ETP 4 HPC

THE EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

www.etp4hpc.eu

HPC Contractual Public-Private Partnership

‘Building a Globally Competitive HPC Technology Value Chain in Europe’

HPC cPPP at a Glance

CONTRACTUAL ARRANGEMENT

SETTING UP A PUBLIC-PRIVATE PARTNERSHIP IN THE AREA OF HIGH PERFORMANCE COMPUTING

BETWEEN

THE ASSOCIATION ETP4HPC

AND

THE EUROPEAN UNION

Contract between EC and ETP4HPC

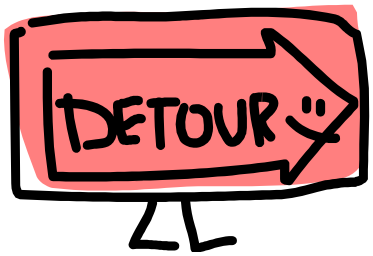
Main Objective: HPC Technologies Development

- To build a European world-class HPC technology value chain that will be globally competitive, fostering synergy between the three pillars of the HPC ecosystem (technology development, applications and computing infrastructure);

700M Euro in H2020

The Commission intends to allocate from the Union budget an indicative financial envelope of EUR 700 million for the period of 2014-2020 for those research and innovation activities (from DG Communications Networks, Content and Technology).

By the end of this talk you should know:

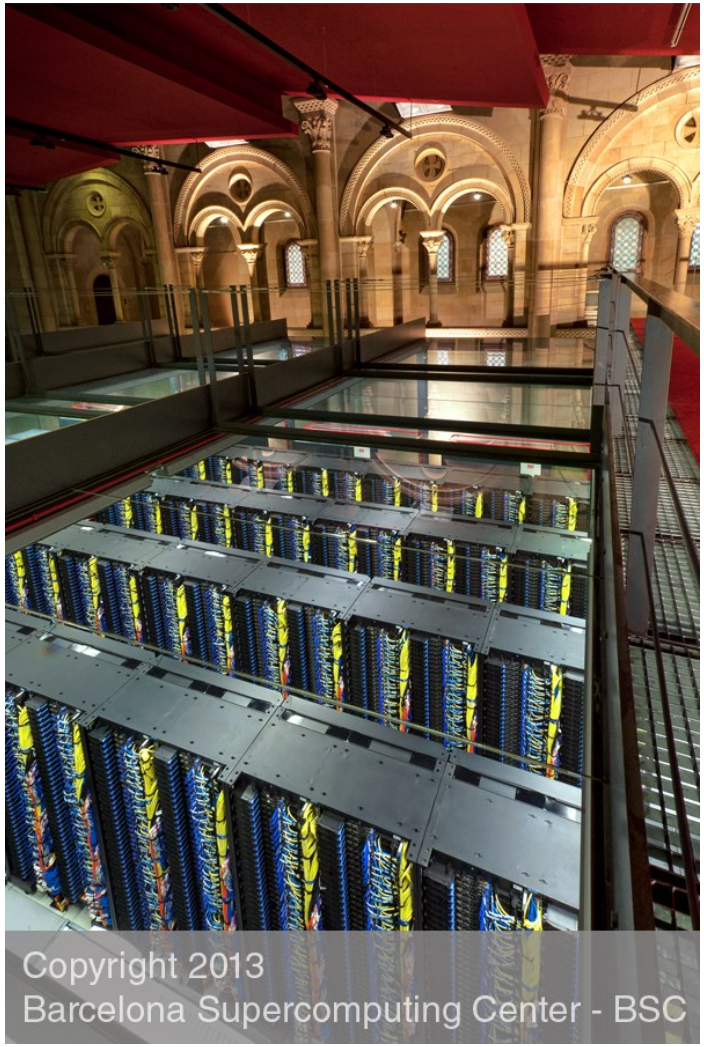


- What HPC is
- (Why HPC is important for Europe)
- The European HPC Eco-system
- **ETP4HPC** – European Technology Platform
- PRACE and Centres and Excellence
- Contractual Public-Private Partnership

Why am I here?

Turó Rudi?

What is HPC?



- Simulations
- Prototyping
- Big Data
- New Technologies

HPC for Science

'The Human Brain Project will be a leader in the creation of new technology for simulation, for visualization and for big data handling in Europe.'

Prof. Thomas Lippert, Institute for Advanced Simulation, Jülich Supercomputing Centre, leader of the High Peformance Computing subproject

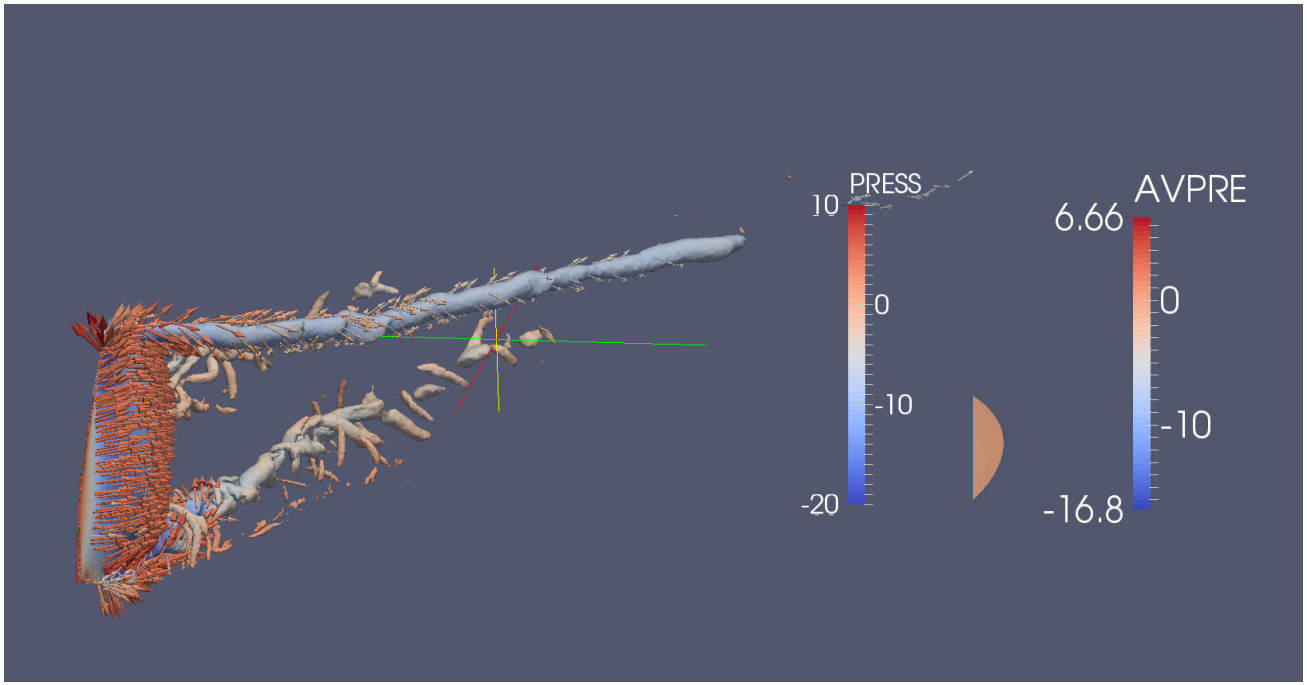
HPC for Industry

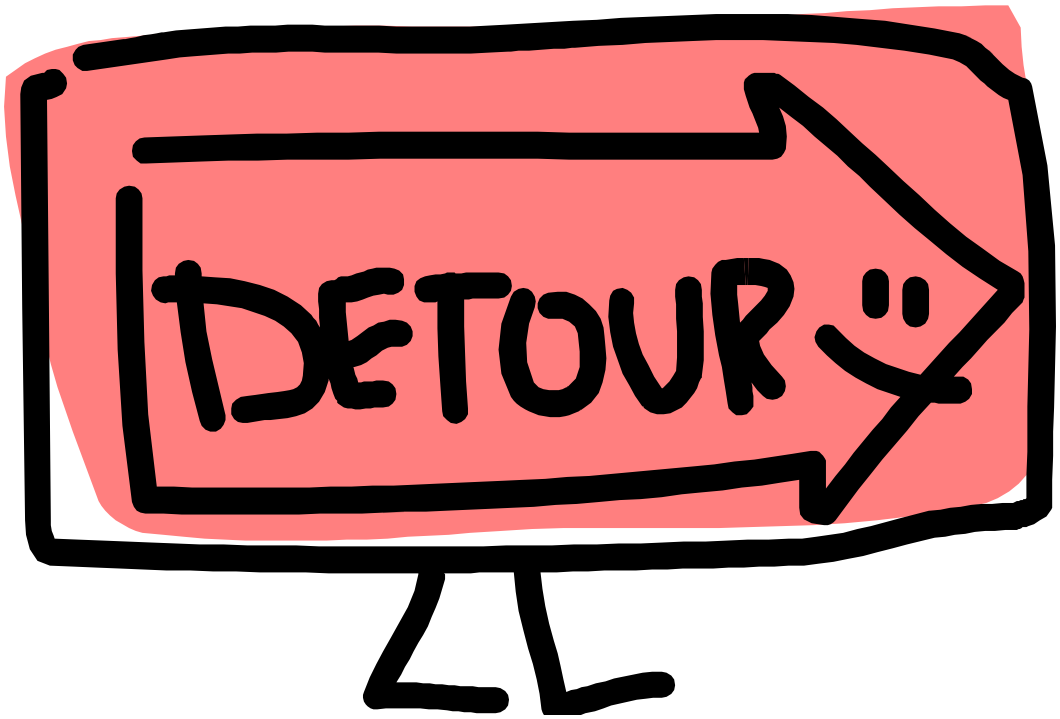
97 % of the industrial companies that employ HPC consider it indispensable for their ability to innovate, compete, and survive.

IDC (International Data Corporation) Studies ‘A Strategic Agenda for European Leadership in Supercomputing: HPC 2020’ and ‘Financing a Software Infrastructure for Highly Parallelised Codes’

PRACE SHAPE

SME HPC Adoption Programme in Europe

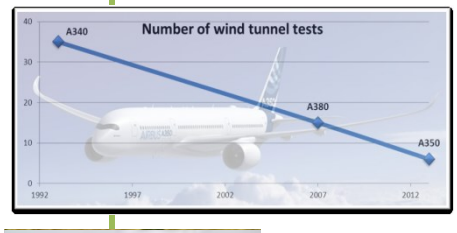


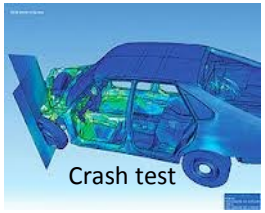


HPC will not succeed without the Technology!!!

1 000 000 000 000 000 000 operations per second ?

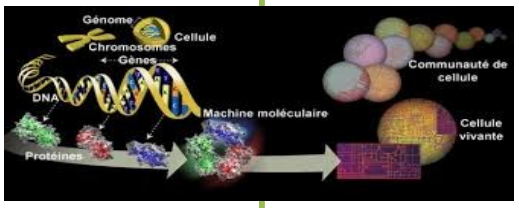
Competitiveness





- Innovation
- Time to Market
- Cost Reduction

Societal improvement



- Life Science progress
- Predictive analysis
- Complex problems resolution
- Entertainment

Sovereignty

- Defense systems
- Intelligence activities
- Cyber security

ETP 4 HPC

Yesterday's challenges are today's standards

Democratisation of access

Technology breakthroughs

1970s

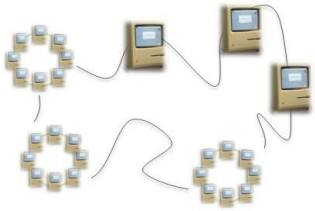
(1976) Cray- I

0.1 Gigaflop / 100 kW

Mainframe → Personal → Network

1996

Internet 1.0



2010

Internet 2.0

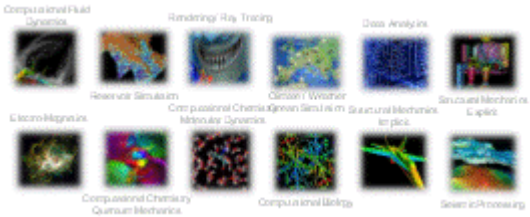
1 Gigaflop / 1 W

2010

1 Petaflop / 1 MW

Apps store
Software as a Service

Usages – new capabilities, new users



2020

Mobile
@ Lab
@ Enterprise
@ Home

2020

exaflop

1 Exaflop / 20 MW

Internet 3.0

200 billion objects

connected in 2020

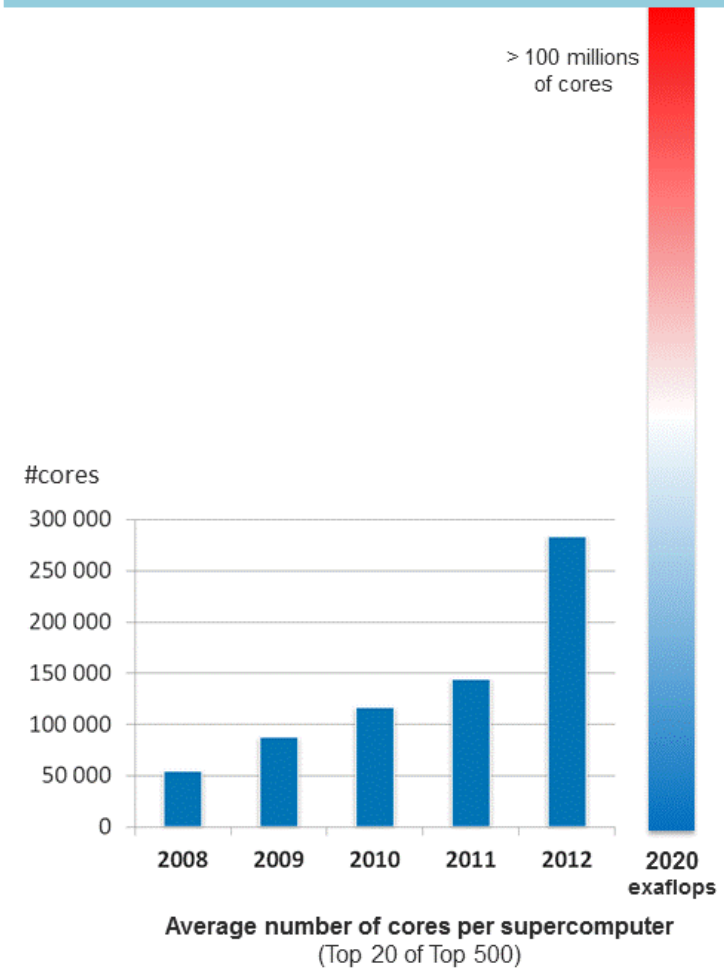
Sustainable Performance

2035

1 Petaflop ?

Parallelisms and Application challenges

EXAFLOP: Number of cores increases exponentially



Average number of cores per supercomputer
(Top 20 of Top 500)

The Current Situation:

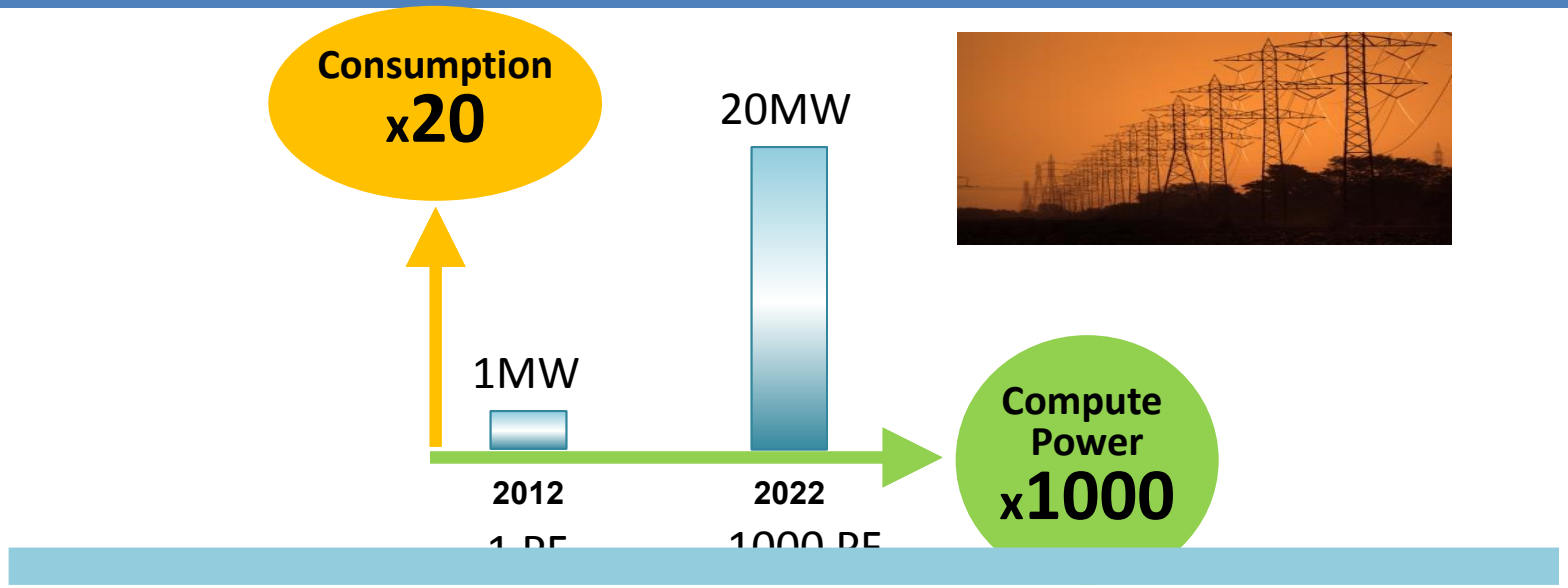
- Only 1% of SW are capable to exploit 10 000 processors
- It takes 5 to 10 years in average to rewrite an application
- 50% of IT managers said that their applications scaled at a maximum of 120 cores (2011 survey, Addison Snell)

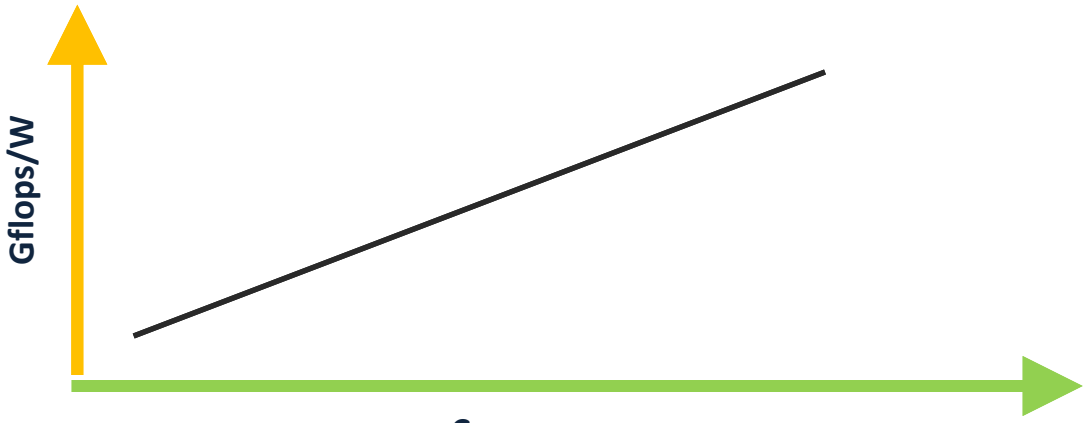
The two-fold Challenge:

1. Keep the early adopters on path
   (capture the full benefits of the performance from thousands of processors to millions of cores)

2. Bring all the others in the game

The Challenge of Power Consumption

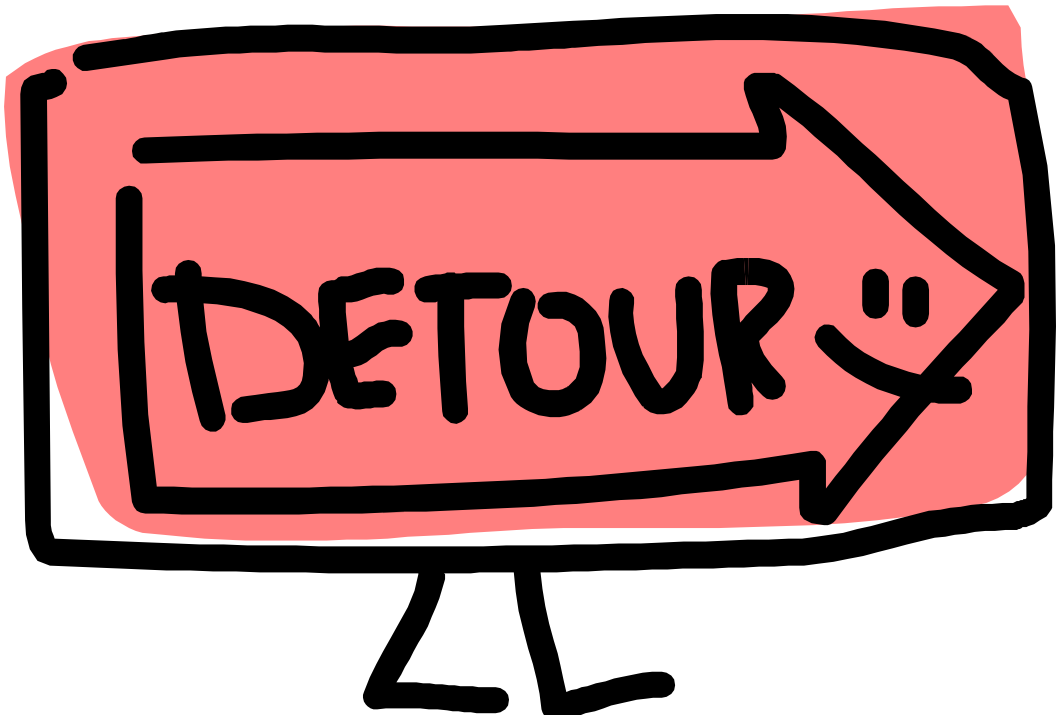




Power consumption concurrency trade off

1000 PF (20-40 W)
Brain power consumption

Efficiency improvement beyond the 20MW target for exaflop is possible…



END

EUROPEAN COMMISSION

Brussels, 15.2.2012
COM(2012) 45 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

High-Performance Computing: Europe's place in a Global Race

Access to **best HPC resources** for industry and academia

Autonomous EU development of **Exascale technologies**

Centres of Excellence in **HPC applications**

SME Competence Centres

PRACE

ETP 4 HPC

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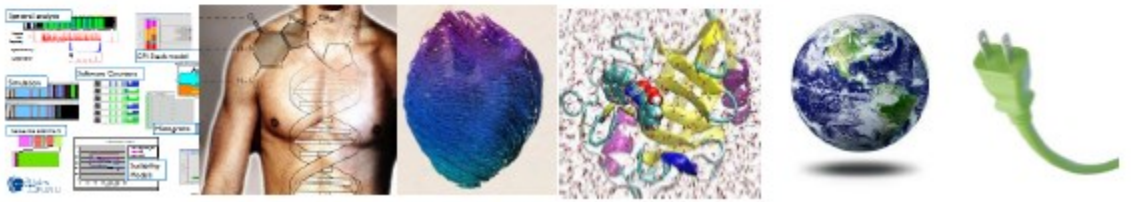


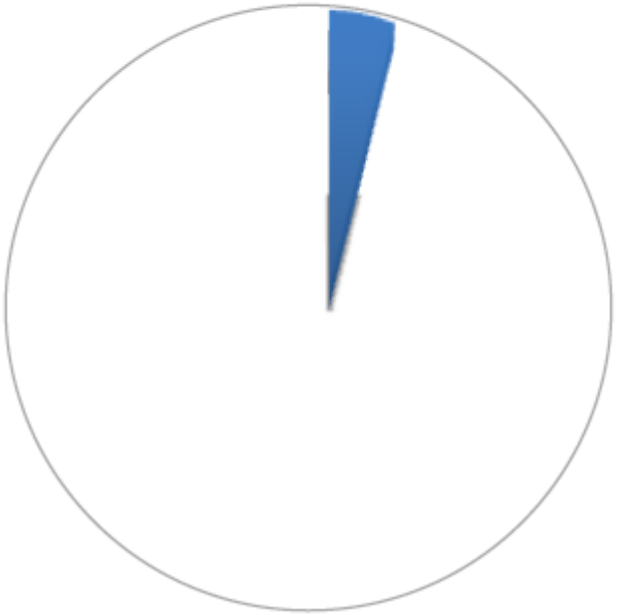
HPC – an opportunity for European providers

Worldwide HPC Compute, Storage, Middleware, Application and Service Revenues ($M)				
	2011	2012	2017	CAGR (12-17)
Server	10,300	11,098	15,441	6.8%
Storage	3,664	4,059	6,008	8.2%
Middleware	1,147	1,254	1,568	4.6%
Applications	3,370	3,621	4,837	6.0%
Service	1,801	1,877	2,368	4.8%
Total	20,282	21,909	30,223	6.6%

Why do we need to act now?

EU **consumes** 33% of global HPC resources

But **supplies** less than 5% of them

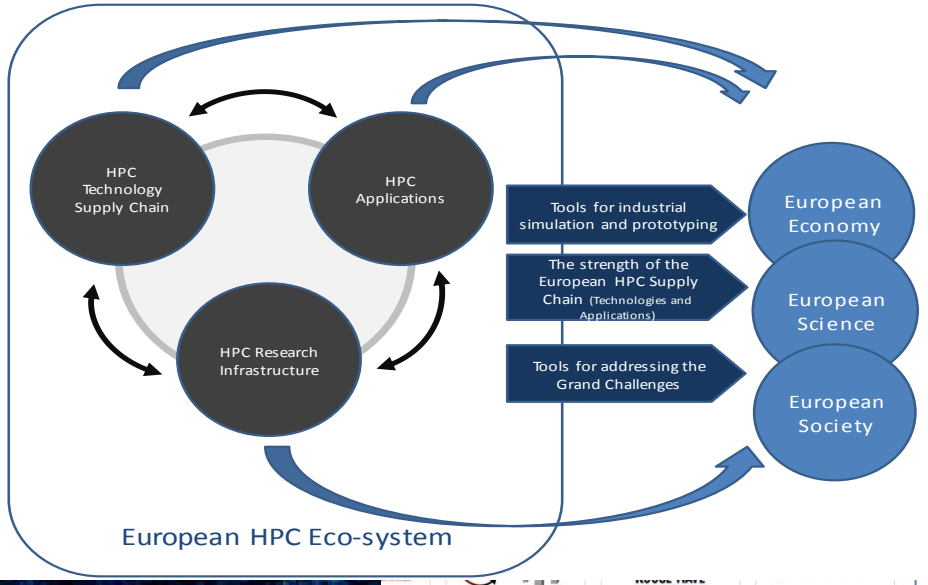


Individual ETPs

Bio-based economy	Energy	Environment	ICT	Production and processes	Transport
EATIP	Biofuels	WssTP	ARTEMIS	ECTP	ACARE
ETPGAH	EU PV TP		EUROP	ESTEP	ERRAC
Food for Life	TPWind		ETP4HPC	EuMaT	ERTRAC
Forest-based	RHC		ENIAC	FTC	Logistics
Plants	SmartGrids		EPoSS	SusChem	Waterborne
FABRE TP	SNETP		ISI	Nanomedicine	
TP Organics	ZEP		Net!Works	ETP-SMR	
			NEM	Manufuture	
			NESSI		
			Photonics 21		

EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

ETP4HPC Strategic Research Agenda Achieving HPC leadership in Europe



PROGRAMMING ENVIRONMENT
Including: Support for extreme parallelism

HPC SYSTEM ARCHITECTURE

SYSTEM SOFTWARE AND MANAGEMENT

HPC STACK ELEMENTS

USABILITY
AFFORDABILITY
HPC SERVICES
Including: ISV support, End-user support
SME FOCUS
EDUCATION AND TRAINING

HPC USAGE EXPANSION

EXTREME SCALE REQUIREMENTS

IMPROVE SYSTEM AND ENVIRONME CHARACTERISTIC
Including: Energy System resilience
BALANCE COMPU SUBSYSTEM, I/O STORAGE PERFO

cPPP

Contractual Public-Private Partnership

Done in duplicate at Brussels on 17 December 2013.
FOR ETP4HPC ASSOCIATION
FOR THE EUROPEAN COMMISSION
Philippe VANNIER
Board Representative
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Vice-President in charge of Digital Agenda
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EUROPEAN COMMISSION
PRESS RELEASE
Brussels, 17 December 2013
EU industrial leadership gets boost through eight new research partnerships

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allinea
ARM
BSC
BULL
CAPS
cea
CINECA
EUROTECH
Imagine. Build. Succeed.
Fraunhofer
IBM
intel
JÜLICH
FORSCHUNGSZENTRUM
lrz
PARTEC
CLUSTER COMPETENCE CENTER
life.augmented
xyratex
MAXELER Technologies
MAXIMUM PERFORMANCE COMPUTING
INFN
Istituto Nazionale di Fisica Nucleare
epcc
numascale
Inria
Ter@tec
ROGUE WAVE SOFTWARE
KALRAY
HLRS
NVIDIA
FINMECCANICA
clustervision
produban
Science & Technology Facilities Council
MEGWARE
SUPERCOMPUTING TECHNOLOGY
NICE
transtec
scilab enterprises
DISTENE
UNIVERSITÉ DE REIMS CHAMPAGNE-ARDENNE
SILKAN
Micron
elixir
eXact
solutions for your productivity
SICOS
KTH
UNIVERSITAT POLITÈCNICA DE VALÈNCIA
Bright Computing
ARCTUR universe
CIMNE
DataDirect NETWORKS
HPC WALES • CYMRU
E4 COMPUTER ENGINEERING
ENGIN SOFT
CSC
CRAY
THE SUPERCOMPUTER COMPANY
FUJITSU
SYSFERA


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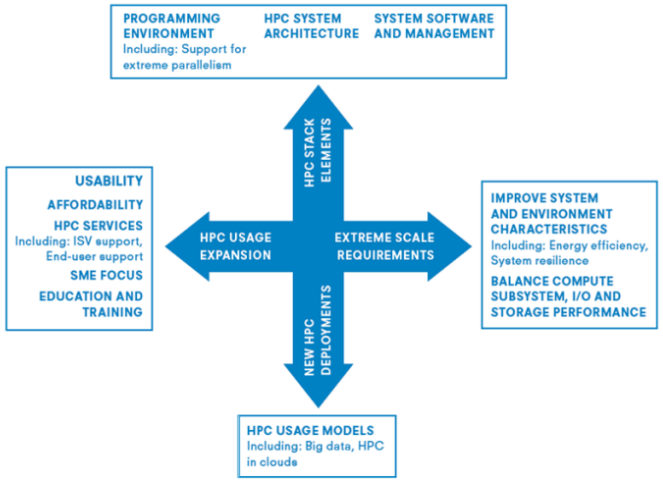
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Including: Energy efficiency, System resilience
BALANCE COMPUTE SUBSYSTEM, I/O AND STORAGE PERFORMANCE
NEW HPC DEPLOYMENTS
HPC USAGE MODELS
Including: Big data, HPC in cloude

EXISTING HPC REPORTS

INDUSTRIAL USERS' VIEW

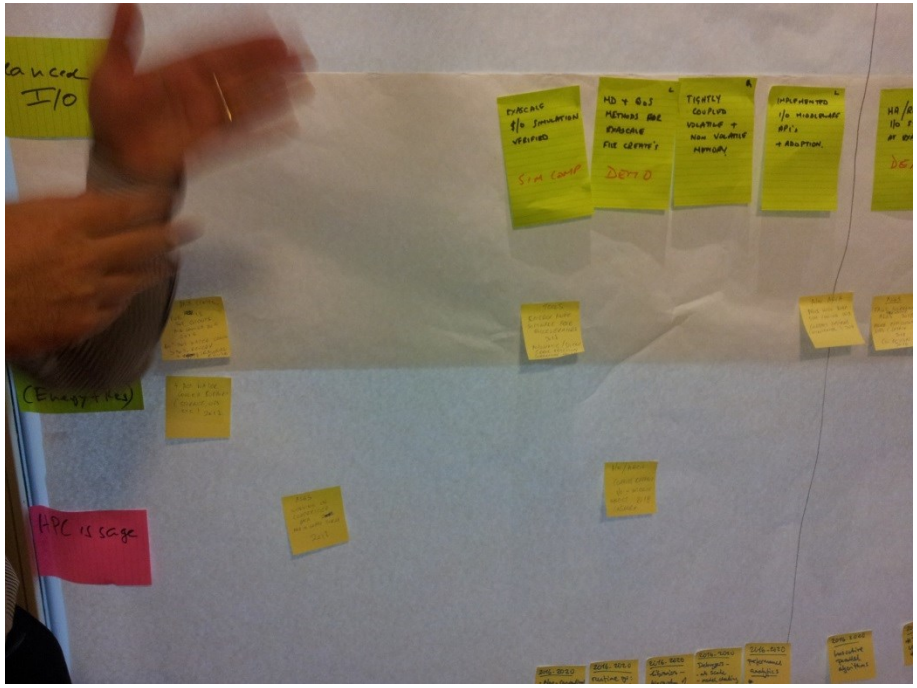
ETP4HPC EXPERTS

PRACE INPUTS

INDEPENDENT SOFTWARE VENDORS INPUTS

WORKING GROUPS
MEETING
SWOT ANALYSIS

SRA

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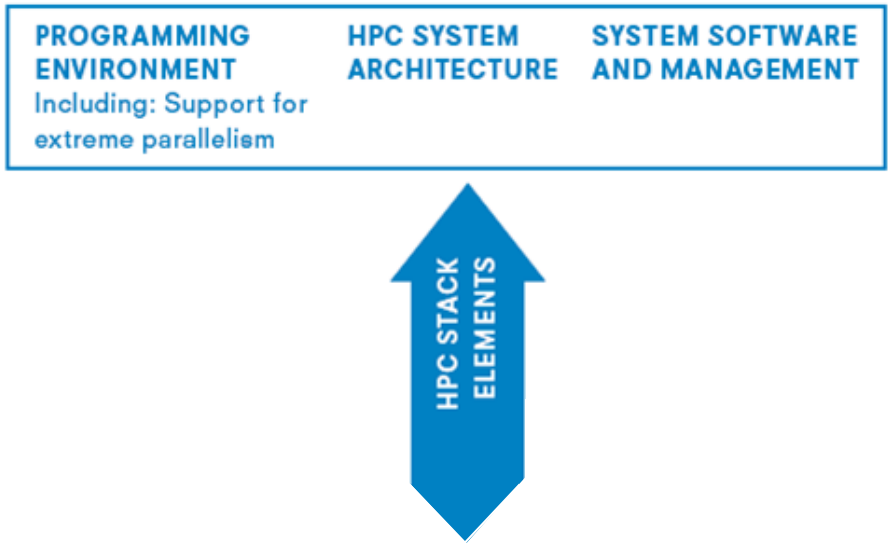
Strategic Research Agenda (SRA)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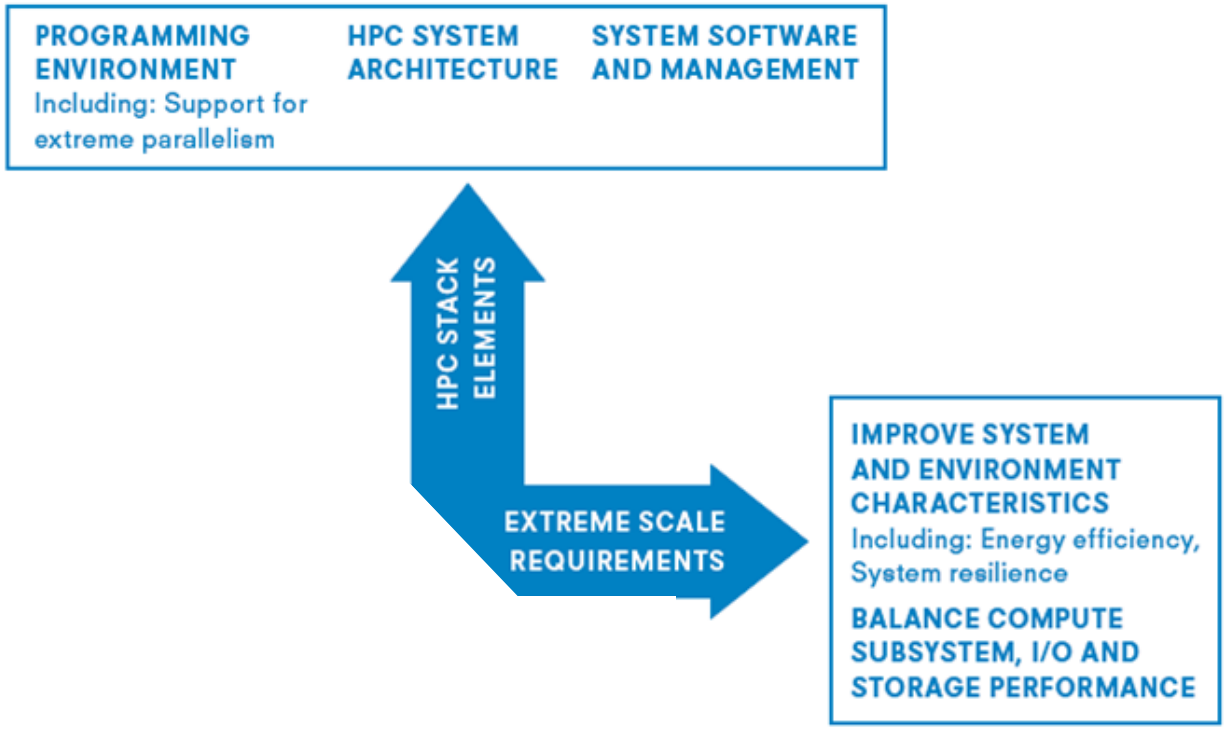
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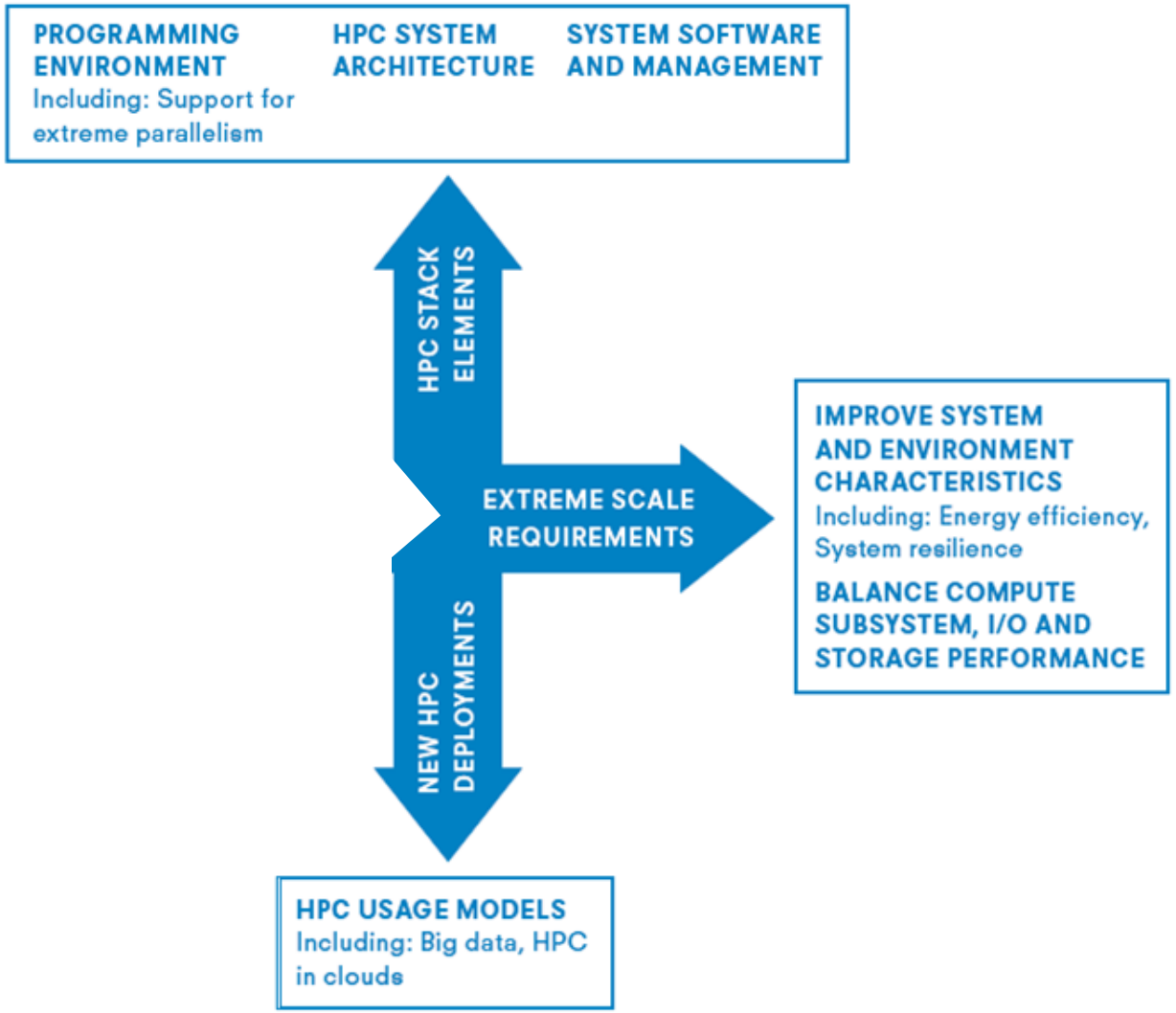
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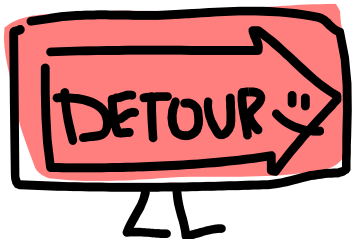
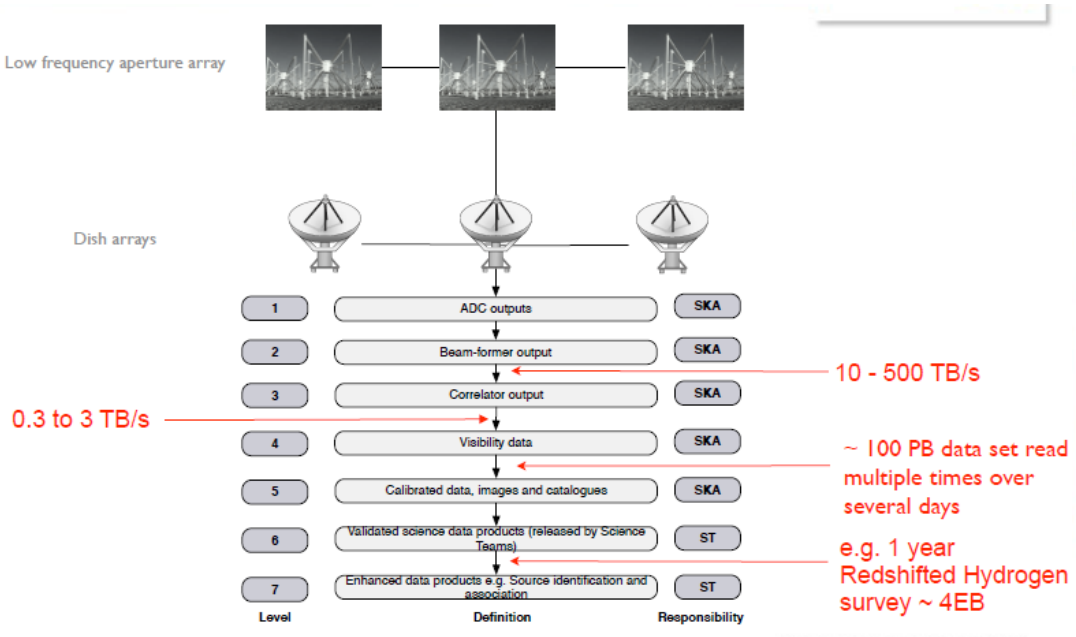
Including: Big data, HPC in clouds



Big Data : SKA

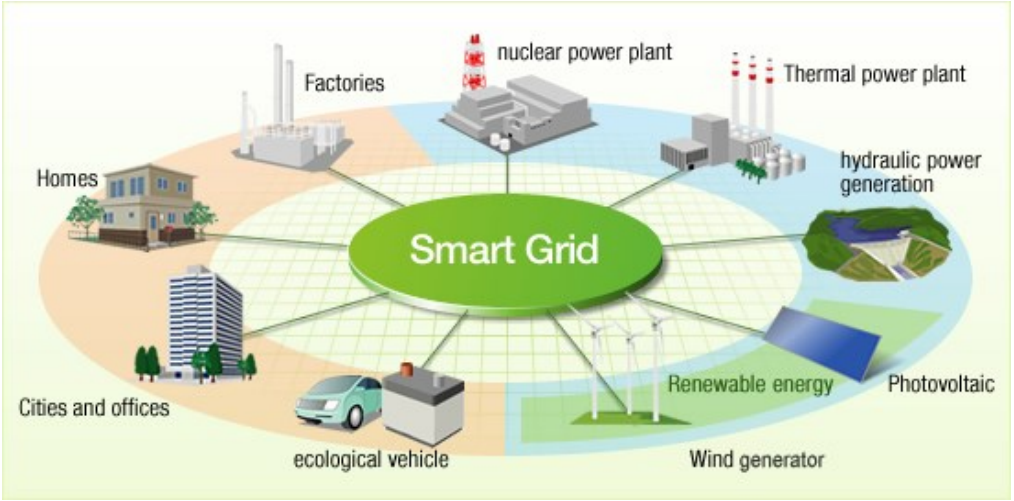


- Data centric architecture
- On the fly correlation
- Implementation of specific workflows
- Interactive processing

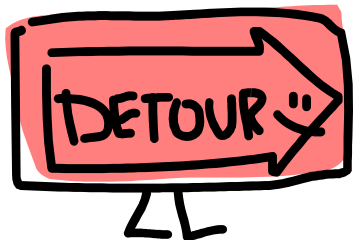
- Phase 1 : 400 M€ up to 2020
- Phase 2 : 1,200 M€ 2020-2025
- Optimisation € /W / EB

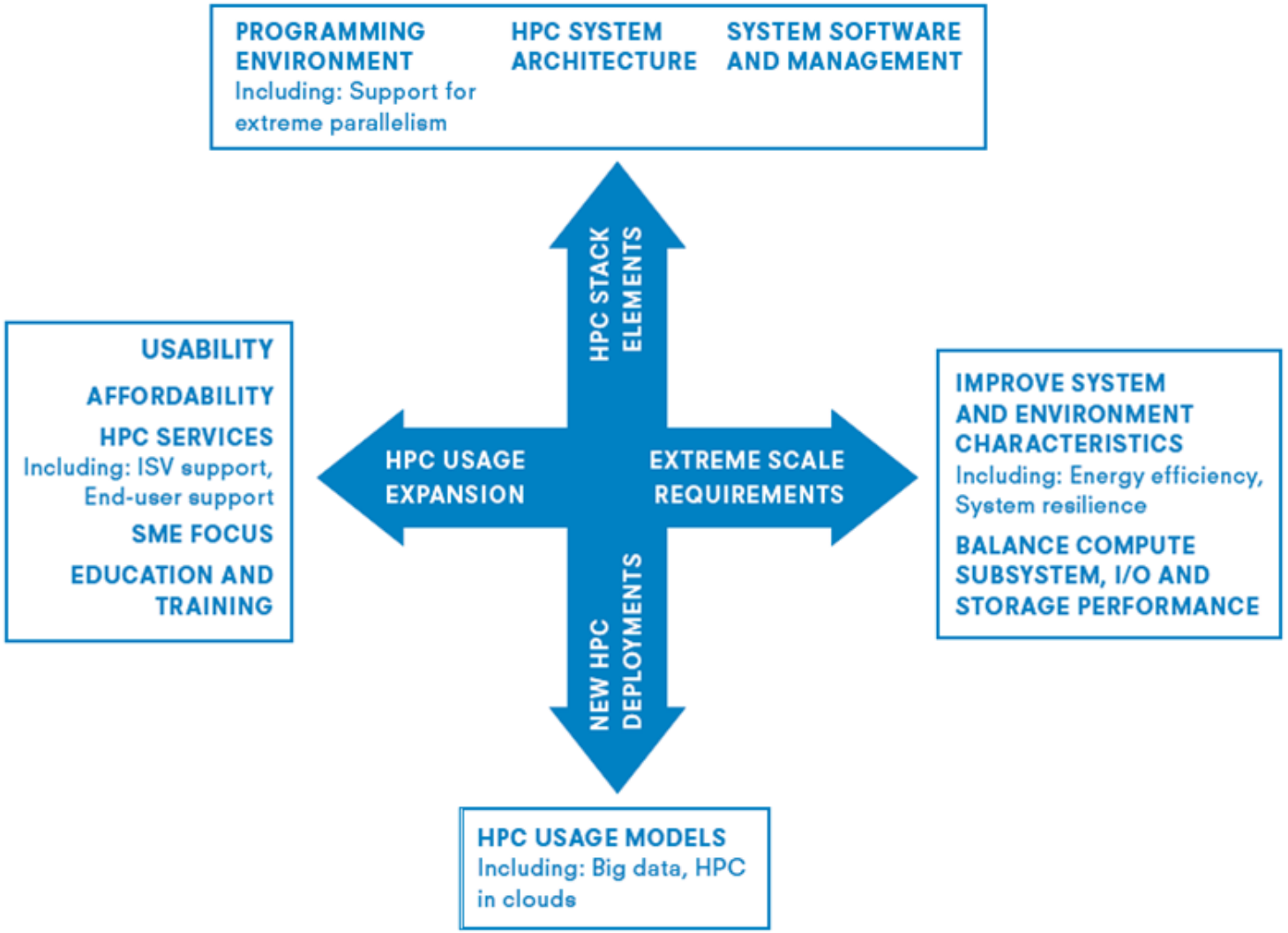
HPC in the loop : Smart Grid

- Huge optimization problem
- Three levels
  - Production
  - Distribution
  - Consumer



- More and more data available to optimization and control
- Big stakes
  - Electricity wasted : billion of MWh
  - Reduction of CO2
- New HPC technologies
  - Interactive HPC system,
  - Best answer at a given time algorithms

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How do we work?

- Incorporated as a Dutch association
- Open membership for organisations having R&D based in Europe
- Managed by a Steering board with 15 members representing:
  - Research centres (5)
  - European SMEs (3)
  - European controlled corporations (5)
  - International companies with R&D in Europe (2)
- Steering Board organization
  - Chairman
  - 2 Vice chairmen for PRACE coordination and HPC development
  - Secretary-Administrator, Treasurer
- Virtual office
  - BSC, CEA, Cineca+Eurotech, IBM

ETP4HPC Working Groups

- **FETHPC2 – HPC Strategy Coordination**
- **Education and Training**
- **Monitoring and KPIs**
- **Exploitation and IPR**
- **Centres of Excellence**
- **SME**
- **Co-desing and Prototyping**
- **Ecosystem**

PRACE and Centres of Excellence

PRACE

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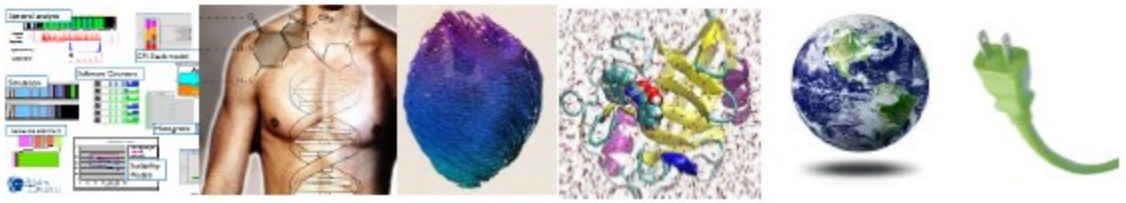
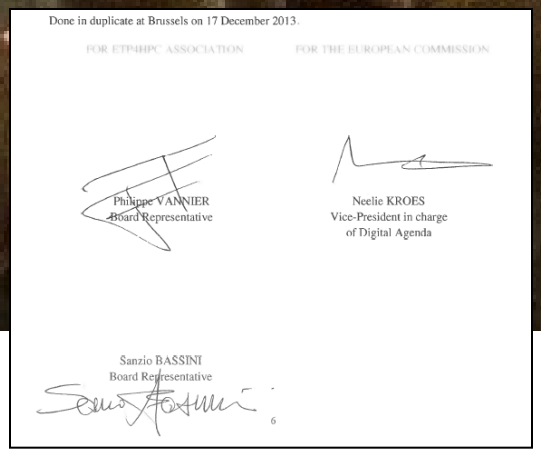


cPPP

Contractual Public-Private Partnership



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6

EUROPEAN COMMISSION

PRESS RELEASE

Brussels, 17 December 2013

EU industrial leadership gets boost through eight new research partnerships

The European Commission today launched *eight* contractual Public Private Partnerships (cPPPs) of strategic importance for European industry. The partnerships will leverage more than €6 billion of investments to be allocated through calls for proposals under Horizon 2020, the new EU programme for research and innovation. Each euro of public funding is expected to trigger additional investments of between three and 10 euro to develop new technologies, products and services which will give European industry a leading position on world markets (MEMO/13/1159).

European Commissioner for Research, Innovation and Science Máire Geoghegan-Quinn said: *"Europe needs industry to innovate to create income and jobs. New technologies and products, such as green cars, energy efficient buildings and cleaner manufacturing processes, are essential to address societal challenges such as climate change, energy and resource efficiency. We want these contractual PPPs to have a substantial impact on the competitiveness of the EU industry, on sustainable economic growth and the creation of new high-skilled jobs in Europe."*

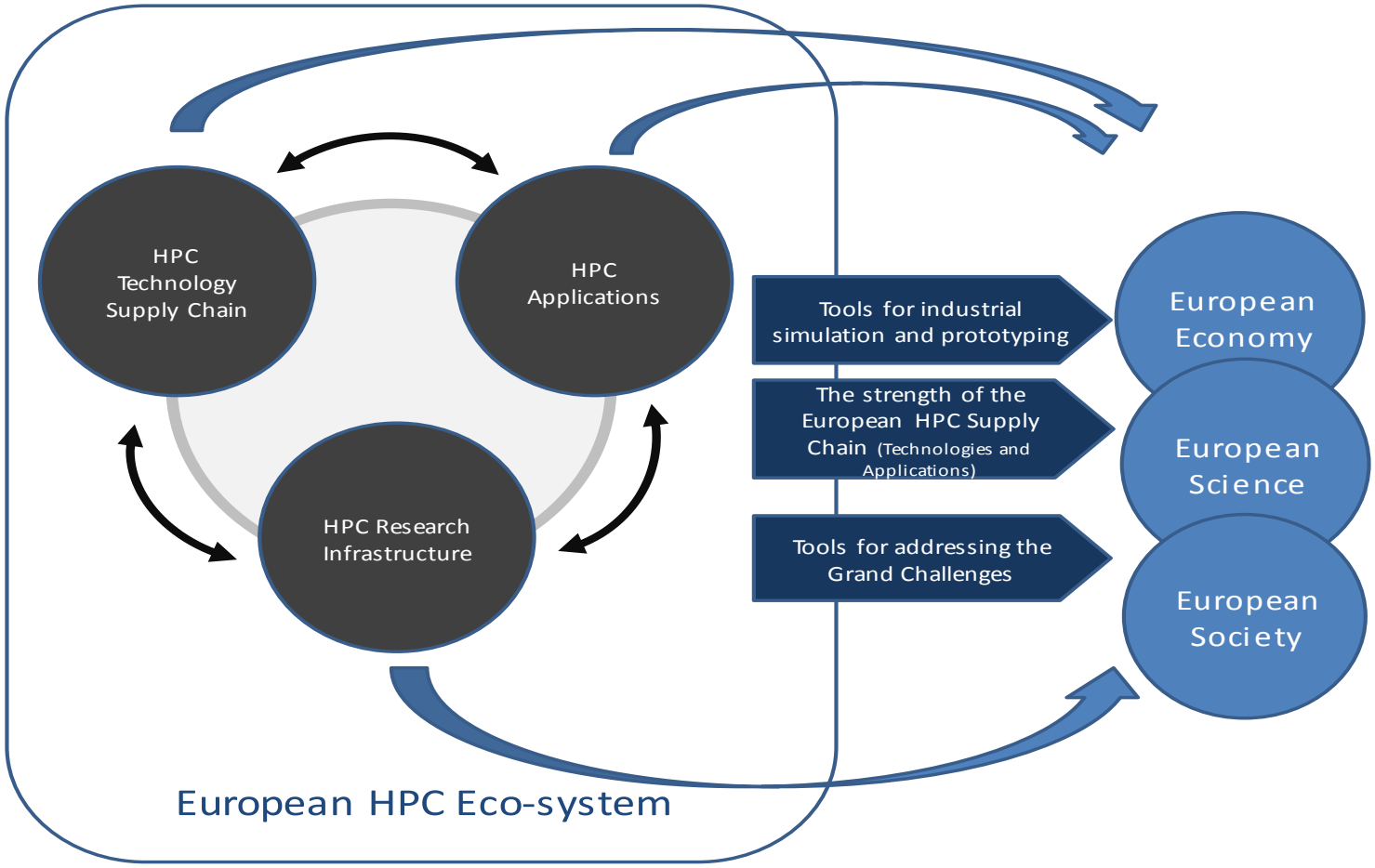
Vice President Neelie Kroes, Commissioner responsible for the Digital Agenda, said: *"This is a great opportunity for Europe. These PPPs will maintain our global lead in robotics, photonics, high performance computing, telecoms and give us a head start in smart cities, intelligent transport, education, entertainment, media and other promising markets. Combined with a comprehensive industrial strategy, the PPPs will ensure vigorous European leadership and a better future for all."*

The eight contractual Public-Private Partnerships are:

- **Factories of the Future (FoF)**, to support the manufacturing industry through the development of sustainable production technologies and systems (Link to factsheet)
- **Energy-efficient Buildings (EeB)**, to increase the competitiveness and energy efficiency of the construction industry (Link to factsheet)
- **European Green Vehicles Initiative (EGVI)**, to develop a competitive and resource efficient transport system with significantly less CO2 emissions (Link to factsheet)
- **Sustainable Process Industry (SPIRE)**, to make the process industry more resource- and energy-efficient (Link to factsheet)
- **Photonics**, one of the key enabling technologies for our future prosperity and an essential element of many sectors, from energy and health, to everyday products like DVD players and mobile phones (Link to factsheet)
- **Robotics**, a key driver of industrial competitiveness and essential to address key societal challenges in areas such as demographic change, health and well-being, food production, transport and security (Link to factsheet)
- **High Performance Computing (HPC)**, which plays a pivotal role in stimulating Europe's economic growth and advancing European science (Link to factsheet)
- **Advanced 5G networks for the Future Internet (5G)**, to stimulate the development of network internet infrastructure to ensure advanced ICT services for all sectors and users (Link to factsheet)

The contracts setting up the PPPs were signed today by the Commission and chairpersons of specially-created industrial research and innovation associations, representing more than 1,000 large and small enterprises across Europe.

HPC cPPP – Building a European HPC Ecosystem



Other PPPs

- Energy-efficient Buildings (EeB)
- Factories of the Future (FoF)
- Sustainable Process Industry (SPIRE)

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The five other contractual Public-Private Partnerships:

- European Green Vehicles Initiative (EGVI), to develop a competitive and resource efficient transport system with significantly less CO2 emissions
- Photonics, one of the key enabling technologies for our future prosperity and an essential element of many sectors, from energy and health, to everyday products like DVD players and mobile phones
- Robotics, a key driver of industrial competitiveness and essential to address key societal challenges in areas such as demographic change, health and well-being, food production, transport and security
- High Performance Computing (HPC), which plays a pivotal role in stimulating Europe's economic growth and advancing European science
- Advanced 5G networks for the Future Internet (5G), to stimulate the development of network internet infrastructure to ensure advanced ICT services for all sectors and users

One of the 8!

3. ACTIVITIES, INVESTMENT and OUTPUTS: The research and innovation activities to be co-funded under the Horizon 2020 Framework Programme in the scope of the partnership will be subject to the Horizon 2020 Rules for participation and dissemination. The Commission intends to allocate from the Union budget an indicative financial envelope of EUR 700 million for the period of 2014-2020 for those research and innovation activities (from DG Communications Networks, Content and Technology). These allocations will be included in the periodic Horizon 2020 work programmes. The Private Side commits to engage the stakeholder community to invest funds in research and innovation activities specific to the partnership domain both by complementing the Commission's support to the projects for the implementation of the research and

At PPP implementation level:

- Global market share of HPC systems, components and tools based on technologies developed and built in Europe
- Direct, sustainable jobs out of HPC research programmes
- Level of high-tech investment and private investment mobilised
- Patent and invention-submissions – contributions to standards
- Number of new SME start-up companies created out of HPC research programmes

- To build a European world-class HPC technology value chain that will be globally competitive, fostering synergy between the three pillars of the HPC ecosystem (technology development, applications and computing infrastructure);

- To achieve a critical mass of convergent resources in order to increase the competitiveness of European HPC vendors and solutions;

- To leverage the transformative power of HPC in order to boost European competitiveness in science and business;

- To expand the HPC user base, especially SMEs: facilitating access to HPC resources and technologies, and opening the possibilities for SMEs to participate in the provision of competitive HPC technology solutions;

- To support a EU leadership and world-wide excellence in key application domains for industry, science and society that are most important for Europe,

  - facilitating the provision of innovative solutions for grand societal challenges;
  - allowing the development of the future applications for the next exascale computing generation.

At project impact level:

- Contribution to next-generation HPC technologies, software codes, libraries and algorithms
- European application and codes adapted to the next computing generation
- Project results taken-up for further investments
- Trainings for a higher quality workforce
- Patents and activities leading to standardisation

The impact of the PPP will also be monitored on the following:

- Research programme effectiveness and coverage
- Performance of HPC technologies developed
- High-skilled HPC profiles and curricula developed
- HPC use (both academia and industry in particular SMEs) and scientific impact of pan-European HPC infrastructure
- Impact on software ecosystem (number of applications, number of users, etc)

Co-design

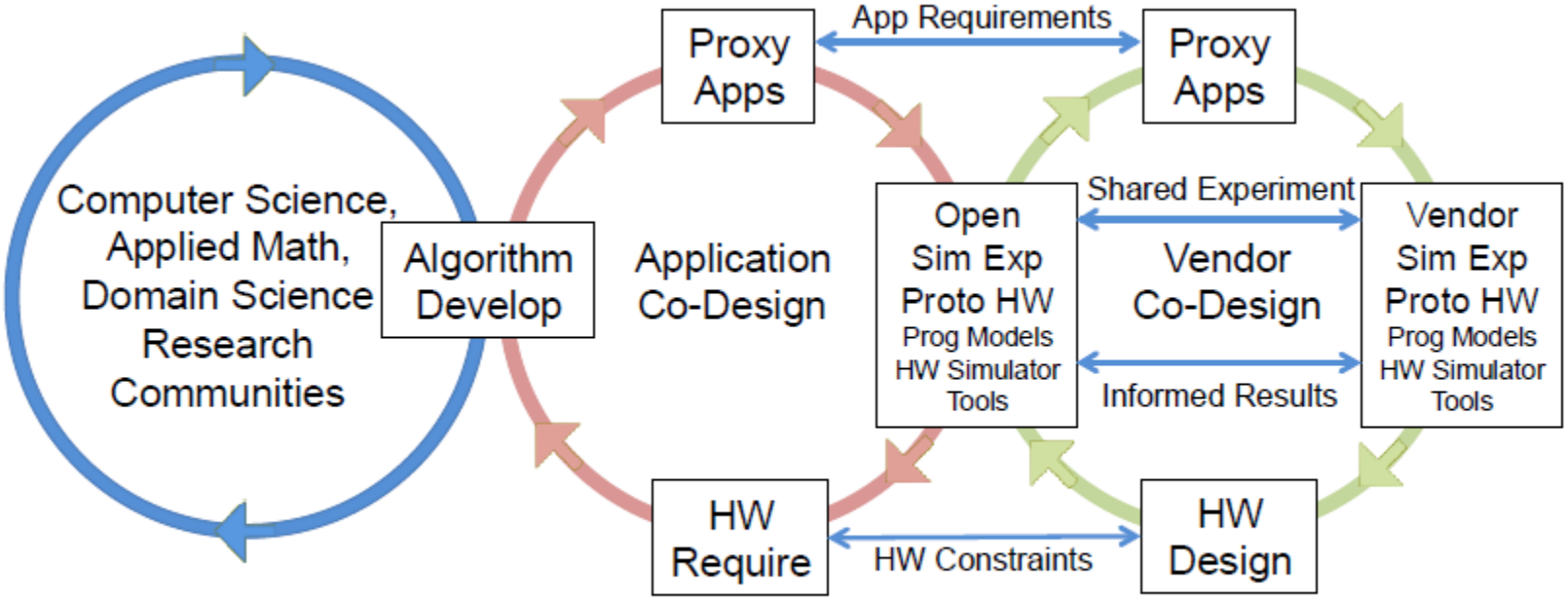

Figure 1 Notional Description of Co-design (courtesy: ASCR)

- Analysis of the interaction between application, middleware, system software and hardware
- Iterative process
- Global optimization

THANK YOU!

For more information visit

www.etp4hpc.eu

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THE EUROPEAN TECHNOLOGY PLATFORM
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