Exascale-related EC activities

IESP 7th workshop
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Context

IDC Study 2010: A strategic agenda for EU leadership in Supercomputing: HPC 2020 (1/2)

Executive Overview, a few conclusions…

- HPC use is indispensable for advancing both science and industrial competitiveness
- Europe is under-investing in HPC, while other nations are growing their supercomputer investments dramatically
  - Even in 2009, the most difficult year of the global economic recession
- Supercomputing revenues (annual spending on systems priced above €375,000, or $500,000) increased by 25% worldwide in 2009
  - But only 9% in Europe

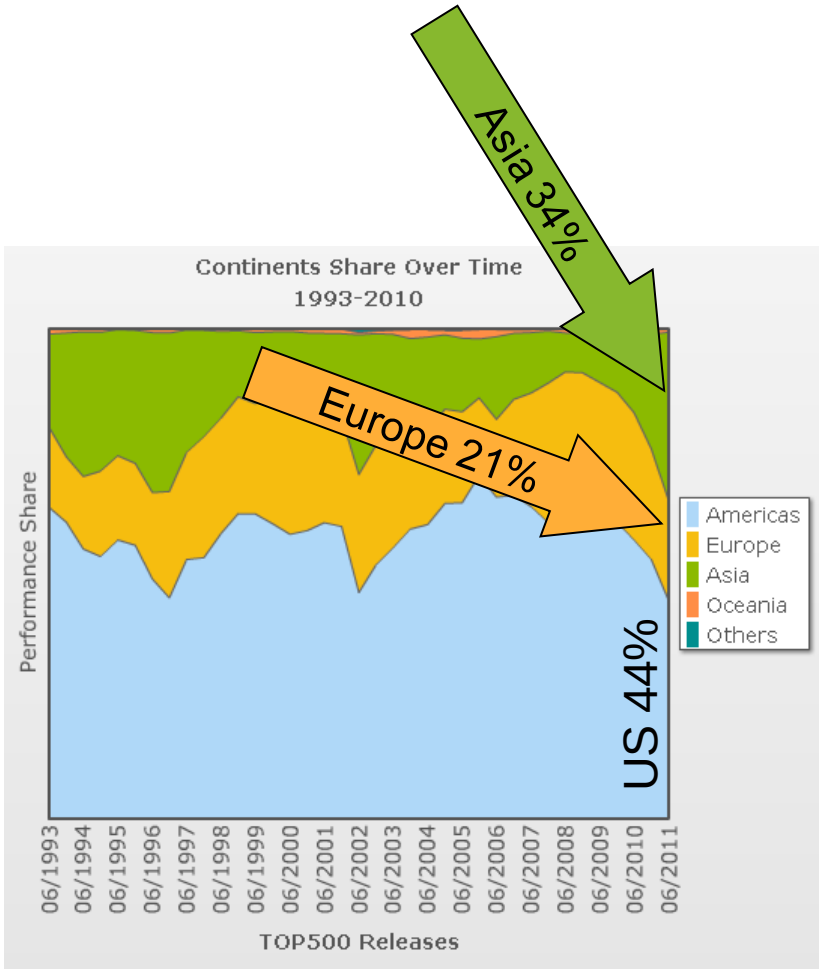
IDC Study 2010: A strategic agenda for EU leadership in Supercomputing: HPC 2020 (2/2)

- HPC research funding in Europe includes a diversity of EU, national and regional programs, and few countries have a coherent HPC development strategy
- HPC stakeholders from research, industry and academia rank U.S. and Japanese HPC research programs ahead of Europe's research programs
- The transition to petascale and exa-scale computing **creates opportunities**

  For Europe's scientific and computing communities to return to the forefront of development for the next generation of research and HPC software technologies

Top500 List

Rank	Site	System
1	RIKEN Advanced Institute for Computational Science (AICS) Japan	K computer, SPARC64 VIIIfx 2.0GHz, Tofu interconnect Fujitsu
2	National Supercomputing Center in Tianjin China	NUDT TH MPP, X5670 2.93Ghz 6C, NVIDIA GPU, FT-1000 8C NUDT
3	DOE/SC/Oak Ridge National Laboratory United States	Cray XT5-HE Opteron 6-core 2.6 GHz Cray Inc.
4	National Supercomputing Centre in Shenzhen (NSCS) China	Dawning TC3600 Blade, Intel X5650, NVidia Tesla C2050 GPU Dawning
5	GSIC Center, Tokyo Institute of Technology Japan	HP ProLiant SL390s G7 Xeon 6C X5670, Nvidia GPU, Linux/Windows NEC/HP
6	DOE/NNSA/LANL/SNL United States	Cray XE6 8-core 2.4 GHz Cray Inc.
7	NASA/Ames Research Center/NAS United States	SGI Altix ICE 8200EX/8400EX, Xeon HT QC 3.0/Xeon 5570/5670 2.93 Ghz, Infiniband SGI
8	DOE/SC/LBNL/NERSC United States	Cray XE6 12-core 2.1 GHz Cray Inc.
9	Commissariat a l'Energie Atomique (CEA) France	Bull bullx super-node S6010/S6030 Bull SA
10	DOE/NNSA/LANL United States	BladeCenter QS22/LS21 Cluster, PowerXCell 8i 3.2 Ghz / Opteron DC 1.8 GHz, Voltaire Infiniband IBM



"European" HPC Issues

- Europe has lost 10% of its HPC capabilities in the last 2 years while Asia and the US have increased their capabilities
- Japan overtook Europe (all 27 Member States combined) in terms of HPC capacities available
- Fragmentation of European HPC efforts across many countries
- Some HPC production capabilities with reliance on foreign components and (sub) systems;
- European IPR benefitting others

Ongoing efforts in HPC

- ICT Call 7 (2010): first objective in FP7 dedicated specifically to exa-scale computing
- Commitment of the EC to support HPC
  - PRACE in European HPC infrastructures
  - TEXT, Mont-Blanc, CRESTA, *DEEP* projects
  - Other objectives related to HPC (FET, Advanced Computing…)
  - Support to collaboration: EESI (IESP)
  - Drafting EC Communication to Parliament and Council on HPC
  - Study "Financing a Software Infrastructure for Highly Parallelised Codes“ (IDC)
  - Possible ICT WP 2013 objective on exa-scale computing
  - Consultations with stakeholders

State of play

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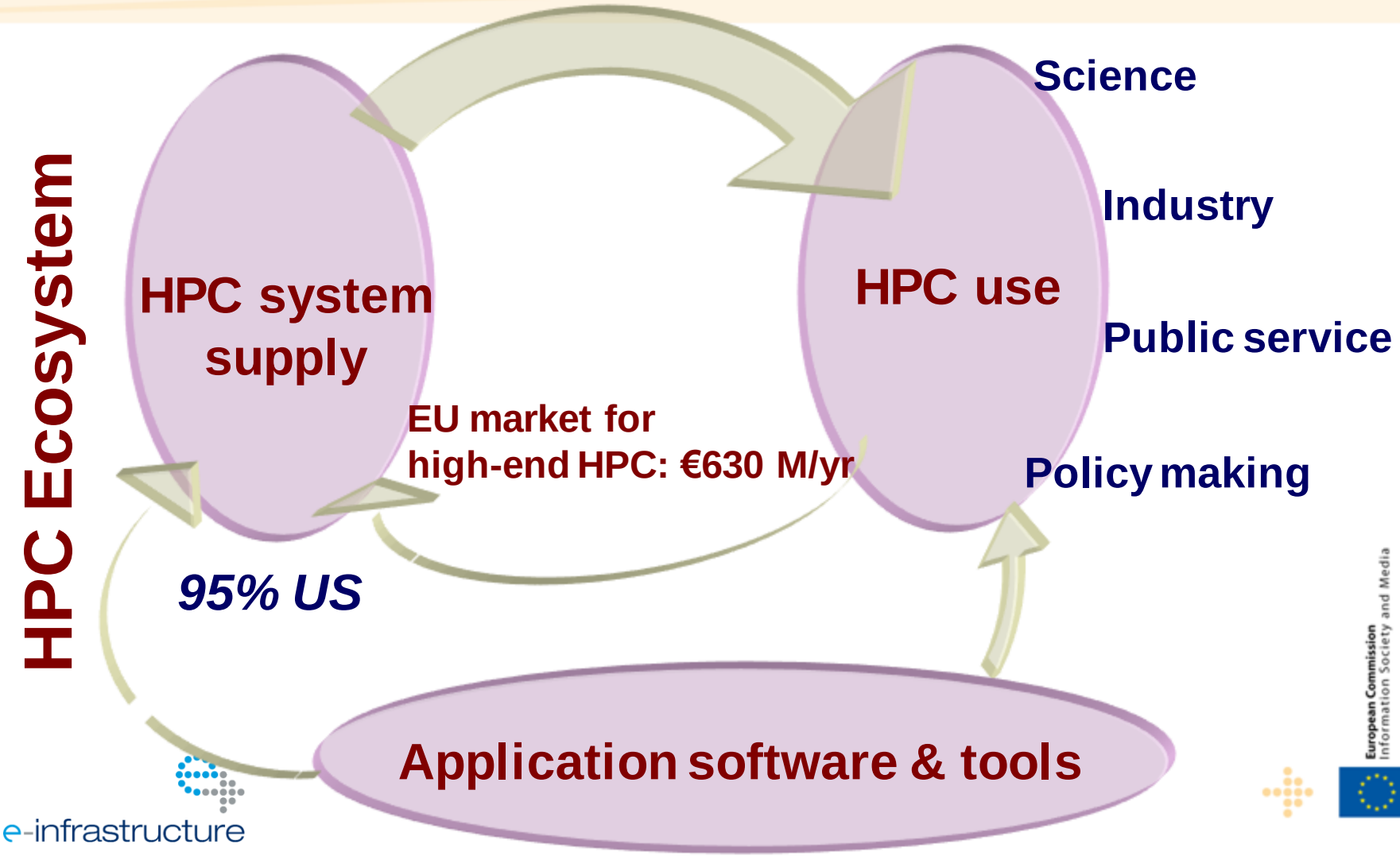
HPC: state of play



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HPC: Europe's place in a Global Race

Basic premise:
Europe should be a global HPC leader

excelling in the application *and* production of HPC, in all domains (for industry, science and society)

Alternative:
A follower is just fine, what matters is the applications

- Develop EU autonomous industrial capability
  - Alternative: continue to rely on systems from the US and others
- HPC policy should be *European*
  - Alternative: Member States continue with their national (sub-critical) policies

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Key Policy Actions

- Develop EU-level governance
- Spend more (MS, EU, industry)
- Development of EU native capability through
  - Pre-commercial procurement
  - Level-playing field for EU supply industry
- Increase HPC use in industry, especially by SMEs
- Share application and software development with global partners

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Some questions and conclusions….

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Some questions regarding exa-scale computing…

- A European vision in exa-scale?
  - **What** should we (EU/Member States) do?
  - **Where** is "Europe" located, its strengths and weaknesses, in the overall international HPC landscape and competition?
  - **Who** are the European stakeholders willing/able to carry out the strategy? Internationally collaborate with whom?
  - **When**/By **when**?

Some questions… (2)

- **Why** is it important? Who cares? Impact?
  - Scientific & Social & Economic
    - What are the Grand Challenge applications? On which criteria?
      - What are the "stories" behind to convince decision-makers?
  - Will investment in exa-scale technologies result in the long run in advances/benefits in "mainstream" (mobiles, desktop, embedded, etc.)?
  - Strategic importance of independent technological capabilities

- **How much**? (cost/benefits) Do we have enough arguments for a Business Case for exa-scale?

Some questions… (3)

- What is the key objective binding stakeholders where the benefits come from the "path" to achieve it (e.g. "Put a man in the moon")?
- Primordial consideration of the supply side of HPC (not only the use) …?
  - what to do with the current non-EU dominated situation?
  - How to create an appropriate ecosystem users-suppliers?
  - Where does IP go? Who will exploit/benefit from EU R&D?
- What are the components of the overall strategy?
  - R&D (e.g. exa-scale/computing objectives) – 2011/2013
  - PRACE/Procurement …. Longer term (e.g. Horizon 2020)
  - Political (funding, measuring public/private efforts, etc.)

Consultations with stakeholders...

- There is no choice: a European-wide effort must be engaged to develop autonomous technology (covering the whole spectrum from processor architectures to applications) to build exa-scale systems in ~10 years.
- Europe has the technical and human-skills capabilities to tackle this big challenge
- Highly relevant strengths for the next generation of computing (e.g. in applications, interconnects, embedded/low-power computing, systems and integration)
- There is a window of opportunity that cannot be missed: the transition from peta to exa-scale computing could be used to get European industry back in the computing scene as technology leading-edge supplier !

Consultations with Stakeholders (2)

Three main areas where timely action should be taken:

1. **structuring the European stakeholders**: European Technology Platform (ETP)?
2. **applications**, as supporters of scientific research, as drivers for the co-design process, but also as providers of socio-economic arguments and justification for political support,
3. **sustainability**, supporting the necessary R&D, engineering and application (re-)coding effort for exa-scale systems, and of market and industrial strategy considerations

Something that could be said for Europe too?

- « So it's not that I want to beat China per se; it's that I want us to have parity with them. I don't want to rely on them for the chip technology embedded in the supercomputers we use for national security. I don't want to rely on them for the low level software that runs my supercomputer because they figured out the parallelism before we did. I don't want to rely on them, or anyone else, for my own standard of living, for my safety and security, for the inventions that propel us forward, for open dialog and communications, all of which rely on supercomputing. I want the U.S. **to be self reliant, capable and responsible for our own prosperity**. »
- « If we are to be partners in a world of global competition, I want us to come from **a position of strength based on the best** U.S. **industry, academia and the national labs have to offer**. That's what put us and has kept us in the leadership role we enjoy today in supercomputing. It's imperative we now begin to push forward on the necessary technology to ensure a continued leadership position. The stakes are very high. »
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DONA CRAWFORD - *associate director for the Computation directorate, at Lawrence Livermore National Laboratory (February 2011)*

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THANKS FOR YOUR ATTENTION!

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