

Future and Emerging Technologies (FET) Work Programme 2014-2015 in H2020



Andrea Feltrin
Future and Emerging Technologies
DG CONNECT
European Commission

Overview

- FET in Horizon 2020
- FET-Open – *fostering novel ideas*
- FET-Proactive - *High-Performance Computing*
- FET Flagships - *tackling grand interdisciplinary science and technology challenges*



HORIZON 2020

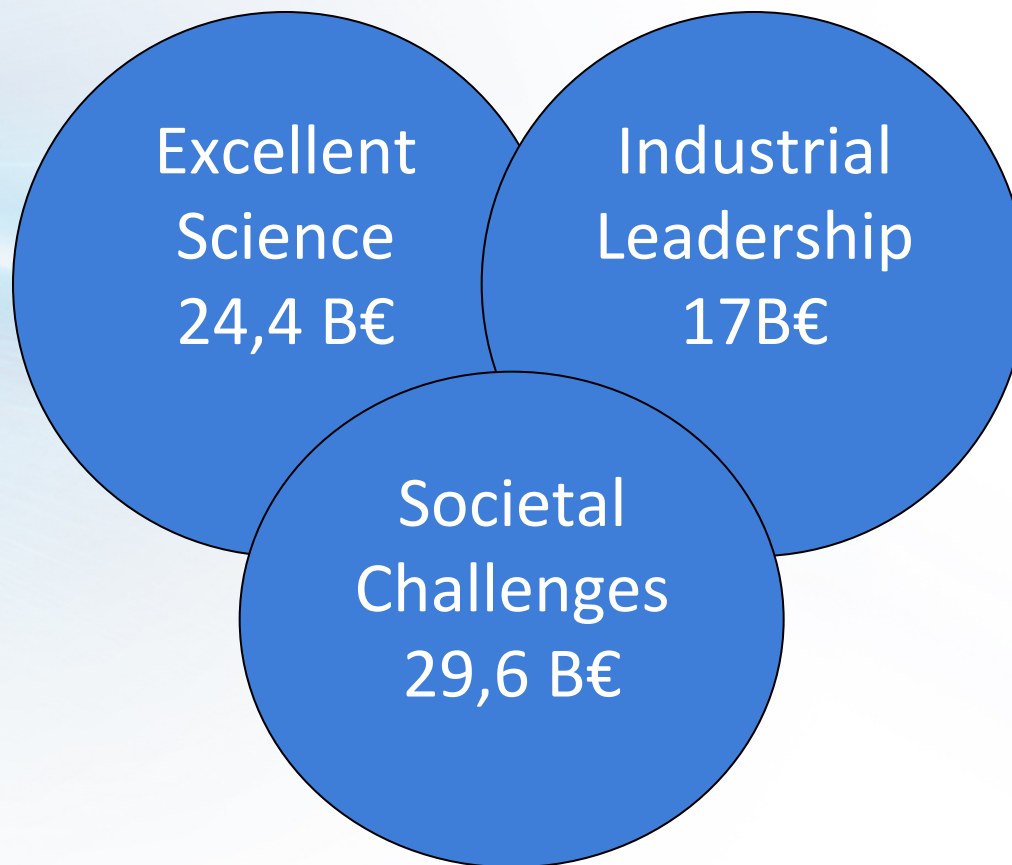
the EU framework programme for
research and innovation

2014-2020



A stronger, clearer focus

H2020 Budget: 77B€ (current prices)



OTHERS: 5,8B€ (Spreading excellence & widening participation, Science & Society, JRC, EIT)



Excellent Science pillar in H2020

- European Research Council (13B€)
- Marie Skłodowska-Curie actions (6,1B€)
- **Future and Emerging Technologies**
- Research infrastructures programme (2,4B€)

FET: 2,7 B€

*"**Future and emerging technologies** shall support collaborative research in order to extend Europe's capacity for advanced and paradigm-changing innovation. It shall foster scientific collaboration across disciplines on radically new, high-risk ideas and accelerate development of the most promising emerging areas of science and technology as well as the Union wide structuring of the corresponding scientific communities."*

HORIZON 2020 - THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION (2014-2020)

Pathfinding Europe's technological future

FET mission



- To turn Europe's excellent science base into a competitive advantage by uncovering radically new technological possibilities
- To turn Europe into the best place for collaborative research on future and emerging technologies



From FP7 to H2020

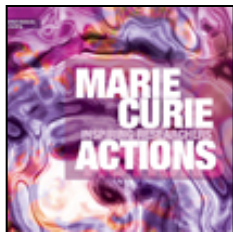


A new level of ambition

- *New mandate, going beyond ICT*
 - Pathfinding Europe's technological future
 - Bootstrapping new R&I eco-systems
- *New large-scale partnering initiatives complementing small and medium scale activities*
 - FET Flagships
 - High-Performance Computing (PPP)

A new actor in the S&T funding landscape

A much larger intervention budget



Digital Science

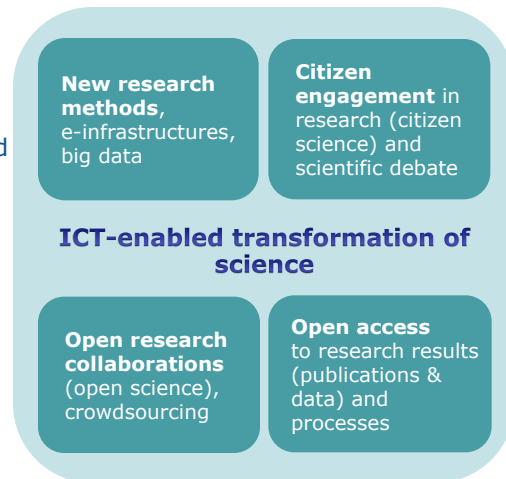
Digital science is about making science and research more efficient, transparent, better valued and with higher impact through the tools, collaboration models and openness made possible by ICT.

Digital Science in H2020:

- relies on the use of e-infrastructures that offers virtual and collaborative research environments;
- addresses policy challenges related to harnessing its full potential;
- develops discipline-specific or generic scientific tools and practices;
- Promotes policies for take-up by research organizations, among them Open Access and Open Research Data Pilot.

More efficient science: shared resources, dynamic collaborations, democratization of research

New science:
New disciplines, new research topics



Higher impact science:
relevance, accessibility and impact to society and industry

Better science:
Transparent and replicable research



Open Access & Open Research Data

Open Access in H2020

- Mandatory for all publications resulting from H2020 projects;
- It is a tool to facilitate and improve the circulation of information in ERA and beyond;
- Not in conflict with Intellectual Property Rights;
- Publishing charges are eligible for reimbursement;
- E-infrastructure support for publications management & sharing.

Open Research Data Pilot in H2020

- Open data pilot for specific areas, including Future and Emerging Technologies;
- Possibility to Opt-in or Opt-out when justified, also for running projects;
- Participating projects need to develop a Data Management Plan within 6 months from project start;
- E-infrastructure support for research data management & sharing

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**

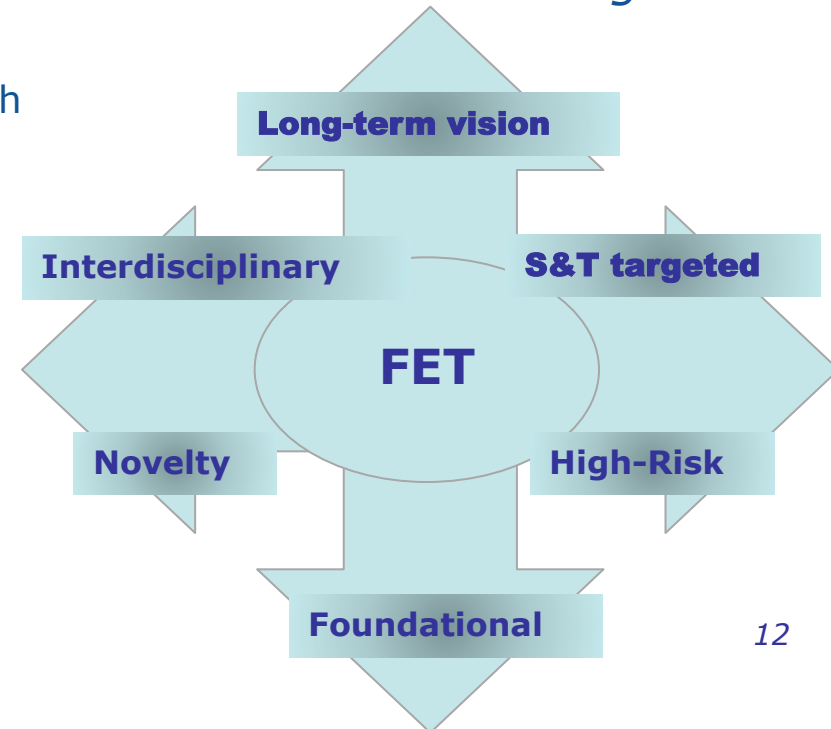
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Call FET-Open : novel ideas for radically new technologies

- **'Open is open'**
- All technologies, no thematic restriction
- *FET gatekeepers define the kind of research that FET is looking for*
- Scope defined by the 6 gatekeepers
- Bottom-up, but targeted - not blue sky research
- Collaborative research
- *Total budget: 160M€ in 2014-15*
- *Instrument*
- Research and Innovation Action - 154M€
- Coordination and Support actions (CSA) – 6M€





Long-term vision: *a new, original or radical long-term vision of technology-enabled possibilities going far beyond the state of the art*

Breakthrough S&T target: *scientifically ambitious and technologically concrete breakthroughs plausibly attainable within the life-time of the project.*

Foundational: *the breakthroughs must be foundational in the sense that they can establish a basis for a new line of technology not currently anticipated.*

Novelty: *new ideas and concepts, rather than the application or incremental refinement of existing ones.*

High-risk: *the potential of a new technological direction depends on a whole range of factors that cannot be apprehended from a single disciplinary viewpoint.*

- This inherent high-risk has to be countered by a strongly interdisciplinary research approach, where needed expanding well beyond the strictly technological realm.

Interdisciplinary: *the proposed collaborations must go beyond current mainstream collaboration configurations in joint S&T research, and must aim to advance different scientific and technological disciplines together and in synergy towards a breakthrough.*

Building on FET interdisciplinary research



Restored real-time sensory feeling

biorobotic prosthesis



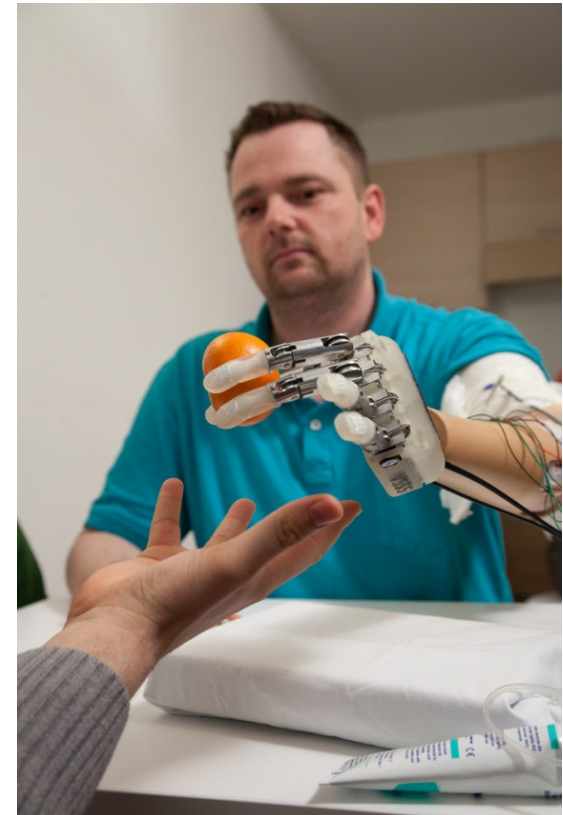
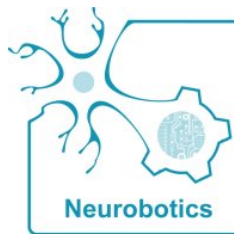
algorithms and software



implant surgery

clinical and neurophysical protocols

Nebias-Project.eu





FETOPEN 1: FET-Open research projects

Specific challenge

Supporting a large set of early stage, high risk visionary science and technology collaborative research projects is necessary for the successful exploration of new foundations for radically new future technologies. Nurturing fragile ideas requires an agile, risk-friendly and highly interdisciplinary research approach, expanding well beyond the strictly technological disciplines.

Recognising and stimulating the driving role of new high-potential actors in research and innovation, such as women, young researchers and high-tech SMEs, is also important for nurturing the scientific and industrial leaders of the future.

Project size: 2 to 4M€

- **1 step submission and evaluation of a 16 pages proposal**
- **Proposals are not anonymous**

Budget: 154M€

Deadlines	30/09/2014	31/03/2015	29/09/2015
Budget	77 M€	38,5 M€	38,5M€



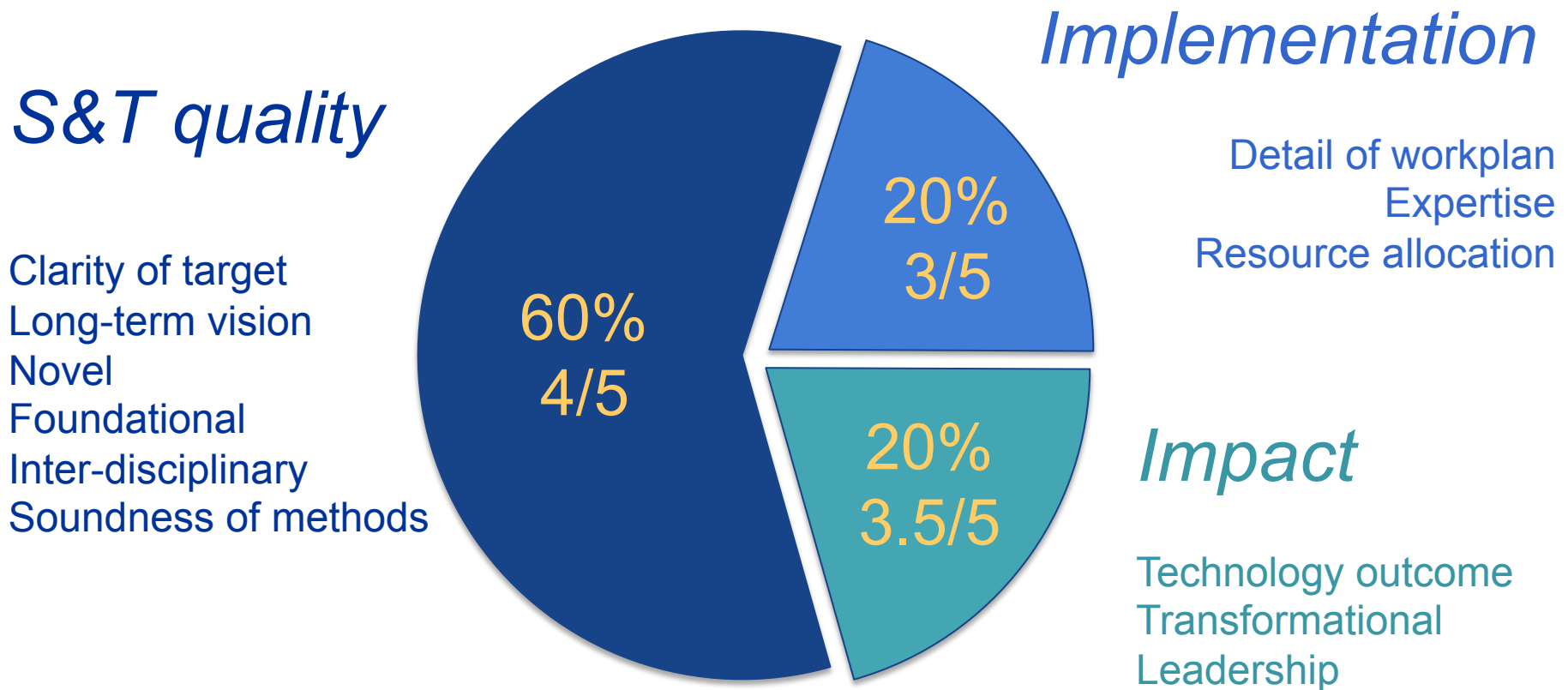
One step submission and evaluation

Part A: Administrative part of the proposal

Part B : Scientific part of the proposal

- **16 pages – core proposal**
 - Cover page (1 page)
 - Section 1: S&T Excellence
 - Section 2: Impact
 - Section 3: Implementation
- **Additional information**
 - Operational capacity
 - E.g. legal entity, CV, subcontract, third party
 - Ethics section

FET Evaluation criteria (R&I proposals)





FETOPEN 2: Coordination and Support Activities 2014

Specific challenge: The challenge is to make Europe the best place in the world for collaborative research on future and emerging technologies that will renew the basis for future European competitiveness and growth, and that will make a difference for society in the decades to come.

Scope: Proposals shall address one of the following topics:

FET Observatory: identifying new opportunities and directions for FET research

FET Communication: communicating on FET projects and activities

FET Exchange: structuring an emerging FET-relevant topic and communities

FET Conference: supporting the organisation of the third FET Conference

FET Prizes: identifying suitable areas for prizes and competitions in FET

FET Impact: Assessing the impacts of the FET programme

Project size: 0,3 to 0,5M€ per topic, up to 1M€ for FET Conference

Budget & deadline:

- 3M€ -> Deadline: 30/9/2014



FETOPEN 3 : Coordination and Support Activities 2015

Specific challenge: The challenge is to make Europe the best place in the world for collaborative research on future and emerging technologies that will renew the basis for future European competitiveness and growth, and that will make a difference for society in the decades to come.

Scope: Proposals shall address one of the following topics:

FET Exchange: structuring an emerging FET-relevant topic and communities

FET Take-Up: actions for stimulating take-up of FET research results towards impact and innovation

Project size: 0,3 to 0,5M€ per topic

Budget & Deadline:

- 1,5M€ -> Deadline: 31/3/2015
- 1,5M€ -> Deadline: 29/9/2015

FET Information Day in Brussels



What?

- **Overview of the FET-CSA topics**
- *H2020 proposal guidelines and submission procedures*
- *Presentation of ideas for projects and networking*

When?

- *May 16th, 2014*

Where?

- *DG CONNECT, Brussels*

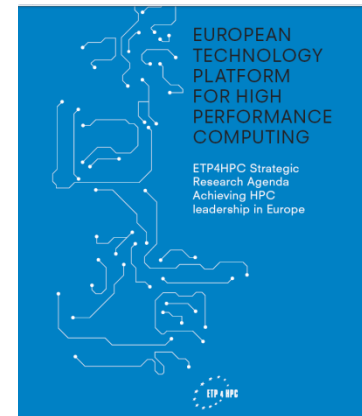
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Key EU developments in 2012-2013

- *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 - 2013)*
 - **ETP4HPC - Strategic Research Agenda**
 - **Public-Private Partnership with ETP4HPC***



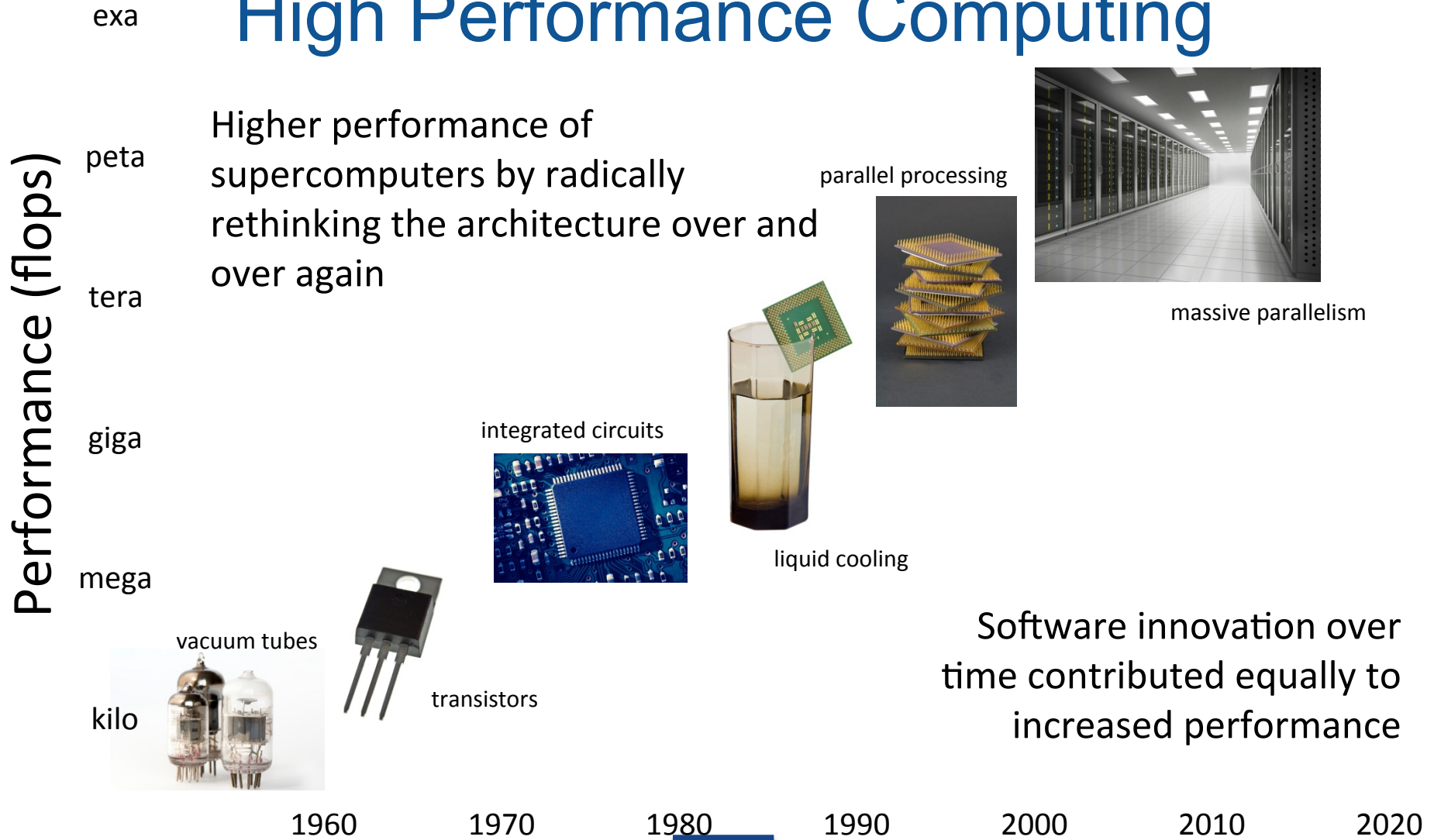
www.etp4hpc.eu

An integrated HPC approach in H2020



- 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 FET]
 - (b) achieving excellence in HPC **applications**; *Centres of Excellence for scientific/industrial HPC applications in (new) domains that are most important for Europe* [e-infrastructures]
 - (c) providing **access** to the best supercomputing facilities and services for both industry and academia; *PRACE - world-class HPC infrastructure for the best research* [e-infrastructures]
- complemented with training, education and skills development in HPC

High Performance Computing



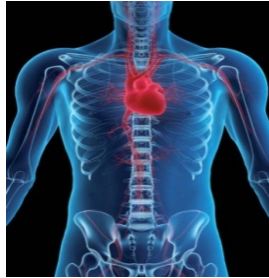
HPC in FET: Critical technologies



Addressing Societal Challenges

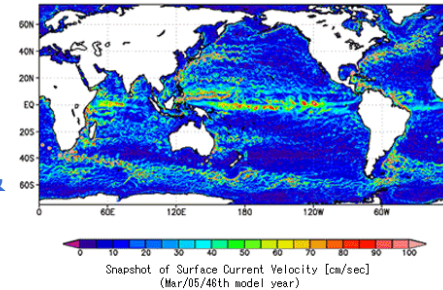
Health, demographic change and well-being

(Personalised medicine, pharma/bio-medical simulations, Virtual Physiological Human, Human Brain Project)



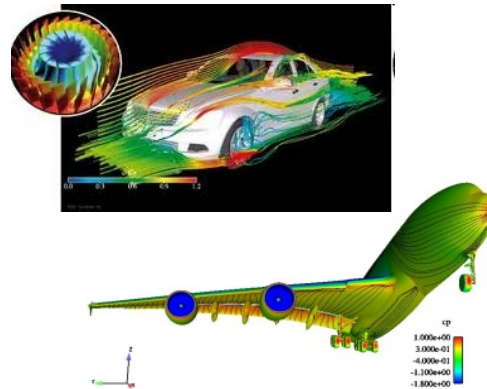
Climate action, resource efficiency and raw materials

(Simulators for Climate & Earth Sciences, Gas&Oil)



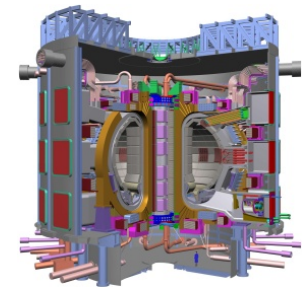
Smart, green and integrated transport Engineering

(performance, sustainability, energy efficiency)



Secure, clean and efficient energy

(Fusion, nuclear plant simulations)



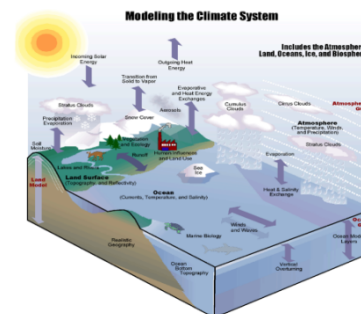
Inclusive, innovative and secure societies

(Smart Cities, multivariable decision/analytics support)



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- Exascale Challenges in FET



- **Energy:** Extrapolation of current power consumption (e.g. Top system Tianhe-2) would need ~ 1 GW for sustained exaflops: breakthroughs and advances in circuits, architecture and software are needed to achieve the ~ 20 MW exaflop computing
- **Memory and I/O:** Handling of memory, latency and locality at all levels, from processor, to network and storage
- **Programmability and algorithms:** Programmers face the challenge of handling billions of computing threads. Only very few applications using HPC really take advantage of current petaflop system.
- **Resilience:** Innovative ideas are needed to cope with a very unstable and complex environment of millions of cores with frequent fault rates
- **Co-design:** Technology development must be associated to users requirements to get the right systems to satisfy the needs of applications.
 - engaging a European-wide effort to develop technology to build exascale systems within ~ 10 years



FETHPC 1: HPC core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications - 2014

*Specific challenge: Addressing the exascale challenges to achieve, by 2020, the full range of technological capabilities for **exascale-class HPC systems** which are balanced at all levels and validated with significant application drivers*

Scope :

- **a. Core technologies and architectures** (e.g. processors, memory, interconnect and storage) and their optimal integration into HPC systems, platforms and prototypes
- **b. Programming methodologies, environments languages and tools**: new programming models for extreme parallelism and extreme data applications
- **c. APIs and system software** for future extreme scale systems
- **d. New mathematical and algorithmic approaches** (e.g. ultra-scalable algorithms for extreme scale systems with quantifiable performance for existing or visionary applications)

Project size : 2 to 4M€, up to 8M€ for topic a)

Budget & Deadline : 93,4M€ -> Deadline: 25/11/2014

- with a minimum of 60% to be allocated to research under part a) of the scope



FETHPC 2: HPC Ecosystem Development - 2014

Specific challenge: To develop a sustainable European HPC Ecosystem

Scope:

- **Coordination of the HPC strategy** : coordination of the activities of stakeholders such as ETP4HPC, PRACE, application owners and users (including emerging HPC applications), the European exascale computing research community, the open source HPC community, etc.
- **Excellence in High Performance Computing Systems** : boost European research excellence on the key challenges towards the next generations of high-performance computing systems; cutting across all levels – hardware, architectures, programming, applications; ensure a durable integration of the relevant European research teams; self-sustainability of the research integration on the longer-term

Budget & Deadline: 4M€ -> Deadline: 25/11/2014

Overview

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- FET-Proactive - *nurturing emerging themes and communities*
- FET-Proactive - *High-Performance Computing*
- FET Flagships - *tackling grand interdisciplinary science and technology challenges*

FET Flagships – salient features

FET Flagships are highly ambitious, large-scale, long-term, science-driven, goal-oriented, roadmap-based research initiatives, which will:

- provide strong scientific, technological and IPR basis for establishing areas of European leadership and bringing substantial benefits for society
- help overcome fragmentation and increase the impact of European research and innovation efforts

and which will require:

- cooperation among a range of scientific communities/disciplines, with industries and with the involvement of representatives from the civil society
- a long-term commitment of all key stakeholders sharing a common scientific vision and under a strong leadership
- a joint effort of EU and national programmes to provide a large financial support (~ 100 M€/year) over a long period (~ 10 years)

Graphene & Human Brain Project selected



Call for
Preparatory Actions
21 → 6
July 2010

Stimulating ideas &
structuring the
scientific community
2009 - 2010

Preparatory
Phase Pilots
05/2011 -
04/2012

Flagship
selection
6 → 2
end 2012

FP7 ramp-up phase
10/2013- 03/2016

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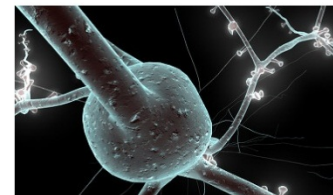
Brain Simulation and Graphene Research Receive Billion Euro Each

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Mark Hoffman

First Posted: Jan 28, 2013 09:57 AM EST

The result of the highly anticipated decision of which two research projects will receive a one billion Euro research grant, the largest single research award ever, from the European Commission were announced by the European Commission's Vice-President Neelie Kroes today.



The first project is the [Human Brain Project](#), led by neuroscientist Henry Markram at the Swiss Federal Institute of Technology (EPFL) in Lausanne, which aims to simulate the human brain in a supercomputer, in order to aid medical advancement in brain disorders.

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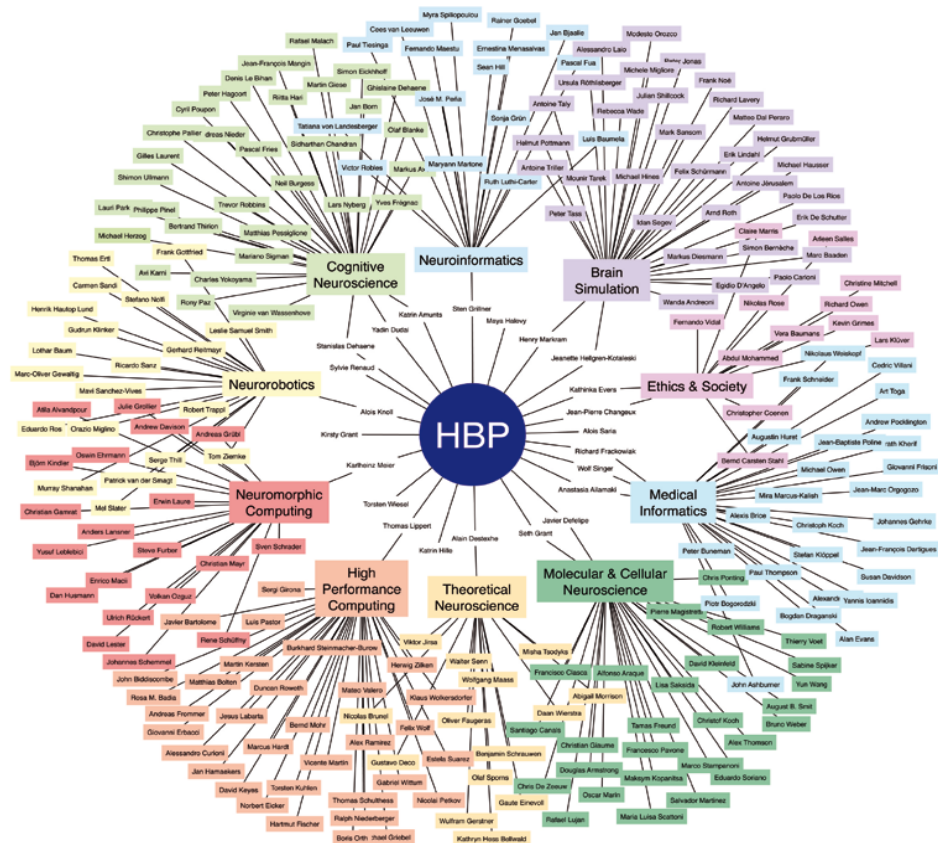
The second, called [Graphene Project](#), is led by theoretical physicist Jari Kinaret at Chalmers University of Technology in Gothenburg, Sweden. Its goal is to develop the awesome

The Human Brain Project (HBP)

HBP will create the world's largest **experimental facility for developing the most detailed models of the brain** (from genes to mind), for studying how the human brain works and ultimately for simulating and developing personalised treatment of brain diseases.

This research lays the scientific and **technical foundation for medical progress**: identifying new drug targets and treatment, in response to the urgent need to combat brain diseases and their associated costs to society.

HBP will also produce brain-inspired **'neuromorphic' computing** systems that could drastically reduce power-consumption for super-computers and enhance robots.



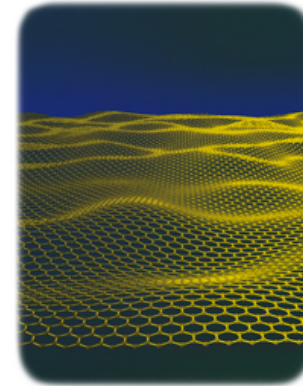
Graphene FET Flagship

Graphene, is a 2D material , a single layer of carbon atoms, stronger than diamond, yet lightweight and flexible and an exceptional electricity conductor.

The Graphene Flagship will bring graphene, and related 2D materials, **from academic labs to industry, manufacturing and society.**

Examples Applications:

- ✓ electronic paper; bendable smartphones; enhanced solar cells and batteries; lighter and more energy efficient airplanes ...
- ✓ On the longer term, graphene is expected to give rise to new computers and revolutionary medical applications such as artificial retinas.



*Artistic impression of a corrugated graphene sheet
Credit: Jannik Meyer*





Thanks for your attention!

H2020 website:

<http://ec.europa.eu/programmes/horizon2020/>

Participant portal:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/index.html>

FET Work Programme call text :

http://ec.europa.eu/research/participants/portal/doc/call/h2020/common/1587754-02._fet_wp2014-2015_en.pdf

Contact FET : CNECT-FET@ec.europa.eu, Andrea.Feltrin@ec.europa.eu

Twitter: @FET_EU