High Performance Computing in Horizon 2020

Big Data and Extreme Scale Computing Workshop
February 26-28, 2014 – Fukuoka Japan

Excellence in Science
DG CONNECT
European Commission

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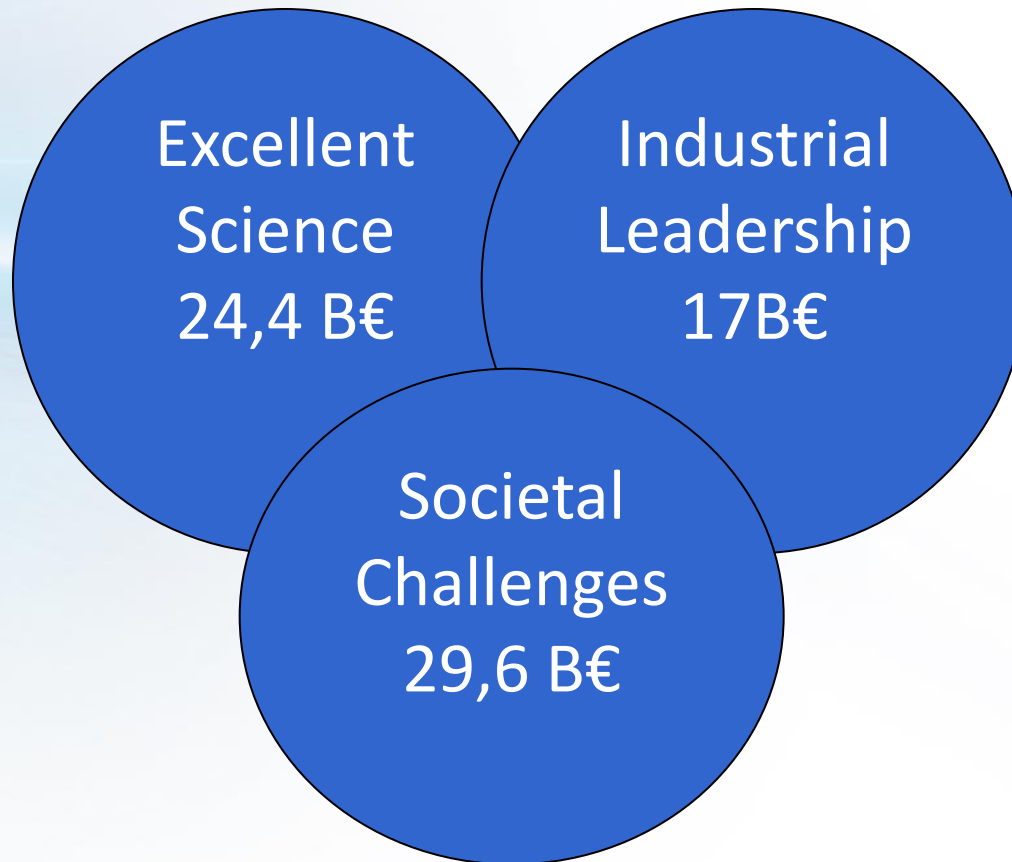on behalf of the European Commission Leonardo Flores, Panagiotis Tsarchopoulos, Aniyan Varghese

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HORIZON 2020

the EU framework programme for research and innovation

2014-2020

APPROVED

A stronger, clearer focus

H2020 Budget: 77B€ (current prices)

Excellent Science 24,4 B€

Industrial Leadership 17B€

Societal Challenges 29,6 B€

OTHERS: 5,8B€ (Spreading excellence & widening participation, Science & Society, JRC, EIT)
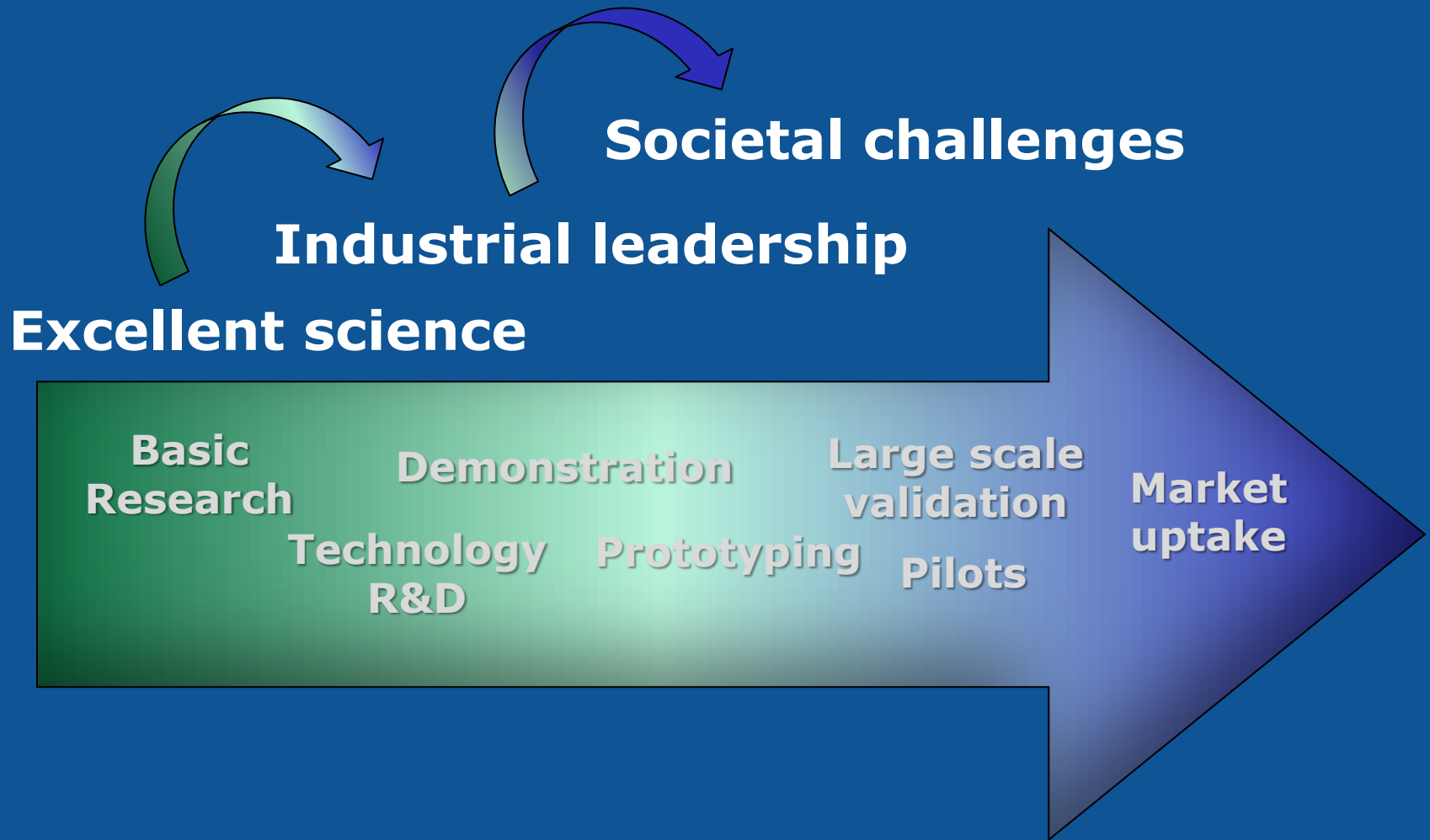
The European HPC strategy: key EU developments in 2012-2013

Key EU developments HPC

- *Communication from the EC: "High-Performance Computing: Europe's place in a global race" (2012) defining the main lines of the European HPC strategy*

  " 15.02.2012 - *The Council asked for a further development of the European High Performance Computing Infrastructure and a pooling of national investments in HPC in order to strengthen the position of European industry and academia in the **use, development** and **manufacturing** of advanced computing products, services and technologies*.."

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

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

- *Horizon 2020 programme adopted (end of 2013)*

- *Public-Private Partnership with ETP4HPC (1st January 2014)*

HPC - interrelations between strategic actions

PRACE

Access to best HPC for industry and academia

- **specifications of exascale prototypes forTier-0**
- **technological options for future procurements**

ETP4HPC/cPPP

Autonomous EU development of Exascale technologies

- **CoEs may be associated to PRACE Centres**
- **provision of HPC capabilities and expertise**

- **identify applications for co-design of exascale systems**

Centres of Excellence

Network of SME Competence Centres

Excellence in HPC application

- 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

Public Private Partnership (PPP) in HPC

PPPs in Horizon 2020

*Horizon 2020 may be implemented through PPPs where all the partners concerned commit to **support the development and implementation of R&I activities of strategic importance to the Union**.*

The Union may enter a <u>contractual agreement (cPPP)</u> with private partners

Eight cPPPs launched in January 2014:

- *Factories of the Future, Energy-efficient Buildings, Green Vehicles, Sustainable Process Industry, Future Internet, Robotics, Photonics, **HPC***

- ***HPC PPP** starting 1st January 2014: **700 m€ for the period 2014-2020** (€143,4 million in Calls in 2014-2015)*

Support to HPC in Horizon 2020 Workprogramme 2014-2015

**FET-Proactive
Towards Exascale High Performance Computing**

FETHPC-1-2014: HPC core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications (93,4 M€)

    a) HPC core technologies and architectures

    b) Programming methodologies, environments, languages and tools

    c) APIs and system software for future extreme scale systems

    d) New mathematical and algorithmic approaches

FETHPC-2-2014: HPC Ecosystem Development (4 M€)

    a) Coordination of the HPC strategy

    b) Excellence in High Performance Computing Systems

**PAN-EUROPEAN
HIGH PERFORMANCE COMPUTING
INFRASTRUCTURE AND SERVICES
(PRACE)**

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EINFRA-4-2014 - Pan-European HPC infrastructure and services

Specific Challenge (15 M€):

1. Create a world-class pan-European infrastructure, and provide state-of-the-art services to users, independently of location by
2. Pooling, integrating and rationalising HPC resources in Europe
3. Contribute to the implementation of the EU strategy on HPC:
   1. Provide access to the best supercomputing facilities and services for both industry and academia,
   2. Complement the activities of the Public-Private Partnership (PPP) in HPC

Expected Impact:

1. Improved services and procedures (inc. openness)
2. Increased amount of computing cycles available to researchers
3. Increased number of industrial organisations (in particular SMEs), including training in HPC
4. Increased investment in HPC infrastructure in Europe (national, regional and EU)
5. Long term financial sustainability (business model/governance)
6. Linking demand and supply in the European HPC ecosystem

EINFRA Call, HPC Centres of Excellence (HPC CoE)

EINFRA-5-2015 - Centres of Excellence (CoE) for computing applications: Establish a number of user-centred Centres of Excellence (CoE) in the application of HPC for addressing scientific, industrial or societal challenges (40 M€ TBC)

CoEs may be:

- **'thematic', addressing specific application domains such as medicine, life science or energy**
- **'transversal' on computational science (e.g. algorithms, analytics, numerical methods etc.)**
- **'challenge-driven', addressing societal or industrial challenges (e.g. ageing, climate change, clean transport etc.); or a combination of these types.**

Overview of HPC related Calls

	2014 EUR million	2015 EUR million	Call Deadline
FETHPC1-2014 HPC Core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications	93,4		25/11/2014 at 17:00 Brussels time
FETHPC 2 – 2014: HPC Ecosystem Development	4		25/11/2014 at 17:00 Brussels time
EINFRA-4-2014 - Pan-European HPC infrastructure and services	15		02/09/2014 - 17:00 Brussels time
EINFRA-5-2015 - Centres of Excellence (CoE) for computing applications		*40 (tbc)*	*2015 (date tbc)*
EINFRA-6-2014 - Network of HPC Competence Centres for SMEs	2		02/09/2014 - 17:00 Brussels time

All H2020 Calls and necessary documentation
are published on the Participant Portal

http://ec.europa.eu/research/participants/portal

HPC Call texts available
in the FET and e-infrastructures
Workprogrammes

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Other Cloud/HPC/Big Data calls, 2014-2015

Call H2020 – LEIT (Leadership in Enabling and Industrial Technologies) – 2014/2015 Budget 184 M€

- **ICT 15 - 2014** Big Data and Open Data Innovation and Take-up **Budget 50 M€**

- **ICT 16 - 2015** Big Data – research **Budget 39 M€**

- **ICT 7 - 2014:** Advanced Cloud Infra-structures and Services : towards new computational and data management models, **Budget 73 M€**

- **ICT 8 - 2015:** Boosting public sector productivity and innovation through cloud computing services **Budget 22 M€**

Call H2020 – LEIT (Leadership in Enabling and Industrial Technologies)

- **Cooperation**

  EU-Brazil Research and Development Cooperation in Advanced Cyber Infrastructure, Budget 7 M€
  - EUB 1 – 2015: Cloud Computing, including security aspects
  - EUB 2 – 2015: High Performance Computing (HPC)
  - EUB 3 – 2015: Experimental Platforms

  EU-Japan Research and Development Cooperation in Net Futures, Budget 1,5 M€
  - EUJ 1 – 2014: Technologies combining big data, internet of things in the cloud

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Call H2020 – FET (FUTURE AND EMERGING TECHNOLOGIES)

FETFLAG 3 - 2015: *Human Brain Project FET Flagship Core Project, contains a large part dedicated to HPC/Exascale (50%)* **=> 0 MEURO-2014, 89 M€ -2015**

FETPROACT 1 – 2014, Global Systems Science (GSS) : Not focus on BDEC (Big Data and Extreme-scale Computing) but connected to (climate change, global financial crises, global pandemics, and growth of cities, …) **=> 10 M€ 2014**

Call H2020 – European research infrastructures (including e-Infrastructures)

- **EINFRA-1-2014 – Managing, preserving and computing with big research data => 55 M€**

- **EINFRA-3-2014 – Towards global data e-infrastructures – Research Data Alliance => 4 M€**

- **EINFRA-9-2015 – e-Infrastructures for virtual research environments (VRE) => 42 M€**

- **INFRAIA-1-2014/2015: Integrating and opening existing national and regional research infrastructures of European interest,
=> 90 M€-2014 and 50 M€-2015 for all infras (2 sub-items among 40)**

  Distributed, multidisciplinary European infrastructure on **Big Data and social data mining.**

  Integrating activity for facilitating access to HPC (**High Performance Computing**) centers.

To conclude

European Expected BDEC workshops output

Recommandations for international collaborations

Deliverable: a plan describing the what, the who, the when and how much, preparing the ground for international calls in H2020 and other European national work programs