FETHPC Call 2014

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Future and Emerging Technologies
DG CONNECT
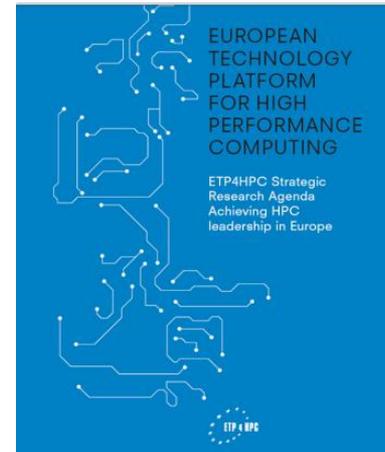European Commission

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)

European Commission

EUROPEAN COMMISSION - PRESS RELEASE

Digital Agenda: Plan to make EU the world leader in High-Performance Computing

EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

ETP4HPC Strategic Research Agenda Achieving HPC leadership in Europe

ETP 4 HPC

COUNCIL OF THE EUROPEAN UNION

EN

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

3242nd COMPETITIVENESS (Internal Market, Industry, Research and Space) Council meeting Brussels, 29 and 30 May 2013

The EU Framework Programme for Research and Innovation

HORIZON 2020

Excellent Science Competitive Industries Better Society

European Commission

High Performance Computing PPP: Mastering the next generation of computing technologies for innovative products and scientific discovery

- HPC to tackle major scientific, societal and competitiveness challenges
- Innovative world-class industrial products and services in a cost effective way
- Underpinning scientific discovery through modelling and simulation
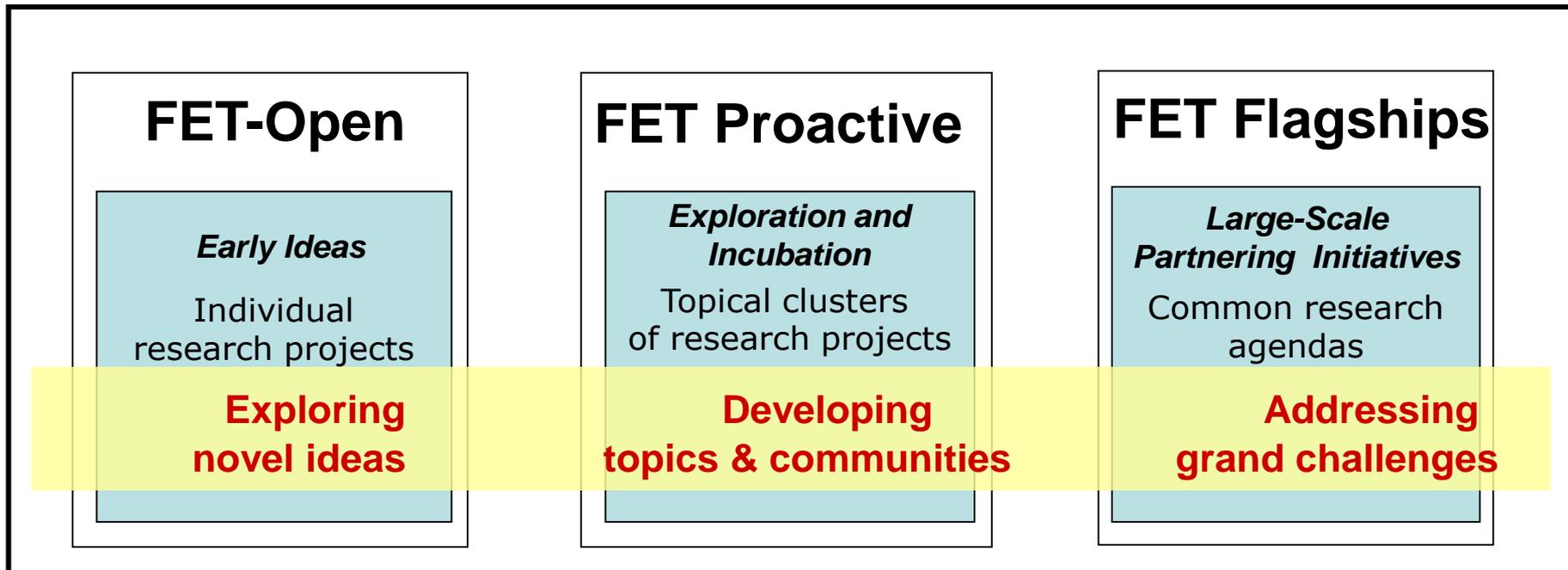
- HPC strategy combining three elements:

  (a) Towards exascale High Performance Computing
  [HPC in FET]

  (b) providing access to the best supercomputing facilities and services for both industry and academia
  [HPC in e-infrastructures]

  (c) achieving excellence in HPC applications
  [HPC in e-infrastructures]

  - complemented with training, education and skills development in HPC

Focus of this talk

- HPC strategy combining three elements:

(a) Towards exascale High Performance Computing
   [HPC in FET]

(b) providing access to the best supercomputing facilities and services for both industry and academia
   [HPC in e-infrastructures]

(c) achieving excellence in HPC applications
   [HPC in e-infrastructures]

- complemented with training, education and skills development in HPC

FET funding schemes

Open, light and agile ←→ Roadmap based research

FET-Open

Early Ideas

Individual research projects

Exploring novel ideas

FET Proactive

Exploration and Incubation

Topical clusters of research projects

Developing topics & communities

FET Flagships

Large-Scale Partnering Initiatives

Common research agendas

Addressing grand challenges

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- **FET-Proactive: Towards Exascale High Performance Computing** [FETHPC]

- The exascale computing frontier requires **fundamental science and technology developments** to ensure the transition to extreme parallelism and extreme data

  - evolution of most of the key technological solutions that are satisfactory today will be **insufficient** to meet the exascale challenge

- **Content: R&D covering the whole spectrum** from processors and system architectures to high-level software and tools and novel applications (e.g. encompassing system software, file systems, programming environments and tools, algorithms, mathematics etc.)

  - ➤ engaging a European-wide effort to develop technology to build exascale systems within ~10 years

FET-Proactive
Towards Exascale High Performance Computing

Topics:

➢ FETHPC 1 (research and innovation):

    HPC Core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications

➢ FETHPC 2 (coordination and support):

    HPC Ecosystem Development

FETHPC Call

FETHPC 1: HPC core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications

➢ Proposals shall target one of the following subtopics:

    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 1-a

HPC core technologies and architectures

❑ addressing <u>one or more</u> of the HPC core technologies (<u>processors, memory, interconnect and storage</u>) and their optimal integration into <u>HPC systems, platforms and prototypes</u>.

❑ Proposals should have a <u>co-design</u> approach <u>driven by ambitious applications</u> and in close cooperation with the scientific disciplines and stakeholders concerned, aiming at radical overall system performance improvement while at the same time addressing issues such as:

- a holistic understanding of <u>energy efficiency</u> across the full HPC system architecture;
- I/O, storage and data-throughput capabilities especially for <u>big-data</u> applications;
- radical <u>scalability</u>, <u>concurrency</u>, <u>locality</u> and <u>resilience</u> in the presence of <u>millions of cores</u>.

FETHPC 1-b

Programming methodologies, environments, languages and tools

development of new programming models, domain-specific languages, programming paradigms, visualisation and data-analysis tools

to facilitate

the effective exploitation of the full system capabilities (including energy management) of the emerging large- and extreme scale systems, in particular for extreme parallelism and extreme data applications.

FETHPC 1-c

APIs and system software for future extreme scale systems:

New APIs and the corresponding efficient, flexible and scalable exascale system software for managing extreme scale systems, taking into account extreme parallelism, extreme data, energy consumption and resilience.

Proposals are expected to include communication and dissemination activities towards relevant standards bodies and research programmes.

Critical mass to coordinate the API work in the exascale stack.

FETHPC 1-d

New mathematical and algorithmic approaches for existing or emerging applications on extreme scale systems.

Energy-aware algorithms and maximum exploitation of projected characteristics of exascale-class systems.

Specific issues are quantification of uncertainty and noise, multiscale and extreme data.

Software engineering for extreme parallelism should be addressed.

Open source development is privileged.

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FETHPC1: Expected impact

- Contribution to the realisation of the ETP4HPC Strategic Research Agenda, thus strengthened European research and industrial leadership in HPC technologies.

- Covering important segments of the broader and/or emerging HPC markets, especially extreme-scale HPC systems.

- Impact on standards bodies and other relevant international research programmes and frameworks.

- European excellence in mathematics and algorithms for extreme parallelism and extreme data applications to boost research and innovation in scientific areas such as physics, chemistry, biology, life sciences, materials, climate, geosciences, etc.

Budget and type of projects in FETHPC1

- *Total budget for FETHPC1: 93.4 million EUR*
- *Type of projects: Research and Innovation Actions (100% funding).*
- *A minimum of 60% of the available budget will be allocated to research under part a) of the scope.*
- *The Commission considers that proposals requesting a contribution from the EU of **between EUR 2 and 4 million** would allow this specific challenge to be addressed appropriately.*
- *Under **part a) of the scope also larger proposals requesting a contribution from the EU of up to EUR 8 million** can be envisaged.*
- *Nonetheless, **this does not preclude submission and selection of proposals requesting other amounts.***

Evaluation criteria

Research and Innovation Actions

European Commission

Excellence

Clarity and pertinence of the objectives

Soundness of the concept, including trans-disciplinary considerations, where relevant

Extent that proposed work is ambitious, has innovation potential, and is beyond the state of the art (e.g. ground-breaking objectives, novel concepts and approaches)

Credibility of the proposed approach

Impact

The expected impacts listed in the work programme under the relevant topic

Enhancing innovation capacity and integration of new knowledge

Strengthening the competitiveness and growth of companies by developing innovations meeting the needs of European and global markets; and, where relevant, by delivering such innovations to the markets

Any other environmental and socially important impacts (not already covered above)

Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant

Implementation

Coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources

Complementarity of the participants within the consortium (when relevant)

Appropriateness of the management structures and procedures, including risk and innovation management

FETHPC 2: HPC Ecosystem Development

Proposals shall address one of the two following topics:

a) **Coordination of the HPC strategy**

b) **Excellence in High Performance Computing Systems**

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FETHPC 2-a
Coordination of the HPC strategy

The aim is to **support the implementation of a common European HPC strategy through coordination of the activities of stakeholders** such as the European Technology Platform for HPC (ETP4HPC), PRACE, application owners and users (including emerging HPC applications), the European exascale computing research community, the open source HPC community, related activities in other parts of H2020, etc.

Proposals must include activities for **promoting a joint community structuring and synchronisation** as well as other non-research activities such as the development of Strategic Research Agenda for High Performance Computing (including the roadmap for exascale in Europe), the link to the H2020 Societal Challenges, the mapping and analysis of related national and international R&I programmes/activities/research agendas in HPC towards exascale, coordination with and participation in relevant international activities, etc. Specific actions for attracting young talent into HPC must be included.

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FETHPC 2-b
Excellence in High Performance Computing Systems

- boost <u>European research excellence</u> on the key challenges towards the next generations of <u>high-performance computing systems</u>

- cutting <u>across all levels</u> – hardware, architectures, programming, applications

- ensure <u>a durable integration of the relevant European research teams</u>

- identify and promote <u>best practices in curricula and training</u>

- build and strengthen <u>links to venture capital</u>

- promote <u>entrepreneurship</u> and <u>industry take-up</u>.

- <u>self-sustainability of the research integration</u> on the longer-term

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FETHPC 2 Expected impact

- Strengthened European research and industrial leadership in the supply, operation and use of HPC systems;

- Contribution to the realisation of the ETP4HPC Strategic Research Agenda;

- Development of competitive European technology for building and exploiting a wide range of next-generation extreme performance computing systems;

- Structuring the efforts of stakeholders for implementing the European HPC strategy;

- Reinforced cooperation in international endeavours on HPC software and systems towards exascale;

- European Excellence in High Performance Computing systems.

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Budget and type of projects in FETHPC2

- Total budget for FETHPC1: 4 million EUR

- Type of projects: Coordination and Support Actions (100% funding)

- Separate proposals per subtopic a) and b)

Evaluation criteria

European Commission

Excellence

Clarity and pertinence of the objectives

Soundness of the concept

Quality of the proposed coordination and/or support measures

Credibility of the proposed approach

Impact

The expected impacts listed in the work programme under the relevant topic

Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant

Implementation

Coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources

Complementarity of the participants within the consortium (when relevant)

Appropriateness of the management structures and procedures, including risk and innovation management

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***HPC core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications** (Research and Innovation Actions - 93,4 M€)*

- **HPC core technologies and architectures** *(e.g. processors, memory, interconnect and storage) and their optimal integration into HPC systems, platforms and prototypes*
- **Programming methodologies, environments languages and tools***: new programming models for extreme parallelism and extreme data applications*
- **Application Programming Interfaces and system software** *for future extreme scale systems*
- **New mathematical and algorithmic approaches** *for existing or emerging applications*

***HPC Ecosystem Development** (Coordination and Support Actions - 4 M€)*

- **Coordination of the HPC strategy**: coordination of the activities of stakeholders, development of Strategic Research Agenda, mapping and analysis of national and international R&I programmes, attracting young talents ,…
- **Excellence in High Performance Computing Systems**: boosting European research excellence on the key challenges towards the next generations of high-performance computing systems; cutting across all levels.

Thank you for your attention!

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

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

FETHPC Call text available
in the FET Workprogramme

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