ISC Breakfast

June 20th, 2013
Leipzig
Agenda

• 7h45  
  Presentation of the ETP4HPC activities
  – HPC leadership and PPP
  – On-going actions
    • Working Groups
    • General Assembly

• 8h00 
  Presentation of the SRA
  – Technical and ecosystem context
  – The strategic vision: the 4 dimensions
  – The research priorities: 6 areas to develop

• 8h30  Discussion

• 8h45  End
Contact with the EC

• Letter to VP Neelie Kroes June 14th
  – Announcement of the creation of ETP4HPC and Vision Paper

• Meeting with VP Neelie Kroes September 27th
  – Economical impact of HPC
  – ETP4HPC objective
  – Potential impact of EC policy

• Document from the ETP4HPC November 1st
  – Europe achieving HPC leadership

• Letter from VP Neelie Kroes
  – Positive feedback
Europe achieving leadership in HPC

• Importance and impact of HPC
• 3 axes:
  – Development of HPC technology
  – Existence of world-class HPC e-infrastructure
  – Development of HPC application and use
• 3 key success factors
  – Coordination
  – Education and training
  – Focus on SMEs
• PPP could leverage all the stakeholder actions
• Budget for HPC technology R&D of 150 M€/year
Thank you for your plan for the development of HPC in Europe. As I already said during our meeting on 27 September, your efforts are fully aligned with the implementation of the Commission strategy for HPC. I am therefore positive about your suggestion to prepare the grounds for a Public-Private Partnership in this area in Horizon 2020. Such an initiative should include the three elements of the strategy: development of exascale technologies, access to world-class HPC facilities and services for both industry and academia; and excellence in HPC applications. I encourage you to continue working with all stakeholders, to encompass these three components.

These plans are, of course, subject to availability of resources in Horizon 2020. The ambitious goals of the HPC strategy will need substantial means, and in this sense I also count on a strong mobilisation of your constituency to support the Commission’s ambitious budget proposal for research and innovation 2014-2020, and to actively champion HPC in Council and Parliament.

Yours sincerely,
Public Private Partnership proposal

• On June 10th 2013, ETP4HPC sent a proposal for a PPP to VC Kroes

• Support of and action plan with 3 pillars:
  – The provision of HPC system technologies (i.e. the HPC Technology Supply Chain)
  – The European HPC Research Infrastructure
  – European scientific and industrial applications

• Commitment for R&D programs:
  – HPC technologies based on SRA
  – HPC application development with the establishment of Centre of Excellence
Work group Education and training

• Consolidating Education and Training Needs
  – **Across All HPC groups,**
    • Infrastructure and Service Providers, Application developers, End Users
  – Focus on HPC industrial needs,
    • Technology Suppliers, **Current and Potential** HPC Users

• Reviewing: Providers, Subject fields and Recipients
• Develop education and Propose training directions
• Encourage the establishment of E&T programs.....

• Group is now Active – **PLEASE COME AND JOIN US**
First Steps: Map out the HPC E&T Landscape
Work group SMEs

• Creation of economic value in the HPC ecosystem by the creation of SMEs
• To leverage the EU support initiatives for SMEs in HPC
• Showcase successful HPC SMEs
• Facilitate HPC development and testing infrastructure for SMEs
General Assembly

• Paris, September 20th (hosted by ST)
• Renewal of the Board
  – Call for candidatures open until June 30 (members having joined until June 6 are eligible)
    • 10 industrials
      – 5 European Corporate Active Members
      – 3 SME Active Members
      – 2 Global Active Members
    • 5 research organisations
  – Full members approved until August 31 will be able to vote
• Direction for the discussion with EC
Strategic Research Agenda (SRA)

• **Purpose:** R&D roadmap to develop HPC technology in Europe

• Position of HPC within **Horizon 2020** will be decided in the coming weeks

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<th>Deadline</th>
<th>Milestones</th>
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<td>2014</td>
<td>M-PROG-API-1: Develop benchmarks and mini-apps for new programming models/languages</td>
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<td>M-PROG-API-2: APIs and annotations for legacy codes</td>
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<td>M-PROG-API-3: Advancements of MPI+X approaches (beyond current realizations)</td>
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<td>M-PROG-DC-1: Data race detection tool with user support for problem resolution</td>
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<td>M-PROG-LIB-1: Self-auto-tuning libraries and components</td>
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<td>M-PROG-PT-1: Scalable trace collection and storage; sampling and folding</td>
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<td>M-PROG-RT-1: Runtime and compiler support for auto-tuning and self-adapting systems</td>
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<td>M-PROG-RT-2: Management and monitoring of runtime systems in dynamic environments</td>
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<td>M-PROG-RT-3: Runtime support for communication optimization; data-locality management, caching, and pre-fetching</td>
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<td>2015</td>
<td>M-PROG-API-4: APIs for auto-tuning performance and energy</td>
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<td>M-PROG-LIB-2: Components/library interoperability APIs</td>
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www.etp4hpc.eu
Where should we go?

What do you see as the major role of Europe in the field of Supercomputing in the years to come?

(a) Developing and building the fastest supercomputers, i.e., taking part in the race for Exascale systems.
(b) Supercomputer applications on systems not necessarily manufactured in Europe.
(c) Withdrawal in the field of supercomputing, in general.
SRA - Technological Context

Rationale:

• **A window of opportunity** for a European HPC Technology Value Chain - European strengths meet global opportunities: e.g.: energy efficiency & power, data, concurrency & scale, resiliency

• Europe’s HPC consuming power is not matched by its share in HPC systems
SRA - Impact

The implementation of the recommendations of the SRA will have the following impact:

- Strengthen the European HPC technology provision eco-system and increase its global market share
- Allow Europe to achieve global leadership in HPC-related technological areas, with the possibility of transferring such technologies to other industries
- Address some of the globally recognised grand challenges, such as energy efficiency and the handling of large data volumes
- Design HPC solutions required by European science and industry
SRA - Ecosystem Context and Methodology
Strategic, multi-dimensional vision
Strategic, multi-dimensional vision

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<th>PROGRAMMING ENVIRONMENT</th>
<th>HPC SYSTEM ARCHITECTURE</th>
<th>SYSTEM SOFTWARE AND MANAGEMENT</th>
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<td>Including: Support for extreme parallelism</td>
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HPC STACK ELEMENTS
Strategic, multi-dimensional vision

- **Programming Environment**: Including: Support for extreme parallelism
- **HPC System Architecture**: 
- **System Software and Management**

**HPC Stack Elements**

**Extreme Scale Requirements**

**Improve System and Environment Characteristics**
- Including: Energy efficiency, System resilience
- **Balance Compute Subsystem, I/O and Storage Performance**
Strategic, multi-dimensional vision

**PROGRAMMING ENVIRONMENT**
Including: Support for extreme parallelism

**HPC SYSTEM ARCHITECTURE**

**SYSTEM SOFTWARE AND MANAGEMENT**

**HPC STACK ELEMENTS**

**EXTREME SCALE REQUIREMENTS**

**NEW HPC DEPLOYMENTS**

**HPC USAGE MODELS**
Including: Big data, HPC in cloud

**IMPROVE SYSTEM AND ENVIRONMENT CHARACTERISTICS**
Including: Energy efficiency, System resilience

**BALANCE COMPUTE SUBSYSTEM, I/O AND STORAGE PERFORMANCE**

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Strategic, multi-dimensional vision

- Programming Environment
  - Including: Support for extreme parallelism

- HPC System Architecture

- System Software and Management

- Usability
  - Affordability
  - HPC Services
    - Including: ISV support, End-user support
  - SME Focus
  - Education and Training

- HPC Stack Elements

- HPC Usage Expansion

- Extreme Scale Requirements

- New HPC Deployments

- HPC Usage Models
  - Including: Big data, HPC in cloud

- Improve System and Environment Characteristics
  - Including: Energy efficiency, System resilience
  - Balance Compute Subsystem, I/O and Storage Performance

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The time line of the R&D program

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- Definition of ETP4HPC Strategic Research Agenda
- Putting in place the coordination and the first actions in relation with the SRA (potential PPP)
- First demonstration of technologies developed: energy efficient system, scalable IO system, new APIs,Is, programming models, HPC usage models...
- Demonstration of technologies developed: exascale system based on European technologies, broad HPC market solutions with high usability and energy efficiency,...
- Prototypes of disruptive technologies: hardware or software prototypes to develop the technology and user ecosystem

First phase of the European HPC technologies development
Second phase of the European HPC technologies development
The budget of the R&D programme

• 150 M€/year over 7 years necessary for the SRA R&D programme
  Co-funded 50% by EC

• Focused on the domains where Europe can make a difference

• The budget will cover the range of necessary technologies and will allow the development of a comprehensive set of results Prototypes not included
Research priorities in 6 areas

- **HPC System Architecture**
  - Energy and power
  - Memory and storage
  - Interconnects
  - Concurrency and locality
  - Resilience
  - Exascale system architecture

- **System Software and Management**
  - Operating system (OS)
  - Interconnect management (IC)
  - Cluster management software (CM)
  - Resource management and job scheduling

- **Programming Environment**
  - Parallel Programming APIs and Languages
  - Runtime supports/systems
  - Debugging and correctness (DC)
  - High-performance libraries/components (LIB)
  - Performance Tools (PT)

- **Energy and Resiliency**
  - Cooling and Energy Reuse
  - Energy-efficient design of computer systems
  - System Software and OS Optimization
  - Energy-Efficient Algorithms
  - Resilience and RAS

- **Balance Compute, I/O and Storage Performance**
  - I/O Interfaces
  - Storage Hierarchy
  - Storage Services
  - I/O System Simulation
  - Interconnects and Networks

- **Big Data and HPC Usage Models**
  - HPC as an Instrument
  - HPC for Big Data Workloads
  - Industrial Use of HPC as a Commodity
  - The Use of HPC in Cloud Environments
  - Very Large Volume
  - Distributed, Streaming Data and Noisy Data
  - New HPC Workloads
Proposed rollout of EC HPC research calls

Research areas:
- Compute platform
- I/O platform
- Interfaces & APIs
- System Management Software
- Programming Environments & Tools
- New HPC usage modes
- Definition and scoping of system prototypes

Call 2 focus on research gaps left behind after selection of Projects in Call 1

Each project has proofpoints (technology demonstrations)
Thanks for your attention!
Time for discussion
Do you have any questions?