Partnership for Advanced Computing in Europe

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Member of the Board of Directors PRACE aisbl

CREMLIN WP2 Workshop on Big data Management

Moskow, 15-16 February 2017

Content

- PRACE – the pan European HPC e-Infrastructure
- PRACE Access to HPC
- PRACE Training
- PRACE and Industry

PRACE – THE PAN EUROPEAN HPC INFRASTRUCTURE

Partnership for Advanced Computing in Europe

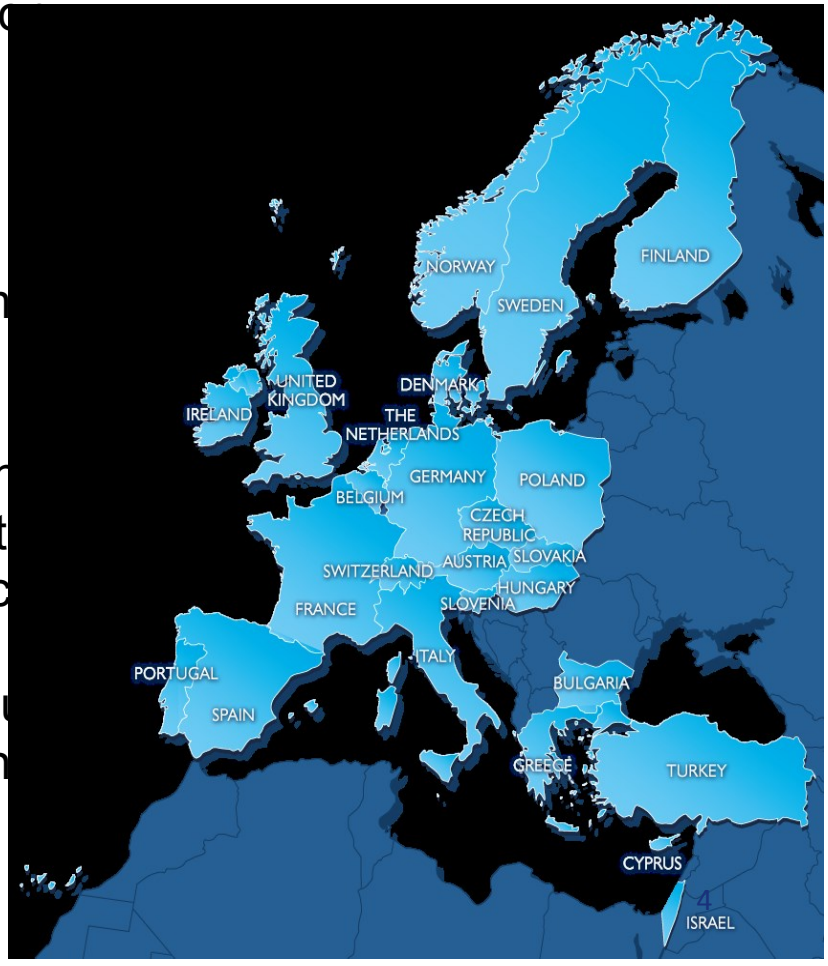
PRACE is an international not-for-profit associati
under Belgian law, with its seat in Brussels.

PRACE counts 25 members and 2 observers.

The **PRACE** Hosting Members are France, Germ
Italy, Spain, and Switzerland.

PRACE is governed by the **PRACE** Council in wh
each member has a seat. The daily management
the association is delegated to the Board of Direc

PRACE is funded by its members as well as throu
series of implementation projects supported by th
European Commission.

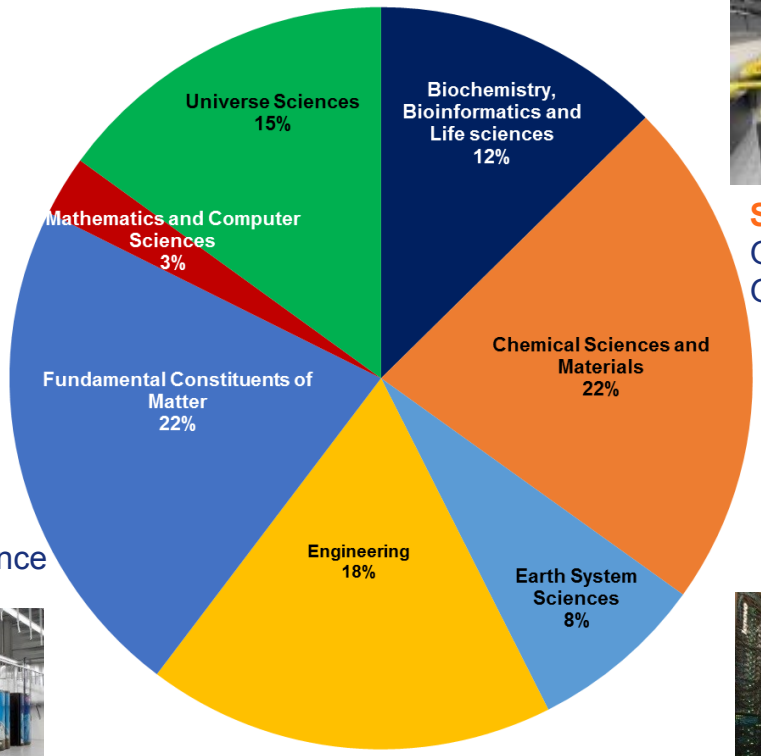


5 Hosting Members offering core hours on 7 world-class machines

MareNostrum: IBM
BSC, Barcelona, Spain

CURIE: Bull Bullx
GENCI/CEA,
Bruyères-le-Châtel, France

Piz Daint: Cray XC30 system,
CSCS, Lugano, Switzerland

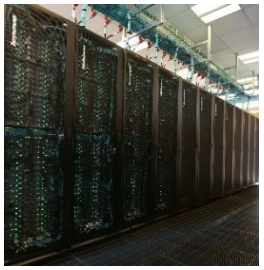


Research Domain Pie Chart up to and including Call 13

SuperMUC: IBM
GAUSS/LRZ
Garching, Germany

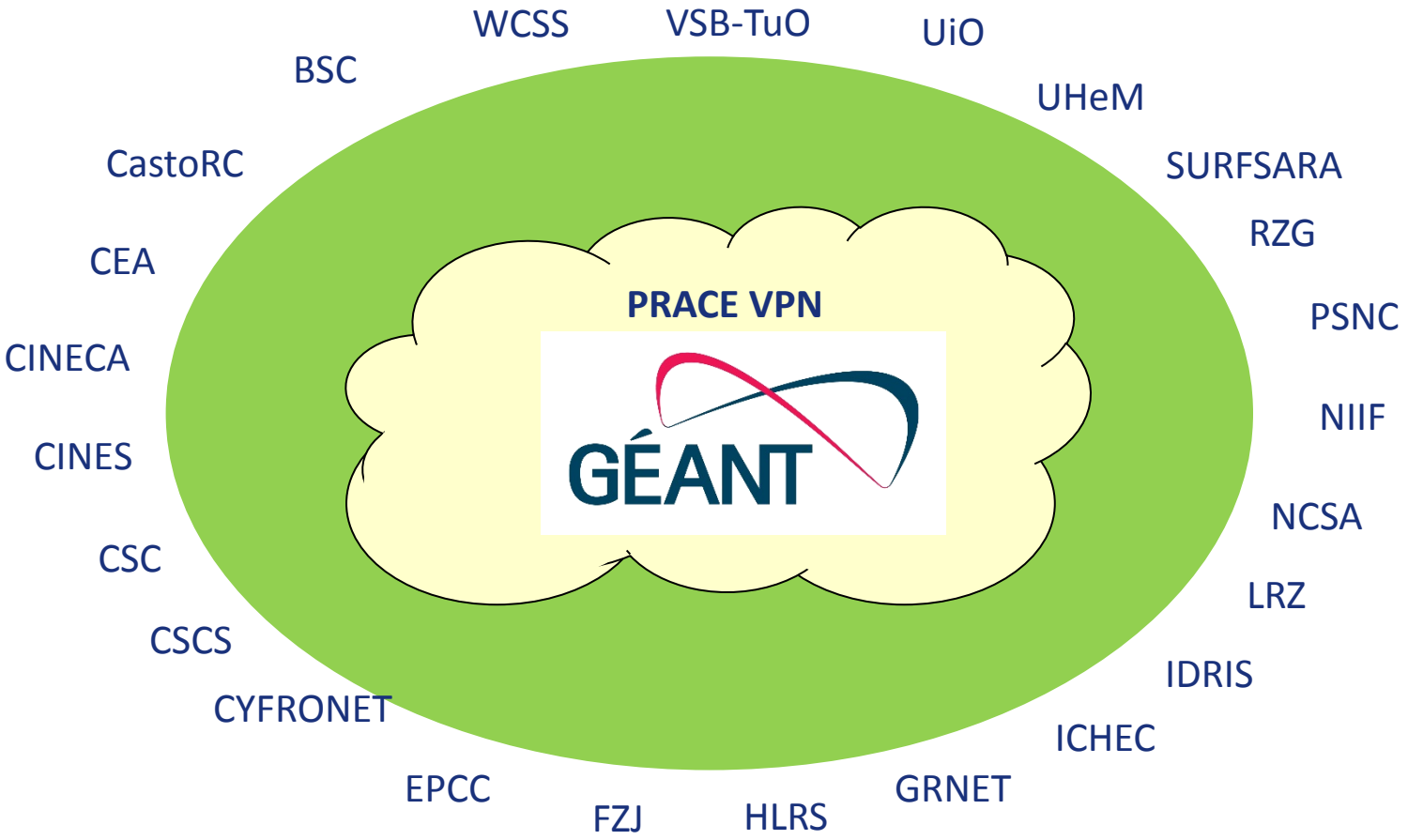
JUQUEEN: IBM
BlueGene/Q,GAUSS/
FZJ, Jülich, Germany

Hazel Hen: Cray
GAUSS/HLRS,
Stuttgart, Germany



MARCONI: Lenovo
CINECA, Bologna, Italy

The PRACE Network Infrastructure



465 scientific projects **enabled**

12.2 thousand million core hours awarded since 2010 with peer review, main criterion is **scientific excellence**. **Open R&D** access for **industrial users** with **>50 companies** supported

>7 350 people trained by **6** **PRACE Advanced Training Centers** and others events

40 Petaflops of peak performance on **7 world-class systems**

530 M€ of funding for **2010-2015**, access **free at the point of usage**

25 members, including **5 Hosting Members**
(France, Germany, Italy, Spain and Switzerland)

PRACE – ACCESS TO HPC

Criterion: Scientific Excellence

Access through PRACE Peer Review

Free-of-charge required to publish results at the end of the award period
Open to **international (PRACE 1)** projects

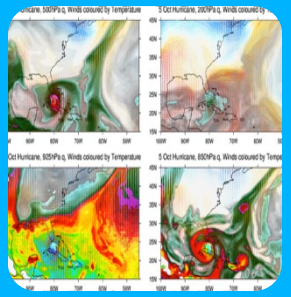
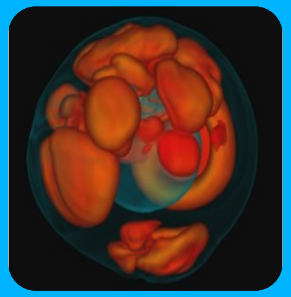
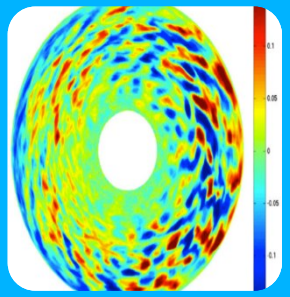
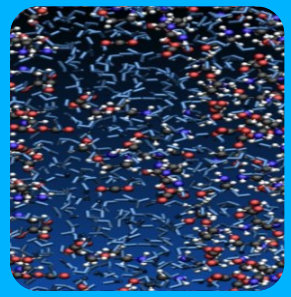
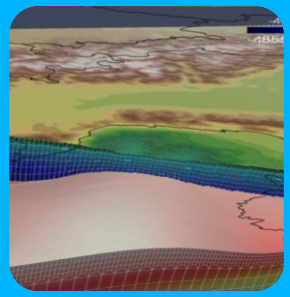
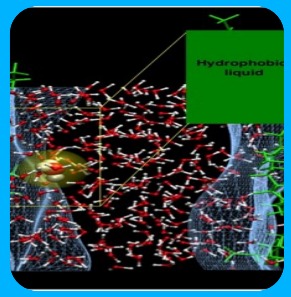
Project Access (*every 6 months*) **award period 1 to 3 years**
Individual researchers and groups
No restriction on nationality (PRACE 1) for both researcher and centre Required to demonstrate technical feasibility of project

Preparatory Access (*cut-off date every 3 months*)
Optional support from PRACE experts
Prepare proposals for Project Access

Project Access

www.prace-ri.eu/call-announcements/

PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

Climate

144 million core hrs on Hermit (DE) **for UK - UB**

PRACE will give to UK Met a 3 years advance in the development of their models (high resolution global weather & climate models).

Astrophysics

million core hrs: 98 on CURIE (FR) + 49 on SuperMUC (DE) **for Germany**

This PRACE grant is one of the biggest worldwide allocation in this domain. Without this huge computational resources this project would not have been carried out in a decent time.

Energy

30 million core hrs on SuperMUC (DE) **for Finland**

PRACE resources enable the first European direct comparison of first-principles simulations to multi-scale experimental data for fusion energy (Link ITER).

Chemistry

59,8 million core hrs on JUQUEEN (DE) **for Switzerland**

Simplified models would not give reliable or meaningful results: Only PRACE systems are large enough to allow these computational models to be calculated.

Seismology

53.4 million core hrs on SuperMUC (DE) **for Italy**

The massive allocation of computing resources awarded via PRACE can be used to explore the non-linearity involved in the dependence of local ground shaking on geological structure.

Life Science

40 million core hrs on JUQUEEN (DE) **for Germany**

A single standard PC would need 5.000 years to do what JUGENE did in 100 days (40 million core hours) Only a PRACE system can offer enough resources to accomplish such a computationally intensive project.

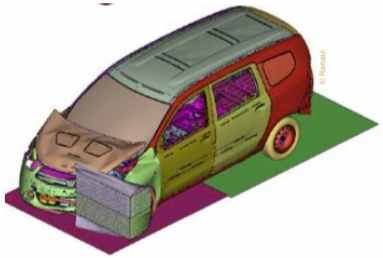
Example Automotive

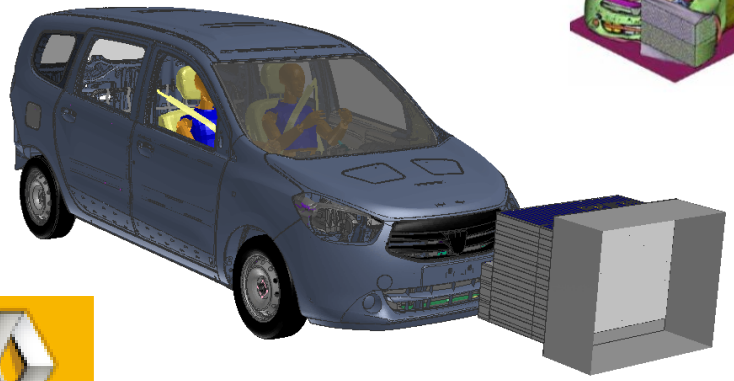
42 million core hours awarded on PRACE hosting partner GENCI, Curie (France) using PAM-CRASH software

Renault performed on PRACE Tier-0 systems **the first-ever biggest crash optimisation study**. Numerical simulations can take the place of real-time crash tests as well as of prototypes.

Best use of HPC in Automotive
HPCwire Readers' Choice Awards 2014

V00_J92_BFD_Serie





RENAULT

Team: Marc Pariente of Renault SAS, France with ESI Group and Ecole Mines Saint Etienne

Goals:

- better model the behaviour of a car body when impacted
- anticipate future safety regulation
- improve competitiveness of Renault

PRACE TRAINING

Seasonal Schools

- Have been running since 2008
- Offering top-quality face-to-face training events
- Organised around / all over Europe
- Topics range from generic intermediate to advanced
- From programming techniques to more specialised topical schools

Upcomming Seasonal Schools

- 10 – 12 April 2017

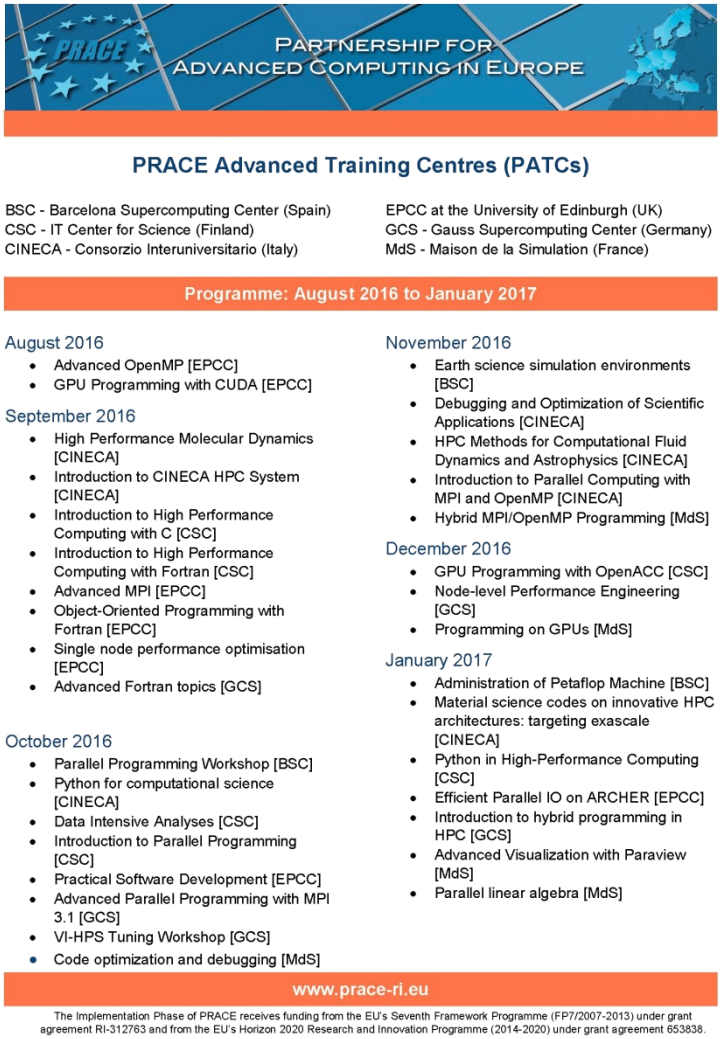
  PRACE Spring School 2017, Sweden - HPC in the Life Sciences

- 25 - 27 April 2017

  PRACE 2017 Spring School joint event with VI-SEEM, Cyprus - System Administration and Data/Computational Services for Scientific Communities

PATC Programme 2016-2017

- 79 courses, 215 training days
- New courses on forward-looking topics
  - New hardware and programming paradigms
  - Data science
- Collaboration with CoEs on several courses



PRACE
PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

PRACE Advanced Training Centres (PATCs)

BSC - Barcelona Supercomputing Center (Spain)
CSC - IT Center for Science (Finland)
CINECA - Consorzio Interuniversitario (Italy)
EPCC at the University of Edinburgh (UK)
GCS - Gauss Supercomputing Center (Germany)
MdS - Maison de la Simulation (France)

Programme: August 2016 to January 2017

August 2016
- Advanced OpenMP [EPCC]
- GPU Programming with CUDA [EPCC]

September 2016
- High Performance Molecular Dynamics [CINECA]
- Introduction to CINECA HPC System [CINECA]
- Introduction to High Performance Computing with C [CSC]
- Introduction to High Performance Computing with Fortran [CSC]
- Advanced MPI [EPCC]
- Object-Oriented Programming with Fortran [EPCC]
- Single node performance optimisation [EPCC]
- Advanced Fortran topics [GCS]

October 2016
- Parallel Programming Workshop [BSC]
- Python for computational science [CINECA]
- Data Intensive Analyses [CSC]
- Introduction to Parallel Programming [CSC]
- Practical Software Development [EPCC]
- Advanced Parallel Programming with MPI 3.1 [GCS]
- VI-HPS Tuning Workshop [GCS]
- Code optimization and debugging [MdS]

November 2016
- Earth science simulation environments [BSC]
- Debugging and Optimization of Scientific Applications [CINECA]
- HPC Methods for Computational Fluid Dynamics and Astrophysics [CINECA]
- Introduction to Parallel Computing with MPI and OpenMP [CINECA]
- Hybrid MPI/OpenMP Programming [MdS]

December 2016
- GPU Programming with OpenACC [CSC]
- Node-level Performance Engineering [GCS]
- Programming on GPUs [MdS]

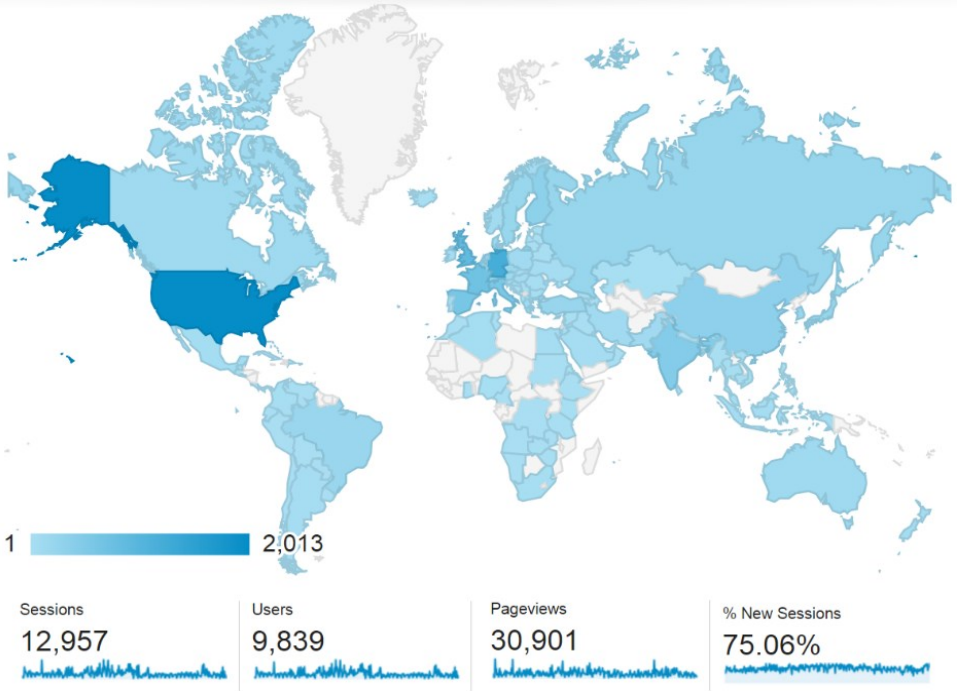
January 2017
- Administration of Petaflop Machine [BSC]
- Material science codes on innovative HPC architectures: targeting exascale [CINECA]
- Python in High-Performance Computing [CSC]
- Efficient Parallel IO on ARCHER [EPCC]
- Introduction to hybrid programming in HPC [GCS]
- Advanced Visualization with Paraview [MdS]
- Parallel linear algebra [MdS]

www.prace-ri.eu

The Implementation Phase of PRACE receives funding from the EU's Seventh Framework Programme (FP7/2007-2013) under grant agreement RI-312763 and from the EU's Horizon 2020 Research and Innovation Programme (2014-2020) under grant agreement 653838.

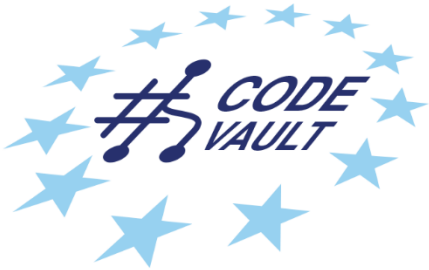
Training and Events Portal

- www.training.prace-ri.eu
- Single hub for the PRACE training events, training material and tutorials
- Number of page views increased by 25% and number of users by 45% since 2014



CodeVault and More

- Repository of Open Source code samples
  - https://gitlab.com/PRACE-4IP/CodeVault
  - Examples and model solutions of common HPC programming tasks
    - Possible to utilise in training and as building blocks of real-world applications
  - Anonymous read access
- Best Practice Guides
  - http://www.prace-ri.eu/best-practice-guides/
- White Papers
  - http://www.prace-ri.eu/white-papers/



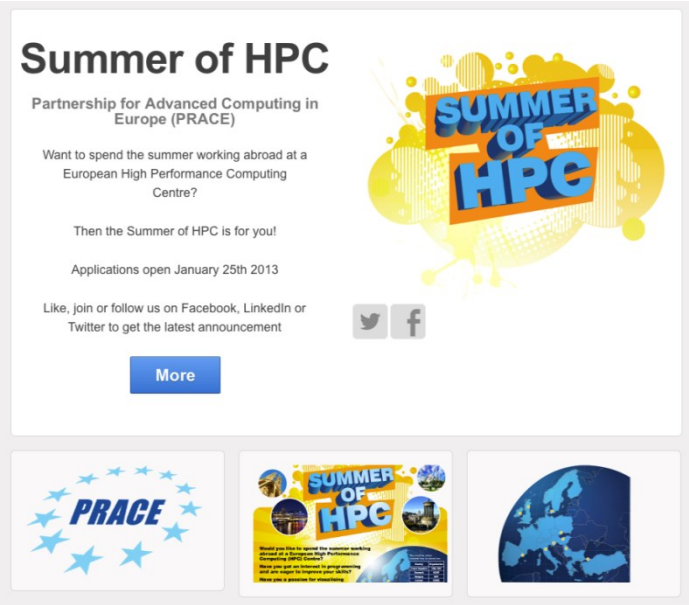
Future Training Activities

- On-demand events addressing the needs of the CoEs
  - Needs for basic, intermediate, and advanced training
- Launch of Massive Open Online Courses (MOOCs)
  - Introduction to HPC, coordinated by EPCC
    https://www.futurelearn.com/courses/supercomputing
  - Management of massive data, coordinated by Univ. Ljubljana
- PRACE Training Centres (PTCs)
  - Cover basic and advanced needs across Europe

PRACE SUMMER OF HPC

PRACE Summer of HPC (SoHPC)

Goal: To inspire the next generation of software engineering, system administrators, and general users of HPC



PRACE Summer of HPC (SoHPC)

SoHPC 2016

- 10 Partners/sites
- 110 applications
- 21 students chosen
- Training week in Juelich
- 2 month internship
- 2 Award winners

SoHPC 2017

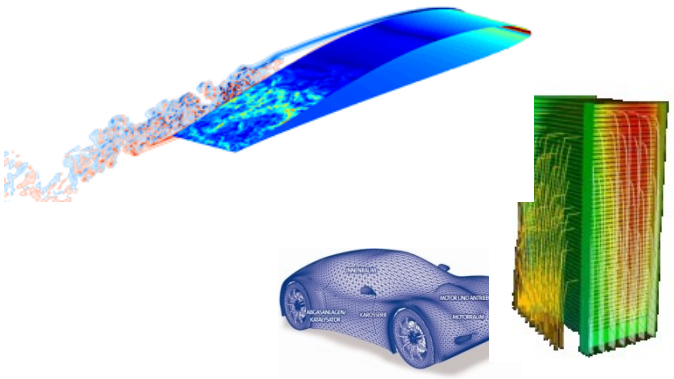
- Programme & Application open date: 04 January 2017
- Call for Applications: 11 January 2017
- Call for Applications closes: 19 February 2017
- 21 Projects proposed

PRACE AND INDUSTRY

PRACE offers services to the Industry

Access to leading edge resources

- To assess the scalability on a wide number of HPC architectures
- To give access to HPC resources based on scientific excellence, free of charge, alone or in collaboration with labs



Access to high value services

- Training (PRACE Advanced Training Centers, opened to industrial users)
- Code enabling (Open Source codes for industry, etc)

- To foster technology transfer between academia and industry
- To access to the competences enabling to build new methodologies (multiscale, multi physics, disruptive, uncertainties…)

PRACE SHAPE (1/2)

SME HPC Adoption Programme in Europe

Pan-European, PRACE-based, programme supporting HPC adoption by SMEs.

- Raise awareness and equip European SMEs with the expertise necessary to take advantage of the innovation possibilities opened up by HPC thus increasing their competitiveness.
- Overcome the barriers to HPC adoption:
  - Lack of expertise in knowledge of the possibilities of HPC and advanced numerical simulation;
  - Lack of resources to facilitate the HPC adoption process;
  - The entry costs of implementing new technologies.
- SHAPE facilitates the process of defining a workable solution based on HPC
- SHAPE helps to define an appropriate business model.

PRACE SHAPE (2/2)

SME HPC Adoption Programme in Europe

- The main focus is to work on a one-to-one basis with SMEs willing to adopt a new HPC-supported solution
- Based on an integrated set of services:
  - **networking,**
  - **training in PRACE Centres**
  - **expertise provided by HPC and domain-specific experts,**
  - **access to PRACE HPC systems (R&D model)**
  - **support for identifying funding sources**
- Support SMEs up to a proof-of-concept

Possible Cooperation with Russian RI

Some ideas for future cooperations in HPC:

- Exchange of Experience
  - Network
  - Operation
  - …
- Training
- Applications Enabling

Questions ???