The European Strategy on HPC & the EuroHPC Joint Undertaking

Andrej Filipcic for

DG CONNECT, European Commission

HSF/OSG/WLCG Workshop, March 19th 2019

The EuroHPC Joint Undertaking

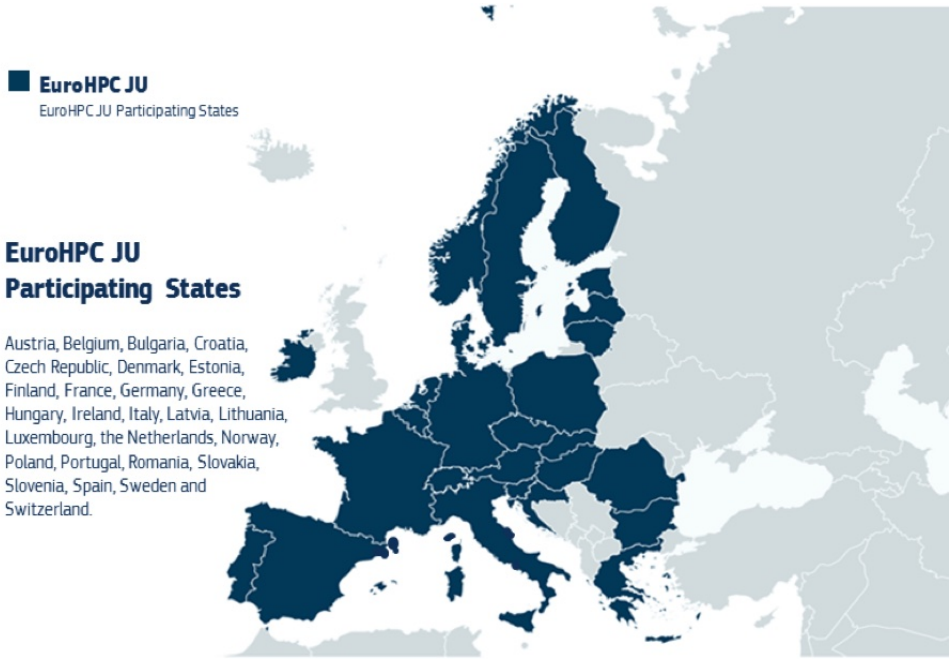
EuroHPC
Joint Undertaking

https://eurohpc-ju.europa.eu/

A legal and funding agency

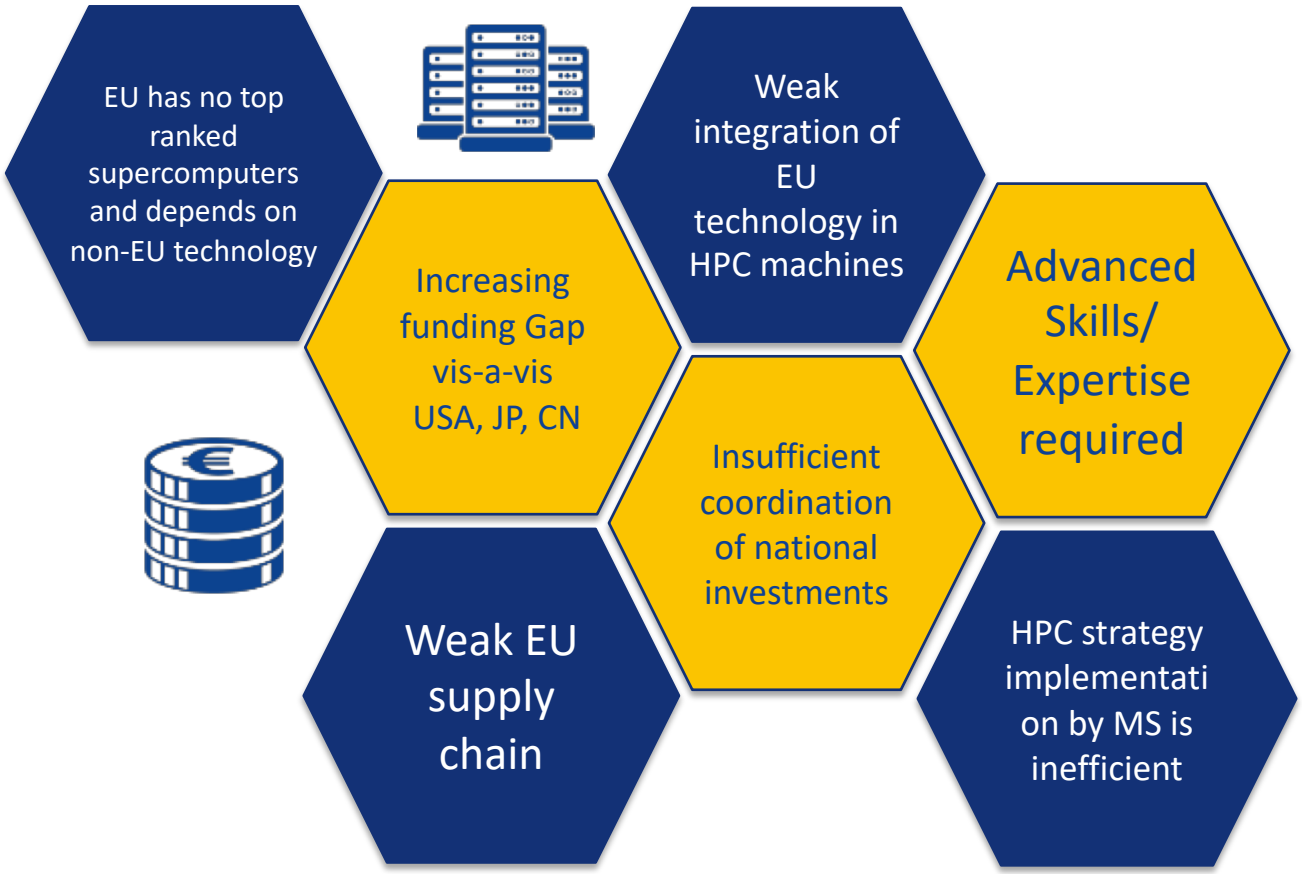
- 27 Participating States + EU
- Site: Luxembourg
- Budget: ~1 B€ (half from EU)
- Operational: 11/2018 to 2026

Mission: Establish an integrated world-class supercomputing & data infrastructure and support a highly competitive and innovative HPC and Big Data ecosystem

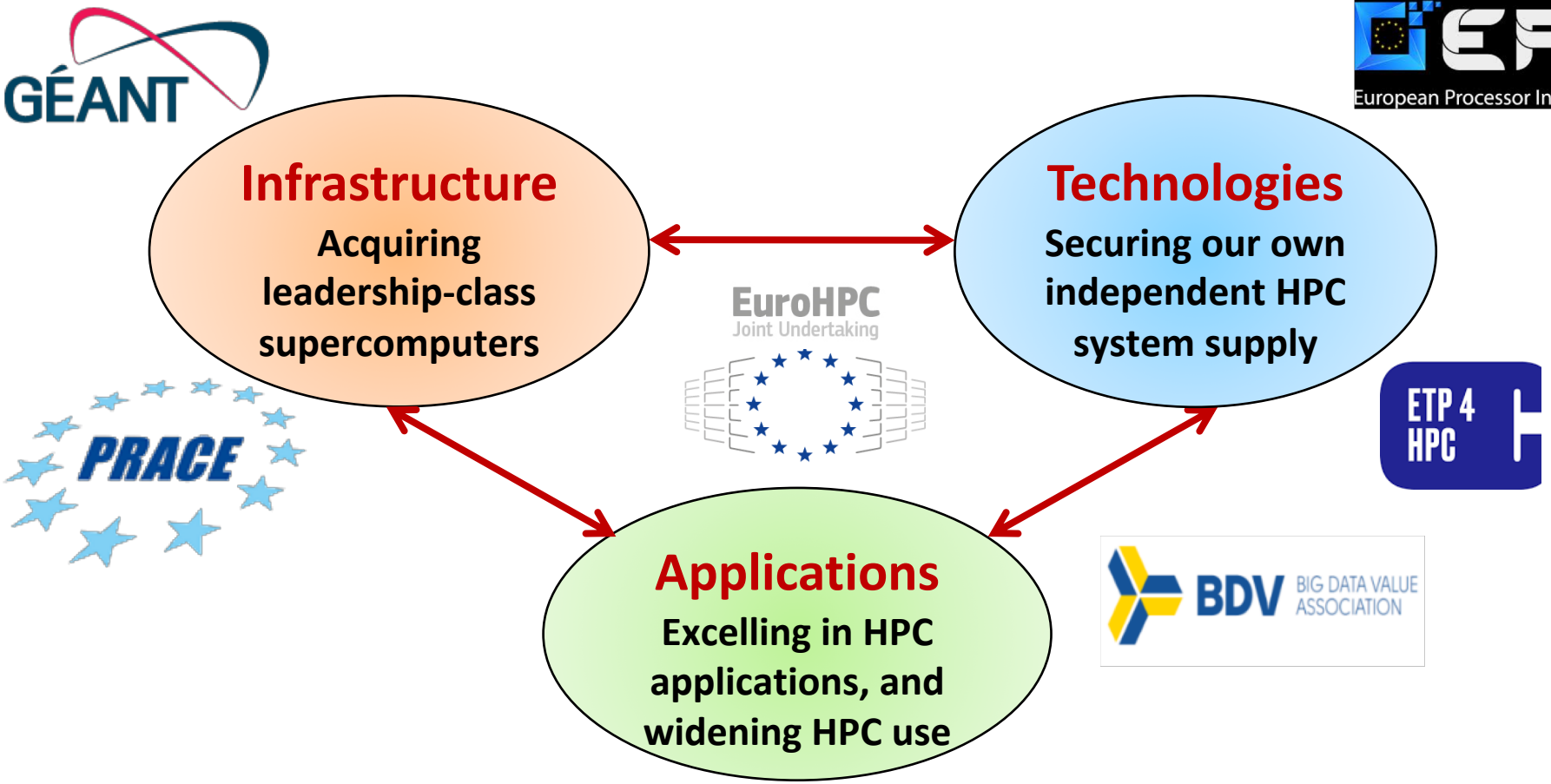


Sweden joined as 26th country a few weeks ago, Switzerland as 27th last Friday

Issues at stake



The European HPC Strategy



Build a thriving European HPC Ecosystem

(hardware, software, applications, skills, services…)

The EuroHPC Governance

Intelligence gathering | **Decision making & Advice** | **Implementation**

Stakeholders
[academia, industry]

- **Users forum**
- **Technology forum**

Governing Board
Public Members

The decision making Board

Industrial & Scientific Advisory Board

Research & Innovation Advisory Group

ETP 4 HPC

BDV BIG DATA VALUE ASSOCIATION

Infrastructure Advisory Group

- **HPC machines**
- **R&I activities**
- **PRACE activities**
- **GEANT activities**
- **…**

EuroHPC JU
The two pillars of activity

Infrastructure & Operations

R&I, Applications & Skills

HPC Ecosystem

2019-2020

1. Acquire an integrated world-class supercomputing infrastructure

EU budget ≥ 270 M€

- Pre-exascale & petascale machines accessible via PRACE

2. R&I for a competitive HPC/BD ecosystem

EU budget ≥ 180 M€

- Calls for R&I: exascale technologies and systems (incl. low-power processor); applications and use; training and skills

2021-2028 (next financial framework)

1. Exascale and post-exascale infrastructure

2. R&I for the HPC/BD ecosystem

The R&I Pillar
(indicative R&I priorities)

Work in progress

2019	2020

HPC Technologies, Hardware, Software and Applications

EPI Phase 2

EPI Phase towards Exascale

Extreme scale technologies

HPC applications

Widening the HPC use + HPC Skills

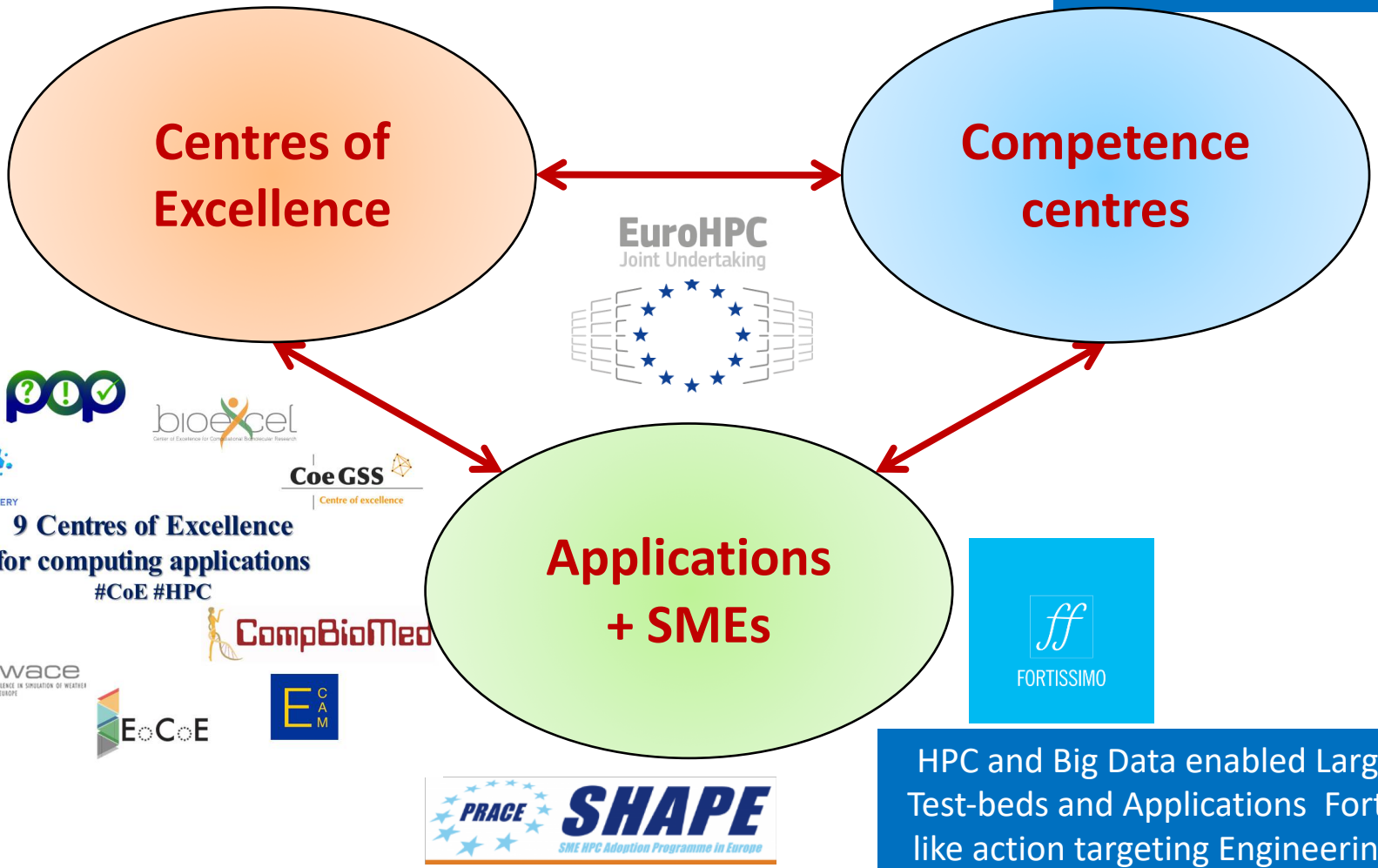
HPC Competence centres + Skills

Support to SMEs

EuroHPC and the Users

9 CoEs renewed in 2018, adding Earth Sciences and Engineering

1 per MS providing expertise + on-demand services and tools to users + training



HPC and Big Data enabled Large-scale Test-beds and Applications Fortissimo-like action targeting Engineering SMEs

Core activities of HPC Competence Centres

Networking: Active at the regional, national, and EU level

Training: Industrial sectorial approach, and HPC outreach

Infrastructures: Offer cost-effective and easy access (HPC,HPDA, AI)

The Infrastructure Pillar 2019-2020

Work in progress

Pre-exascale

≥ 2 Pre-exascale

Per machine:
- investment under discussion

EU contribution:
≤ 50% of CAPEX and ≤ 50% of OPEX

Petascale

≥ 2 Petascale

Range of cost: to be agreed with the Governing Board

EU contribution:
≤ 35% of CAPEX

Access to the JU machines:

- free of charge for publicly funded R&I
- allocation of access time based on calls and peer reviews
- up to 20% of access time for pay-per-use commercial services

The Infrastructure Pillar

Tasks of the EuroHPC Joint Undertaking:

- Acquire at least two world-class pre-exascale supercomputers
- Acquire at least two petascale supercomputers

Participate

The EuroHPC Joint Undertaking (EuroHPC JU) will launch annual Calls for Proposals. All stakeholders (large industries, SMEs, technology providers, academia) are encouraged to take part in this new venture and contribute to the deployment of a new and sustainable economy.

Selection of HE Precursors to Exascale

CALL FOR EXPRESSION OF INTEREST for the selection of Hosting Entities for Precursors to Exascale Supercomputers (REF: EUROHPC-2019-CEI-PE-01)

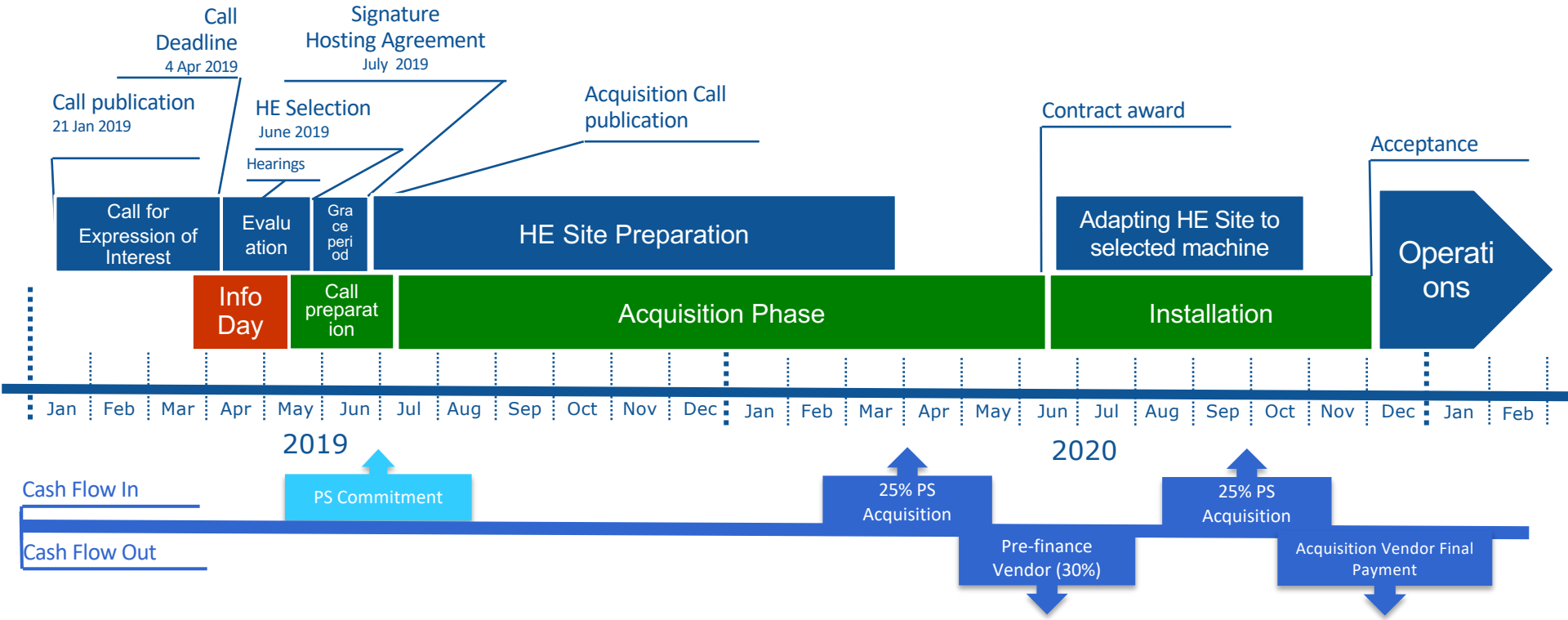
The EuroHPC Joint Undertaking aims to select hosting entities for the precursors to exascale supercomputers, which will be acquired by the EuroHPC Joint Undertaking.

Topic identifier: EUROHPC-2019-CEI-PE-01
Publication date: 21 January 2019
Opening Date: 21 January 2019

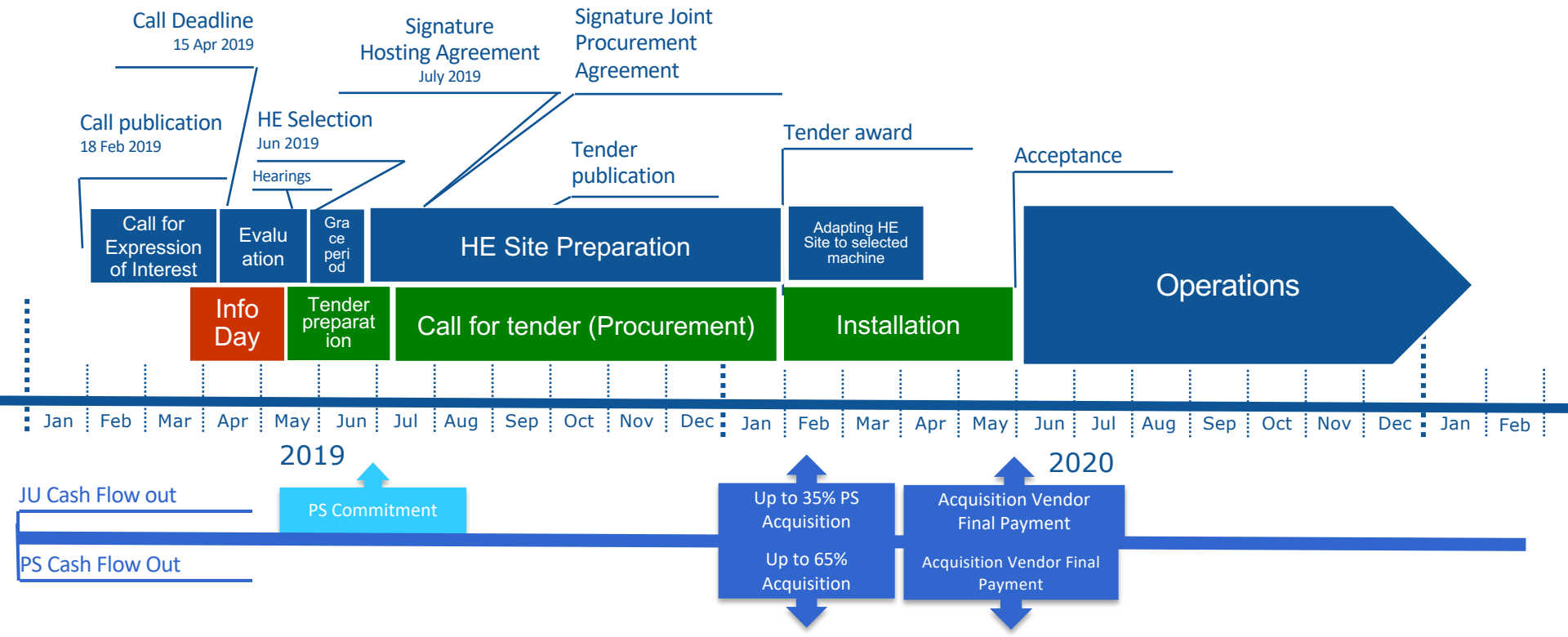
Deadline Model: Single-stage
Deadline date: 4 April 2019 12:00:00 Brussels time

Please read the full text of the call for expression of interest before applying.

Acquisition Pre-ExaScale Indicative timeline



Acquisition Petascale
Indicative timeline



Existing PRACE HPC infrastructure

Distributed Supercomputing Infrastructure

26 members, including

5 Hosting Members

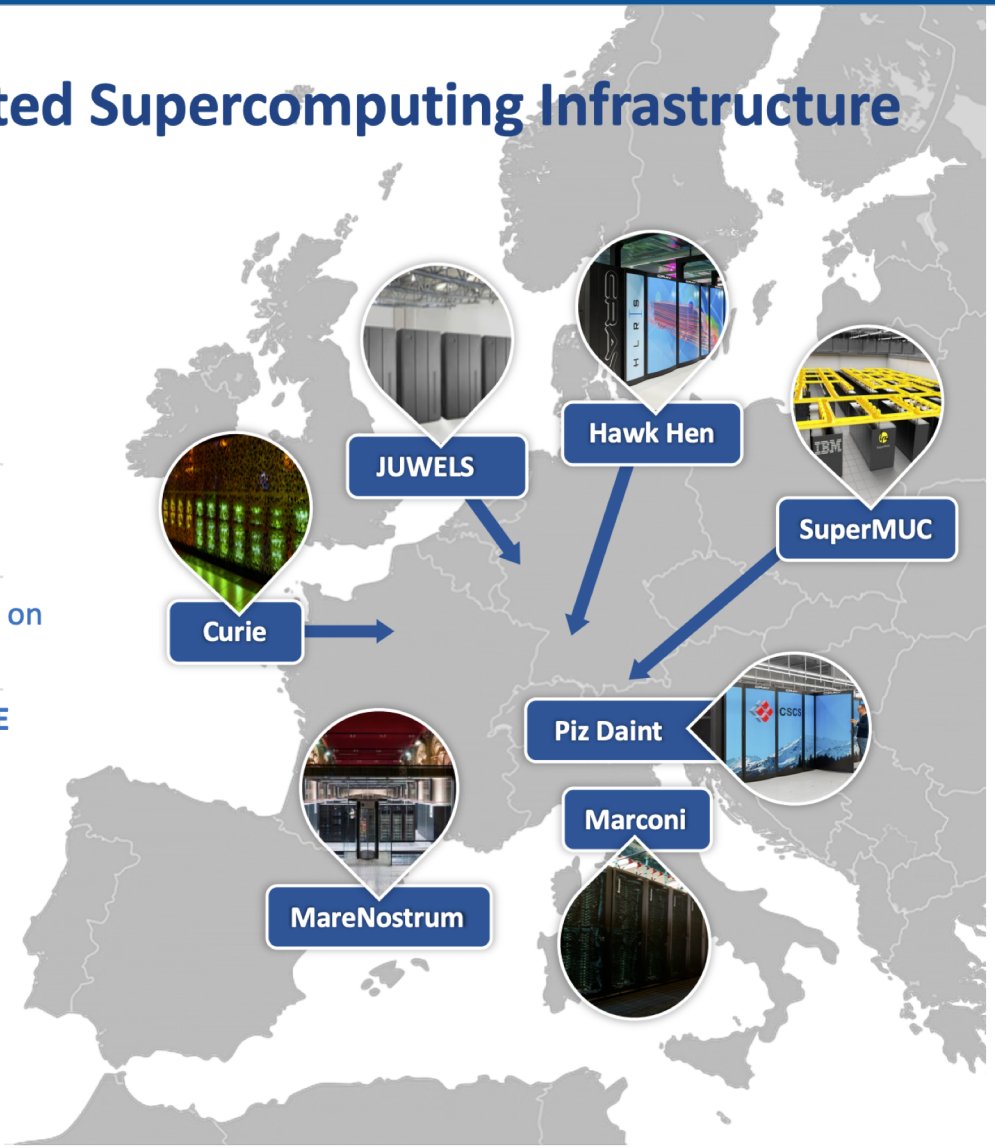
(Switzerland, France, Germany, Italy and Spain)

652 scientific projects **enabled**

110 PFlops/s of peak performance on **7 world-class systems**

>12.000 people trained by **6 PRACE Advanced Training Centers** and others events

Access prace-ri.eu/hpc-acces

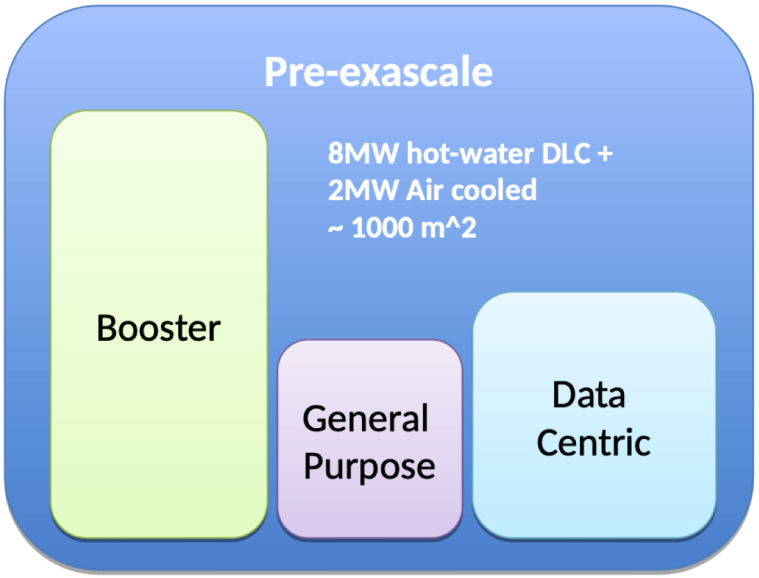


Barcelona Supercomputing Center
Centro Nacional de Supercomputación

Pre-exascale proposal IT

EuroHPC InfoDay: https://events.prace-ri.eu/event/863

Proposed Systems



Use cases:

- 10x computing capability in a large set of key applications for science, industry and society (CoEs, HEP, Pharma, Oil&GAS), and keep the European leadership.
- gain sovereignty on strategic technologies for the European economic wealth, like Artificial Intelligence, Cybersecurity and Internet of Thing,
- tackle relevant and urgent societal challenges.

Advanced experimental platform towards exascale

BASED on European IPs (e.g. PRACE PCP)

Use cases:

- Validate Inference engines on FPGA (in collaboration with ST micro), with training performed on the Booster.
- Acceleration of Quantum inspirited Algorithm for basic science.
- Image/Video processing & Cybersecurity
- Large scale Spiking neural networks
- Data processing for HEP experiments

Pre-exascale proposal ES

BSC as EuroHPC Hosting Entity

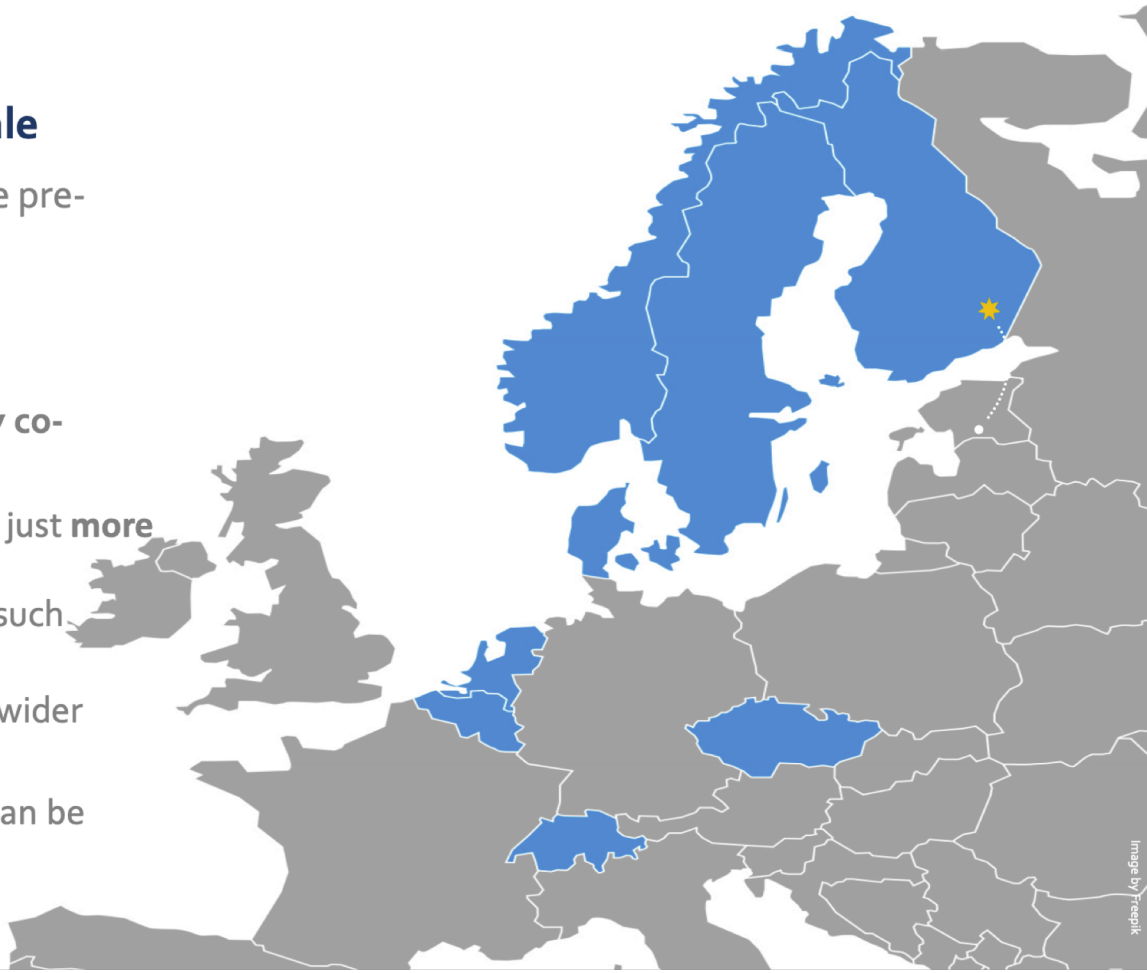
- BSC has full support of its trustees:
  - Spanish government
  - regional Catalan government
  - Polytechnic University of Catalonia (UPC)
- Our aim is to lead a consortium with different member states interested in fostering their local HPC ecosystem by participating in a proposal like this
  - Open for new partners: confirmed Portugal
  - Member/Participating states with long tradition in HPC and the willingness to enhance the European HPC ecosystem
- What we offer to partners
  - Partners contribute to TCO, and receives corresponding access time
    - Contribution around 5% of TCO
  - Larger contribution in CAPEX
  - Small contribution to OPEX, with in-kind, in user support, to improve the knowledge of HPC on every country
  - It will include a system targeting the development of an advanced experimental platform towards exascale systems based on RISC-V technology

Pre-exascale proposal FI

European Consortium for pre-Exascale

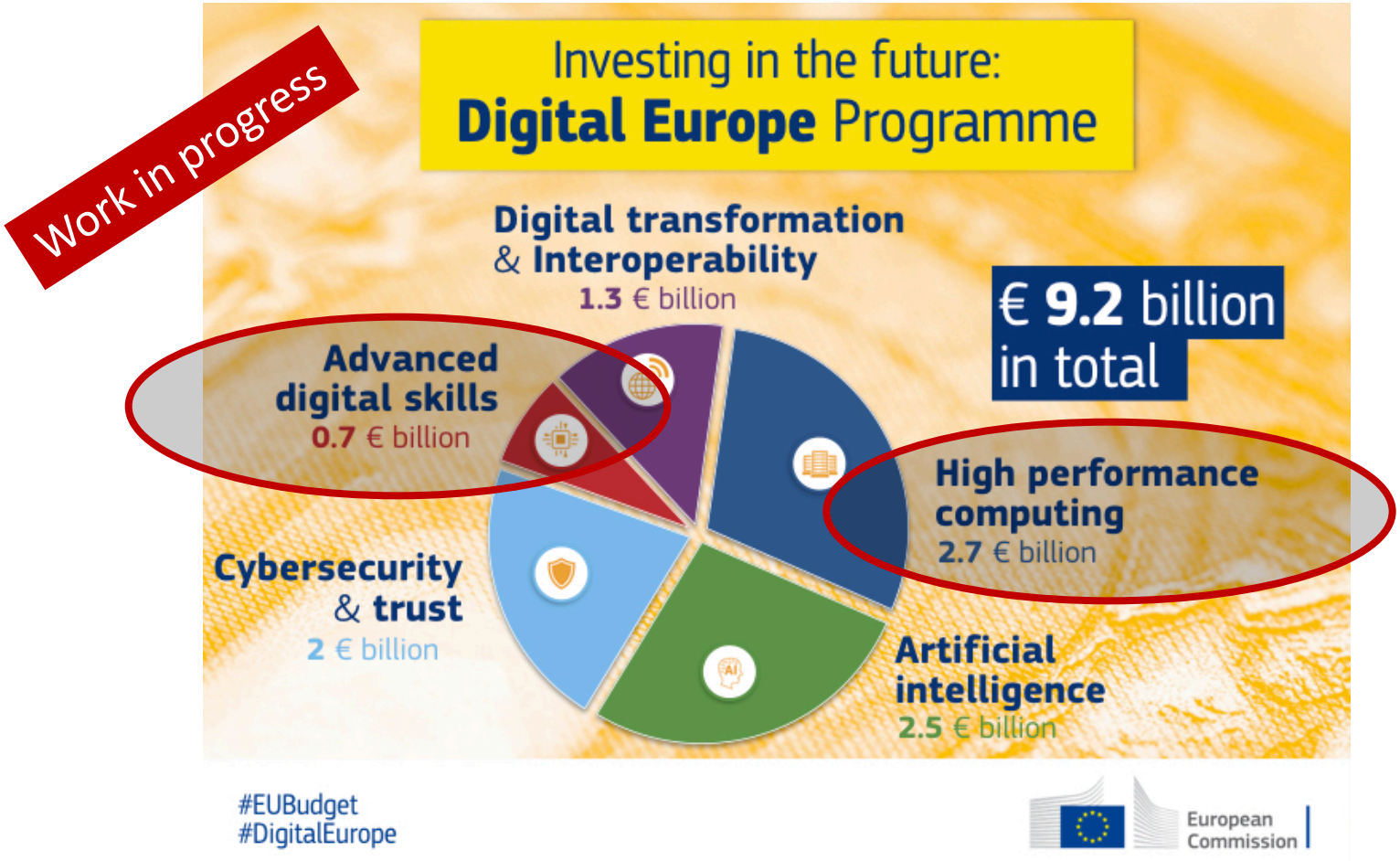
More than 8 countries around the table, one pre-exascale system in Kajaani!

- Focus on **”evolutionary road” to exascale**
  - No major disruptive changes but **steady co-evolution of technology and software**
- This implies ”x86 CPUs + GPUs” style system, just **more of the same**
  - Predict available exaflop/s system with such approach for 30-40 MW by 2023
  - Trade some of the flop/W capability for wider applicability, **”useful exascale”**
- Larger power envelope of “useful exascale” can be mitigated by **hosting it in optimal conditions**



EuroHPC in Digital Europe (2021-2027)

Overall objective: **to achieve competitive world-class exascale and post-exascale High Performance Computing (HPC) technologies in Europe, including integration with Quantum computing**



Actions in Digital Europe

Operational Objectives of specific objective 1: High Performance Computing

i. To acquire in 2023 two competitive exascale systems (targeting one with European technology) and in 2027 post-exascale systems

ii. To integrate and deploy the first hybrid HPC / Quantum computing infrastructure in Europe

iii. To develop and deploy a pan-European federated and cloud-based computing service infrastructure;

iv. To support the development of HPC skills and the access of public & private stakeholders to the HPC ecosystem (through HPC Competence Centres).

v. To coordinate with other digital priorities such as artificial intelligence and cybersecurity

Work in progress

EuroHPC in Horizon Europe (2021-2027)

Work in progress

Commission proposal for **Horizon Europe**

THE NEXT EU RESEARCH & INNOVATION PROGRAMME **(100 B€)**

Advanced computing
& Big Data

Actions in Horizon Europe

Work in progress

Area of intervention: High performance computing and Big Data

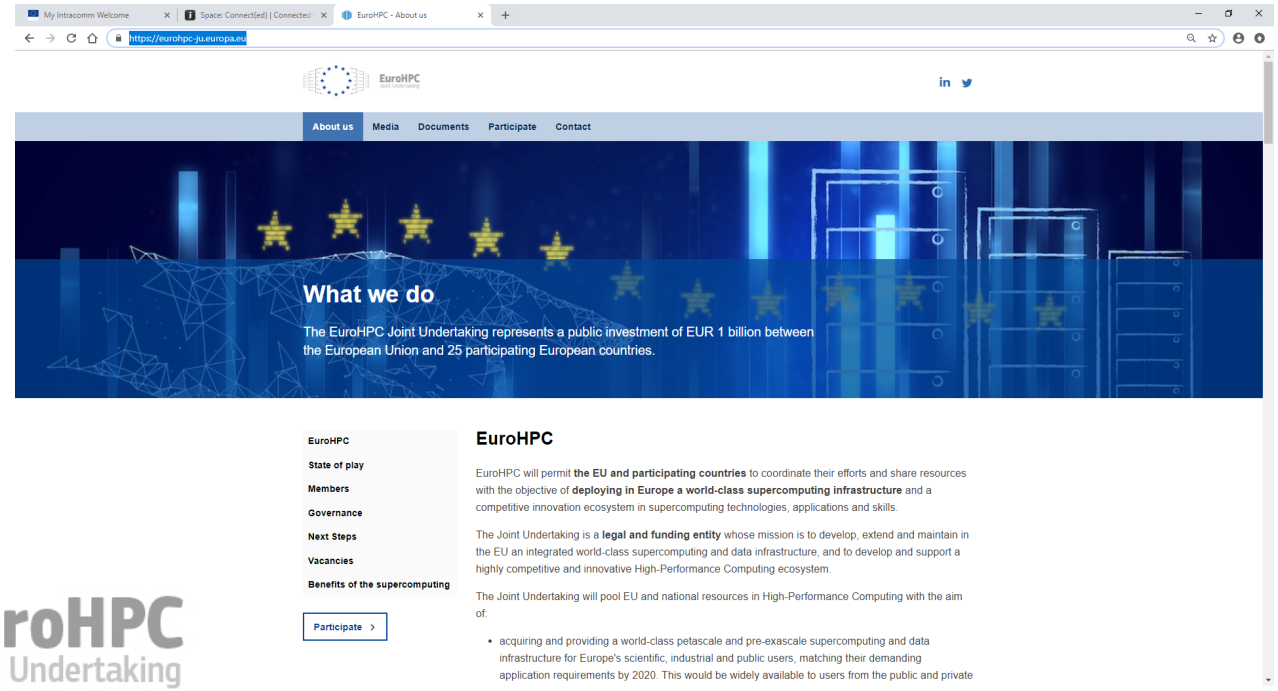
i. To develop the next generation low-power microprocessor and novel computing architectures and technologies for post-exascale systems

ii. To support software, algorithms, programming models & tools, operating systems

iii. To support the co-design and system integration in pilots for preparing the next generation of (post-exascale) HPC systems (including integration of neuromorphic or quantum computing, …)

iv. To support innovative HPC and big data enabled test-beds and applications for strategic European industrial sectors.

More info on the web



EuroHPC Joint Undertaking

Visit the EuroHPC JU website at: https://eurohpc-ju.europa.eu/