



# The High Performance Computing strategy and the European Cloud Initiative

**HPC User Forum  
September 5-7, 2017  
Milwaukee, USA**

Leonardo Flores Añover  
Senior Expert - HPC and Quantum technologies  
DG CONNECT  
European Commission

# What is Europe doing in HPC?

***"You Europeans, you talk a lot  
but do little!"***

*A prominent American attendee....  
BDEC March 2017 (China)*

# European HPC strategy

One year ago....

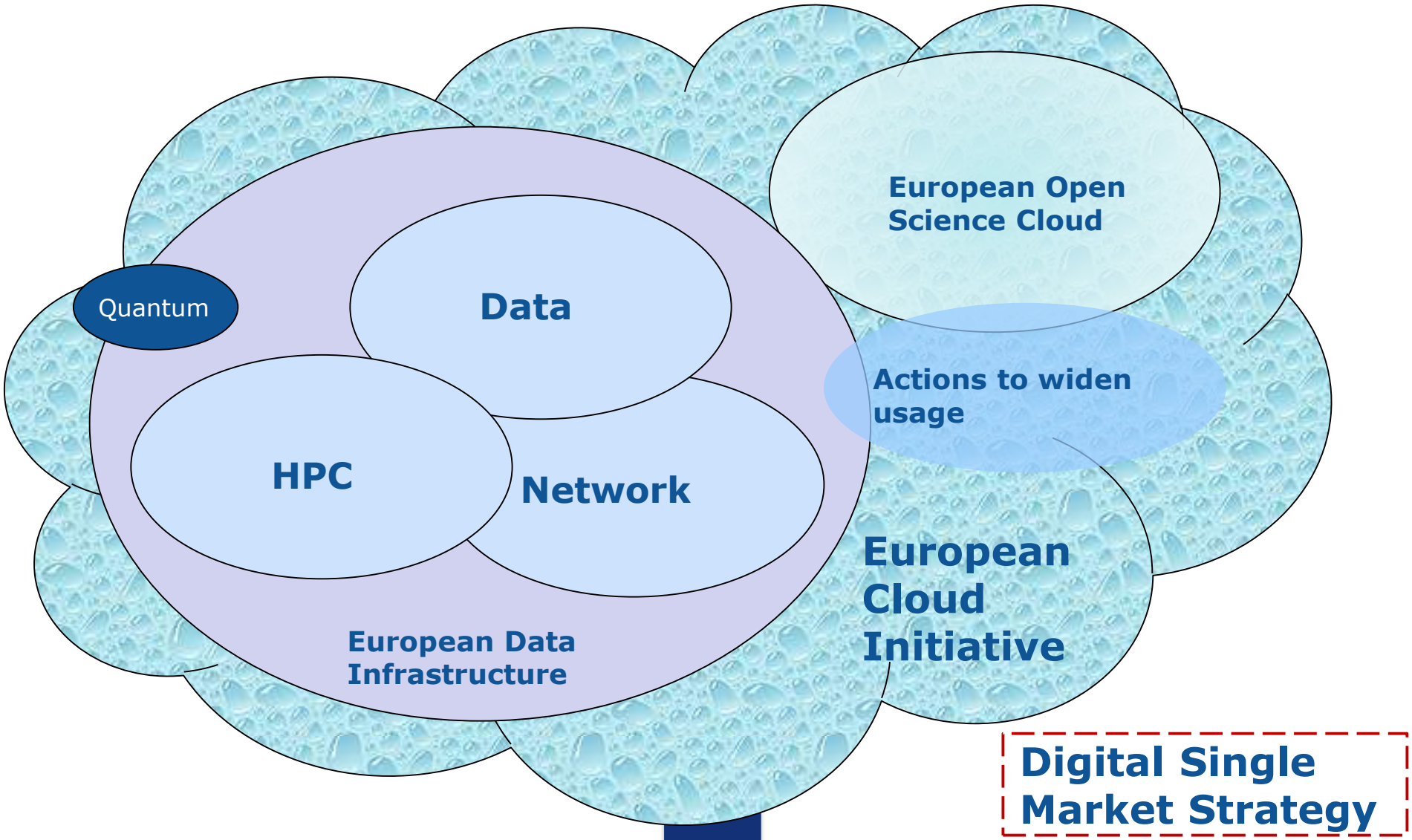
# HPC - High on the European agenda



## European Commission President Jean-Claude Juncker

*"Our ambition is for Europe to become  
one of the top 3 world leaders in  
high-performance computing by 2020"*

Paris, 27 October 2015



# What happened since last year...

## Political

# HPC - High on the European agenda



*Ministers from nine Member States (Belgium, France, Germany, Italy, Luxembourg, Netherlands, Portugal, Slovenia and Spain) signed a declaration to support in cooperation with the Commission **the next generation of computing and data infrastructures, -EUROHPC***

Digital Day Rome, 23 March 2017

*I encourage even more EU countries to engage in this ambitious endeavour*

*The European Commission has the intention to propose, by end of 2017, a legal instrument that provides a procurement framework for an integrated pan European exascale supercomputing and data infrastructure.*

Digital Single Market Review, 10 May 2017



**Vice-President  
Andrus Ansip**

# **Overall goal of the European HPC strategy**

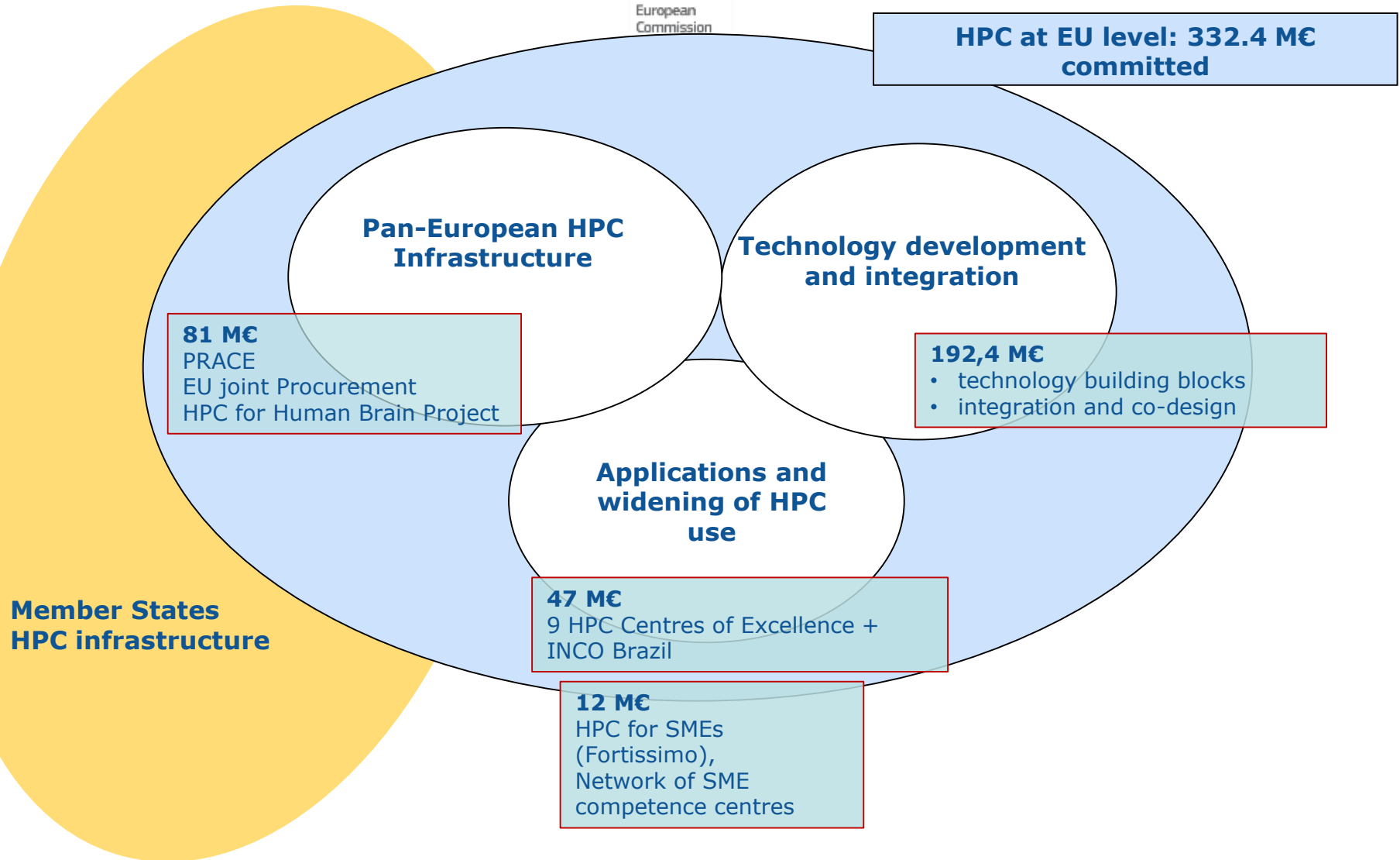


# The European HPC strategy



*The overall strategic goal is to develop a thriving European HPC ecosystem in terms of hardware, software, applications, skills, services and interconnections :*

- 1. Capacity of acquiring leadership-class computers**
  - making available HPC infrastructure and services to a wide range of scientific, industrial and public sector users
- 2. Securing our own independent HPC system supply,**
  - i.e. by developing new European technology such as low power HPC chip
- 3. Excellence in HPC applications, and widen the HPC use**
  - developing, preparing and optimising the HPC codes and applications for future exascale systems, and actions for increasing the innovation potential of industry and SMEs



## Highlights of recent developments...

- PRACE-2 agreement
- Workprogrammes support to the European HPC strategy 2018-2020
- EuroHPC

# PRACE-2



- PRACE: a persistent, federated European world-class HPC infrastructure and service for scientists and researchers from academia and industry
- More than 14 billion core hours awarded since 2010
- PRACE 2 phase signed until 2020 :
  - Provisioning of a world-class Tier-0 HPC infrastructure that is architecturally diverse
  - An excellence-based Peer Review Process for resource allocation
  - High-Level Support Teams (HLST) providing support for code enabling/scaling, and R&D on code refactoring on the Tier-0 systems
  - dissemination, industry collaboration, training, and exploration of future supercomputing technologies

# PRACE Tier-0 Systems



CSCS, Switzerland - Cray XC50 System "Piz Daint" (~25 PF Rpeak)  
CINECA, Italy - Lenovo System "Marconi" (~20 PF)  
BSC, Spain - Lenovo System "MareNostrum 4" (~11 PF)  
HLRS, Germany - Cray XC40 System "Hazel Hen" (~7.4 PF)  
Juelich, Germany - IBM Blue Gene/Q system JUQUEEN (~5.9 PF)  
LRZ, Germany - IBM System X iDataPlex "SuperMUC" (~3.1 PF)  
GENCI - CEA, France - Bull Bullx cluster "Curie" (~1.7 PF)

**JUQUEEN:** Jülich, DE



**CURIE:**  
GENCI/CEA  
Bruyères-le-Châtel, FR



**Hazel Hen:** HLRS,  
Stuttgart, DE



**SuperMUC:** LRZ Garching,  
DE



**Piz Daint:** CSCS, Lugano,  
CH



**MareNostrum:**  
BSC, Barcelona, Spain



**FERMI:** CINECA,  
Bologna, IT





# **Workprogrammes support to the European HPC strategy 2018-2020**

# Resources for the HPC strategy



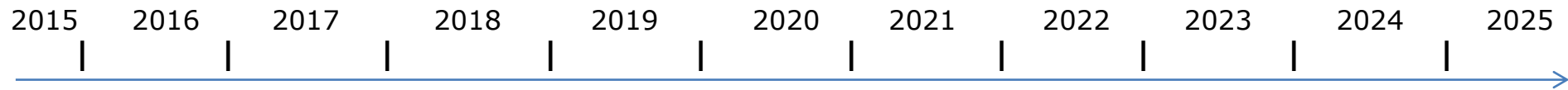
- Horizon 2020 activities in 2018-2020 supporting the full HPC ecosystem development covering:
  - Technology development (*including low-power HPC processor*)
  - Co-design and integration (*prototypes, Extreme Scale Demonstrators*)
  - Applications (*Centres of Excellence on HPC, large scale test-beds and pilot applications*)
  - HPC infrastructure development (*PRACE, Public Procurement for Innovation on HPC*)
  - Widening use of HPC (SMEs)
- Connecting Europe Facility (CEF) for a new generation of HPC and data-powered public services (2017-2020)



# HPC: The Logic of investments



2014-2020



**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

**Infrastructure/Services**

- Centres of Excellence in HPC applications
- Procurement of HPC infrastructures and services (exascale, big data nodes, interconnection) and widening of HPC use

# HPC in Horizon2020/CEF

## Work Programmes



**DRAFT – under discussion with the H2020/CEF Programme Committees**

### 2018-2020

**FET → Key components & concepts: preparing next generation & beyond**

**Future and Emerging Technologies (FET)**

extreme scale HPC compute & data technologies and co-designed prototypes

**170m€**

**LEIT → Microprocessor, integration, test-beds & demonstration**

**Leadership in Enabling and Industrial Technologies (LEIT)**

Low-power processor design and development **120m€**

Co-design of extreme scale demonstrators **80m€**

HPC Large scale test-beds **50m€**

**e-Infrastructures and Connecting Europe Facility (CEF)**

**CEF 2017 WP**

HPC-enabled services supporting decision-making for public authorities – **6 M€**

PRACE-2 , Centres of Excellence, widening use **106m€**

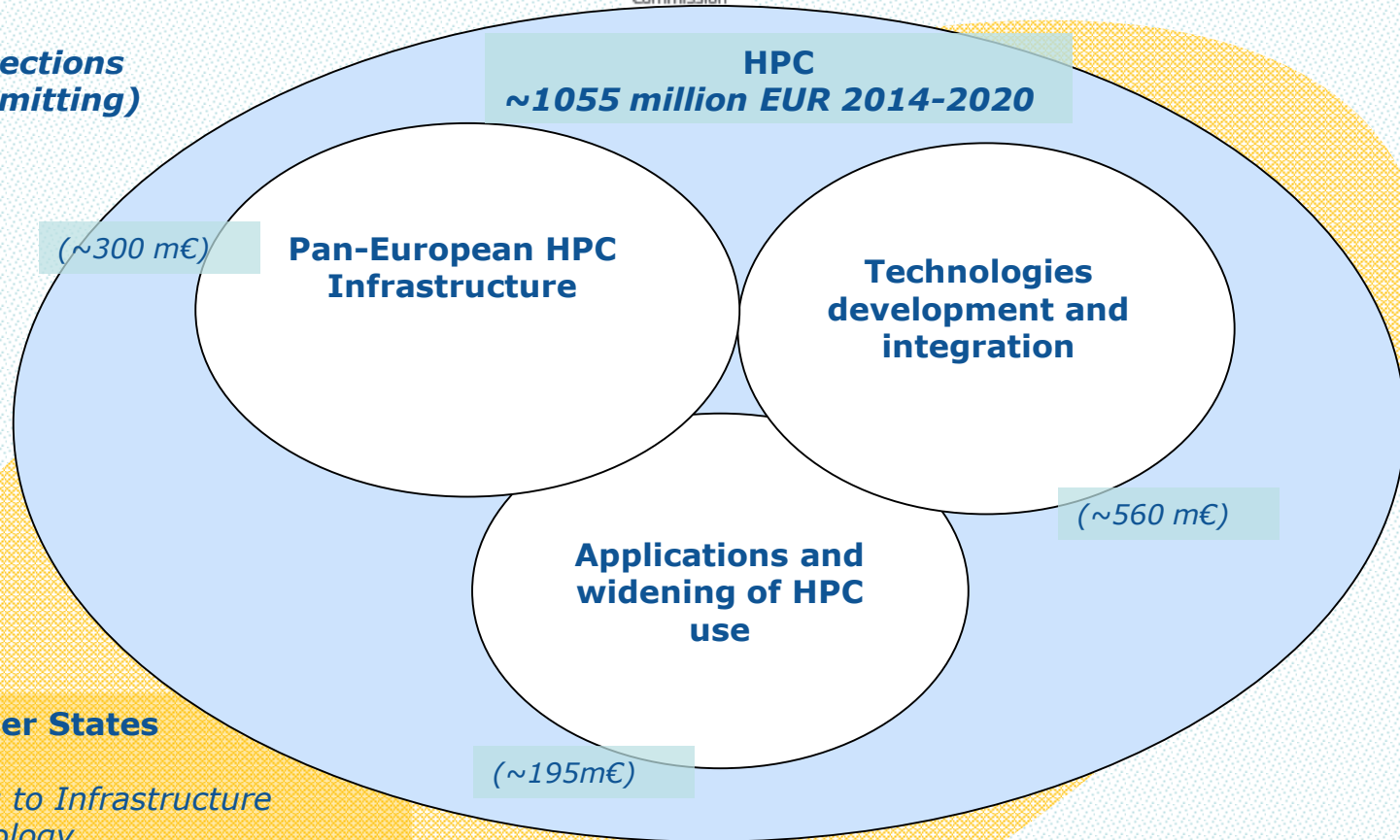
PPI Pre-exascale systems **80m€**

Data nodes, Interconnectivity

**CEF 2018 ~15m€?**      **CEF 2020 ~100m€?**



*Draft projections  
(non-committing)*



• **Member States**

- *Access to Infrastructure*
- *Technology*
- *Large Scale Test-beds*



European  
Commission

# EUROHPC

# EuroHPC – a new instrument



***EUROHPC*** → *A specific instrument for HPC put forward by the DSM Mid-Term Review to provide a **new legal framework to coordinate national and European efforts:***

- to build a HPC ecosystem (hardware, software, applications, skills, services and interconnections);
- to define an integrated European HPC research and innovation agenda
- to support the development and procurement of a world class HPC and data infrastructure and their interconnection

# HPC: The Logic of investments



2014-2020



**Technology development, integration, pilot test-beds and applications**

- Technology development (low-power processor, SW, applications)
- Integrating and co-designing extreme scale systems

*EuroHPC*

**HPC – Cloud – BDA  
Ecosystem development**

Two pre-exascale

Two exascale

**Infrastructure/Services**

- Centres of Excellence in HPC applications
- Procurement of HPC infrastructures and services (exascale, big data nodes, interconnection) and widening of HPC use

## **Where are we now, and next steps...**

- Adoption process of WP 2018-2020
- Financial perspectives post-2020
- Preparation of the EuroHPC legal instrument



- Adoption process of WP 2018-2020
  - Ongoing discussions with Member States
  - Expected approval of WP 2018-2020 in September
  
- Financial perspectives post-2020
  - Discussions on future budget for HPC will take place in the context of the next post-2020 Multiannual Financial Framework (MFF)  
(.... *Brexit*) ?





- Preparing EuroHPC: *roadmap for implementation (by end of 2017):*
  - Requirements and funding resources
  - Legal and financial instruments
  - Procurement process of two pre-exascale systems(2019-2020) and of two exascale systems (2022-2023)
  - Development of high-quality competitive European technology, its optimisation through co-design and its integration in at least one of the two exascale supercomputers
  - Test-beds for scientific, public administration and industrial applications



## High Performance Computing: a strategic area for the European Commission

- ***Clear roadmap*** and timeline implementing the political priorities
- ***Coordinated actions*** using all mechanisms of H2020 and CEF
- Covering the ***full HPC ecosystem***
- ***A new dedicated instrument*** to implement the EU HPC strategy
- Further ***strong cooperation with Member States***

# What is Europe doing in HPC?

***"You Europeans, you talk very little but do a lot"***



# Thank you for your attention!

<http://ec.europa.eu/horizon2020-hpc>