Building the European HPC Ecosystem

ISC BOF
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Computational science infrastructure
Main players in European HPC Ecosystem

- ESFRI Roadmap and 35 new research infrastructures
- PRACE – Petaflop computing centers
- EU-supported infrastructure projects, such as DEISA, EGEE, GEANT2, …
- European Grid Initiative, EGI
- Policy groups, such as HET, ESFRI and e-IRG
- Regional activities
- National Infrastructures
- International centers, such as CERN, EBI and ECMWF
- User communities with HPC requirements, such as fusion or climate
PRACE First Steps and Achievements

Production of the HPC part of the ESFRI Roadmap; Creation of a vision, involving 15 European countries

- Bringing scientists together
- Creation of the Scientific Case
- Approval of the project
- Kick-off
- Submission of the project proposal
- Signature of the MoU

Timeline:
- HPCEUR: 2004
- HET: 2006
- PRACE Initiative: 2007-2008
HPC Ecosystem to support the top

- The upper layers of the pyramid
  - HPC centers / services
  - European projects (HPC/Grid, networking, …)

- Activities which enable efficient usage of upper layers
  - Inclusion of national HPC infrastructures
  - Software development and scalability issues
  - Competence development

- Interoperability between the layers
Policy and strategy work

- HET: HPC in Europe Taskforce
  http://www.hpcineuropetaskforce.eu/

- e-IRG: e-Infrastructure Reflection Group
  http://www.e-irg.org/

- ESFRI: European Strategy Forum on Research Infrastructures
  http://www.cordis.lu/esfri/
ESFRI

- Strategy Forum with a consulting role to EU
- Wide representation of scientists in various disciplines
- Roadmap process for major new European research infrastructures (range of 10-1000 MEUR for an infrastructure)
  - Roadmap published in 2006
    - 35 projects labeled mature
    - One of the projects European HPC Service
  - Preparatory projects for each project
    - 1-4 years
    - Deadline for project call was May 2nd, 2007
- ESFRI-list update in process
  - Renewed list targeted for autumn 2008
Topics to discuss in HPC Ecosystem

- How to collaborate between different projects?
- How to involve all relevant stakeholders?
- How to improve interaction between researchers and those providing IT services?
- How to increase the decision makers’ interest towards computational science?
- What do the users really need?
Some definitions…
Terminology and pointers

- **HPC**
  - High Performance Computing

  - High Performance Computing in Europe Taskforce, established in June 2006 with a mandate to draft a strategy for European HPC ecosystem

- **Petaflop/s**
  - Performance figure $10^{15}$ floating point operations (calculations) in second

  - e-Infrastructure Reflection Group. e-IRG is supporting the creation of a framework (political, technological and administrative) for the easy and cost-effective shared use of distributed electronic resources across Europe - particularly for grid computing, storage and networking.

  - European Strategy Forum on Research Infrastructures. The role of ESFRI is to support a coherent approach to policy-making on research infrastructures in Europe, and to act as an incubator for international negotiations about concrete initiatives. In particular, ESFRI is preparing a European Roadmap for new research infrastructures of pan-European interest.

- **RI**
  - Research Infrastructure
Terminology and pointers (cont.)

- **PRACE**
  - Partnership for Advanced Computing in Europe
  - EU FP7 project for preparatory phase in building the European petaflop computing centers, based on HET work

- **DEISA**, [https://www.deisa.org/](https://www.deisa.org/)
  - Distributed European Infrastructure for Supercomputing Applications. DEISA is a consortium of leading national supercomputing centers that currently deploys and operates a persistent, production quality, distributed supercomputing environment with continental scope.

  - Enabling Grid for E-sciencE. The project provides researchers in academia and industry with access to a production level Grid infrastructure, independent of their geographic location.

  - An effort to establish a sustainable grid infrastructure in Europe

  - Seventh generation of pan-European research and education network
Performance Pyramid

- **TIER 0**
  - European HPC center(s)

- **TIER 1**
  - National/regional centers, Grid-collaboration

- **TIER 2**
  - Local centers

Capability Computing

Capacity Computing
Need to remember about petaflop/s…

- **What do you mean with petaflop/s?**
  1. Theoretical petaflop/s?
  2. LINPACK petaflop/s?
  3. Sustained petaflop/s for a single extremely parallel application?
  4. Sustained petaflop/s for multiple parallel applications?

- **Note that between 1 and 4 there might be several years**
- **Petaflop/s hardware needs petaflop/s applications, which are not easy to program, or not even possible in many cases**
  - Do we even know how to scale over 100000 processors …