The PRACE Project

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CAPACITIES

e-infrastructure

Outline

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PRACE general information

Partnership for Advanced Computing in Europe

PRACE

EU Project of the European Commission 7th Framework Program Construction of new infrastructures - preparatory phase

FP7-INFRASTRUCTURES-2007-1

Partners are 16 Legal Entities from 14 European countries
Budget: 20 Mio €
EU funding: 10 Mio €

Duration: January 2008 – December 2009
Grant no: RI-211528

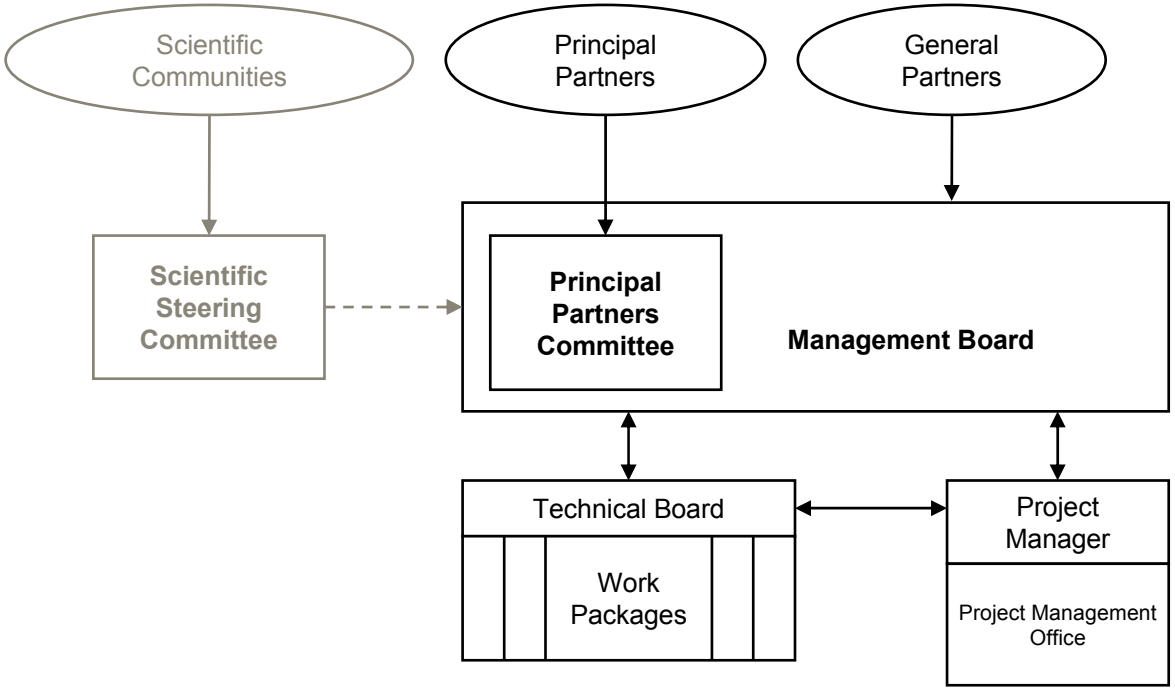
PRACE Partners

1 (Coord.)	Forschungszentrum Juelich GmbH	FZJ	Germany
2	Universität Stuttgart – HLRS	USTUTT-HLRS	Germany
3	LRZ der Bay. Akademie der Wissenschaften	BADW-LRZ	Germany
4	Grand Equipement national pour le Calcul I.	GENCI	France
5	Engineering and Phys. Sciences Research C.	EPSRC	United Kingdom
6	Barcelona Supercomputing Center	BSC	Spain
7	CSC Scientific Computing Ltd.	CSC	Finland
8	ETH Zürich - CSCS	ETHZ	Switzerland
9	Netherlands Computing Facilities Foundation	NCF	Netherlands
10	Joh. Kepler Universitaet Linz	GUP	Austria
11	Swedish National Infrastructure for Comp.	SNIC	Sweden
12	CINECA Consorzio Interuniversitario	CINECA	Italy
13	Poznan Supercomputing and Networking C.	PSNC	Poland
14	UNINETT Sigma AS	SIGMA	Norway
15	Greek Research and Technology Network	GRNET	Greece
16	Universidade de Coimbra	UC-LCA	Portugal

PRACE Stakeholders

- *Principal Partners:* a national coordinator of HPC activities, willing to host and fund one of the Tier-0 HPC centres
- *General Partners:* a national coordinator of HPC activities, involved e.g. in definition of scientific priorities, or as domain specific centre of excellence
- *Associate Partners:* representing scientific communities or industrial users, involved in the scientific steering
- *Users:* academic or industrial groups with a need for Tier-0 HPC services
- *European Commission:* facilitator, catalyser, provider of funding via FP7 Capacities Programme or community projects
- *National funding agencies:* funding part if the PRACE RI

Project Management Structure



- MB is main decision making body
- PPC decides on “principal tasks”
- TB ensures coherence of work, prepares and implements MB decisions
- PM/PMO is responsible for day-to-day management and implementation of MB decisions
- SSC will be created in 2009

Project Management (WP1)

- Objectives
  - Efficient management of the project
  - Effective project internal communication
  - Quality control of results and deliverables
  - Transparent financial management and control
  - Timely communication with the EC

Project Management – Consortium Bodies

Bodies have been established and meet regularly

- Management Board and Principal Partners Committee
  - Decisions on all important and strategic issues
  - f2f–meetings every 2 months (initially every 3 months)
  - Email consultation and voting on urgent matters
  - Rules for voting and conflict resolution defined in Consortium Agreement
- Technical Board:
  - Coordinates technical work to ensure overall coherence
  - Prepares and implements decisions of the MB
  - Monthly telephone meetings, f2f–meetings every 3 months
- Within Work Packages:
  - Task leaders defined, budget broken down to tasks and deliverables
  - Telephone/f2f meetings on WP or task level as needed (weekly … monthly)
- Project Management Office (PMO):
  - Day to day management of the Project

Project Management – Communication

- Internal Communication
  - Mailing lists for all bodies and work packages, maintained by PMO
  - Secure Intranet (BSCW) for structured central archive for all kind of documents and event calendar, supporting fine-grained access control
- External Communication
  - Standardised PRACE NDAs for exchange of confidential information with vendors
  - Documented light-weight process for approval of dissemination activities

Quality Management

- Documented QA process for deliverables
  - Assignment of responsible author
  - Fixed timeline and milestones for all intermediate steps
  - Internal peer review by 2 reviewers (1 from PMO)

Monitoring

- Progress Monitoring through PMO
  - Monthly WP reports: work performed and planned, problems & solutions
  - Monitoring and QA of Deliverables
- Financial Monitoring
  - Quarterly financial reports by each partner
    - PMs broken down to persons, WPs, months
    - Other major costs items
  - PMO: Early recognition of serious under- over spending
  - WP-leaders: consistence of partner's contributions with work plan
- Documented in Internal Reporting Guidelines

Organisational concept of the RI – Objectives:

- Definition of the **Legal Form** of the Research Infrastructure
- Definition of the **Governance Structure**
- Specification of **Funding and Usage** strategies
- Establishment of the **Peer-Review Process**
- Establishing **Links with the HPC Ecosystem**
- Development of the **Operation Model**
- **Selection of Prototypes** and Production Systems

Organisational concept of the RI – Results:

- Drafts of documents completed
- Internal review in progress
- Management Board decisions early 2009
- Final documents completed and processes defined in 2009 according to project schedule

- Permanent Research Infrastructure to become operational in 2010

Dissemination, Outreach and Training

- WP3 Objectives
  - Dissemination to major HPC stakeholders, European science & research communities, RIs, universities, general public
  - Establish industry and business relations
  - Implementation of an education and training program for computational science / scalable computing

WP3: Dissemination

- Web page: www.prace-project.eu
- Dissemination package: roll-up, poster, flyer, brochure, folder, T-shirt, candy, …

WP3: Dissemination

- Past activities
  - 8 press releases
  - 21 presentations/papers
  - strong presence at ISC'08
    - PRACE Plenary session with 3 presentations
    - Ecosystem BoF
    - PRACE Award
    - Booth
- Next major events
  - PRACE booth at SC 08 Austin, TX
  - ICT 2008, Lyon

WP3: Industry Relations

- Approaching User Industry:
  - 1st Industry Seminar, September 4
    - Understand industries needs
    - Raise awareness for PRACE and HPC in general
    - Establish contacts for cooperation (to be exploited by other WPs): access to systems, requirements, scientific steering committee, …
  - High-profile program
    - Krasnapolsky Hotel, Amsterdam
    - Welcome by J. Cohen (Mayor of Amsterdam)
    - Industry and Science success stories, needs and expectations presented by top-level managers from EDF, Repsol, GM, Organon
    - Invitation to CEOs, CTOs, CIOs only
- HW/SW vendor relations are addressed by WPs 6-8 !

WP3: Education and Training

- Rationale
  - Efficient programming and usage of Petaflop/s systems will be challenging
  - Computer Science Curricula do not emphasize HPC
  - User education and training will be key for exploitation of tier-0 systems by European users
- Understanding users needs
  - Comprehensive online survey of HPC training needs among Top-10 users of PRACE partner's HPC systems
    Results see: PRACE-TrainingSurvey.pdf
  - 1st event: PRACE Petascale Summer School in Stockholm, August 26-29
  - 31 participants, lectures and hands-on sessions (IBM BG/P, Cray XT4)

Distributed Systems Management

- WP4 Objectives
  - Analysis, evaluation and deployment of existing solutions for system management of the distributed tier-0 systems
  - Technologies for ecosystem integration, especially with tier-1
  - Planning and design of the distributed system management of the RI

WP4: Management of the tier-0 systems

- Operational model will determine services to be deployed
- Survey among potential tier-0 sites about their expectations, includes lessons learned from DEISA
  - Uniform user environment across tier-0 and tier-1 sites
  - Uniform user/group naming across tier-0 sites
  - Federated accounting has to respect local site policies
  - Uniform monitoring for users and administrators
  - Data sharing is important, not necessarily via shared file-system

WP4: Management of the tier-0 systems

- Close cooperation with DEISA2-WP4 as **the** major provider of European solutions for distributed systems management solutions
  - Regular meetings to maximize synergies and avoid duplicate efforts
  - Exchange of requirements, specifications and results
  - Rule of a thumb: PRACE specifies, DEISA2 implements

- Work in progress:
  - Survey and assessment of existing solutions for management of distributed HPC and Grid infrastructures:
    DEISA, EGEE, NorduGrid, RISA (Europe), TeraGrid, OSG (USA), NAREGI, CROWN (Asia), Grid Australia

Deployment of Prototype Systems

- WP5 Objectives:
  - Installation of prototypes for the tier-0 production systems for 2009/2010
  - Test integration and operation in production environments
  - Evaluation of the capabilities
  - Benchmarking

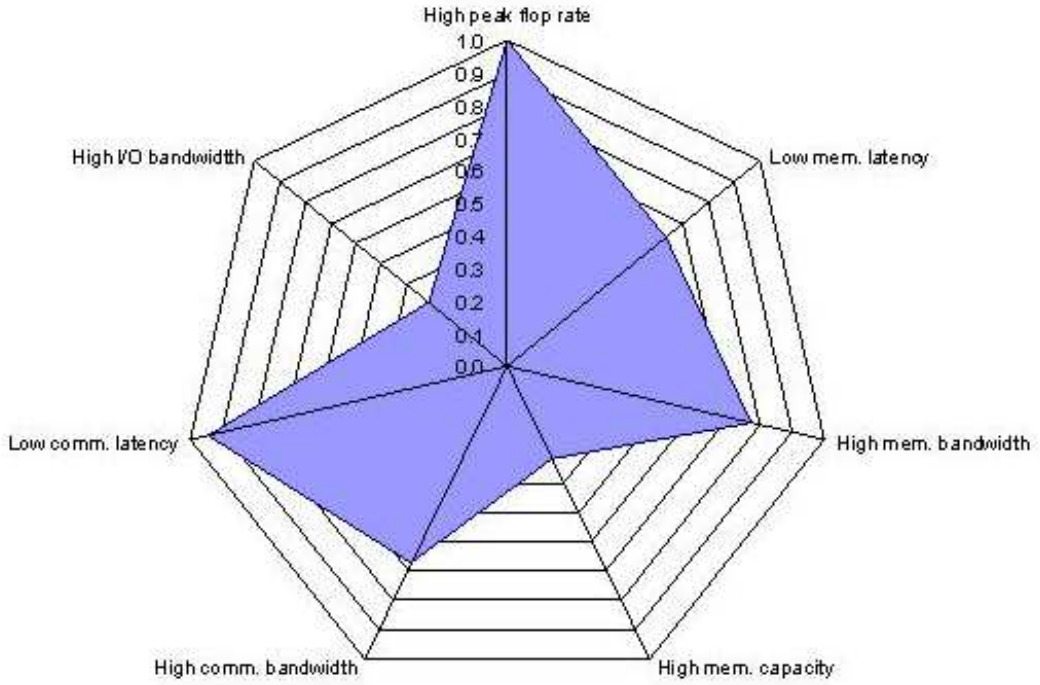
- Current main activity:
  - Preparation of prototype installation
  - Planning document with detailed timing produced

Software enabling for Petaflop/s systems

- WP6 Objectives:
  - Create an application benchmark suite
  - Capture application requirements for petascale systems
  - Port, optimise, and scale selected applications
  - Evaluate application development environments of the prototypes

WP6: Application Requirements Capture

- Understanding application requirements is key for assessing and selecting architectures and systems
  - WP5 / WP7 Prototype selection process requires results at M3
  - Assessment based on existing application set: DEISA benchmark suite of most relevant codes of 11 leading European tier-1 centres
  - Method: questionnaire to users and authors of the codes
  - Result: peak performance & communication latency are key



WP6: Initial PRACE Benchmark Suite

- Rationale:
  - Define a set of representative applications from which PRACE will select sub-sets as benchmarks for the procurements of tier-0 systems
- The benchmark suite should
  - be representative for expected use of the tier-0 systems
  - cover scientific communities
  - cover relevant algorithms
- Method used by PRACE for D6.1
  - Survey of top usage of 24 HPC systems of PRACE partners (these systems deliver > 34% of Europe's total TOP500 Performance)
  - 9 core codes plus 11 additional codes which have the requested coverage and consume most cycles have been selected for the benchmark suite
- Additional benefit: snapshot of HPC usage in Europe
  - Particle physics, computational chemistry and condensed matter physics are the main consumers of cycles
- Results see: PRACE-Applications.pdf

Petaflop/s Systems for 2009/2010

- WP7 Objectives:
  - Identify architectures and vendors capable of delivering Petaflop/s systems in 2009/2010 (tier-0)
  - Translate user requirements into architectures
  - Define installation requirements and map with site capabilities
  - Risk analysis and mitigation
  - Define technical requirements and evaluation criteria for tier-0 systems
  - Define the procurement process for the tier-0 systems

- Prototype selection: see PRACE-Prototypes.pdf

WP7: Risks

- The major risks concerning both prototypes and production systems identified
  - Technical risks are identified as major risks
    - Prototypes will help reducing these risks for production systems
  - For reducing the risks concerning prototypes,
    - a mix of existing systems and to be installed systems
    - a mix of proven technology and more advanced technology

    is suggested for the selection of prototypes

- Future work will concentrate on risk mitigation strategies for production systems taking into account the risks identified

Future Petaflop/s computer technologies beyond 2010

- WP8 Objectives:
  - Strategy for continuous HPC technology evaluation and system evolution for the RI
  - Anticipation and evaluation of emerging multi-petascale technology, following user requirements
  - Fostering the development of future multi-petascale systems in cooperation with European and international HPC industry
- Long-term goal:
  - Foster HPC developments in Europe and involve European industry to the benefit of PRACE, its users and the European vendors:
    - independent access to HPC technology for European users
    - boost European competitiveness in a key technology

WP8: Prototypes for Multi-Petaflop/s technology (1/2)

- Goal:
  - bootstrap a process of continuous technology evaluation and deployment for the RI
- Method:
  - Translate application requirements to architectural specifications
  - Assess user requirements with the similar approach as WP7 for the systems for 2009/2010, but already based on the initial PRACE benchmark suite
  - Take into account prototypes already selected by WP7 / WP5
- Result:
  - All architectures remain relevant
  - CPUs/accelerator and network performance will be key components
  - I/O reliability becomes more important
  - Size of the systems will make energy consumption the limiting factor

WP8: Prototypes for Multi-Petaflop/s technology (2/2)

- 15 EoIs for prototypes issued that address these challenges
  - I/O: 2 proposals
  - Communication: 1 proposal
  - Novel programming models: 2 proposals
  - Accelerators: 8 proposals; Many-core CPUs: 1 proposal;
  - Low power CPUs and systems: 1 proposal
  - Today's technology options for energy-efficient systems are widely covered:
    - low-power CPUs, accelerators, many-core CPUs
- Selection process defined
  - Process with selection criteria, weighting, detailed review process defined
  - Final proposals until July 27, WP8 decision Sept. 18, MB decision end of Sept.
- Clustering of proposals to coordinate work
  - Ensure coherent work and comparable results
  - maximize know-how gained
- WP8+WP7 meetings with vendors planned for market survey:
  - CPUs and Accelerators, incl. Software: September 15-19, Paris
  - Networking and I/O: October 22-24, Munich
  - Memory components and other components: Early 2009

WP8: Advanced HPC Technology Platform

- Rationale:
  - PRACE consortium consists of national HPC representatives only
  - PRACE needs a platform that provides a framework for cooperation with technology providers mainly from industry
- Achievements
  - Technology watch contact list – acquire a clear view on ongoing research and development
  - Created momumentum among the vendors (creation of PROSPECT)
- Next steps
  - Establishment of the formal structure through a MoU, defining goals and actions
  - Initial members
    - PRACE WP8 partners
    - PROSPECT, an open interest group of European and international HPC vendors has expressed its interest

Summary and Outlook

- PRACE
  - … has set up its management and communication structures
  - … is progressing in accordance with its work plan and has document its first results
  - … has raised significant awareness and initiated contacts already with various actors on the HPC ecosystem:
    - HPC resource providers on the national level,
    - academic and industrial user communities,
    - HPC technology providers
  - … is prepared for the next challenges
    - installation and assessment of the prototypes: technical assessment, distributed systems management, benchmarking
    - define the organisational structure and further establish its links to the ecosystem

About PRACE

- The aim of PRACE is to provide scientists in Europe with unlimited and independent access to fast supercomputers and competent support.
  PRACE prepares the creation of a persistent pan-European HPC service, consisting several tier-0 centres providing European researchers with access to capability computers and forming the top level of the European HPC ecosystem.
  PRACE is a project funded in part by the EU's 7th Framework Programme.
  The following countries collaborate in the PRACE project: Germany, UK, France, Spain, Finland, Greece, Italy, Ireland, The Netherlands, Norway, Austria, Poland, Portugal, Sweden, Switzerland and Turkey.
  The PRACE project is coordinated by the Gauss Centre for Supercomputing (Germany), which bundles the activities of the three HPC centres in Jülich, Stuttgart, and Garching.

- http://www.prace-project.eu/

- The PRACE project receives funding from the EU's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° RI-211528.