# Calcul haute performance en Europe
# Panorama et évolutions

Dr. Jean-Philippe Nominé
ETP4HPC Office
jean-philippe@office.etp4hpc.eu
office@etp4hpc.eu
www.etp4hpc.eu

Forum TERATEC

Palaiseau, 19 juin 2018

DE LA RECHERCHE À L'INDUSTRIE

# Calcul haute performance en Europe
# Panorama et évolutions

Jean-Philippe Nominé
CEA – Direction Des Analyses Stratégiques

*jean-philippe.nomine@cea.fr*
*www.cea.fr*
*www-hpc.cea.fr*

Forum TERATEC
Palaiseau, 19 Juin 2018

www.cea.fr

# Références

- ETP4HPC
  - [www.etp4hpc.eu/](www.etp4hpc.eu/)
  - [www.etp4hpc.eu/ETP4HPC-2017-annual-report/](www.etp4hpc.eu/ETP4HPC-2017-annual-report/)
  - [www.etp4hpc.eu/cppp.html](www.etp4hpc.eu/cppp.html)
  - [www.etp4hpc.eu/sra.html](www.etp4hpc.eu/sra.html)
  - [http://www.etp4hpc.eu/european-hpc-handbook.html](http://www.etp4hpc.eu/european-hpc-handbook.html)
- HPC dans H2020
  - [https://ec.europa.eu/programmes/horizon2020/en/h2020-section/high-performance-computing-hpc](https://ec.europa.eu/programmes/horizon2020/en/h2020-section/high-performance-computing-hpc)
- PRACE
  - [www.prace-ri.eu/](www.prace-ri.eu/)
- EXDCI
  - [https://exdci.eu/](https://exdci.eu/)
- FETHPC
  - [https://ec.europa.eu/programmes/horizon2020/en/news/21-new-h2020-high-performance-computing-projects](https://ec.europa.eu/programmes/horizon2020/en/news/21-new-h2020-high-performance-computing-projects)
- CoE
  - [https://ec.europa.eu/programmes/horizon2020/en/news/overview-eu-funded-centres-excellence-computing-applications](https://ec.europa.eu/programmes/horizon2020/en/news/overview-eu-funded-centres-excellence-computing-applications)
- EPI
  - [https://ec.europa.eu/digital-single-market/en/news/european-processor-initiative-consortium-develop-europes-microprocessors-future-supercomputers](https://ec.europa.eu/digital-single-market/en/news/european-processor-initiative-consortium-develop-europes-microprocessors-future-supercomputers)
- EuroHPC
  - [https://ec.europa.eu/digital-single-market/en/eurohpc-joint-undertaking](https://ec.europa.eu/digital-single-market/en/eurohpc-joint-undertaking)
  - [http://eurohpc.eu/news](http://eurohpc.eu/news)

# Une brève histoire
# des 10 dernières années du HPC européen

**2010 PRACE**

**2012**
Déclaration N. Kroes - création ETP4HPC

**2014 cPPP HPC**
Appels à projets FETHPC, CoE

**2015 Début effectif des projets FETHPC+CoE, EXDCI**

**2016 Déclarations Oettinger/Juncker**
DSM, DEI, EDI, EOSC…

**2017 Déclaration EuroHPC**
EPI

**2018 Préparation EuroHPC**

**2019…**

Forum TERATEC 2018

**2010 PRACE**

**2012**
**Déclaration N. Kroes - création ETP4HPC**

**2014 cPPP HPC**
**Appels à projets FETHPC, CoE**

**2015 Début effectif des projets FETHPC+CoE, EXDCI**

**2016 Déclarations Oettinger/Juncker**
**DSM, DEI, EDI, EOSC…**

**2017 Déclaration EuroHPC**
**EPI**

**2018 Préparation EuroHPC**

**2019…**

# De PRACE à PRACE 2....

2011

- Preparatory Phase 2008-2010
- PRACE aisbl en 2010

- Cycles et services
- Support utilisateurs
- Formations
- …

2017

- 2018 en France:
  - JOLIOT-CURIE remplace CURIE Tier0 GENCI@CEA TGCC

2010 PRACE

2012
Déclaration N. Kroes - création ETP4HPC

2014 cPPP HPC
Appels à projets FETHPC, CoE

2015 Début effectif des projets FETHPC+CoE, EXDCI

2016 Déclarations Oettinger/Juncker
DSM, DEI, EDI, EOSC…

2017 Déclaration EuroHPC
EPI

2018 Préparation EuroHPC
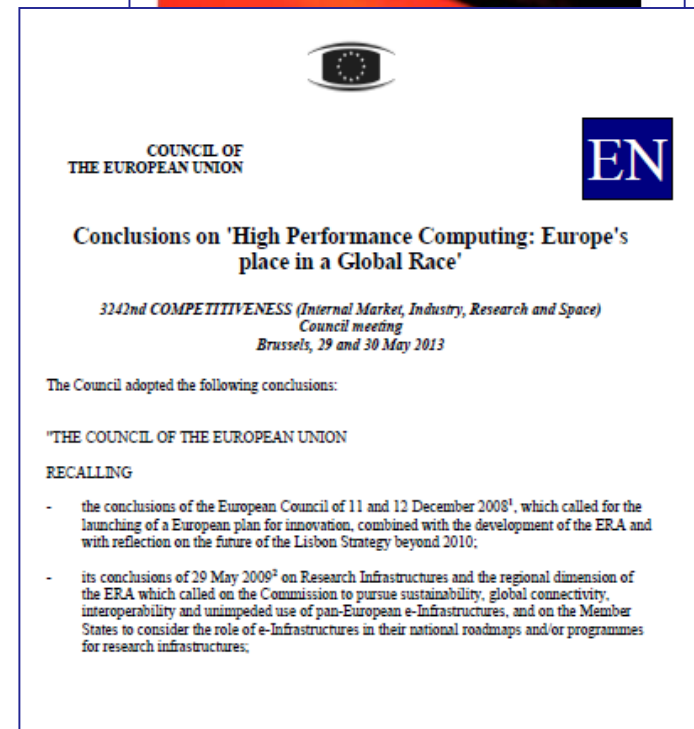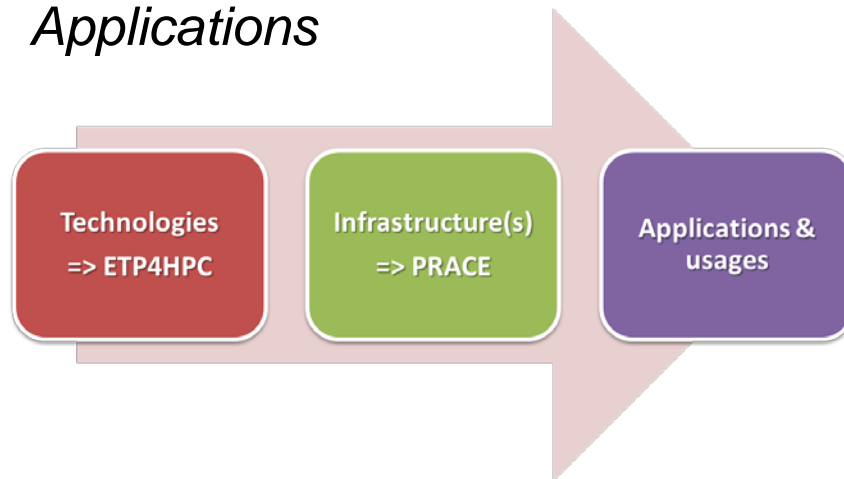
2019…

# 2012 : prémisses de H2020

- Avril-Mai 2012

- Première affirmation de l'importance d'une vision globale de la chaîne de valeur du HPC
  *Technologies*
  *Infrastructures*
  *Applications*





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

Brussels, 15.2.2012
COM(2012) 45 final

**COUNCIL OF THE EUROPEAN UNION**

**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 Council adopted the following conclusions:

"THE COUNCIL OF THE EUROPEAN UNION

RECALLING

- the conclusions of the European Council of 11 and 12 December 2008[1], which called for the launching of a European plan for innovation, combined with the development of the ERA and with reflection on the future of the Lisbon Strategy beyond 2010;

- its conclusions of 29 May 2009[2] on Research Infrastructures and the regional dimension of the ERA which called on the Commission to pursue sustainability, global connectivity, interoperability and unimpeded use of pan-European e-Infrastructures, and on the Member States to consider the role of e-Infrastructures in their national roadmaps and/or programmes for research infrastructures;

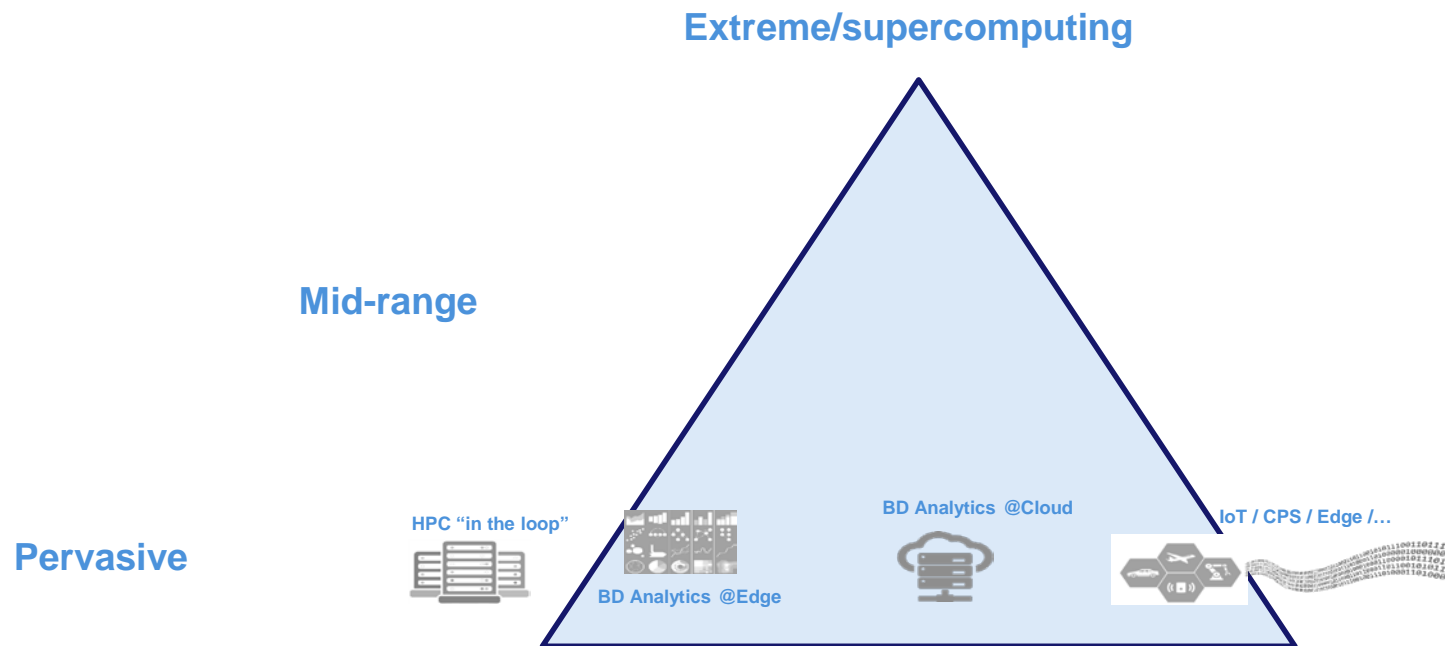# 2012 : ETP4HPC – une réponse à la déclaration - pilier « technologies »

- Association industrielle
- "Building a globally competitive European world-class HPC technology value chain"

*15 membres fondateurs => 90 membres en mai 2018*
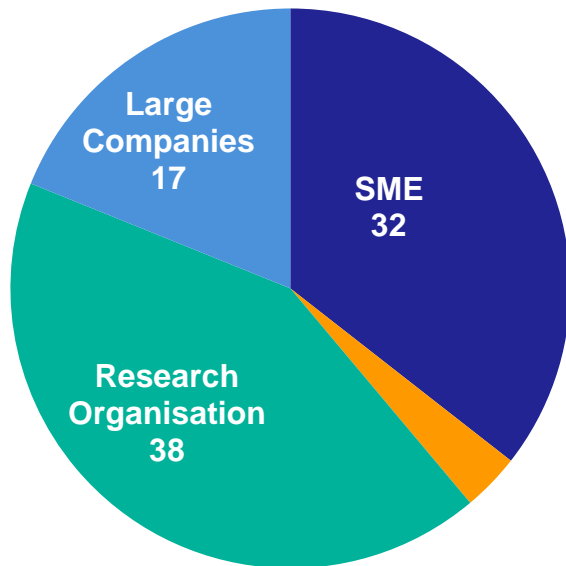
# ETP4HPC

- « Extreme Scale » = un moteur – problèmes aux frontières
- Mais: importance de la diffusion des technologies dans tous les domaines à toutes les échelles….

**Extreme/supercomputing**

**Mid-range**

**Pervasive**

HPC "in the loop"

BD Analytics @Edge

BD Analytics @Cloud

IoT / CPS / Edge /…

2010 PRACE

2012
Déclaration N. Kroes - création ETP4HPC

2014 cPPP HPC
Appels à projets FETHPC, CoE

2015 Début effectif des projets FETHPC+CoE, EXDCI

2016 Déclarations Oettinger/Juncker
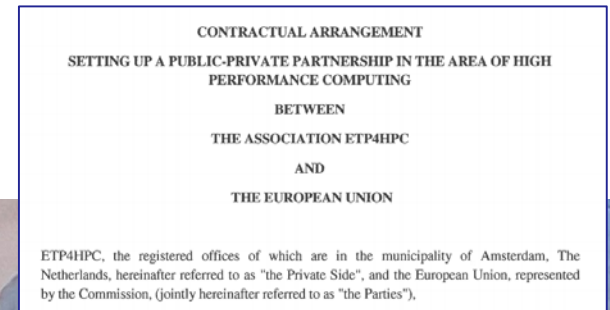DSM, DEI, EDI, EOSC…

2017 Déclaration EuroHPC
EPI

2018 Préparation EuroHPC
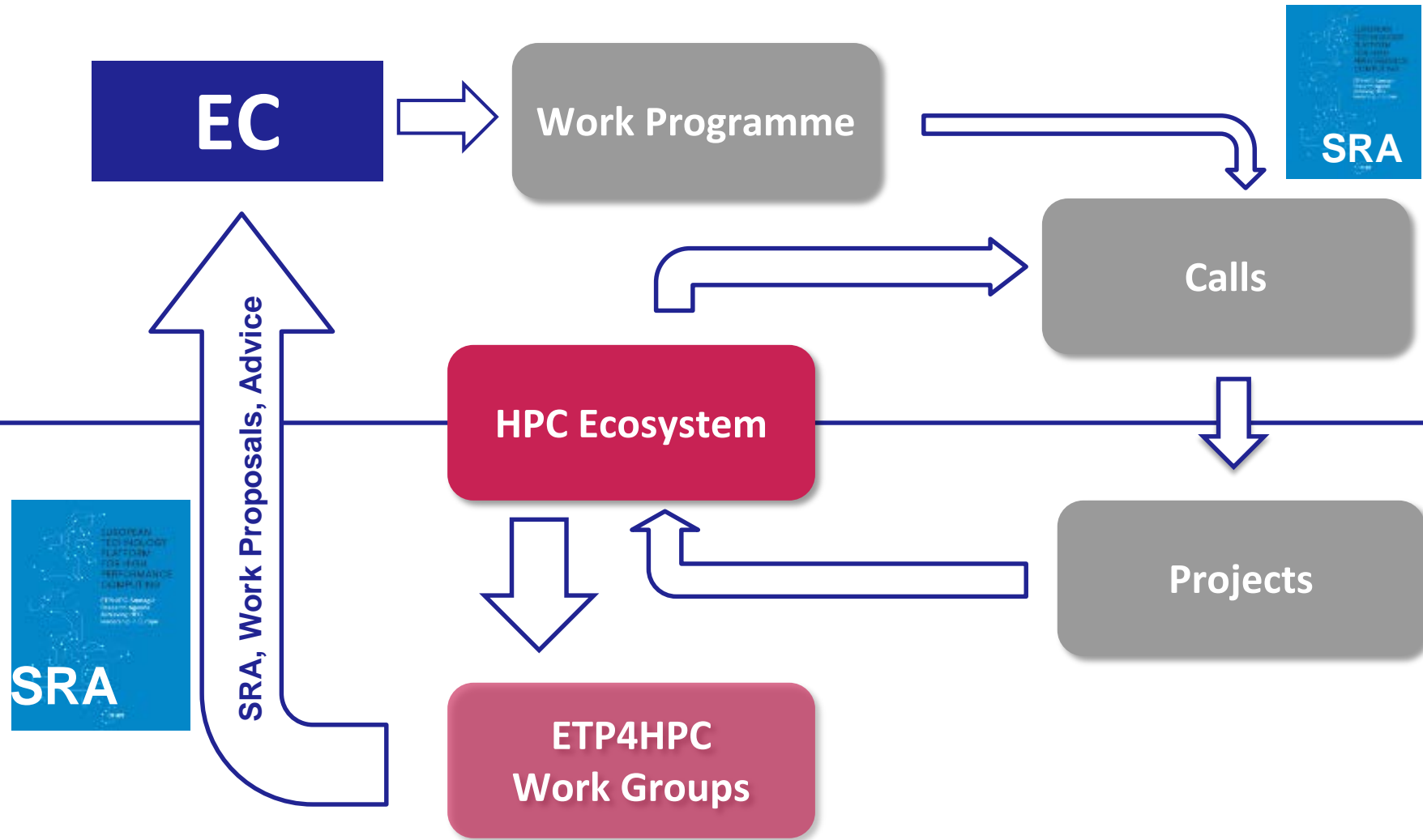
2019…

# 2013-2014 : mise en place du cPPP

- contractual Public Private Partnership co-signed EC+ETP4HPC
  - Develop the next generation of HPC technologies, applications and systems towards exascale
  - Achieve excellence in HPC applications delivery and use

- 700 M€ EC funding under H2020

- Structured dialogue ETP4HPC ⇔ EC +CoEs joining in in 2015
  - R&D orientations
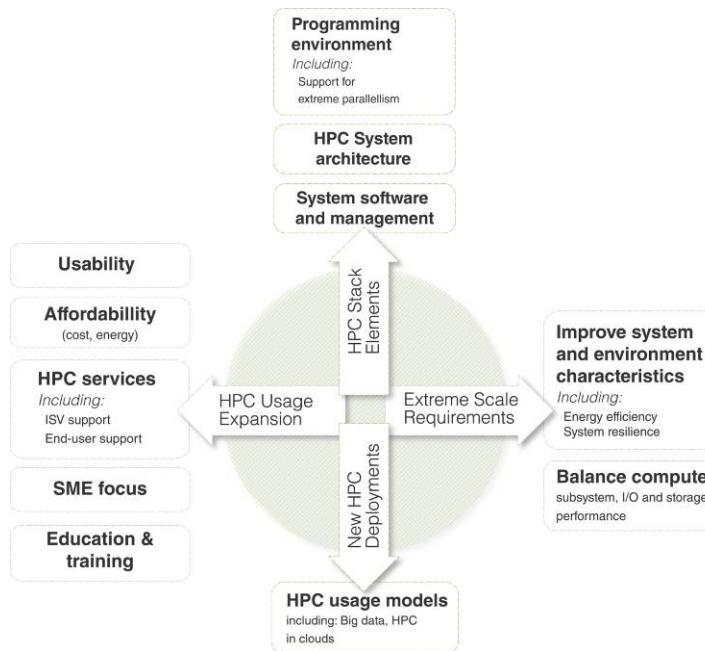  - Monitoring & impact assessment

- Entry in force Jan. 2014

CONTRACTUAL ARRANGEMENT

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

BETWEEN

THE ASSOCIATION ETP4HPC

AND

THE EUROPEAN UNION

ETP4HPC, the registered offices of which are in the municipality of Amsterdam, The Netherlands, hereinafter referred to as "the Private Side", and the European Union, represented by the Commission, (jointly hereinafter referred to as "the Parties"),

# Le rôle du Strategic Research Agenda ETP4HPC

**EC**

**Work Programme**

**SRA**

**Calls**

**SRA, Work Proposals, Advice**

**HPC Ecosystem**

**Projects**

**SRA**

**ETP4HPC Work Groups**

# 2014-2015: premiers appels à projets dans le champ du cPPP

- Thèmes du SRA => bien pris en compte

- Les appels FETHPC (briques h/w s/w pour solutions de supercalcul)

- Puis appels à projets CoE dans 'EINFRA' (applications)



**Programming environment**
Including:
Support for extreme parallellism

**HPC System architecture**

**System software and management**

Usability

Affordabillity (cost, energy)

HPC services
Including:
ISV support
End-user support

SME focus

Education & training

HPC Stack Elements

HPC Usage Expansion

Extreme Scale Requirements

New HPC Deployments

Improve system and environment characteristics
Including:
Energy efficiency
System resilience

Balance compute
subsystem, I/O and storage performance

HPC usage models
including: Big data, HPC in clouds

FETHPC1 had 4 subtopics and FETHPC2 had 2 subtopics:

HPC core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications (RIAs ) with four subtopics:
a) **HPC core technologies and architectures**, addressing one or more of the HPC core technologies (processors, memory, interconnect and storage) and their optimal integration into extreme scale HPC systems, platforms and prototypes
b) **Programming methodologies, environments, languages and tools**
c) **APIs and system software for future extreme scale systems**
d) **New mathematical and algorithmic approaches** for existing or emerging applications on extreme scale system
HPC Ecosystem Development (CSAs ) with two subtopics:
a) **Coordination of the HPC strategy**
b) **Excellence in High Performance Computing Systems**

The FETHPC call closed November 25th, 2014. Eighty-one (81) eligible proposals were submitted

FETHPC-1-2014 (RIAs): 79 proposals
FETHPC-2-2014 (CSAs): 2 proposals

2010 PRACE

2012
Déclaration N. Kroes - création ETP4HPC

2014 cPPP HPC
Appels à projets FETHPC, CoE

2015 Début effectif des projets FETHPC+CoE, EXDCI

2016 Déclarations Oettinger/Juncker
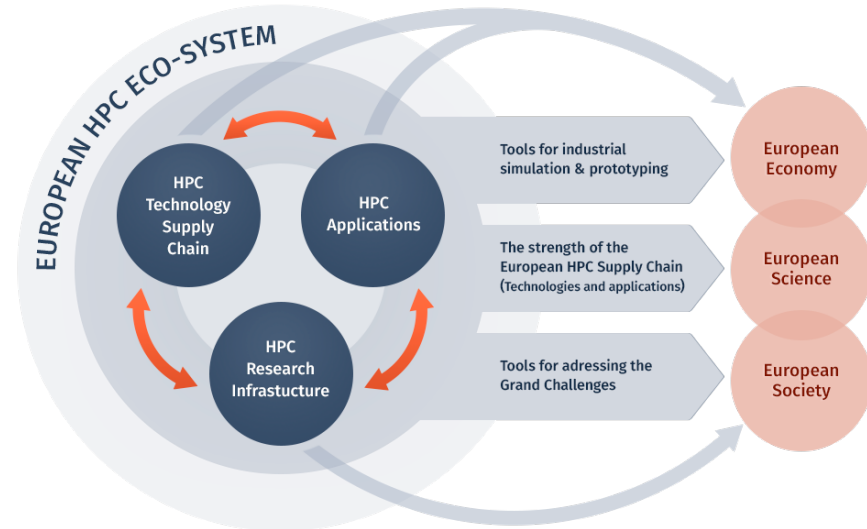DSM, DEI, EDI, EOSC…
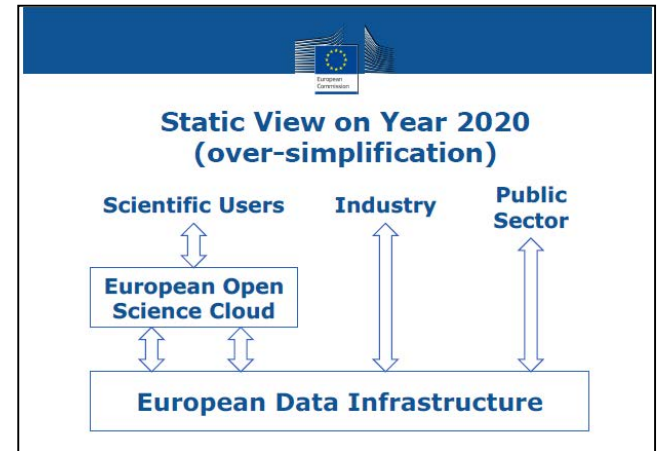
2017 Déclaration EuroHPC
EPI

2018 Préparation EuroHPC

2019…

# Premiers projets HPC H2020

- 19 FETHPC
  Mix de briques h/w et s/w
  - 2 CSA (dont EXDCI= écosystème)
  - ~ 97 M€
  - Démarrage Q3 2015
- 8+1 Centres d'Excellence
  - 42 M€
  - Démarrage fin 2015 également
- Finalement une majorité de logiciel
  - même dans FETHPC …
    (pile logicielle)

2010 PRACE

2012
Déclaration N. Kroes - création ETP4HPC

2014 cPPP HPC
Appels à projets FETHPC, CoE

2015 Début effectif des projets FETHPC+CoE, EXDCI

2016 Déclarations Oettinger/Juncker
DSM, DEI, EDI, EOSC…

2017 Déclaration EuroHPC
EPI

2018 Préparation EuroHPC

2019…

# 2016: nouvelles déclarations EC

- Digital Single Market
  - Digitising European Industry
- European Data Infrastructure
  - EOSC
- …
- Conforte vision globale du HPC,
  en renforçant la vision industrielle (supply/use)
  - HPC = une 'technologie' fondamentale
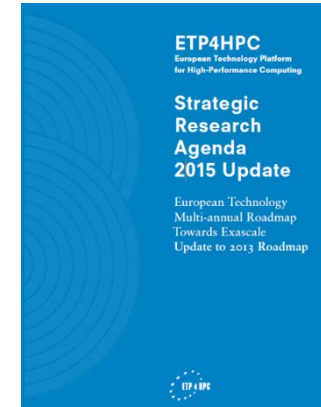
NB: déclarations fin 2015
Communications avril 2016



**Static View on Year 2020 (over-simplification)**

Scientific Users — Industry — Public Sector

European Open Science Cloud

European Data Infrastructure

*Our ambition is that by 2020, Europe ranks in the top 3 HPC powers worldwide*

**European Commission President**

**04/2016: European Cloud Initiative** COM(2016) 178

*A world-class HPC, data & network infrastructure and a leading HPC and Big Data ecosystem*

**05/2017: Mid-Term Review of the Digital Single Market Strategy** COM(2017) 228

*by end-2017, propose a legal instrument providing a procurement framework for an exascale supercomputing & data infrastructure*

# Work Programme 2016-2017 (la vie continue)

| Topic | Type of actions | Funding | Opening Date Closing Date |
|---|---|---|---|
| FETHPC-01-2016: Co-design of HPC systems and applications[13] <br> *The Commission considers that proposals requesting a contribution between EUR 10 and 20 million would allow this specific challenge to be addressed appropriately.* | RIA | €41 M | 14 April 2016 <br> 26 September 2016 |
| FETHPC-02-2017: Transition to Exascale Computing[14] <br> *The Commission considers that proposals requesting a contribution from the EU between EUR 2 and 4 million would allow this specific challenge to be addressed appropriately.* | RIA | €40 M | 12 April 2017 <br> 26 September 2017 |
| FETHPC-03-2017: Exascale HPC ecosystem development[15] <br> *The Commission considers that proposals requesting a contribution between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.* | CSA | €4 M | 12 April 2017 <br> 26 September 2017 |

ETP4HPC
European Technology Platform
for High-Performance Computing

**Strategic Research Agenda 2015 Update**

European Technology
Multi-annual Roadmap
Towards Exascale
Update to 2013 Roadmap

ETP4HPC

| Work Programme | Call | Projects | Selection date | Start date | Funding M€ |
|---|---|---|---|---|---|
| 2014-2015 | FETHPC-1 | 19 | Q1 2015 | Q3 2015 | 94 |
|  | FETHPC-2 | 2 EXDCI, Eurolab4HPC | Q1 2015 | Q3 2015 | 4 |
|  | EINFRA | 9 CoEs | Q1 2015 | Q3 2015 | 42 |
| 2016-2017 | FETHPC-01-2016 | 2 | Q1 2015 | Q3 2017? | 35 |
|  | FETHPC-02-2017 | 11 | Q1 2018 |  | 40 |
|  | FETHPC-03-2017 | 2 CSA | Q1 2018 |  | 4 |
| 2018-2020 | … |  |  |  |  |

# Statistiques : projets reliés au cPPP HPC

| | |
|---|---|
| **# of H2020 calls implemented related to HPC** | **6** |
| **Avg. time-to-grant** | 7 months |
| **Total H2020 funding committed** | €229.6 million |
| **# of running projects** | 33 |
| **# of projects to start in 2018** | 11 (RIA) + 2 (CSA) |
| **Projects coordinated by ETP members** | 20 |
| **Participating organisations** | 436 |
| **Unique participations** | 222 |
| **non-ETP members participations** | 62% |
| **Industry (non-SME) participations** | 12.9% |
| **SME participations** | 11.2% |

# => Le portefeuille de projets augmente

- Projets 2015-2017



http://www.etp4hpc.eu/en/european-hpc-handbook.html
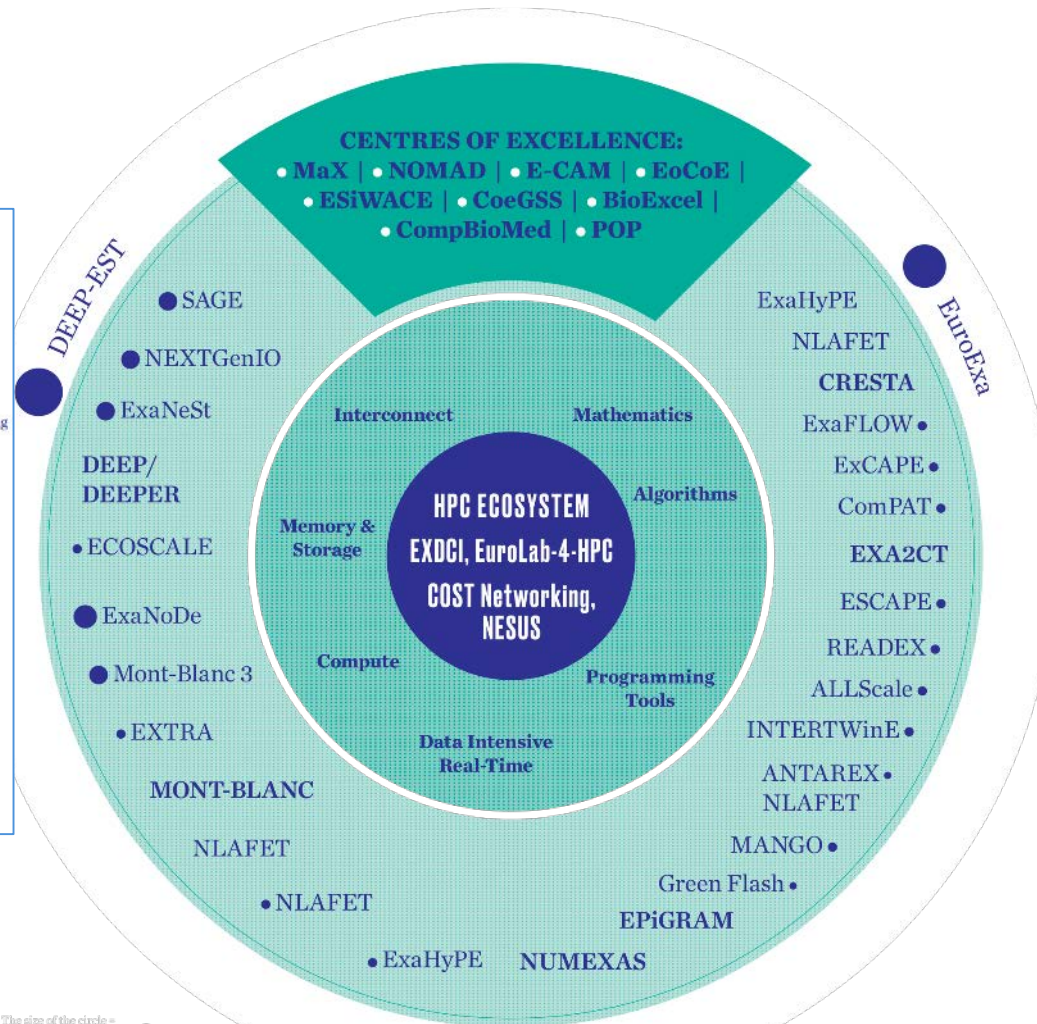
# MONT-BLANC 3 PROTOTYPE: DIBONA



As part of the Phase 3 of Mont-Blanc, a new prototype is built by Atos. It is named Dibona, after the Dibona peak in the French Alps, and it started operation in Fall 2017. It is based on 64 bit ThunderX2 processors from Cavium®, relying on the ARM® v8 instruction set.

The prototype leverages the BullSequana X1000 infrastructure, including Direct Liquid Cooling – cooling with warm water. Three compute nodes will be integrated side by side in each BullSequana X1000 blade.

The full configuration will ultimately include 48 computes nodes, ie. 96 Cavium® ThunderX2 CPUs, or 3000 cores.

Atos announced at ISC 2017 that the blade model developped for the Mont-Blanc prototype would be productized commercialized by Atos as part of its BullSequana X1000 range.

## DEEP Aurora Booster

- 1 rack with 24 (half) backplanes in 12 chassis
- 24 x Booster Interface Cards (BIC)
- 16 x 2 booster nodes (BNs) per chassis (384 total)
- Processor: Intel Xeon Phi 7120X
- Main memory: 6.1 TB (aggregate)
- Overall peak performance: 500 Teraflops
- Network:
  - Gigabit-Ethernet
  - 3D EXTOLL torus
- Power consumption: max. 150 kW
- Operating system: Linux
- Vendor: Eurotech

**Performance Optimisation and Productivity**

A Centre of Excellence in Computing Applications

The symbols inside the logo, along the path, represent the three basic services provided by POP:
- Performance audit: What are the performance problem(s) of the application (?)
- Performance plan: These are the root-causes of the issues found and approaches to address them (!)
- Proof-of-Concept: Experiments and projections to show the effect of the proposed optimizations ⇒ problem solved (✔)

EoCoE **Energy Oriented Centre of Excellence**



**Heterojunction Solar cell**

Quantum Molecular Dynamics simulation of an interface between crystalline silicon (c-Si) and hydrogenated amorphous silicon (a-Si:H) at room temperature. The simulation reveals how electronic and optical properties are linked to the atomic-scale chemistry at the interface. This is the first step of a multiscale approach to design silicon based heterojunction solar cells.
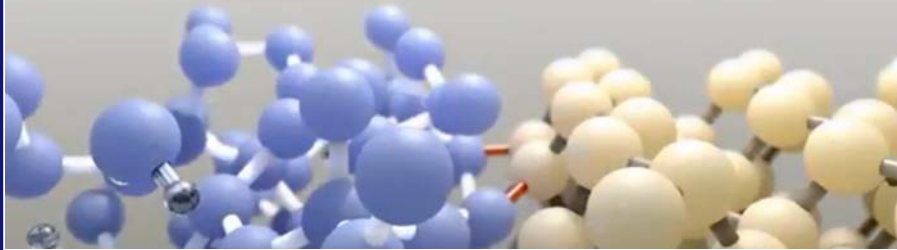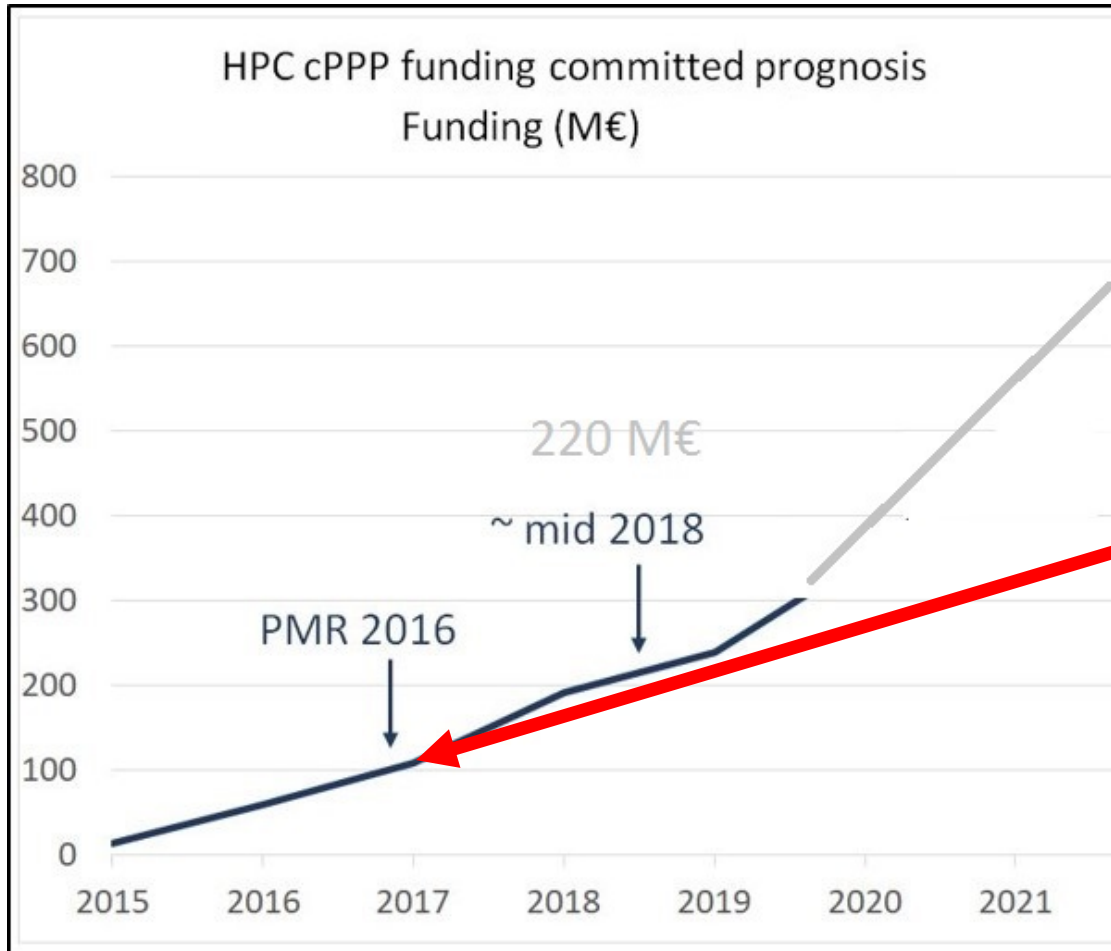
ESiWACE stands for **Centre of Excellence in Simulation of Weather and Climate in Europe**
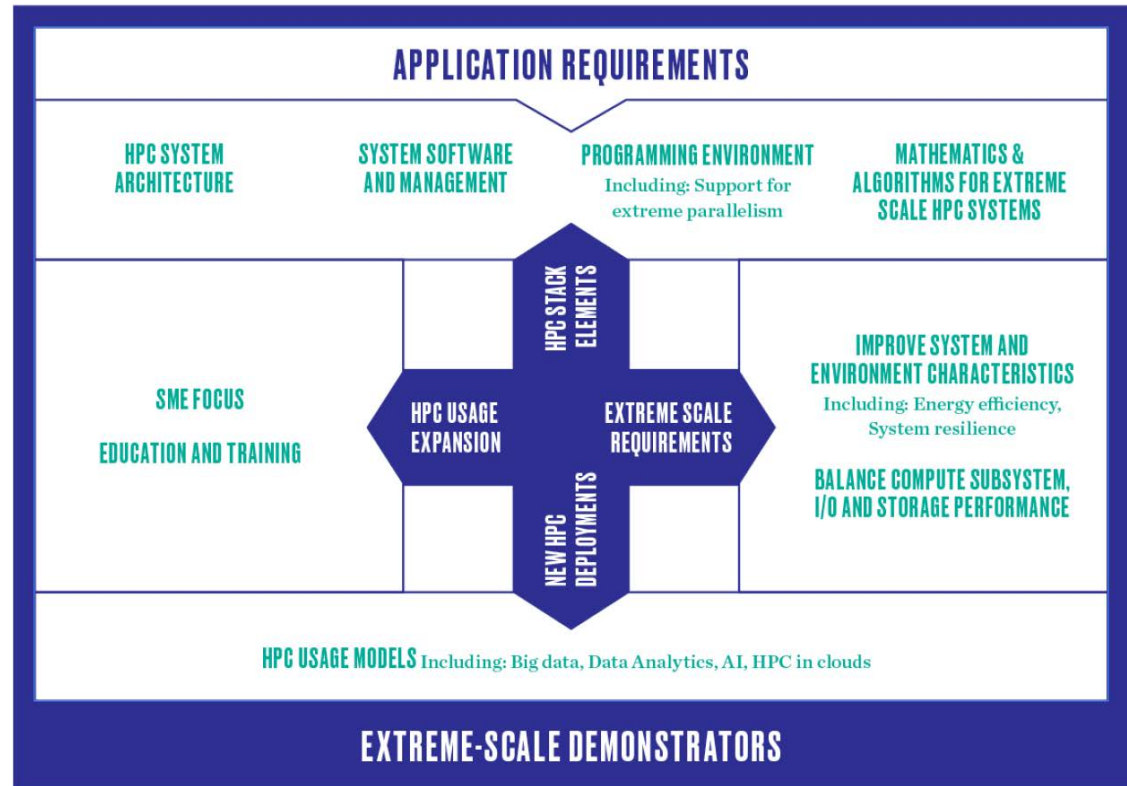
**Global 2.5km Simulations**
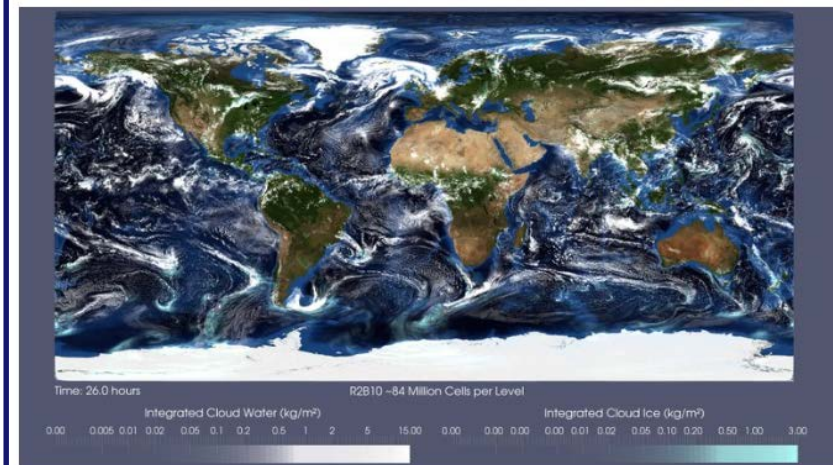
# 2017: cPPP – revue à mi-parcours



Forum TERATEC 2018        19 Juin 2018

# 2017: SRA3
# → Work Programme HPC 2018-2020

2010 PRACE

2012
Déclaration N. Kroes - création ETP4HPC

2014 cPPP HPC
Appels à projets FETHPC, CoE

2015 Début effectif des projets FETHPC+CoE, EXDCI

2016 Déclarations Oettinger/Juncker
DSM, DEI, EDI, EOSC…

2017 Déclaration EuroHPC
EPI

2018 Préparation EuroHPC

2019…

# 2017: déclaration EuroHPC

- Mars 2017 – Rome
- 7 pays signataires initiaux dont la France

## EU ministers commit to digitising Europe with high-performance computing power

Published on 23/03/2017

Ministers from seven European countries (France, Germany, Italy, Luxembourg, Netherlands, Portugal and Spain) have signed in Rome a declaration to support the next generation of computing and data infrastructures, a European project of the size of Airbus in the 1990s and of Galileo in the 2000s.

They plan to establish EuroHPC for acquiring and deploying an integrated world-class high-performance computing infrastructure capable of at least 10 to the 18th power calculations

Share

per second (so-called exascale computers). This will be available across the EU for scientific communities, industry and the public sector, no matter where the users are located.

Andrus Ansip, European Commission Vice-President for the Digital Single Market welcomed this important step: *"High-performance computing is moving towards its next frontier - more than 100 times faster than the fastest machines currently available in Europe. But not all EU countries have the capacity to build and maintain such infrastructure, or to develop such technologies on their own. If we stay dependent on others for this critical resource, then we risk getting technologically 'locked', delayed or deprived of strategic know-how. Europe needs integrated world-class capability in supercomputing to be ahead in the global race. Today's declaration is a great step forward. I encourage even more EU countries to engage in this ambitious endeavour".* See full speech by Vice-President Ansip at the Digital Day in Rome.

High-performance computing (HPC) involves thousands of processors working in parallel to analyse billions of pieces of data in real time. HPC allows to design and new drugs and simulate their effects, and provide faster diagnosis, better treatments and personalised health care. It can make our communications and online financial transactions more secure and can help clean-energy production, by making for example, wind farm operations based on accurate weather forecasts.

At the moment, EU industry provides about 5% of HPC resources worldwide, but consumes one third of them. In April 2016 in the European Cloud Initiative – part of the EU's strategy to digitise European industry – the Commission urged Member States to step up cooperation in HPC to boost Europe's scientific capabilities and industrial competitiveness. It also committed to develop a high-performance computing ecosystem based on European technology, including low power chips. The goal is to have exascale supercomputers based on European technology in the global top 3 by 2022.

World-class infrastructure will also support the European Open Science Cloud, which will offer Europe's 1.7 million researchers and 70 million science and technology professionals a virtual environment to store, share and re-use their data across disciplines and borders. Focusing initially on the scientific community, the user base of the cloud will over time be enlarged to the public and to businesses.

The EU Member States which signed the EuroHPC declaration agree to work towards the establishment of a multi-government cooperation framework for acquiring and deploying an integrated supercomputing infrastructure of the next generation. Other Member States are encouraged to join in the future to work together and with the European Commission in this initiative.

# Digital Day, 23 March
# (Rome Treaty 60th Anniversary)

Thierry Mandon
Ministre de la Recherche



Digital Day: Europe as a global player

Thierry Breton
CEO, ATOS



60 ROME DIGITAL DAY
Declaration of European cooperation on HPC
Signing ceremony



DECLARATION

Cooperation framework on High Performance Computing

Bundesrepublik Deutschland

and

República Portuguesa

and

République française

and

Reino de España

and

Repubblica Italiana

and

Grand-Duché de Luxembourg

and

Koninkrijk der Nederlanden

The signing Member States agree to work together towards making available across the EU an integrated world-class high performance computing (HPC) infrastructure, which in combination with European data and network infrastructures would upraise Europe's scientific capabilities and industrial competitiveness.

https://ec.europa.eu/digital-single-market/en/news/eu-ministers-commit-digitising-europe-high-performance-computing-power

# 2017: European Processor Initiative

- « FPA » = consortium pré sélectionné sur appel ICT ad hoc en 2017
- En attente: validation de programme technique (première tranche de 80M€ démarrant en 2018)

  - 23 partenaires
  - 10 pays
  - "Multidisciplinary"
  - "Cross-market"
  - "Industry + academia"

BMWGroup   Bull atos technologies   BSC Barcelona Supercomputing Center   cea   CHALMERS   CINECA   E4 COMPUTER ENGINEERING

ETHzürich   Elektrobit   EXTOLL latency matters.   Fraunhofer   FER

FORTH INSTITUTE OF COMPUTER SCIENCE   GENCI   Infineon   JÜLICH FORSCHUNGSZENTRUM   KALRAY

semidynamicS   ST   SURF SARA   TÉCNICO LISBOA   UNIVERSITÀ DI PISA

- *Develop low-power processor technology to be included in a European pre-exascale system (capable of around $10^{16}$ calculations per second) and in European exascale systems (a billion billion or $10^{18}$ calculations per second),*
- *Guarantee that a significant part of that technology is European,*
- *Ensure that the application areas of the technology are not limited only to HPC, but cover other areas such as the automotive sector or the data centres, thus ensuring the overall economic viability of the initiative. One specific objective for the automotive sector is for instance to develop customized processors able to meet the performance needed for autonomous cars."*

2010 PRACE

2012
Déclaration N. Kroes - création ETP4HPC

2014 cPPP HPC
Appels à projets FETHPC, CoE

2015 Début effectif des projets FETHPC+CoE, EXDCI

2016 Déclarations Oettinger/Juncker
DSM, DEI, EDI, EOSC…

2017 Déclaration EuroHPC
EPI

2018 Préparation EuroHPC

2019…

# 2018: en route vers EuroHPC..

- Vision actuelle: 2 piliers Infra/Ops + R&I/Skills
- Co-entreprise à partir de janvier 2019 (ramp up…)
- Intense activité de préparation, des statuts, des futures activités (groupes de travail « procurement », « user needs » etc.)
- Remodelage en vue des appels R&D 2018-2020, sous égide EuroHPC

**Infrastructure & Operations**
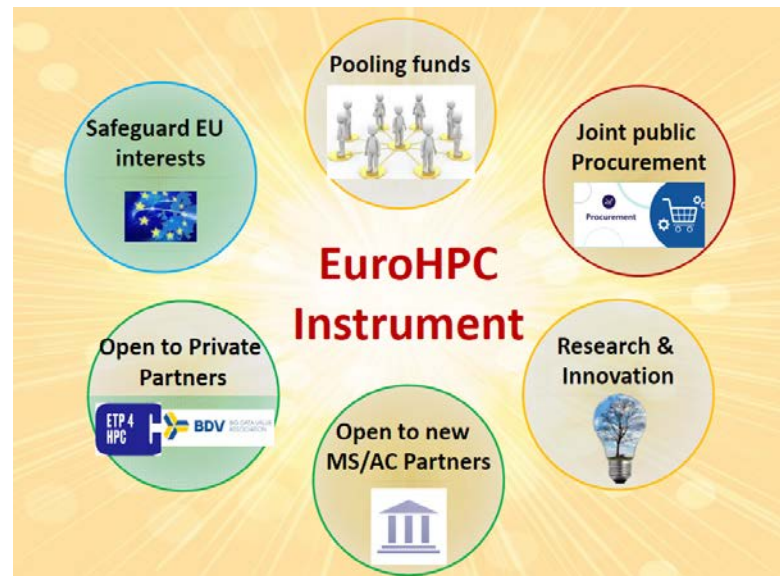
**R&I, Applications & Skills**

**HPC Ecosystem**

- **Infrastructure + Operations**

  *Procurement of 2 pre-exascale machines and several (tbd) mid-range machines*

- **Applications & Skills + R&I**

  **R&I,** exascale technologies and systems (incl. low-power processor); applications
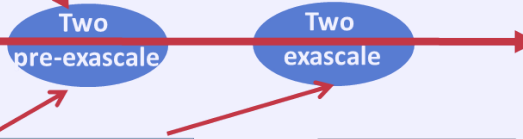
# EuroHPC



2015    2016    2017    2018    2019    2020    2021    2022    2023    2024    2025

**FET & LEIT Calls: technology development, integration, pilot test-beds and applications**

➔ Technology development (low-power processor, SW, applications)

➔ Integrating and co-designing extreme scale systems

## HPC – Cloud – BDA Ecosystem development

Two pre-exascale

Two exascale

**EuroHPC**

**Infrastructure/CEF calls**

➔ Centres of Excellence, Ecosystem development
➔ Procurement and services for EDI/HPC infrastructures
(exascale, big data nodes, interconnection) and use widening

32

2010 PRACE

2012
Déclaration N. Kroes - création ETP4HPC

2014 cPPP HPC
Appels à projets FETHPC, CoE

2015 Début effectif des projets FETHPC+CoE, EXDCI

2016 Déclarations Oettinger/Juncker
DSM, DEI, EDI, EOSC…

2017 Déclaration EuroHPC
EPI

2018 Préparation EuroHPC

2019…

# Première annonce Digital Europe – vers le FP9 etc.
## …la valse des milliards



**European Commission - Press release**

**EU budget: Commission proposes €9.2 billion investment in first ever digital programme**

Brussels, 6 June 2018

**The European Commission is today proposing to create the first ever Digital Europe programme and invest €9.2 billion to align the next long-term EU budget 2021-2027 with increasing digital challenges.**

With the Digital Single Market strategy we have established a regulatory framework that is fit for the digital age. This needs to be matched with equally ambitious funding and investments in the Digital Europe programme for increasing EU's international competitiveness as well as developing and reinforcing Europe's strategic digital capacities. These key capacities concern high-performance computing, artificial intelligence, cybersecurity and advanced digital skills and ensuring their wide use and accessibility across the economy and society by businesses and the public sector alike.

Andrus **Ansip**, Vice-President for the Digital Single Market, said: *"The Digital Single Market provides the legal framework to ensure people and companies fully benefit from the digital transformation. Our aim has been to make the EU budget fit for future challenges: digital transformation is taken into account across all proposals, from transport, energy and agriculture to healthcare and culture. To reinforce this, today we are proposing more investment in artificial intelligence, supercomputing, cybersecurity, skills and eGovernment – all identified by EU leaders as the key areas for the future competitiveness of the EU."*

Mariya **Gabriel**, Commissioner for the Digital Economy and Society, said: *"Having the first pan-European digital programme is a major step for strengthening Europe's world leadership in the digital transformation. We will invest in key strategic digital capacities, such as artificial intelligence, high performance computing and cybersecurity, and, as is the case with all our digital initiatives, European citizens will stay at the heart of this programme. One of the main pillars of the programme is investment in our citizens to acquire the advanced digital skills they need for accessing and using the latest digital technologies."*

The Commission's proposal focusses on five areas:

1. **Supercomputers:** €2.7 billion will fund projects to build-up and strengthen supercomputing and data processing in Europe, which is crucial for the development of many areas – from health care and renewable energy to car safety and cybersecurity. The funding will ensure a more effective and wider use of supercomputing in both the public and private sectors, including small and medium-sized enterprises. Digital Europe will aim to deploy a world-class supercomputer and data infrastructure with exascale capabilities (a billion billion or 1018 calculations per second) by 2022/2023, and post exascale facilities by 2026/2027, endowing the EU with its own independent and competitive technology supply, achieving excellence in applications and widening supercomputing availability and use. The planned initiatives will build on the European strategy on supercomputers that will help the EU advance in many areas from health care and renewable energy to car safety and cybersecurity.

2. **Artificial intelligence (AI):** €2.5 billion is planned to help spread AI across the European economy and society. This budget builds on the European approach on AI presented on 25 April 2018: the aim is to boost investments to make the most out AI, while taking into account the socio-economic changes brought about by AI and to ensure an appropriate ethical and legal framework. The Digital Europe programme will give better access for public authorities and businesses, especially smallest ones, to AI testing and experimentation facilities in Member States, while increased investments in research and innovation under Horizon Europe will ensure that the EU stays at the forefront of scientific and technological developments in AI. The Commission proposes to develop common 'European libraries' of algorithms that would be accessible to all, to help the public and private sectors to identify and acquire whichever solution would work best for their needs. Open platforms and access to industrial data spaces for artificial intelligence will be made available across the EU in Digital Innovation Hubs, providing testing facilities and knowledge to small businesses and local innovators.

3. **Cybersecurity and trust:** €2 billion will be invested into safeguarding the EU's   digital

**EU budget: Commission proposes €9.2 billion investment in first ever digital programme**
Brussels, 6 June 2018

**The European Commission is today proposing to create the first ever Digital Europe programme and invest €9.2 billion to align the next long-term EU budget 2021-2027 with increasing digital challenges.**
With the Digital Single Market strategy we have established a regulatory framework that is fit for the digital age. This needs to be matched with equally ambitious funding and investments in the Digital Europe programme for increasing EU's international competitiveness as well as developing and reinforcing Europe's strategic digital capacities. These key capacities concern high-performance computing, artificial intelligence, cybersecurity and advanced digital skills and ensuring their wide use and accessibility across the economy and society by businesses and the public sector alike.
…/…
The Commission's proposal focusses on five areas:

**Supercomputers**: €2.7 billion will fund projects to build-up and strengthen supercomputing and data processing in Europe, which is crucial for the development of many areas – from health care and renewable energy to car safety and cybersecurity. The funding will ensure a more effective and wider use of supercomputing in both the public and private sectors, including small and medium-sized enterprises. Digital Europe will aim to deploy a world-class supercomputer and data infrastructure with exascale capabilities (a billion billion or 1018 calculations per second) by 2022/2023, and post exascale facilities by 2026/2027, endowing the EU with its own independent and competitive technology supply, achieving excellence in applications and widening supercomputing availability and use. The planned initiatives will build on the European strategy on supercomputers that will help the EU advance in many areas from health care and renewable energy to car safety and cybersecurity.

**Artificial intelligence (AI)**: €2.5 billion is planned to help spread AI across the European economy and society. This budget builds on the European approach on AI presented on 25 April 2018…/…

**Cybersecurity and trust:** €2 billion will be invested into safeguarding the EU's digitaleconomy…/…

**Digital skills:** €700 million will ensure that the current and future workforce will have the opportunity to easily acquire advanced digital skills …/…

**Ensuring a wide use of digital technologies across the economy and society:** €1.3 billion will ensure the digital transformation of public administration and public services …/…
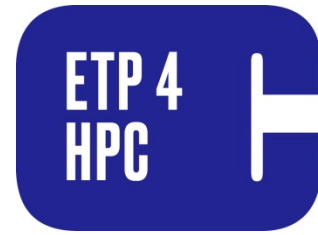
**…/…**
**For More Information**
Legal proposal and factsheet
Press release: Connecting Europe Facility
EU budget for the future

Merci de votre attention!