



PARTNERSHIP FOR  
ADVANCED COMPUTING IN EUROPE

# **PRACE**

## **Contributions to the HPC Strategy**

Thomas Eickermann,  
Member of PRACE Board of Directors

HPC Info Day, Paris, April 9, 2014

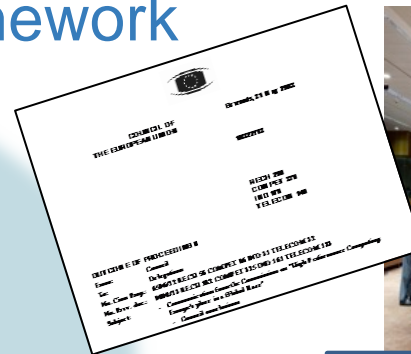


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## HPC Context in Europe European political framework



Communication 45/2012  
of the European  
Commission  
(February 2012)



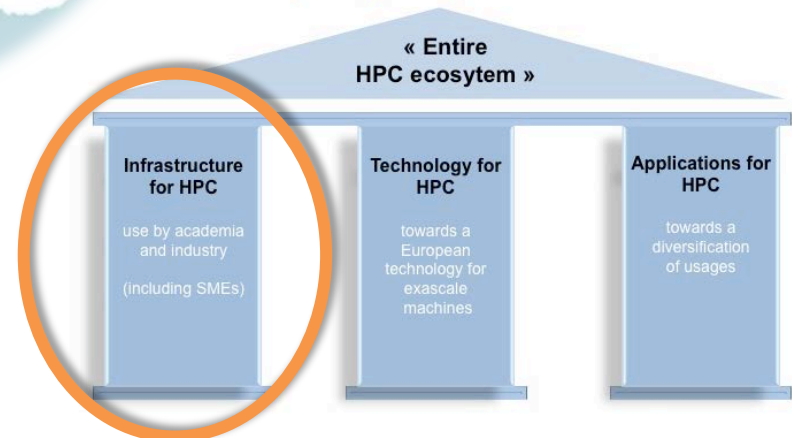
Conclusions 10322/13  
Competitiveness Council  
(29-30 May 2013)

« High performance computing:  
Europe's place in a global race »



The European policy for HPC in H2020

“The Union, Member States and  
Industry should double their  
**investments** in HPC – equal in  
terms of GDP to other world  
regions”





# PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

## PRACE → *the* European HPC Research Infrastructure

- Enabling **world-class science** through large scale simulations
- Providing **HPC services** on **leading edge capability** systems
- Operating as a **single entity** to give access to **world-class supercomputers**
- **Attract, train** and **retain** competences
- **Lead the integration** of a highly effective **HPC ecosystem**
- Offering its resources through a **single** and **fair** pan-European **peer review process** to **academia** and industry



- **25** members, since 2010
- **6** supercomputers in **4** hosting countries, nearly **15 Pflop/s**
- Common operation procedure between **35** centers in Europe
- **22** prototypes evaluated
- **169** white papers produced
- **1500** communications from our users
- **166** Thesis
- HPC Community building: **183** events

- **8 billion** hours granted since 2010 (a system with 900k cores for 1 year)
- **303** scientific projects enabled from **38** countries
- More than **20 SME** and **industries** access in first year
- **360** PATC Training days
- **2734** Trained people
- **170** applications enabled

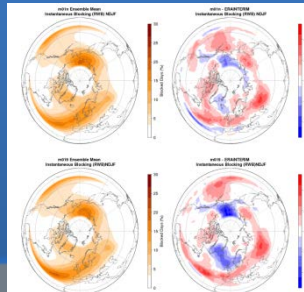


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## Scientific Achievements: some examples

### CLIMATE : PAVING THE PATH TO THE 6<sup>th</sup> IPCC CAMPAIGN

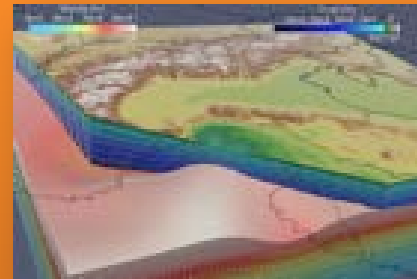
An international collaboration towards  
new high resolution and ensemble climate  
models



**38+50 million  
core hours  
on  
Marenostrum  
(Spain)**

Team: , F. Doblas-Reyes  
(Catalan institute of climate  
sciences), C. Jones (SHMI,  
Sweden), E. Maisonnavé  
(CERFACS), W.  
Hazeleger, (KNMI)

### IMAGING A WHOLE SEISMIC AREA 1<sup>st</sup> numerical mapping of the North of Italy



**53,4 million  
core hours  
on  
SuperMUC  
(Germany)**

Team: **Dr. Andrea  
Morelli** – Istituto  
Nazionale di Geofisica  
e Vulcanologia, Italy

Academia





# PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

## Industrial impacts : OPEN R&D examples (1/2)

### SAFER CARS

**Multiplying crash simulation parameters**

→ Anticipating the new European security rules  
(EuroNCAP6 in 2015)



**42 million  
core hours on  
CURIE  
(France)**

Team: M. Pariente, Y.  
Toubier (Renault), A.  
Kamoulakos (ESI Group)  
and Mines St Etienne

Industry:  
Large  
Companies

### SOLVE INSTABILITIES IN HELICOPTER ENGINES

**Optimized and reliable turbines**

→ Predict combustion instabilities on gas turbines and  
piston engines

→ Combustion = 86% of the use of energy on Earth



**15 million  
core hours  
on CURIE  
(France)**

Team: Anthony  
Roux (Safran)  
G. Staffelbach  
(CERFACS)



# PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

## Industrial impacts : OPEN R&D examples (2/2)

### IMPROVING SHIP SURVIVABILITY UNDER WAVE IMPACT AND AQUAPLANNING FOR AUTOMOTIVE

→ Major step: 32k cores simulations – Increased EU visibility

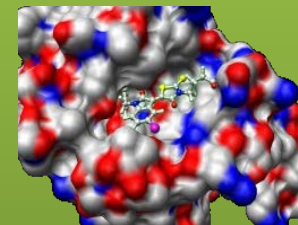


**20.8 million  
core hours** on  
Hermit  
(Germany)  
**8.2 million core  
hours** on CURIE  
(France)

Team: M. De Leffe, D.  
Guilber and all  
(Hydrocean), G. Oger, N.  
Grenier and all (Ecole  
Centrale de Nantes)

### USING HPC TO DISCOVER NEW THERAPIES

→ Creation of a database containing a  
comprehensive range of possible protein targets  
for every drug available



**200 000 core  
hours**  
on CURIE  
(France)

Team:  
Dompé/University  
of Parma

Industry:  
SMEs



## HPC Infrastructure – PRACE Core Business

### EINFRA-4-2014 – Pan-European High Performance Computing infrastructure and services

- Call Objectives in short:
  - Support the migration of PRACE to PRACE 2.0 (2015 – 20120)
  - Further develop: Tier-0 services, Tier-1/ecosystem integration, new users incl. SMEs, new funding and usage models, training, applications enabling, ...
- Working in synergy with:
  - the **Centres of Excellence** (EINFRA-5-2015 – CoEs for computing applications);
  - **the European Technology Platform for HPC**; the pan-European HPC infrastructure will consult its users in order to provide technical specifications to guide research activities for future exascale prototypes and systems
  - other e-Infrastructure providers towards interoperability (EINFRA-7-2014, e.g. AAI)



## HPC Technology – PRACE Contributions

- Prototyping
  - Assessment of technologies for future multi-Petaflop/s systems
  - 22 Prototypes: CPUs, Accelerators, I/O, Cooling, Programming models – focus on energy efficiency
- Pre-Commercial Procurement
  - 1st multi partner PCP on HPC on scale in Europe: 9 Mio €
  - Blueprint for other projects such as Human Brain Project
- Benefits
  - Partners: gain insight for future procurements
  - Technology providers: get feedback on usability and user requirements
  - Users: get early access to future architectures





## HPC Technology – H2020 Opportunities

**PRACE and its members are the natural interlocutor between vendors and users**

- Assessment of prototypes produced under the SRA
- Participate in Co-design actions
  - Support the selection of applications suitable for co-design
  - Make new technologies available to users – when sufficiently mature
  - Provide requirements and feedback to technology providers
- Train users on new technologies



## Centres of Excellence - H2020 Opportunities

### **EINFRA-5-2015 – Centres of Excellence for computing applications**

- CoEs will be: user-driven, integrated, multidisciplinary, distributed ... including **Domain & HPC expertise**
- Provision of services such as: developing, optimising (including if needed re-design) and scaling HPC application codes towards peta and exascale computing;
- Working in synergy with the **pan-European HPC infrastructure**, including by identifying suitable applications for co-design activities relevant to the development of HPC technologies towards exa-scale.



## Applications – PRACE Contributions

- Provide HPC Expertise for
  - Code enabling, optimisation, scaling, tools, ...
  - SHAPE – ready SMEs for HPC usage
  - Training (9% non-academic)
  - Documentation (Best Practice Guides, Whitepapers)
- Offer a platform to meet and organise
  - PRACE days: Annual Scientific Conference + Industry Seminar
  - Update of Scientific Case – a community effort organised by PRACE
  - SSC and IAC – HPC user community representatives
  - PRACE User Forum and PRACE members satellite events
- CoE Access to Tier-0/1 systems/services – ongoing definition



# PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

## Summary

- PRACE has delivered
  - 303 projects from academia and industry provided with 8 billion core hours
  - Tier-0 Infrastructure
  - Tier-1 Coordination
  - User Support
    - Application enabling
    - Training
    - Community Building
  - Technology assessment



PRACE can bring its expertise and resources to provide support to and cooperate with the other major players in the Ecosystem





[www.prace-ri.eu](http://www.prace-ri.eu)  
**HPC for Innovation**  
WHEN SCIENCE MEETS INDUSTRY



**BARCELONA**  
**20 - 22 May 2014**





# PARTNERSHIP FOR ADVANCED COMPUTING IN EUROPE

- Public session for joint analysis with proposers for centres of excellence and VRE
- Expectations for resources from PRACE
  - HPC resources
  - Storage resources
  - Expertise
  - ...
- Organised on May 20, afternoon session
- Two additional days for private discussion with PRACE on specific needs

See you in Barcelona PRACEdays14!

**BARCELONA**  
**20 - 22 May 2014**