The European HPC strategy and actions in Horizon 2020

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**Key challenge:** stabilise the financial and economic system while taking measures to create economic opportunities

1. **Smart & inclusive growth (€451 billion)**
   - Education, Youth, Sport
   - Connecting Europe
   - Cohesion
   - Competitive Business SMEs

2. **Sustainable growth, natural resources (€373 billion)**

3. **Security and citizenship (€16 billion)**

4. **Global Europe (€58 billion)**

5. **Administration (€61.6 billion)**

**TOTAL €960 billion**
What's new?

• **A single programme** bringing together three separate programmes/initiatives*

• **Coupling research to innovation** – from research to retail, all forms of innovation

• **Focus on societal challenges** facing EU society, e.g. health, clean energy and transport

• **Simplified access**, for all companies, universities, institutes in all EU countries and beyond

*The 7th Research Framework Programme (FP7), innovation aspects of Competitiveness and Innovation Framework Programme (CIP), EU contribution to the European Institute of Innovation and Technology (EIT)
Three priorities

- **Excellent science**: 31% (24.4B€)*
- **Industrial leadership**: 22% (17B€)*
- **Societal challenges**: 39% (29.7B€)*

*in current prices (inflation rate est. 2%)

+EIT, JRC, Widening, SwfS

8% (5.9B€)*
Horizon 2020 and partnering

**Public private partnerships:**
Through *Joint Technology Initiatives* or other formal structures (Art. 187)
Through *contractual agreements*, which provide inputs for work programmes
Only when criteria met, e.g. clear commitments from private partners

**Public public partnerships:**
Through « ERA-Nets » for topping up individual calls/actions (replacing current ERA-Net, ERA-Net Plus, Inco-Net, Inno-net)
Through participation in joint programmes between Member States (Art. 185)
Supporting agendas of Joint Programming Initiatives when in line with Horizon 2020
Only when criteria met, e.g. financial commitments of participating countries

**European Innovation Partnerships:**
Not funding instruments, but for coordination with broader policies and programmes
Public-Private Partnerships
(Article 19 H2020 FP)

**Joint Technology Initiatives** (under Article 187 FR)
- Innovative Medicines Initiative 2
- Clean Sky (Aeronautics) 2
- Fuel Cell and Hydrogen 2
- Bio-based Industries
- Electronic components and systems

**Contractual Public-Private Partnerships**
- Factories of the Future
- Energy-efficient Buildings
- European Green Vehicles Initiative
- Sustainable Process Industry
- Photonics
- Robotics
- High Performance Computing
- Advanced 5G networks for the Future Internet
Why HPC?
Importance of HPC

Weather, Climate & Earth Sciences

New applications e.g. Health, Big data

Fundamental sciences: Physics, Chemistry, Material Sciences, Astrophysics

Key for Science

Bio/Life Sciences

Industrial & Engineering
HPC addressing Societal Challenges

Health, demographic change and well-being
(Personalised medicine, pharma/bio-medical simulation, Virtual Physiological Human, Human Brain Project)

Smart, green and integrated transport Engineering
(performance, sustainability, energy efficiency)

Inclusive, innovative and secure societies
(Smart Cities, multivariable decision/analytics support)

Climate action, resource efficiency and raw materials
(Simulators for Climate & Earth Sciences, Gas&Oil)

Secure, clean and efficient energy
(Fusion, nuclear plant simulations)

Food security, sustainable agriculture, marine research and the bio-economy
(simulation of sustainability factors (e.g. weather forecast, stock plagues and diseases control, etc))
HPC is a strategic resource for Europe's future

- **Computational Science is already the "third pillar" of science:** Scientific endeavours increasingly rely on data, simulation and models. The most powerful supercomputers are needed to address scientific and societal grand challenges needing huge computing and data resources
  
  - e.g. modelling the brain to fight diseases such as Alzheimer, forecasting climate evolution, study new elementary particle experiments or pushing the limits of knowledge of the universe.

- **Industry relies more and more in HPC to innovate in products and services.** Several of the most profitable and vibrant industrial sectors in Europe are big HPC users
  
  - e.g.: manufacturing - 6,500 B€ of GDP and 30 million jobs-, oil & gas - 440B€ of GDP and 170K jobs-, pharmaceutical industry - 800B€ of GDP and 40% of EU worldwide market shares for medicine - 1,000B€ of public spending (10% of the EU’s GDP)
The European HPC strategy: key EU developments in 2012-2013
Key EU developments
HPC

• Communication from the EC: "High-Performance Computing: Europe's place in a global race" (2012)

• Council Conclusions on High-Performance Computing (Competitiveness Council – 2013)

• Establishment of the European Technology Platform on High-Performance Computing (ETP4HPC - 2012) and Strategic Research Agenda on HPC (2013)

• Horizon 2020 programme adopted (end of 2013)

• Public-Private Partnership with ETP4HPC (1st January 2014)
COM "High-Performance Computing: Europe's place in a global race" *(adopted 15 Feb 2012)*

- **HPC drivers**: 
  - Addressing Societal/Scientific/Industrial challenges more effectively
  - Industry is increasingly depending on HPC to fulfil the need to innovate in products and services (better jobs)
  - Transition from petascale to exascale computing creates new opportunities for both science applications and computing technologies
  - Gaining independent access to HPC systems and services for Europe supports growth and competitiveness in industry and the economy
HPC is an important asset for the EU's innovation capacity of strategic importance to the EU's industrial and scientific capabilities as well as its citizens:

- developing innovative industrial products and services,
- increasing competitiveness,
- addressing societal and scientific grand challenges more effectively.

All relevant actors, public and private, need to work in partnership;

Europe has the technology, knowledge and human skills to develop capabilities covering the whole technological spectrum of the next HPC generation (exascale computing)

Importance of developing state-of-the-art HPC technologies, systems, software, applications and services in Europe

Invites the EC to elaborate its plans for HPC to support academic and industrial research and innovation under H2020;
An industry-led forum founded by stakeholders of HPC technology

**Open** to any actor of the HPC ecosystem in Europe

Through the **Strategic Research Agenda**, the ETP4HPC has identified research areas and topics to reach a stronger European HPC ecosystem that can benefit Europe and the rest of the world.


www.etp4hpc.eu
PPP in HPC:

**General objectives**

- To build a *European world-class HPC technology value chain that is globally competitive* - 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, and to facilitate the participation of SMEs in the provision of competitive HPC technology solutions
- To develop a *EU leadership and world-wide excellence in key application domains for industry, science and society*
  - provision of innovative solutions for grand societal challenges
  - development of the future applications for the next exascale computing generation
An integrated approach to HPC strategy in Excellent Science
HPC strategy combining three elements:

(a) **Computer Science: towards exascale HPC;** A special FET initiative focussing on the next generations of exascale computing as a key horizontal enabler for advanced modelling, simulation and big-data applications [HPC in Future and Emerging Technologies (FET)]

(b) providing **access** to the best supercomputing facilities and services for both industry and academia; *PRACE - world-class HPC infrastructure for the best research* [HPC in e-infrastructures]

(c) achieving excellence in HPC **applications;** *Centres of Excellence for scientific/industrial HPC applications in (new) domains that are most important for Europe* [HPC in e-infrastructures]

• complemented with training, education and skills development in HPC

**(a) and (c) will be implemented in the context of the HPC Public-Private Partnership**
Interrelation between the three elements

**Access to best HPC for industry and academia (PRACE)**

*Excellent Science e-infrastructures*

- Collaboration of HPC Supercomputing Centres and application CoEs
- Provision of HPC capabilities and expertise

**EU development of Exascale technologies**

*FET/HPC*

- Specifications of exascale prototypes
- Technological options for future systems
- Identify applications for co-design of exascale systems
- Innovative methods and algorithms for extreme parallelism of traditional/emerging applications

**Excellence in HPC applications (Centres of Excellence)**

*Excellent Science e-infrastructures*

"Excellent Science" part of H2020

Scope of the PPP
Support to HPC in Horizon 2020 Workprogramme 2014-2015
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<th>Call Identifier</th>
<th>Program Description</th>
<th>2014 EUR million</th>
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<td>FETHPC1-2014</td>
<td>HPC Core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications</td>
<td>93.4</td>
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<td>FETHPC 2 - 2014</td>
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THANK YOU!