NEWSletter

PRACE 2.0:
Meeting Europe's Ambitions with HPC

The PRACE Council has been working to design the strategy for the next phase of PRACE: PRACE 2.0. This strategy was unanimously approved during the PRACE Council meeting on 4 and 5 February 2013 and is intended to guarantee the sustainability of PRACE as the European HPC Infrastructure. PRACE 2.0 forms part of the response of PRACE to the EC's call to sustain Europe's leading global position in HPC.

The European Commission has great ambitions for HPC: The EC Communication 2012(45) **HPC: Europe's place in a global race** (http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=7826) places the emphasis on the crucial asset that a European HPC infrastructure represents for EU's competitiveness and innovation capacity. It highlights the role of ICT-based research infrastructure (such as PRACE) as an underpinning tool for a European HPC policy, and acknowledges the importance of a wider remit to link future infrastructure provision with investment in novel HPC technology, implemented by DG Connect and DG Research and Innovation.

More recently the Council of the European Union published its draft conclusions on the EC Communication (http://register.consilium.europa.eu/pdf/en/13/st07/st07854.en13.pdf). It recognises the past achievements of PRACE and highlights its importance of pooling and sharing national and EU resources, including leadership and expertise, to provide a world-class European HPC infrastructure, and for stimulating innovation through joint public procurement, pre-commercial procurement and other innovation instruments to support the development of leadership-class HPC capabilities in Europe.

A bit of history

The members and founders of PRACE have been working together for almost 10 years now. Building on EU funded initiatives since 2004 (HPCEUR, HET) and on the first **Scientific Case for HPC in Europe**, they started the PRACE Preparatory Phase in 2008, which resulted in the founding of PRACE aisbl on 23 April 2010. Four hosting members (France,

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Germany, Italy and Spain) secured funding for the initial period from 2010 to 2015, while the PRACE Project partners continued to develop the brand and services of PRACE through three FP7-funded Implementation Phase projects. PRACE started with 21 members and grew to 25 by end 2012; several more governments are showing interest.

From PRACE 1.0 to PRACE 2.0

Now that the PRACE infrastructure is fully deployed with 6 systems and 15 petaflops of capability, and the initial period has passed its mid-point, the moment had come to think about the future of PRACE and the shape this future was to take. Therefore, to ensure th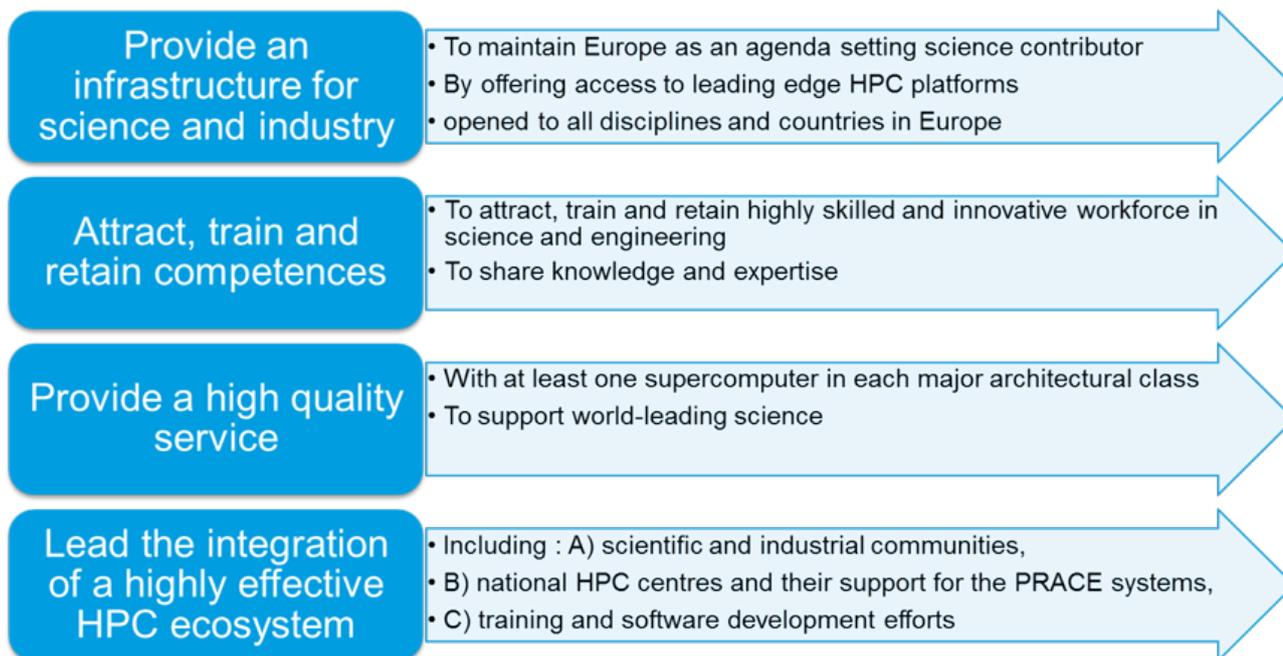e European's Union leadership position in the provision of HPC systems and services to European academia and industry, and their efficient utilisation, PRACE sought to establish a strong strategy and persistent implementation scenarios for the next phase of its development. In this phase, PRACE will promote the setting-up of a consolidated HPC ecosystem, from the top level of the HPC pyramid model with the Tier-0 systems, to the national enhancement of HPC services at Tier-1 level, thus providing a ramp from the smallest to the largest systems in Europe. PRACE has already enabled many excellent scientific results during the initial period since 2010 and PRACE 2.0 will build on the solid foundation of its past achievements.

GENCI/CEA

PRACE 2.0 Goals

PRACE 2.0 revolves around 4 major goals:

Provide an infrastructure for science and industry
- To maintain Europe as an agenda setting science contributor
- By offering access to leading edge HPC platforms
- opened to all disciplines and countries in Europe

Attract, train and retain competences
- To attract, train and retain highly skilled and innovative workforce in science and engineering
- To share knowledge and expertise

Provide a high quality service
- With at least one supercomputer in each major architectural class
- To support world-leading science

Lead the integration of a highly effective HPC ecosystem
- Including : A) scientific and industrial communities,
- B) national HPC centres and their support for the PRACE systems,
- C) training and software development efforts

PRACE 2.0 Principles

The strategy developed by the PRACE Council is founded on nine PRACE 2.0 Principles. These principles permeate and support all activities of PRACE and provide a framework to achieve the PRACE 2.0 Goals. Reference to those principles will help PRACE reach the decisions needed to adapt to the heightened expectations of scientific communities, as well as of national and European public authorities.

- **Scientific excellence**
  Remaining open to worldwide competition
- **Economic and technological competitiveness**
  Fostering innovation by setting up and amplifying an offer based on high value services for industrial users, developing European human skills by establishing training and outreach programmes, and establishing links with provider communities.
- **Partnership between users and PRACE**
  Embracing the broadest range of concerns in all scientific and industrial European user communities and functions

BSC

- **Persistence**
  Striving for long-term stability.
- **Subsidiarity**
  Realizing at European level what cannot be pursued at national level.
- **Recognition of past contributions**
  Taking into account past investments and achievements by PRACE members.
- **Transparency**
  Ensuring that all partners and users have equal and public access to PRACE resources, and equal treatment in PRACE decision processes concerning access to the facilities.
- **Solidarity**
  Valuing all members cooperating to bring

common solutions to user needs and stakeholder expectations.
- **Openness**
  PRACE membership to be open to all EU Member States, PRACE access to be open to all scientific and engineering disciplines, including new entrants

GCS/LRZ

PRACE is confident that the PRACE 2.0 strategy provides a useful framework both for internal discussion about the future of the European HPC infrastructure and for discussions with the many stakeholders who provide financial support to or who collaborate with or depend on PRACE infrastructure and services to deliver scientific excellence.

GCS/HLRS

CINECA

European Twisted Mass Collaboration work meeting in Regensburg.

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The power of PRACE:
Looking Beyond the Standard Model

PRACE awarded millions of core hours on three of Europe's most powerful supercomputers (17.5 million on JUQUEEN (JSC@GCS); 7.5 million on FERMI (CINECA); 5 million on SuperMUC, (LRZ@GCS)) to a project in fundamental physics entitled "Next generation of lattice QCD simulations of the first two quark generations at the physical point". The project was implemented by a multi-national team of physicists, who shed light on the tension between theory and experiment when looking at the anomalous magnetic moment of the muon. For this pioneering work the team received the "Ken Wilson lattice award."

The standard model (SM) of high energy physics describes the fundamental interaction between elementary particles – bits of energy and mass so tiny that it sometimes (like in the case of the Higgs boson) needs enormous machines such as the Large Hadron Collider (LHC) at CERN to actually find hints of them or detect them. The standard model is often referred to as "a theory of almost everything", but despite its success, we know that it cannot be the theory of particle interaction down to arbitrary small distances or equivalently arbitrary large energies. It is predicted that at some very small, so far unknown distance a new kind of physics will appear, replacing our present picture of particle interaction with something completely new.

It is for this quest beyond the laws of presently known physics that **Dr. Karl Jansen** of NIC, DESY in Zeuthen, Germany, applied for access to Europe's most powerful high performance computers via the PRACE 5th Regular Call for Proposals. A consortium of more than 50 physicists spanning eight European countries, led by Dr. Jansen and anchored in the European Twisted Mass Collaboration, was awarded a multi-year access project, with allocations of core hours on three systems: 17.5 million core hours on JUQUEEN installed at Jülich Supercomputing Center (JSC@GCS), Germany; 7.5 million core hours on FERMI installed at CINECA, Italy and 5 million core hours on SuperMUC, installed at Leibniz Supercomputing Centre (LRZ@GCS), Germany.

With this extensive support from PRACE, Dr. Jansen and his team applied lattice field theory methods to quantum chromodynamics (QCD) simulations to unravel the secrets of the strong force between quarks and gluons, a force that has great impact on nuclear and high energy physics. Besides the award winning work on the anomalous magnetic moment of the muon, they also computed the hadron spectrum and decay constants as well as hadron matrix elements. This has far reaching relevance, for example in detecting dark matter and understanding non-perturbative phenomena. The novelty of their project lays in the first-time inclusion of the complete first two quark generations in the simulations: essentially the development of a new method in which the lattice data comes close to nature.

Projects in fundamental physics such as this are in dire need of high performance computing resources. As the computational costs increase rapidly for smaller and smaller hadron masses, this means that researchers are often limited to values of pion masses, for example, that are approximately a factor or two larger than those observed in nature.

PRACE is proud to help further this fundamental research. The results it yields are important for both the physics community, in terms of improvements to the standard model, as well as for computational science. The applications used for lattice QCD involve enormously complicated calculations that test the supercomputers very aggressively and help develop and debug architectures. It is also noteworthy that more than 25 Ph.D. students and young postdocs are collaborators in Dr. Jansen's project. This is an important stepping stone in the careers of the next generation scientists.

About the European Twisted Mass Collaboration

The European Twisted Mass Collaboration comprises all three universities of Rome, the universities of Bonn, Liverpool, Glasgow, Barcelona, Seville, Valencia, Orsay, Saclay, Frankfurt, Groningen, Cyprus, Grenoble, Berlin, Müunster, Poznan, Bern and the research centres DESY in Hamburg and Zeuthen, ECT* in Trento and LPSC in Grenoble.

http://www-zeuthen.desy.de/~kjansen/etmc/

About CINECA

www.hpc.cineca.it

CINECA is a non-profit Interuniversity Consortium of 54 Italian Universities, The National Institute of Oceanography and Experimental Geophysics – OGS, the National Research Council – CNR, and the Ministry of Education, University and Research – MIUR.

About GCS

The Gauss Centre for Supercomputing (GCS) consolidates the three national supercomputing centres HLRS (High Performance Computing Center Stuttgart – http://www.hlrs.de/), JSC (Jülich Supercomputing Centre – www2.fz-juelich.de), and LRZ (Leibniz Supercomputing Centre, Garching – www.lrz.de) into Germany's Tier-0 Supercomputing institution. Concertedly, the three centres provide one of the largest and most powerful supercomputer infrastructures in Europe to serve a wide range of industrial and research activities in various disciplines. They also provide top-class training and education for the national as well as the European High Performance Computing (HPC) community. GCS has its headquarters in Berlin/Germany.

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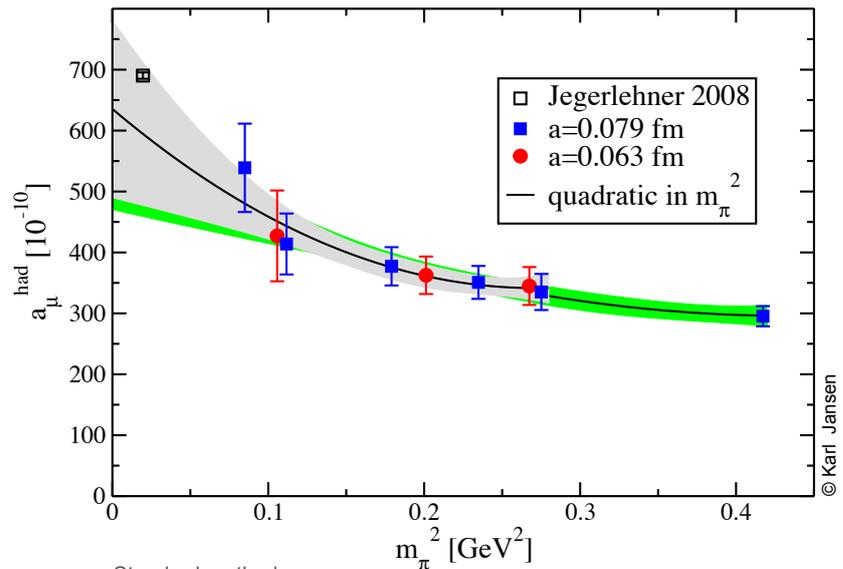
Standard method
– lattice data significantly lower than experiment
– uncontrolled extrapolation to physical point > very large error

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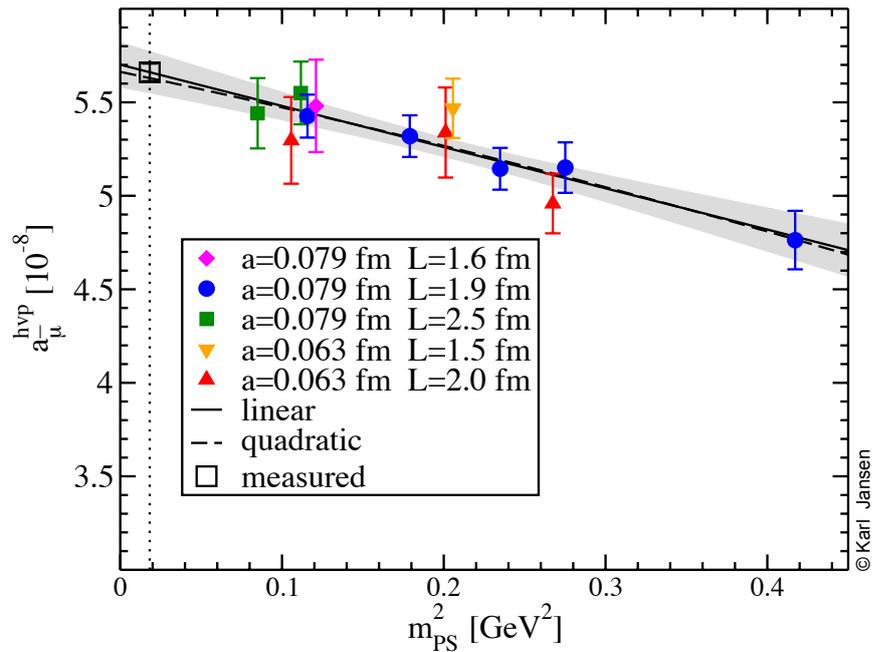
New method
– lattice data are consistent with experiment
– controlled extrapolation to physical point > error substantially reduced
– work was awarded with the First Ken Wilson lattice award

Dare to Think the Impossible

The PRACE-2IP outreach pilot is committed to educating tomorrow's researchers about the power of supercomputing, because today's high school students are tomorrow's researchers and inventors.

We have embarked on an ambitious campaign to introduce high school students to how important HPC is to current and future research on science's most exiting discoveries. There is no doubt that students who are not familiar with HPC infrastructure will find themselves behind the times.

The *Dare to Think the Impossible* educational campaign is focused on 15 to 19 year old students, as well as the general public. The campaign encompasses a variety of media, including an informational website, a Facebook page, printed brochure, and YouTube videos of interviews with PRACE scientists. And the crème de la crème – an astronomy-themed online video game that demonstrates astronomical simulations in a fun and engaging way. Give it a try!

The program's modules introduce students to HPC in a language they can understand and involve them in an interactive demonstration of what supercomputing can do. But what makes the program so innovative is the invitation to join a community to explore real life examples of exciting research being carried out today with the help of PRACE supercomputers.

Please visit the campaign's site (www.daretothinktheimpossible.com),
as well as the Facebook page (www.facebook.com/daretothinktheimpossible) and share them with your friends, family and colleagues, as well as teachers and students. Challenge them to Dare to Think the Impossible. To defy convention and recognize just how far their imagination can take them.

For more information about how to introduce PRACE's Dare to Think the Impossible program into schools or your community, please contact:

Barbara Toth [tbarbara@niif.hu]
Project Assistant, National information Infrastructure Development Institute Hungary

PRACE Summer of HPC

Three students from St. Joseph's Mercy Secondary School, Navan, Co. Meath, Ireland investigating the Raspberry Pi Cluster.

Applications for the PRACE Summer of HPC began with a bang in January 2013 and continued into February with 189 applications! Students from 25 countries across Europe applied, with 45 nationalities represented. The popularity of the programme has been incredible with the application website alone receiving over 5,000 visits.

The PRACE Summer of HPC is a PRACE-3IP outreach programme targeting early-stage postgraduate and late-stage undergraduate students. It offers participants the opportunity to spend a summer abroad at a European HPC centre. The highly competitive selection process is now underway, with many high-quality applicants being considered for 20 summer placements. Successful applicants will be announced in early April and the programme will begin in July.

Stand at the BTYSTE.

BT Young Scientist & Technology Exhibition in Dublin, Ireland

At the BT Young Scientist & Technology Exhibition (BTYSTE), 10–12 January 2013, PRACE with a stand managed by the Irish Centre for High-End Computing (ICHEC) showcased what supercomputers are used for to primary and secondary level students in Dublin, Ireland. At the ICHEC stand in the World of Science & Technology Hall a fully configured live mini "supercomputer" was on display. In addition, HPC introductory sessions and 3D visualisations of climate and weather data were presented while interactive demonstrations were used to showcase the latest in accelerators/coprocessors technology.

Within the third implementation phase project of PRACE (PRACE-3IP) outreach activities are focused on high school and university students. The latter are targeted in the PRACE Summer of HPC programme (http://summerofhpc.prace-ri.eu) while the PRACE Campus Schools focus on students aged between 15–18 years. These events are key to demystify supercomputers, to describe how they are built and what they are used for. Four Campus schools are planned during the course of the PRACE-3IP project in Slovenia (Nov 2012), Ireland (Jan 2013), Bulgaria (Nov

An example audience during presentations at the stand.

2013), and the Czech Republic (Jan 2014) though the scale of these events may not be as large as the BTYSTE.

Over 45,000 students attended the exhibition with over 200 schools visiting the ICHEC stand to understand the utility of supercomputing. The first zone of the stand displayed an eight-way Raspberry Pi cluster built especially for the event where the inner workings of a parallel machine were visible to the attendees. A parallel version of Conway's Game of Life was run across the machine to describe the software layer and the performance gains. More details of the cluster can be found here: http://www.ichec.ie/outreach/rpicluster

Students attended presentations in the second zone where the need for supercomputing and the resources that Europe has to offer in terms of hardware were described. In addition, ICHEC staff presented weather models over Ireland and the UK in 3D as ICHEC runs the national weather forecast for Met Éireann (Irish Meteorological Service).

Within the third zone of the stand live Molecular Dynamics simulations and other interactive demos provided by NVIDIA were run on a NVIDIA K20. While a Sudoku demo, one that searched for 17 clue grids, allowed the direct comparison of the new Intel Xeon Phi and the Intel Sandy Bridge. The demo was first described by ICHEC at the ISC12 event http://www.ichec.ie/conferences/ISC12

MORE INFORMATION:
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PRACE FEATURED EVENTS

Leipzig.

PRACE Summer School
17–21 June 2013 Ostrava, Czech Republic.
This five-day event will offer tutorials on several distinguished software packages, frameworks and libraries widely used for solving large-scale engineering and scientific problems on high performance computing systems.

Each day of the five-day programme will be devoted to a particular software package. The target audience are scientists and developers who wish to use **high-level tools**, but at the same time require **fine-grain control** over the solution process. The open source packages were selected to cover the entire "**life cycle**" of such projects: from pre-processing, solution and post-processing. However, the focus during this even will be on the solution phase.

Ostrava.

PRACE Scientific Conference 2013
The 2013 PRACE Scientific Conference will be held on Sunday, 16 June, in Leipzig, Germany from 9–18 at the Congress Center Leipzig, Hall 4.
Top European scientists present results and advances in large scale simulations obtained with the support of PRACE. The European HPC Strategy implementation will be presented by Konstantinos Glinos, head of the e-Infrastructure unit in the EC Directorate General Connect. PRACE services for Science and Industry will be highlighted by Sergi Girona, Chair of the PRACE Board of Directors.

PRACE scientific and industry partners are welcome to participate, discuss and learn from colleagues about services available and indentify opportunities for future PRACE-supported projects. A social get-together is planned for the evening after the sessions. As in the past, PRACE is partnering with ISC, the International Supercomputing Conference, to maximize value for PRACE Scientific Conference and ISC'13 participants. The PRACE Scientific Conference fee is 40 Euros. Registrations via ISC '13 registration.

MORE INFORMATION:
www.prace-ri.eu/PRACE-Scientific-Conference-2013
REGISTRATION:
www.isc-events.com/isc13/online_registration.html

ISC 13
PRACE will again participate in ISC13 in Leipzig 17–20 June 2013.
For more information please contact praceday2013-oc@fz-juelich.de.
www.prace-ri.eu/PRACE-Scientific-Conference-2013

PRACE SEASONAL SCHOOLS

PRACE Spring School, 2013 – New and Emerging Technologies – Programming for Accelerators

Tuesday, 23–26 April 2013 at 9–16 (CET), Umeå, Sweden.
The Spring School is organized by SNIC and hosted by High Performance Computing Centre North (HPC2N) in Umeå, Sweden. Expert presenters from PRACE Advanced Training Centers (PATCs) and vendors will combine lectures and hands-on sessions to provide an introduction to accelerator programming. The official language will be English. The school is offered free of charge to students and academics residing in PRACE member states. Lunches, coffee breaks and an evening dinner event are included. Note that the number of full participants is limited to around 30 seats. Please register as soon as possible, but no later than March 31.
www.hpc2n.umu.se/prace2013/registration

FOR MORE INFORMATION, PLEASE VISIT:
www.hpc2n.umu.se/prace2013/information

PRACE All Hands Meeting
PRACE "all hands" meeting is scheduled to take place in Bulgaria on shores of the Black Sea, on 3–5 June 2013.
Project Partners only.
This year's venue is the Melia Grand Hotel in Varna, Bulgaria

Varna.

Preliminary programme:
June 3: 15:00–18:00 PRACE-1IP Final Conference
June 4: 9:00–12:00 PRACE-2IP all hands meeting
June 4: 13:00– 18:00 PRACE-3IP all hands meeting
June 5: 9:00–12:00 PRACE-3IP all hands meeting (inter work packages meetings)

FOR MORE INFORMATION ON ALL HANDS MEETING:
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FEATURED NEWS

PRACE wins EU Success Story Competition

Since the establishment of the PRACE Open R&D industrial offer in January 2012, PRACE has been able to attract more than 10 European companies; large companies as well as SMEs (Small and Medium Enterprises) for using its HPC facilities as well as the others high-value services. Now this documented project offer has been remarked and awarded as an effort in catalysing European industrial competitiveness.

The FP7 Success Story Competition highlights the three best success stories from the FP7 Capacities funding programme in e-Infrastructures. Project success stories in Competitive industry category show how the project made Europe a more attractive location to invest in research and innovation, by promoting activities where businesses set the agenda. It will help innovative SMEs to grow into world-leading companies. PRACE´s proposal paper *"How e-research infrastructures can catalyse European industrial Competitiveness"* was selected as the winner of the Competitive industry category. The paper describes PRACE´s continuous commitment to develop services for industry to benefit from PRACE research infrastructure.

"This award in 'Competitive industries' will foster our motivation to work on engaging industrial users on the PRACE research infrastructure in order to boost European competitiveness", says Stephane Requena, author of the project paper and member of the Board of Directors of PRACE. *We are working in the field of the FP7 funded PRACE-3IP implementation project on a tailored programme called SHAPE (SME HPC Adoption Programme in Europe) which aims to help SMEs to co-design and demonstrate a concrete industrial project on PRACE facilities."*

PRACE 6th Regular Call:
growing scientific wingspan

PRACE awarded time on 6 Tier-0 HPC systems to 57 research projects, some of which have been allocated record amounts of core hours or have significant links to the most ambitious current European scientific efforts. One project feeds into the EU FET (Future & Emerging Technologies) Flagship "Graphene", two others are linked to ERC (European Research Council) grants and an additional one to the LHC (Large Hadron Collider).

The 6th PRACE Regular Call for Proposals, which was open from 18 September 2012 to 14 November 2012, received 88 applications for time on one or more of the 6 PRACE systems offered (www.prace-ri.eu/PRACE-Resources). Abstracts and additional information on the 57 projects that were awarded is published on the PRACE website: www.prace-ri.eu/Regular-Access

The largest allocations of the 6th Regular Call are awarded to projects in **Chemical Sciences & Materials, Engineering, Mathematics & Computational Sciences, Biochemistry & Life Sciences**, and **Fundamental physics**.

Through its Open R&D model, PRACE invites industry to participate in the Regular Calls, either as principal investigators or as collaborators. Through the 6th Call allocated 3 projects with principal investigators from industry as well as 2 projects led by academia in collaboration with industry were granted allocations:

A significant number of projects was ranked above scientific threshold, but could not be awarded due to limited resources. This demonstrates the interest of the scientific community in using PRACE resources.

Contact: info@prace-ri.eu   **www.prace-ri.eu**