SHAPE Programme for Competitive SMEs in Europe

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PRACE long-term partnering with Industry

• OpeR&D model from 2012

• Access to leading-edge resources, Regular Calls open to industry twice a year
  – Access is free of charge, based on scientific excellence only, but with commitment to publish results in publicly available media
    • SMES Renault, GE Research, Turbomeca/Safran, EDF R&D UK, ST Micro, ASCOMP, Munich Ré, …
    • Large Companies: Renault, GE Research, Turbomeca/Safran, EDF R&D UK, ST Micro, ASCOMP, Munich Ré, …
    • Private-Public Research centers: Cenaero on JUQUEEN

Next call opens on June 2014

• Permanent Preparatory Access call
  • Assess the scalability and port the codes -> preparation for future regular calls
    • Big companies: PSA, Renault, CS, Tetrapak, RTE
    • SMEs: ARIA, Thermofluids, Vratis, Dompé, Deltares, Continental, …

Since 2012 > 20 companies, -> 200 M CPU H  More than half of them are SMEs
Access to high-value services

- **Access to new knowledge enabled through PRACE**
  - Big science may be usable by industry in advance on leading edge HPC systems
  - PRACE as a catalyzer of technological transfer

- **Training**
  - Specific courses targeting industrial users are programmed in the 6 PRACE Training Centers
  - Online training portal accessible by everyone

- **Code enabling**
  - The implementation projects work at developing Open Source codes for industry
    - Computational Fluid Dynamics: OpenFoam
    - Uncertainties analysis: URANIE, ...
  - Real industrial test cases are used in the process
  - All the reports and white papers from PRACE are public!

- **Information, Promotion and Networking**
  - PRACE Industrial Seminars (now part of the PRACEDays)
    - A cumulated attendance of more than 450 people representing 124 companies
    - Good mix of large companies and SMEs, from various industrial domains
  - PRACE Industrial Award: in 2013 CERFACS awarded for massive CFD simulation in combustion
Open source codes of interest for Industries

• Petascale open source codes of interest for the industrial communities
  
  **OpenFoam**: Computational Fluids Dynamics (*AirLiquide* and the OpenFOAM community)
  **Elmer**: Structural mechanics, Multi-physics finite elements simulation software (*Okmetic*, *Innoluce*)
  **Delft3D**: Hydrodynamics, sediment transport and morphology for fluvial and coastal environments (*Deltares*)

• Enable emerging industry relevant open source codes for HPC systems.
  - ALYA-Solidz: computational mechanics (*Biscarri Consultoria SL*)
  - NUMFRAC: fracturing and granular flows (*Wärtsilä Corporation*)
  - Ontonix Software Suite: system complexity (*Ontonix S.r.l*)
  - SPEED: risk analysis (*Munich Re*, *MOXOFF s.r.l*)
  - URANIE: uncertainties analysis (*Areva*, *CEA*, *EDF*)
  - VISCOSOLVE: viscoelastic fluid flow (*Household appliances industry*)

• Fruitfull collaboration between PRACE and the Industries interested in using these codes
### PRACE links with Industries

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<thead>
<tr>
<th>PRACE’s Industrial Advisory Committee (IAC)</th>
<th>European Technology Platform for HPC (ETP4HPC)</th>
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<tr>
<td>• To gather strategic expectations of industries</td>
<td>• To give the industry key directions on the development of competitive technology and Applications</td>
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<td>• To advise PRACE on the directions that best suit industrial needs</td>
<td>• PRACE is observer at the ETP’s Steering board</td>
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<td>• To help to stimulate the use of HPC and numerical simulation by industry</td>
<td>• PRACE brings the users’ needs</td>
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<td>• IAC meeting tomorrow at PRACEdays14</td>
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Special Issue of PRACE Digest is out!
Special issue on Industrial use of PRACE resources and applications
Read online
or Download PDF
HPC is a powerful technology
  • enable the development of new products or services,
  • reduce time-to-market
  • reduce cost of R&D or increase the product quality
  • create new business opportunities

HPC can change the Europe’s Industrial Landscape

…. but there are still barriers to use HPC

  cost of operation
  lack of knowledge
  lack of resources

PRACE-3IP WP5 “Services for Industrial Users and SMEs”
New 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 will facilitate the process of defining a workable solution based on HPC
- SHAPE will help to define an appropriate business model.
• 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
  - SMEs will co-developing a concrete industrial project with PRACE experts and demonstrate it using PRACE HPC resources.
SMEs Assessment

• After the SHAPE demonstration, companies will have a clear view about
  – potential of HPC,
  – investments to perform,
  – skills to hire,
  – software or methodologies to develop,
  – next HPC Services:
    • PRACE services for Open R&D services
    • buying their own HPC facilities
    • access remote HPC services on commercial Cloud platforms.
    • Service providers collaboration
SHAPE Pilot 1/2

• Trial phase of the programme to prove the viability and value
• Work with selected SMEs in order to help them adopt HPC
• Objective:
  – refine the details of the Programme in order to launch a comprehensive Programme after the Pilot completion
• Parts of the Programme implemented:
  – Pan-European campaign to recruit SMEs for the Programme
  – Announce the Call for Proposals
  – Programme webpage with Call for Proposals and Project Submission process
  – Project Review
  – Implementing some projects using the Open R&D Access Programme
  – Analyse the results of the pilot and develop a set of recommendations to the PRACE AISBL Council for a permanent service
SHAPE Pilot 2/2

• Call for Applications: June 2013 - September 2013
• www.prace-ri.eu/shape/

• 14 applications submitted from SMEs of 7 different Countries
  Bulgaria, France, Germany, Ireland, Italy, Spain, UK

- Review process for the final proposals
  Criteria: Technical Adequacy and ROI
- 10 projects selected from 6 different countries
- Each project assigned to a team of Technical Experts to assist in demonstrating the benefit of applying HPC
- The successful projects run until May 2014
Pilots 1/5

• **THESAN S.p.A**, Italy > *Improvement of hydraulic turbine design through HPC*

  Thesan is an Italian SME involved in energy sustainability. The project aims to optimise the design of a volumetric machine (hydraulic turbine) currently being developed by Thesan, improving the overall performance by designing and realising rotating chambers where the fluid flows, drastically cutting down the time and resources needed to construct a physical prototype and actually building the preferred structure only.

• **Albatern Ltd**, UK > *Numerical Simulation of Extremely Large Interconnected WaveNET Arrays*

  Albatern develops novel interconnected offshore marine renewable energy devices. The goal of the project is to develop and deploy a code to simulate a large scale WaveNET array using HPC parallel technology. The results of the simulations will contribute by mitigating risk and reduce overall development time and cost.
Pilots 2/5

- **NSilico Life Science Ltd, Ireland > High Performance Computation for Short Read Alignment**
  NSilico is a company based in Ireland, developing integrated molecular diagnostics and analytic tools for the life sciences and healthcare industries. The project aims at identify accurate data analytic applications for ribosomal RNA sequence analysis taking advantage of massively parallel architectures. This would not only provide a technical advantage but would also provide the developed solution with greater access to commercial markets.

- **Audionamix, France > Unmix Up**
  Audionamix is a French company developing audio unmixing technologies, relying on computationally intensive optimization algorithms. The project will help Audionamix to explore the latest hardware and software solutions. The unmixing algorithms will be adapted to enable multi-GPU-based hardware configurations. The improvements in technology speed are expected to unveil new business opportunities in processing large audio material bases, accelerating R&D inside the company.
Pilots 3/5

• **Juan Yacht Design, SL, (JYD), Spain** > *Testing LES turbulence models in race boat sail*

Juan Yacht Design SL is a Spanish company specialized in the design of sail boats. The project aims at testing new methods for the design of racing boat sails using novel HPC simulation techniques, introducing competitive advantages that will allow JYD to become a world class leader in this segment.

• **OPTIMA pharma GmbH, Germany** > *Enhanced airflow simulations around filling machines in clean rooms*

Optima pharma (Schwabisch Hall, Germany) offers an immensely diversified and innovative range of filling and packing machines for pharmaceutical products, e.g. sterile liquids and powders, and will profit from airflow simulations in clean rooms which minimize trial and error cycles during innovative machine design and reduce expensive hardware tests.
Pilots 4/5

- **AMET s.r.l., Italy** > *Robustness in safety performances analysis*
  AMET is an Italian high-tech engineering company, active in the design and development of mechanic and mechatronic products and processes. The project aims to analyze state of the art simulation techniques to replace the standard deterministic approach, used to evaluate the passive safety performances of a vehicle, with a robust lean statistical approach.

- **ENTARES Engineering, (NEXIO simulation)** France > *CAPITOL-HPC+
  ENTARES Engineering is a French SME developing electromagnetism simulation software to study the electromagnetic behavior of products during the design, before the manufacturing phase. This project aims to validate a quick and easy parallel simulation tool that can be operated at an early stage of system design, with a controlled level of accuracy. In addition, a commercial offer for this software environment, such as pay-per-use scheme, developing a partnership with a computing center to propose a service, will be investigated.
Pilots 5/5

- **Lapcos Scrl, Italy > Virtual Test Bench for Centrifugal Pump**
  Lapcos is an engineering firm which adopts virtual prototyping technologies. The proposed project is aimed at building, upon the OpenFOAM library for CFD, a custom, vertical product for automatically design centrifugal pumps, exploiting HPC resources.

- **MONOTRICAT S.r.l., Italy > CFD simulation of an innovative hull**
  Monotricat SRL is an Italian company that designs an innovative hull, characterized by hydrodynamic efficiency; the aim of the proposed project is to use CFD on HPC methodologies applied to its hull in order to optimize their R&D work flow.
SHAPE Pilot: AlbaTERN 1/3

- Scottish SME in the renewable energy business
- Have a modular system for capturing wave energy from the sea
  - Known as “Squids”
  - Each squid can be connected to others which allows for shared infrastructure (power cables etc) and exploitation of longer wavelengths
- Currently their compute models are limited to three devices
  - Unsupported third-party software limitation
- Ultimately would like to model huge kilometre-scale arrays of hundreds of these devices
  - This is where SHAPE has assisted
SHAPE Pilot: AlbaTERN 2/3

• Two concurrent activities in the pilot
  – EPCC (at University of Edinburgh) developed a parallel implementation of the underlying mooring system for anchoring the squid devices
  – AlbaTERN focussed on the multibody dynamics simulation of the squid device itself

• Outcome
  – Pilot served as an introduction to HPC for AlbaTERN, and provided them with access to HPC expertise and hardware
  – AlbaTERN are now very well placed to build on this work to develop a full parallel multibody physics simulation of an array of the devices
AlbaTERN: squid testing off the Isle of Muck
SHAPE Pilot: a success story

SHAPE Programme will be part of the PRACE Offer to Industry

Open R&D Access Programme for Industry

The **Objective** is to help European SMEs achieve tangible Return on Investment by adopting solutions supported by HPC, thus facilitating **innovation** and/or increased **operational efficiency** in their businesses.

For any information:

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