



The High Performance Computing strategy and the European Cloud Initiative

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HPC: Looking back with from the EC perspective....



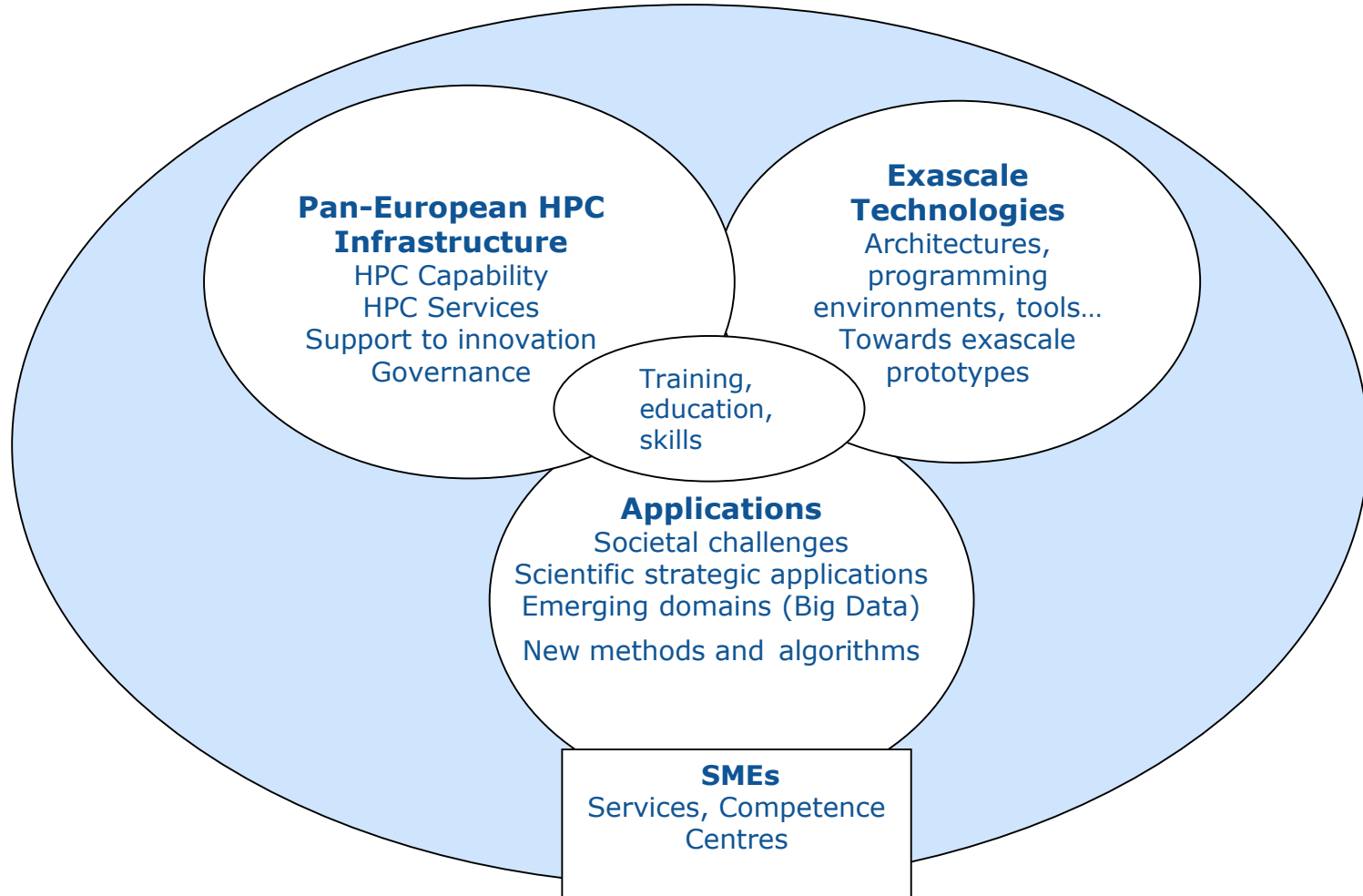
Framework Programmes (FP) for Research and Technological Development of the EU

- Multiannual funding programmes (FP) for research in the European Research Area
- **FP7** (2007-2013), ~50 b€ more focused on R&D
- **Horizon 2020** (2014-2020), ~80b€ focus on innovation and economic growth, coverage of the full innovation chain
- implemented through Calls for proposals in Workprogrammes (WP)

FP7: how to implement a EU HPC strategy?



HPC Strategy



Launching a new EU-level initiative (FP7)



- Idea (**Put Europe in the HPC global race**)

IDC Studies:

2010: "A strategic agenda for European Leadership in Supercomputing: HPC 2020"

2011: "Software infrastructure for Highly parallelised codes"

Exascale experts WG (2010, 2011)

- Consultation/Gathering factual support

EESI Vision/Roadmap (2011)

Planet HPC R&I strategy (2011)

- Political (EC+Member States)/stakeholders support

EC Communication: "HPC: Europe's place in a global race" (Feb. 2012)

Council Conclusions on HPC Communication (May 2013)

PRACE (2010)

European Technology Platform on HPC (ETP4HPC - 2012) Strategic Research Agenda on HPC (2013)

- Implementation (workprogrammes)

Two Calls towards exascale technology (WP 2011 and WP2013, ~50 m€)

- Preparation for the next Framework Programme

Action Plan to achieve the objectives of the HPC Communication

Landscape of HPC in 2013 (end of FP7)



Member States
(4 top 10 systems in 2012)

HPC Strategy

ETP4HPC

BDEC

Pan-European HPC Infrastructure

Exascale Technologies

PRACE:

- 400 m€ of Member States
- 67 m€ of EU funding

Training, education, skills

Applications

~50 m€ in

- Integrated Projects (Mont-Blanc, DEEP, CRESTA)
- Building block technology projects (inc. applications)
- Support Actions (EESI2)

~27 m€ in

- Fortissimo (HPC for SMEs)
- Cloud flow/SME projects

SMEs
Services, Competence Centres



Horizon 2020

a new impulse to the

European HPC strategy....



Member States

HPC
€317.4 million
committed so far in
H2020

**Pan-European HPC
Infrastructure**

Exascale technologies

PRACE (30 m€)
Public Procurement for
HPC (26 m€)

Flagship Applications
(Human Brain Project)
HPC platform (25 m€)

Training
Education
Skills

- technology building blocks
- integration and co-design of systems and applications
- ecosystem support (184.4 m€)

Applications

9 HPC Centres of Excellence
(40 m€) Biomolecular, Energy,
modelling, weather, materials,
performance optimisation,
global systems science

SMEs
Services, Competence
Centres

Fortissimo, Network of
SME competence
centres (12 m€)

**Public-Private
Partnership on
HPC with ETP4HPC**
(700 m€ EC funding
pledged)



- HPC is at the core of major **scientific & industrial innovation** in the digital age and **critical for policy making, national sovereignty and economic competitiveness**
- Impressive progress in the last years towards overall goal: **Europe as a global leader in HPC use & supply by 2020**
 - However, the EU is losing its position in the top supercomputing league
- **Significant additional investments** are needed for Europe to stay in the HPC race and match the developments of Europe's main competitors
- **A full HPC ecosystem is needed**, complementing technology supply with the coordinated acquisition at EU level of world-class systems
- **National and European HPC policies and investments** must be further coordinated
- The **convergence of HPC, Big Data and Cloud must be exploited** for wide spreading and easing HPC use –in particular in industry/SMEs

Supporting HPC in Horizon 2020



- Idea (**European leadership in HPC**)

- Consultation/Gathering factual support

- Political (EC+Member States)/stakeholders support

- Implementation (workprogrammes)

- Preparation for the next Framework Programme

IDC Study 2015: " High Performance Computing in the EU: progress on the implementation of the European HPC Strategy"
Staff Working document on HPC (2015)

EESI2 input

EC Communication: " European Cloud Initiative – Building a competitive data and knowledge economy in Europe" "
(April 2016)
Council Conclusions on Digital Single Market (ref HPC) (June 2016)

Public-Private Partnership on HCP with ETP4HPC (2014-2020)
700 m€

PRACE2 (2016?)

Two Calls, ~317 m€ (collaboration with ETP4HPC) (WP 2014-2015, WP 2016-2017)

Preparation WP 2018 – 2020
Action Plan for the next Framework Programme

A wider context for HPC: Digital Single Market Strategy and European Cloud Initiative

Digital Single Market in a nutshell



- Better online access to digital goods and services,
 - Helping to make the EU's digital world a seamless and level marketplace to buy and sell
- An environment where digital networks and services can prosper,
 - Designing rules which match the pace of technology and support infrastructure development
- Digital as a driver for growth,
 - Ensuring that Europe's economy, industry and employment take full advantage of what digitalisation offers



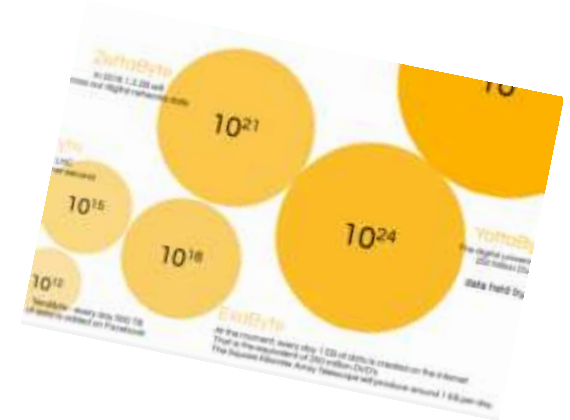
- The **European Cloud Initiative** aims to give Europe a **lead in the global data-driven economy**
 - This initiative is a key component of the Digital Single Market (DSM) Strategy as part of the Digitising European industry
 - Taking advantage of the exponential growth of data and convergence of Cloud and HPC - driving societal challenges, scientific advances and productivity gains across the economy
- **French-German conference on Digital** (Paris, 27 October 2015), President Juncker speech announced the Cloud Initiative, including :
 - the importance of HPC and data infrastructures for economic growth and innovation, and for society, science and knowledge sharing.
 - deployment of a world-class infrastructure and environment for open science in Europe and the ambition that in 2020 Europe will be ranked among the world top three players in HPC



Elements of the European Cloud Initiative

European Cloud Initiative

- 1. European Open Science Cloud** for the management, analysis and re-use of research data;
- 2. European Data Infrastructure** combining:
 - processing data (*HPC infrastructure*)
 - storing data (*Data infrastructure*)
 - moving data (*Network infrastructure*)
- 3. Widening access and building trust**

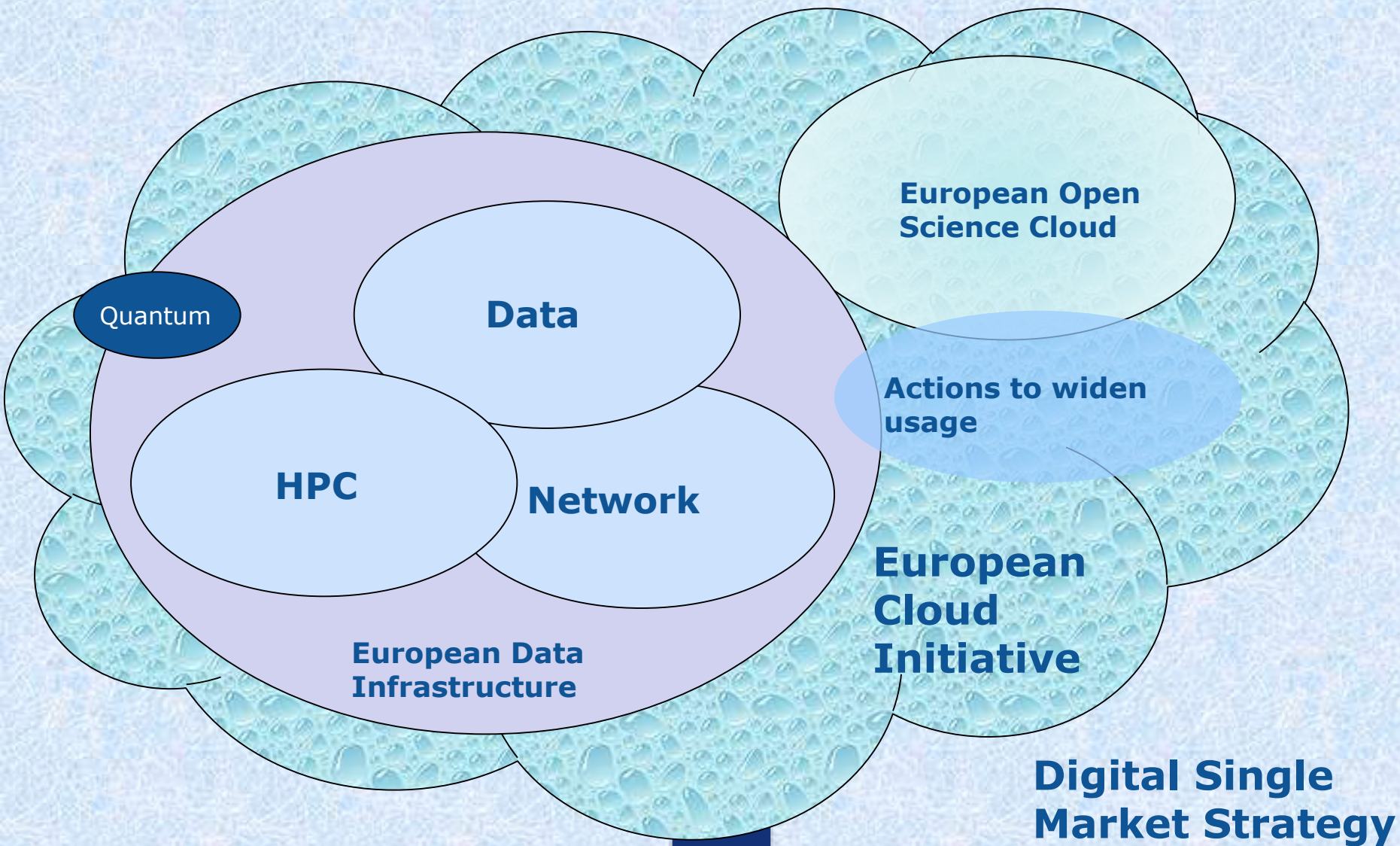


User driven and service oriented – the cloud paradigm

HPC strategy in a wider context



Digital Single Market European Cloud Initiative





The European Open Science Cloud

European Open Science Cloud in a nutshell



- **European Open Science Cloud**
 - a trusted, free at the point of use, open environment with seamless services for storing, managing, sharing, analysing and re-using research data, across borders and scientific disciplines
- **What is needed for the European Open Science Cloud...**
 - Make all scientific data produced by H2020 open by default
 - Raise awareness and incentives to share data, and improve data skills
 - Develop specifications for interoperability and data sharing
 - Create pan-European governance structure
 - Develop cloud-based services for Open Science
 - Enlarge the scientific user base

The European Data Infrastructure



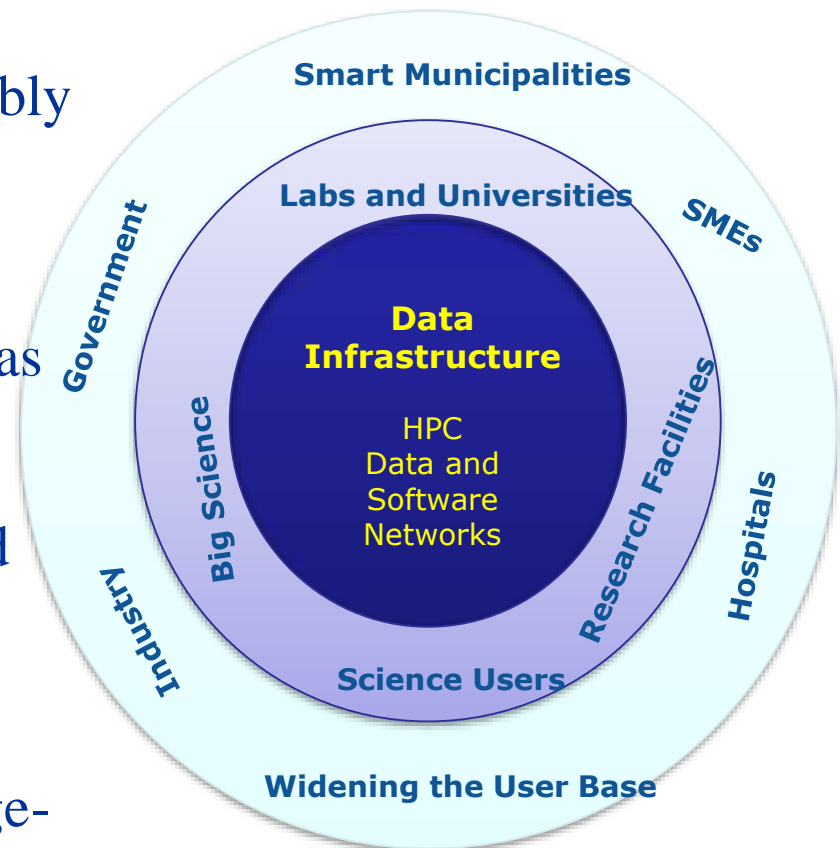
- underpin the European Open Science Cloud and other users
- support the EU to rank among the world's top HPC powers with EU technology
- development of a full European HPC ecosystem
 - acquiring leadership-class computers
 - deploying HPC services to science, industry and SMEs
 - securing our own independent HPC system supply (e.g. low power HPC components)
 - close the chain from R&D to the delivery and operation of the future exascale systems
- ***Confirming the strategic importance of HPC for Europe!***

Widening the user base



Widen the user base of HPC, providing easier access via the Cloud to researchers, but also **industry** and **public authorities**

- adapt HPC and Big Data solutions to a cloud environment for broad access, notably for SMEs
- strengthen the cloud industry in Europe, using the European Open Science Cloud as a testbed
- create a platform to open public data and services, creating a "Government as a Service" (GaaS) base for the EU
- provide a big data test environment (large-scale pilots) for public administrations



The European Cloud Initiative: a call for a coordinated European action



- Horizon 2020 will support the kick-start of implementation
- The realisation of the European Cloud Initiative requires the mobilisation of huge **additional** EU, Member States and private support
- in particular for the European Data Infrastructure:
 - Member States preparation of an Important Project of Common European Interest (IPCEI) on HPC and Big Data enabled applications
 - **Governance:**
 - management and the development of the infrastructure and services, decision making on funding, long-term sustainability and security
 - including users (EU science cloud, public sector), implementers (e.g. PRACE, GEANT) and funders, building on existing governance structures



*Draft projections
(non-committing)*

HPC
~€890 million in H2020

(~165 m€)

Pan-European HPC Infrastructure

Exascale technologies

Training
Education
Skills

- Extreme scale demonstrators - bigger integration and co-design of systems and applications

Applications

(~700 m€)

- Consolidation of HPC Centres of Excellence

- **Member States**

- **IPCEI (Lux, FR, IT, ES)**

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

SMEs
Services, Competence
Centres

(~25 m€)

**Public-Private
Partnership on HPC**

Extreme-Scale Demonstrators



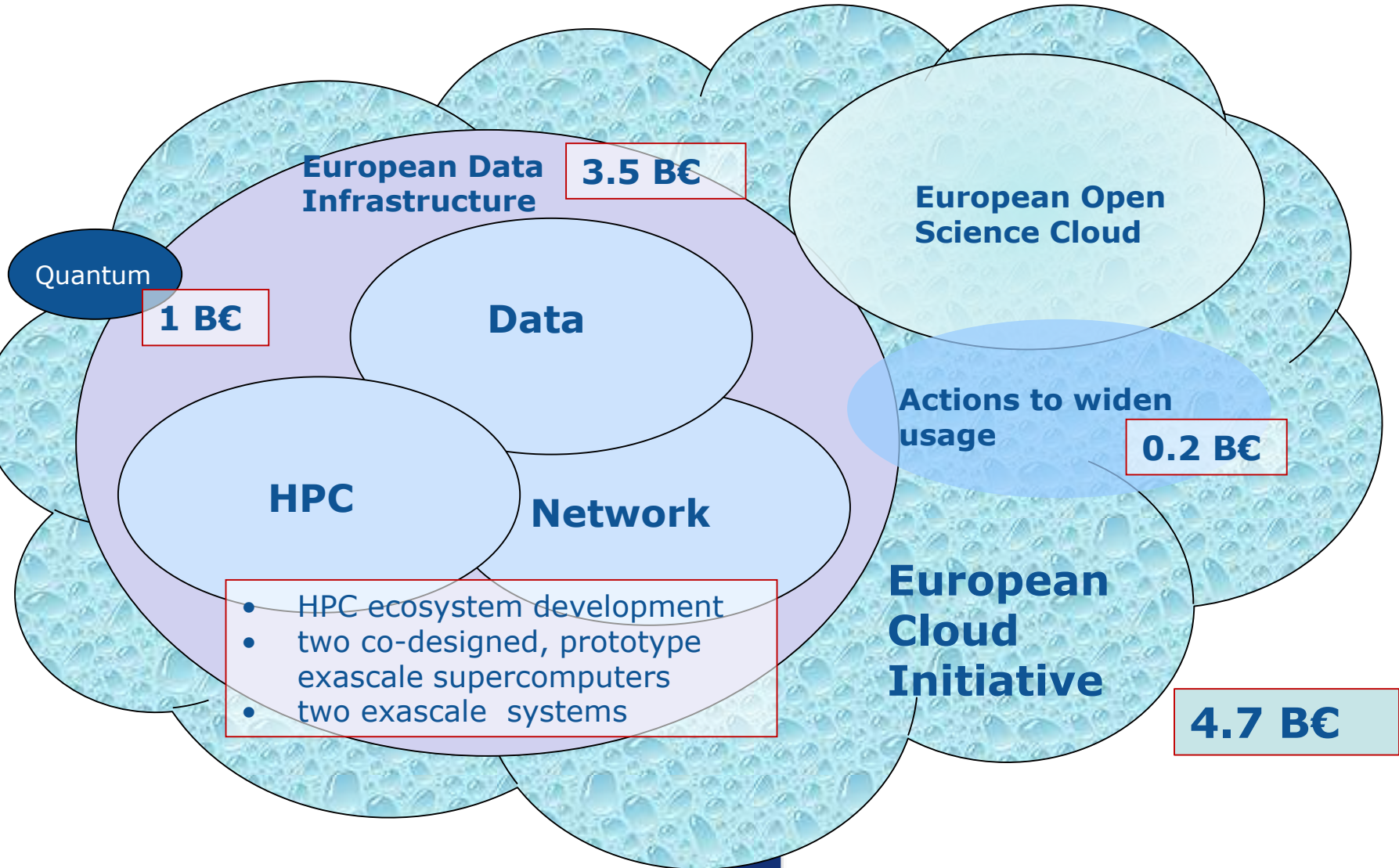
Characteristics

- Complete prototype HPC systems
- high enough TRL to support stable production
- using technologies developed in the previous projects
- based on application – system co-design approach
- large enough to address scalability issues (at least 5% of top performance systems at that time)

Two phases:

- development, integration (of results from R&D projects) and testing
- deployment and use, code optimisation, assessment of the new technologies

Additional funding for the ECI





Thank you for your attention!

European Cloud Initiative COM(2016) 178 final

<https://ec.europa.eu/digital-single-market/en/%20european-cloud-initiative>

<https://ec.europa.eu/digital-single-market/en/news/communication-european-cloud-initiative-building-competitive-data-and-knowledge-economy-europe>