European Exascale Software Initiative

March 2010

Jean-Yves Berthou
European Exascale Software Initiative (EESI)

Context in Europe


**DEISA**, Distributed European Infrastructure for Supercomputing Applications

**PRACE**, Partnership for Advanced Computing in Europe (PRACE)
European Exascale Software Initiative (EESI)

Context in Europe

PRACE History and first steps

2004 2005 2006 2007 2008

HPCEUR HET PRACE MoU PRACE Preparatory

EU-Grant: INFSO-RI-211528, 10 Mio. €

2009 2010 2011 2012 2013

PRACE Implementation Phase PRACE Operation

Foreseen: PRACE Tier-0 centres providing HPC-capability service in a legal entity
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Context in Europe

PRACE – A Partnership with a Vision

- Provide world-class HPC systems for world-class science
- Support Europe in attaining global leadership in public and private research and development

... and a Mission

- Create a world-leading persistent high-end HPC infrastructure managed as a single legal entity
  - Deploy 3 – 6 systems of the highest performance level (Tier-0)
  - IBM BlueGene/P in Jülich will be the first European Tier-0 system
  - Ensure a diversity of architectures to meet the needs of European user communities
  - Provide support and training
Purpose

- The IESP software roadmap is a planning instrument designed to enable the international HPC community to improve, coordinate and leverage their collective investments and development efforts.
- After we determine what needs to be accomplished, our task will be to construct the organizational structures suitable to accomplish the work.

Four Goals for IESP

- **Strategy for determining requirements**
  clarity in scope is the issue

- **Comprehensive software roadmap**
  goals, challenges, barriers and options

- **Resource estimate and schedule**
  scale and risk relative to hardware and applications

- **A governance and project coordination model**
  Is the community ready for a project of this scale, complexity and importance? Can we be trusted to pull this off?
The guiding purpose of the IESP is to empower ultrahigh resolution and data intensive science and engineering research through the year 2020 by developing a plan that addresses the following objectives:

1. Make a thorough assessment of needs, issues and strategies
2. Develop a coordinated software roadmap
3. Provide a framework for organizing the software research community
4. Engage and coordinate vendor community in crosscutting efforts
5. Encourage and facilitate collaboration in education and training

DOE Workshop series, http://www.exascale.org/mediawiki/images/a/a7/Messina-doeexa.pdf,
INESP identified US contribution: http://www.exascale.org/iesp/Main_Page

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Context in US/ International Exascale Software Project
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Motivations for launching EESI

Coordinate the European contribution to IESP

Enlarge the European community involved in the software roadmapping activity

Build and consolidate a **vision and roadmap** at the European Level, including applications, both from academia and industry
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EESI main Goals

Build a **European vision and roadmap** to address the **challenge of performing scientific computing** on the new generation of computers which will provide multi Petaflop performances in 2010 and Exaflop performances in 2020.

- Investigate how Europe is located, its strengths and weaknesses, in the overall international HPC landscape and competition
- Identify priority actions
- Identify the sources of competitiveness for Europe induced by the development of Peta/Exascale solutions and usages
- Investigate and propose programs in education and training for the next generation of computational scientists
- Identify and stimulate opportunities of worldwide collaborations
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**EESI main tasks**

**Coordination** of the European participation in IESP

*Make a thorough assessment of needs, issues and strategies*

*Develop a coordinated software roadmap*

*Provide a framework for organizing the software research community*

*Engage and coordinate vendor community in crosscutting efforts*

*Encourage and facilitate collaboration in education and training*

**Cartography** of existing HPC projects and initiatives in Europe, US and ASIA

**Coordination of** “disciplinary working groups” at the European level

- *Four groups* “Enabling technologies for Petaflop/Exaflop computing”
- *Four groups* “Application Grand Challenges”

**Synthesis**, dissemination and recommendation to the European Commission
A set of recommendations to the EC shared by the European HPC community, on software - tools, methods and applications - to be developed for this new generation of supercomputers.
European Exascale Software Initiative AGENDA

Initial International workshop

Enabling technologies for Exaflop computing
- Hardware roadmap, links with vendors
- Software eco-systems
- Numerical, libraries, solvers and algorithms
- Scientific software engineering

Initial cartography of existing HPC projects, initiatives in Europe, US and ASIA

Application Grand Challenges
- Industrial and Engineering Applications (Transport, Energy)
- Weather, Climatology and Earth Sciences
- Fundamental Sciences (Chemistry, Physics)
- Life science, Health, BPM

Internal workshop: presentation of each working group results and roadmaps

Synthesis of all contributions and production of a set of recommendations

Final conference: public presentation of project result

Updated cartography of existing HPC projects, initiatives in Europe, US and ASIA

Constitution of WG, Setup of guidelines, organisation modes

3 months 8 months T0+11 1 month T0+12 2 months T0+14 1 month T0+15
European Exascale Software Initiative AGENDA

Hardware roadmap, links with Vendors
Chair: Herbert Huber/STRATOS-LRZ
Vice-Chair: Sanzio Bassini/CINECA
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Software eco-systems
Chair: Franck Cappello/INRIA-NCSA
Vice-Chair: Bernd Mohr/JSC
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Numerical, libraries, solvers and algorithms
Chair: Iain Duff/ STFC-Rutherford Appleton Laboratory
Vice-Chair: Andreas Grothey/ Edinburgh University
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Scientific software engineering
Chair: David Emerson/STFC-Daresbury Lab.
Vice-Chair: Andrew Jones/NAG
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Industrial and Engineering Applications (Transport, Energy)
Chair: Philippe Ricoux/TOTAL
Vice-Chair: Jean-Claude André/CERFACS
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Weather, Climatology and Earth Sciences
Chair: Giovanni Aloisio / ENES-CMCC
Vice-Chair: Massimo Cocco/ INGV
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Fundamental Sciences
(Chemistry, Physics)
Chair: Godehard Sutmann/CECAM
Vice-Chair: Jean-Philippe Nominé/CEA
European Exascale Software Initiative AGENDA

Life science, Health, BPM
Chair: Modesto Orozco/ BSC
Vice-Chair: Janet Thorton/EMBL-EBI
European Exascale Software Initiative AGENDA

**Initial International workshop**

- **Internal workshop:** presentation of each working group results and roadmaps
- **Final conference:** public presentation of project result

**European Exascale Software Initiative**

**Enabling technologies for Exaslop computing**
- Hardware roadmap, links with vendors
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**Application Grand Challenges**
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- Fundamental Sciences (Chemistry, Physics)
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**Synthesis of all contributions and production of a set of recommendations**
European Exascale Software Initiative AGENDA

**Link with US and ASIA**

Preparation and participation to IESP boards/meetings, transfer to the EESI partners/contributors, identification of US, ASIA and European cross actions

**Initial cartography of existing HPC projects, initiatives in Europe, US and ASIA**

3 months 8 months 1 month

**T0**  **T0+3**  **T0+11**  **T0+14**  **T0+15**

**Enabling technologies for Exaflop computing**

- Hardware for Exaflop
- Software for Exaflop
- Numerical, libraries, solvers and algorithms

**Application Grand Challenges**

- Industrial and Engineering Applications
- Fundamental Sciences (Chemistry, Physics)
- Life science, Health, BPM

**Internal workshop**

- Presentation of each working group results and roadmaps
- Synthesis of all contributions and production of a set of recommendations

**Final conference**

- Public presentation of project results

**Constitution of WG, Setup of guidelines, organisation modes in Europe, US and ASIA**

Preparation and participation to IESP boards/meetings, transfer to the EESI partners/contributors, identification of US, ASIA and European cross actions
EESI Partners In Europe
EESI Partners around the world