing school, Les Houches, France, 30 June - 1 August 2008
- J. Grujic participated on Mathematics and Society: Cooperation, Social Networks and Complexity School, San Lorenzo de El Escorial, Spain, 15-18 July 2008
- A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic participated in the Induction Grid Training for Users, Institute of Physics Belgrade, Serbia, 19 September 2008
- A. Balaz, D. Vudragovic participated in EGEE'08 Conference, Istanbul, Turkey, 22-26 September 2008
- A. Balaz, I. Vidanovic participated in the Quo vadis BEC conference, Physikzentrum in Bad Honnef, Germany, 29-31 October 2008
- A. Balaz, I. Vidanovic, M. Mitrovic participated in Advanced School in High Performance and GRID Computing, ICTP, Trieste, Italy, 3-14 November 2008
- A. Belic, D. Vudragovic, V. Slavnic participated in Introduction to Cluster and Grid Computing in Mechanical Engineering, Institute of Physics Belgrade, Serbia, 18 November 2008
- D. Vudragovic participates in Gri operations meeting, Abingdon, UK, 3-5 December 2008
- D. Vudragovic, B. Ackovic participated in Science Festival 2008, Belgrade, Serbia, 7 December 2008
- A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic participated in AEGIS Training for Site Administrators, Institute of Physics Belgrade, Serbia, 10-11 December 2008
- A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic participated in AEGIS 2008 Annual Assembly, Institute of Physics Belgrade, Serbia, 11 December 2008
- D. Vudragovic participated in the Learning with ATLAS at CERN project's kick-off meeting, Athens, Greece, 12-13 December 2008

- A. Bogojevic, A. Balaz, D. Vudragovic, I. Smolic, B. Ackovic participated at High Performance Computing in Serbia and Europe Workshop, Union University School of Computing, Serbia, 23 January 2009
- A. Balaz participated at 2nd Workshop on High Performance Computing, Shahid Beheshti University, Tehran, Iran, 25 January - 4 February 2009
- A. Belic, A. Balaz, D. Vudragovic participated at Introduction to High Performance and Grid Computing Workshop, Faculty of Sciences, University of Novi Sad, Serbia, 6 February 2009
- V. Slavnic, D. Vudragovic participated in PRACE Winter School on Petascale Computing, Athens, Greece, 10-13 February 2009
- A. Belic, D. Vudragovic, V. Slavnic, B. Ackovic participated in Grid Training for Union University School of Computing students, Institute of Physics Belgrade, Serbia, 19 February 2009
- A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic participated in Regional SEE-GRID-SCI Training for Site Administrators, Institute of Physics Belgrade, Serbia, 5-6 March 2009
- A. Balaz, I. Stankovic participated on series of Seminars on Modern Physics, Faculty of Physics, University of Belgrade, Serbia, 11 March 2009
- A. Balaz participated in the DPG 2009 Spring Meeting, Dresden, Germany, 22-27 March 2009
- V. Slavnic participated in the Scientific POWER Meeting, Mazurian Lakes, Poland, 26-28 March 2009
- A. Balaz, B. Ackovic participated in Physics Live Conference, Faculty of Physics, University of Belgrade, 11 April 2009
- A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic participated in Grid Computing Hands On Training for Users, Faculty of Sciences, University of Novi Sad, Serbia, 25 April 2009
- A. Balaz participated at Conference on Research Frontiers in Ultra-Cold Atoms, ICTP, Trieste, Italy, 4-8 May 2009
- V. Slavnic participated in GRID and WRF-ARW Model Training, University of Banja Luka, Banja Luka, Bosnia and Herzegovina, 2-3 July 2009
- V. Slavnic participated in Computing Science Summer School, Saint-Lambert-des-Bois, France, June 8-19, 2009
- A. Belic participated at Towards Integration into the European Research Area EU Research Information Event, Belgrade, Serbia, 29 June 2009
- V. Slavnic, B. Ackovic participated in OpenSolaris Summer School, Institute of Physics Belgrade, Serbia, 30 July 2009
- D. Vudragovic participated at PDC Summer School 2009, Stockholm, Sweden, 17-28 August 2009
- V. Slavnic participated in 7th annual International GridKa School, Karslruhe, Germany, 31 August - 4 September 2009
- I. Stankovic, D. Tanaskovic participated at the International Student Conference of the Balkan Physical Union, Bodrum, Turkey, 4-7 September 2009

- M. Radonjic, J. Vucicevic participated at European School on Magnetism 2009, Timisoara, Romania, 1-10 September 2009
- V. Slavnic participated in the XXII International Symposium on Nuclear Electronics and Computing, Varna, Bulgaria, 7-14 September 2009
- A. Belic, A. Balaz, D. Vudragovic participated at EGEE'09 Conference, Barcelona, Spain, 21-25 September 2009
- V. Slavnic, B. Ackovic participated in the Grid training for Petnica students of Mathematics and Computing Science, Petnica Science Center, Valjevo, Serbia, 6 October 2009
- V. Slavnic, B. Ackovic participated in the Grid training for Petnica students of Astronomy, Petnica Science Center, Valjevo, Serbia, 7 October 2009
- I. Vidanovic attended PreDoc school on Ultracold Quantum Gases of Atoms and Molecules, Les-Houches, France, 27 September - 9 October 2009
- A. Balaz, I. Vidanovic participated in the 2009 Arnold Sommerfeld Summer School on Condensed Matter Physics with Ultracold Quantum Gases, Ludwig-Maximilians University, Munich, Germany, 12-16 October 2009
- B. Ackovic participated in the Grid training for Petnica students of Physics, Petnica Science Center, Valjevo, Serbia, 20 October 2009
- V. Slavnic attended HPC Workshop, Barcelona Supercomputing Center, Spain, 21-23 October 2009
- A. Bogojevic participated in the CERN outreach program for physics teachers from Serbia, CERN, Geneve, Switzerland, 1 November 2009
- A. Belic, V. Slavnic, B. Ackovic participated in the Grid training for IPB Business Partners, Institute of Physics Belgrade, Serbia, 3 November 2009
- D. Vudragovic participated in the High Energy Physics Exhibition and Popularization Event, Dimitrovgrad, Serbia, 28 November 2009
- A. Balaz and V. Slavnic participated in SEE-GRID-SCI User Forum 2009, Istanbul, Turkey, 9 December 2009
- A. Balaz, M. Radonjic, J. Vucicevic and J. Scepanovic attended the Advanced School in High Performance and GRID Computing, ICTP, Trieste, Italy, 30 November - 11 December 2009

4.2.7. Dissemination and use material

- Lecture notes in Monte Carlo methods and applications, by A. Belic
- Lecture notes in Quantum Field Theory, by A. Bogojevic
- Lecture notes on Strongly Correlated Quantum Systems, by M. Milovanovic

4.2.8. Trainings

Below is the list of major training events organized during the project:

- gLite Site Administrator Training meeting and set up the new GRID site in Kragujevac – AEGIS04-KG, held on 24. June 2006 at CSANU

- A. Belic, A. Balaz, N. Svraka, B. Ackovic, gLite training for users in Novi Sad, Serbia, 19 January 2007
- A. Balaz, N. Svraka, B. Ackovic, gLite Training Event, Astronomical Observatory Belgrade, Serbia, 17 April 2007
- A. Zaric, Site Administrators' Training on Python I, Institute of Physics Belgrade, Serbia, 16 July 2007
- A. Zaric, Site Administrators' Training on Python II, Institute of Physics Belgrade, Serbia, 20 July 2007
- A. Belic, A. Balaz, Training on Parallel and Distributed Computing, Center for Scientific Research of SASA, University of Kragujevac, Serbia, 28 March 2008
- A. Belic, A. Balaz, SEE-GRID-2 Training Events, Polytechnic University of Tirana, Albania, 31 March 2008
- A. Balaz, D. Vudragovic, GRID Training of Meteorologists, School of Electrical Engineering, University of Belgrade, Serbia, 25 June 2008
- A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic, Induction Grid Training for Users, Institute of Physics Belgrade, Serbia, 19 September 2008
- A. Belic, D. Vudragovic, V. Slavnic, Introduction to Cluster and Grid Computing in Mechanical Engineering, Institute of Physics Belgrade, Serbia, 18 November 2008
- A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic, AEGIS Training for Site Administrators, Institute of Physics Belgrade, Serbia, 10-11 December 2008
- A. Belic, A. Balaz, D. Vudragovic, Introduction to High Performance and Grid Computing, Faculty of Sciences, University of Novi Sad, Serbia, 6 February 2009
- A. Belic, D. Vudragovic, V. Slavnic, B. Ackovic, Grid Training for Union University School of Computing students, Institute of Physics Belgrade, Serbia, 19 February 2009
- A. Belic, A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic, Regional SEE-GRID-SCI Training for Site Administrators, Institute of Physics Belgrade, Serbia, 5-6 March 2009
- A. Balaz, D. Vudragovic, V. Slavnic, B. Ackovic, Grid Computing Hands On Training for Users, Faculty of Sciences, University of Novi Sad, Serbia, 25 April 2009
- V. Slavnic, GRID and WRF-ARW Model Training, University of Banja Luka, Banja Luka, Bosnia and Herzegovina, 2-3 July 2009
- V. Slavnic, B. Ackovic, Grid training for Petnica students of Mathematics and Computing Science, Petnica Science Center, Valjevo, Serbia, 6 October 2009
- V. Slavnic, B. Ackovic, Grid training for Petnica students of Astronomy, Petnica Science Center, Valjevo, Serbia, 7 October 2009
- B. Ackovic, Grid training for Petnica students of Physics, Petnica Science Center, Valjevo, Serbia, 20 October 2009
- A. Belic, V. Slavnic, B. Ackovic, Grid training for IPB Business Partners, Institute of Physics Belgrade, Serbia, 3 November 2009

4.2.9. Other dissemination activities

- IPB and its Scientific Computing Laboratory (SCL) was presented on the Serbian National Broadcasting Corporation RTS in their Euro Net series; Grids in general and SCL projects were presented to the broad audience; further information available on http://www.scl.rs/
- On July 14, 2006 the Institute of Physics in Belgrade (IPB) and its Scientific Computing Laboratory were hosts to high level delegations from EU Directorate General for Research, headed by Janez Potocnik, Commissioner for Research, and from the Ministry of Science of Serbia, headed by Aleksandar Popovic, Minister of Science. The joint delegation also included Andras Siegler, Director INCO, Giancarlo Caratti, JRC, Tania Friederichs, DG Research, Ivan Videnovic, Assistant Minister of Science, and Gradimir Milovanovic, Chairman of the National Science Council. Commissioner Potocnik was particularly interested to learn about SCL's participation in EU INCO (CX-CMCS) and e-Infrastructure projects (SEE-GRID, SEE-GRID-2, and EGEE-II). This visit was announced and popularized on several national TV stations and in newspapers; further information available on http://www.scl.rs/
- Serbian Ministers of Science Aleksandar Popovic and of Finance Mladjan Dinkic visit Institute of Physics and Scientific Computing Laboratory on July 19, 2006. The purpose of their visit was to announce of new Serbian Government program - National Investment Plan. During the visit, both ministers were informed about IPB's involvement in EU FP6 Grid projects, SEE-GRID-2 and EGEE-II, as well as SCL's promotion to EU Centre of Excellence for Computational Modelling of Complex Systems (CX-CMCS). This visit was announced and popularized on several national TV stations and in newspapers; further information available on http://www.scl.rs/
- On 2 March 2007 SCL's A. Bogojevic gave an interview to BBC radio focusing on how EU Centres of Excellence like SCL can become focal points for reversing brain drain in Serbia and the region. The interview was held by Marijana Zivkovic and was first broadcasted on March 5, at 14:00 GMT+1 on BBC radio and radio B92.
- On 5 March 2007 SCL graduate student Jelena Grujic took part in the FameLab Competition organized by the British Council and co-organized in Serbia by the Ministry of Science. Her presentation "Why the sky is blue" won her a place in the final round of the competition in Serbia, held on 5 April. At the finals, Jelena Grujuc took 2nd place in FameLab Finals. The happening was very well covered by press and electronic media (Telekom Internet portal Na dlanu, daily newspapers Politika, Novosti, 24 sata).
- On 17 May 2007 SCL's student Jelena Grujic was a guest on Radio Beograd in the youth program "Step to Science". She talked about science competitions, especially the FameLab competition she recently took part in, but also about other competitions in which she participated, e.g. the National Physics Olympiad. The show was broadcast live on Radio Belgrade I at 9 AM.
- On 7 June 2007 SCL's student Jelena Grujic was guest at Kontekst 21 - scientific TV program on National TV. She talked about Four Seas Conference that she took part in.
- On 1 and 2 December 2007, Belgrade was totally immersed in science! The first Science Festival was a resounding success with more than 10 000 visitors and impressive press coverage. SCL made significant contributions to the Festival. SCL's Jelena Grujić, was co-author (together with Jelena Uzunović from the Petnica Science Center) and organizer of the exhibition "Physics Strikes Back". With the help of 30 student volunteers they prepared and presented more than 50 experiments and demonstrations. One of the key presenters was

SCL's Branimir Acković. Prof. Aleksandar Bogojevic gave a lecture on the “Economy of Immortality”.

- LHC Exhibition in Belgrade (from 16 April 2008 to 16 May 2008). An exhibition centering on CERN's LHC opened in Belgrade on 16 April. The principle venue of the month-long public outreach event was the Gallery of the Serbian Academy of Sciences and Arts (SASA). The event was jointly organized by SASA, the Institute of Physics Belgrade (IPB) and the Institute of Nuclear Sciences - Vinca. The principle focus of the exhibition and its satellite events was to present the science and technology behind the Large Hadron Collider. Particular emphasis was given to the contribution of Serbian R&D to ATLAS, CMS, and EGEE - the two giant detectors looking into the world of elementary particles, and the continent-spanning Grid infrastructure that channels and analyzes the flood of information from these detectors.
- September 10, 2008 marked the official start of the Large Hadron Collider at CERN. The Institute of Physics in Belgrade organized an all-day media event where the general public and representatives of the media watched live video streaming from CERN with additional comments from IPB researchers involved in the ATLAS and CMS collaborations and the EGEE Grid infrastructure. Many of the researchers gave interviews to print and electronic media. SCL researchers gave interviews to ENTER TV and radio Beograd.
- The Serbian Deputy Prime Minister for EU Integration and Minister of Science and Technological Development Bozidar Djelic stated on 12 November 2008 that Serbia has been admitted into the Partnership for Advanced Computing (PRACE). Djelic noted that Serbia is only the second country from South East Europe to be admitted into PRACE. The PRACE project is currently chaired by Spain and its Barcelona Supercomputing Center. Djelic thanked Spain for its assistance regarding Serbias admission to PRACE. The Deputy Prime Minister gave the announcement during his joint visit with the Spanish Ambassador to the Institute of Physics in Belgrade (IPB). IPB has been appointed by the Mininstry of Science and Technological Development to represent Serbia in European initiatives such as PRACE aimed at the creation of Pan-European high performance computing services. The high profile visit to IPB launched a seven year National Supercomputing Initiative whose goal is the creation of the Blue Danube Supercomputing Facility at IPB's Danube campus. Djelic stated that the 10 million project will be jointly funded by the Serbian Government and EU funds.
- The Science Festival 2008 was organized in December 2008 with the aim to connect general public with Serbian research institutes and to popularize science, especially among elementary and high-school students. SCL's Branimir Ackovic and Dusan Vudragovic presented at the festival the basics of Grid technology and its role in modern e-Science. The visitors were introduced to SCL's computing facilities, national Grid infrastructure/initiative AEGIS, regional Grid infrastructure/project SEE-GRID-SCI, as well as pan-European Grid infrastructure/project EGEE.
- On 16 December 2008 in Barcelona, Spain, Serbia has officially become a general partner of Partnersihip for Advanced Computing in Europe (PRACE). The accession documents were signed on behalf of The Institute of Physics Belgrade by Dr Aleksandar Belic, head of the Scientific Computing Laboratory (SCL), the referent institution representing Serbia in European initiatives aimed at the creation of pan-European high performance computing services. On behalf of PRACE the documents were signed by the President of the consortium, Prof Francesc Subirada , Associated Director of the Barcelona Supercomputing Center.
- The three page article in the March 12 edition of the Serbian news weekly Vreme represents the official launch of the Scientific Computing Laboratory's initiative "Beograd je sistem"

(translation from Serbian: Belgrade is a system). The initiative aims to build a scale model of the Solar System the size of Belgrade. In the 1:220 million scale the Sun is represented by a metal sphere (diameter 6m) located at the geographical center of the city at confluence of two major rivers - the Danube and Sava. The Sun and all the inner planets are easily visible from the Medieval fortress Kalemegdan that towers over the old part of the city. True to the same scale the outer planets are also located at key city junctures. Jupiter and the Galilean moons are at the Vracar plateau between the National Library and the Temple of St. Sava (one of the largest Christian Orthodox churches in the world). Saturn and its system of rings an Titan are at Ada Ciganlija a lake and park within the city proper. Uranus is to be located in the main hall of Belgrade's Nikola Tesla Airport, while Neptun and Triton are to be found in the center of the nearby town of Pancevo.

- The chosen scale makes it possible to directly visualize the vastness and majesty of the Solar System, as well as to traverse that vastenss in style at a leasurly walking pace (the speed of light in the chosen scale). "Beograd je sistem" aims to popularize science, but also to snowball a wider initiative aimed at unleashing the creative potential of young people in Belgrade, focusing that potential on the process of discovery and the pursuit of excellence.
- During his second visit to SCL on 2 April 2009, organized as a follow-up to the visit in January 2009, Maciej Remiszewski from IBM Poland discussed with SCL representatives possible extensions of the current collaboration. In particular, joining of the Institute of Physics Belgrade to the IBM Academic Initiative and signing of an agreement on joint research collaboration with the ICM institute were considered as next steps. After recent participation of SCL in an event organized by ICM, it was agreed that the remote use of ICM's IBM-based cluster and porting to the Cell architecture of some of SCL's applications with the support of ICM staff will be starting points of the collaboration. During the meeting, SCL's Dusan Arsenovic and Vladimir Slavnic presented porting of largely used molecular dynamics application Large-scale Atomic/Molecular Massively Parallel Simulator (LAMMPS) to Cell processors. Also, SCL's Igor Stankovic and Dusan Vudragovic presented molecular dynamics simulation of Lithium ions in graphite structures using communication-intensive replicata data algorithm and the work on its porting to Power6 architecture. This visit was organized in collaboration with IBM Serbia's Jelena Vukajlovic, designated by IBM as a focal point for collaboration with SCL and Institute of Physics Belgrade. Srdjan Vucicevic from IBM Serbia also participated in the meeting.
- On 8 May 2009 Institute of Physics hosted a visit from Director-General of CERN Prof. Rolf-Dieter Heuer. As a part of it he visited SCL where Prof. Aleksandar Belic and Prof. Aleksandar Bogojevic welcomed the guest on behalf of SCL and shortly presented the laboratory, its members, recent work, ongoing and future research and development projects, as well as SCL's high performance computing infrastructure.
- As a part of the ongoing collaboration with IBM, on 13 May 2009 SCL hosted a high-profile visit by Mr. Vladimir Aninoiu, Director of Developing Markets from IBM Central and Eastern Europe, Mr. Milos Djurkovic, Director of IBM Serbia, and Ms. Jelena Vukajlovic, IBM Serbia's coordinator for collaboration with SCL/Institute of Physics Belgrade. During the stimulating discussion with IBM representatives, SCL's A. Belic, A. Bogojevic and A. Balaz presented the laboratory, recent work, ongoing and future research and development projects, with special emphasis on the progress in establishing Blue Danube National Supercomputing and Data Storage Facility, testing of new computing architectures and porting of applications to PowerXCell programming paradigm done at SCL on the IBM demo machine delivered recently. IBM representatives presented company's strategic plans for the region and future collaboration with the Institute of Physics Belgrade in the framework of IBM Academic

Initiative and beyond. Possible cooperation on some development projects was also discussed.

- On 18 May 2009, Institute of Physics Belgrade and its Scientific Computing Laboratory were host to a high-level scientific delegation from Russian Federation, headed by Alexey N. Sissakian, Director-General of Joint Institute for Nuclear Research (JINR) in Dubna. The guest were given a brief introduction to SCL, its members, projects and SCL's high performance computing infrastructure. During the visit Dusan Vudragovic demonstrated the use of Hypatia tool developed by SCL in the framework of Learning with ATLAS at CERN project.
- On 26 May 2009 Institute of Physics hosted a visit from Prof. Jonathan R. Ellis Adviser to the Director-General for relations with Non-Member States European Organization for Nuclear Research (CERN) and gave a lecture on Testing theories with the LHC. As a part of it, he visited SCL where Prof. Aleksandar Belic and Prof. Aleksandar Bogojevic welcomed the guest on behalf of SCL and shortly presented the laboratory, its members, recent work, ongoing and future research and development projects, as well as SCL's high performance computing infrastructure.
- Ambassador of Japan Toshio Tsunozaki, visited SCL and IPB on 2 June 2009. After a tour of computing facilities he was briefly introduced to main research topics at SCL - recent work, ongoing and future research and development projects, as well as SCL's high performance computing infrastructure.
- The official signing of the Memorandum of Understanding between the Institute of Physics Belgrade (IPB) and IBM Serbia was held at IPB on 9 June 2009. The MoU was signed by Prof. Dr Dragan S. Popović, director of IPB and Mr. Miloš Đurković, director IBM Serbia, in the presence of representatives of the Ministry of science and technological development of the Republic of Serbia. Cooperation with the network of global partners within IBM's Academic Initiative is of strategic importance both for the IPB, as well as for the country's wider R&D sector. For IBM, on the other hand, this collaboration significantly enhances the company's presence in Serbia, paving the way for future cooperation with research institutions and clients throughout the country. The partnership between the Institute of Physics Belgrade, the coordinating institution of the "Blue Danube" National Supercomputing Initiative, and IBM Serbia has resulted from the identified need for joint collaboration towards the realization of key research, developmental and educational aspects of that national initiative.
- SCL head Aleksandar Belic presented the current status of Serbia's e-Infrastructure at the EU Research Information Event "Towards Integration into the European Research Area" held at the Hyatt Hotel in Belgrade on 29 June 2009. The meeting was opened by Deputy Prime Minister in charge of European Integration and Minister of Science and Technological Development Bozidar Djelic, who presented the draft of Serbia's new National R&D Strategy which strongly emphasizes development of scientific infrastructures. This presentation was followed by the keynote address of European Commissioner for Science and Research Janez Potocnik in which he stressed the success of Serbia's participation in FP7 and outlined the next steps towards the country's full integration into ERA. Dr. Belic's talk on e-Infrastructures focused on national efforts in: developing the network layer, Grid computing for e-Science, Supercomputing, and the knowledge layer comprising scientific data and virtual research communities.
- An info event dedicated to EU FP7 Marie Curie program and funding possibilities for Serbian researchers from FP7 Peoples program was held on 30 June 2009 at the Institute of Physics Belgrade. The guest from European Commission's Directorate General for Research was

Mr. Janne Salo, responsible for Marie Curie fellowships in physical sciences. The program of the event:

- Aleksandar Belic, Nada Milosevic: Welcome addresses
- Miroslav Trajanovic: Mobility portal
- Janne Salo: FP7 Marie Curie Actions - practical aspects
- Discussion

- During the July 2009, SCL hosted OpenSolaris Summer School. It consisted of eight four hours meetings held each twice per week. Meeting topics started from OpenSolaris basic idea and OS foundations to its surrounding technologies developed in past two years. Final topic covered is SUN Cloud which is SUN's state-of-art technology introduced to the market in June, 2009 during JavaOne conference in San Francisco, California, USA. School has been designed like debating sessions. Speaker started session with presentation, and each presentation slide followed by number of questions and debate. Speaker was Mr Uros Nedic, SUN's expert in that area who explained what SUN Cloud technology could deliver to companies dealing with IT. He also intruduced all SUN's technologies for HPC. He showed that SUN also has very competitive offer in this market segment.
- On 3 August 2009, SCL' A. Belic, A. Balaz, D. Vudragovic and I. Smolic visited Mathematical Institute of the Serbian Academy of Sciences and Arts. During the visit Dr. Zoran Markovic, director of the Institute, has signed the accession annex to the Memorandum of Understanding of the Academic and Educational Grid Initiative of Serbia - AEGIS, which makes Mathematical Institute of the Serbian Academy of Sciences and Arts a new official member of AEGIS. Dr. Zoran Ognjanovic presented IBM Linux cluster and HPC-related applications and research projects of the Mathematical Institute. After signing the AEGIS MoU, research ollaboration between two institutes was discussed, with the focus on the "Blue Danube" National Supercomputing Initiative. Subsequent visits of Mathematical Institute staff to SCL are scheduled for August and September.
- On 4 August 2009, Maciej Remiszewski from IBM Poland visited SCL. He gave an overview of future IBM development plan in CPU architectures. He also gave an introduction to IBM software available through IBM's Academic Initiative. During the meeting mr Remiszewski discussed with SCL members Vladimir Slavnic and Dusan Arsenovic about progress in porting SCL applications to Cell architecture. Meeting was organized by SCL and IBM Serbia.
- On 4 September 2009, SCL's Aleksandar Bogojevic gave a popular science talk at the Belgrade Library presenting the project "Beograd je sistem" (Belgrade is a system) which seeks to build a scale model of the solar system in Belgrade, and tie it into the everyday life, rhythm and history of the city. The locations of the planets are to become focal points for presenting the arts, sciences and human creativity in general to the wider public. "Beograd je sistem" is one of the activities undertaken in Serbia during 2009, the year designated by UNESCO as the International Year of Astronomy. IYA honors the 400 anniversary of Galileo's great astronomical discoveries. An overview of the IYA projects and initiatives underway in Serbia was given by Nikola Bozic, national IYA coordinator. Prof. Bogojevic's talk was given at the start of the month-long exhibition of the cosmos-inspired art of Milica Zivadinovic in the library's Artium Gallery. The exhibition is part of the "Cosmic Harmony" project that the artist organized in conjunction with the Scientific Computing Laboratory. "Cosmic Harmony" is funded in part by the Ministry of Science and Technological Development of the Republic of Serbia.

- A representative of Intel Corporation Dr. Pawel Gepner visited SCL on 1 October 2009. As Intel HPC platform architecture specialist, he gave a detailed overview of the present and a number of future CPU technologies being developed by Intel, with special emphasis on novel CPU architectures and their features relevant for HPC. The presentation was interspersed with discussions with SCL members about possible implementation of presented products and solutions in future Blue Danube National Supercomputing Initiative.
- Sun Microsystems company representative in Serbia Mr. Marko Radovic organized, in close collaboration with SCL, a one-day HPC workshop at the Institute of Physics Belgrade on 8 October 2009. Sun was represented by HPC expert Dr. Torben Kling-Petersen and Mr. Lefteris Papakostas, sales manager for Southeastern Europe. During the morning session, Dr. Kling-Petersen presented various topics concerning Sun HPC hardware: rackmount and blade-based solutions, advanced cooling techniques, interconnect technologies (Infiniband and 10G ethernet), storage solutions. The afternoon session was oriented towards Sun's HPC software stack with the accent on Grid software (Sun Grid Engine) and cluster management tools. In the discussion with SCL members, Sun representatives also introduced Sun Academic Initiative, and further collaboration in assessing HPC technologies for the Blue Danube National Supercomputing and Data Storage Center was agreed.
- On 30 November 2009 Institute of Physics Belgrade hosted a visit from Dr. Markus Nordberg, Resources Coordinator of the LHC ATLAS experiment at CERN where his responsibilities include budget planning and resources allocation for ATLAS activities. During his stay at the Institute, Dr. Nordberg visited SCL where Dr. Aleksandar Belic and Dr. Aleksandar Bogojevic welcomed the guest on behalf of the laboratory and shortly presented our members, ongoing and future research and development projects, as well as SCL's high performance computing infrastructure. The support provided by SCL's two Grid sites to ATLAS VO was also discussed during the visit. After his visit to SCL, Dr. Nordberg gave an inspiring talk (IPB Colloquium) on benefits of member-countries from their participation in research activities at CERN. Apart from the benefits for high-energy community in each country, other research groups from the broader field of physical sciences and engineering can actively participate in the work done at CERN, where many cutting-edge technologies are being developed for the purpose of LHC accelerator. In addition to this, industries from all member-countries could greatly benefit from contracts for the commercial work at CERN, as well as from the technology transfer, while developing technological solutions according to the specifications provided by CERN researchers and engineers. Dr. Nordberg also pointed out that participation in CERN activities not only brings benefits to experimental groups and industry, but also boost the development of computing capabilities of each country. CERN is now one of leading players in European Grid computing initiatives, and has successfully led many National Grid Initiatives towards collaborative framework EGI (European Grid Initiative), which will ensure operation of Europe-wide distributed computing and data storage infrastructure, offering support to all researchers requiring significant computing resources. At the end of his presentation, Dr. Nordberg and IPB's director Prof. Dr. Dragan Popovic gave overviews of current Serbian participation in CERN activities. Dr. Nordberg stressed that Serbian contributions to ATLAS and CMS experiments are highly visible. He also praised Serbian contribution to CERN's Grid computing activities, with the prominent amount of CPU time provided to ATLAS and CMS numerical simulations. In addition to the support in terms of computing and data storage resources, Dr. Nordberg emphasized important contribution of SCL to the development of the EU-recognized high-energy physics e-learning tool HYPATIA developed within the Learning with ATLAS at CERN (LA@CERN) project.
- Croatian Minister of Science, Education and Sports Radovan Fuchs visits Institute of Physics Belgrade and its Scientific Computing Laboratory on 14 December 2009. Prof. Aleksandar

Belic and Prof. Aleksandar Bogojevic informed Minister about SCL activities and projects, high performance computing infrastructure, and especially National Supercomputing and Data Storage Facility 'Blue Danube' initiative.