AutoDASP 2019 @ Euro-Par 2019

The European High-Performance Computing EuroHPC JU initiative explained

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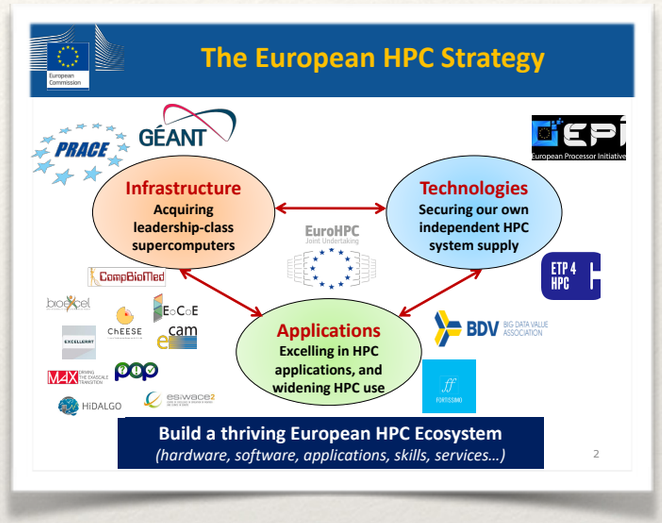
Outline

- EU “institutional” slides
  - Ones you can find at ICT day, e.g. Helsinki 19-20 Sept
- My comments
  - They don’t necessarily represent the vision of EuroHPC Governing Board



The European HPC Strategy

Infrastructure

Acquiring leadership-class supercomputers

Technologies

Securing our own independent HPC system supply

Applications

Excelling in HPC applications, and widening HPC use

Build a thriving European HPC Ecosystem

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

Rationale

1. European Processor Initiative “EPI”
   - CPU + accelerators (of different kinds)
2. A family of European HPC platforms
   - Peta-scale (e.g. 10PF) , pre-exascale (e.g. 150PF)
   - Exascale ***(using EPI)***
3. Pulling the topic+budget out of H2020 and next FP
   - Single, coordinated government
   - Boost industrial/societal impact

The EuroHPC Joint Undertaking

EuroHPC Joint Undertaking

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

A legal funding entity

- 27 Participating States + EC
- Site: Luxembourg
- Budget (2019-2020): ~1 B€ (half from EU)
- Operational: 11/2018 to 2026

EuroHPC Mission & Objectives

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

1. ***An integrated world-class supercomputing and data infrastructure***
   - At least 2 pre-exascale + 3-4 petascale by 2020
   - 2 exascale by 2022/2023 (1 EU tech);
   - post-exascale infrastructure by 2027
   - federation of HPC infrastructures at European level
   - hybrid HPC/Quantum infrastructure
2. ***Research and innovation for a HPC and Big Data ecosystem***
   - an integrated European HPC R&I agenda
   - independent HPC technology supply
   - excellence in HPC applications and use
   - HPC Competence Centres, training/skills, outreach

"Pillar1"

"Pillar2"

EuroHPC Joint Undertaking

Governance

Governing Board

Public Members (Participating States + European Commission)

The decision making Board

25 MS + 2 AC

Executive Director

Industrial and Scientific Advisory Board
(Advisory role)

Infrastructure Advisory Group

Research & Innovation Advisory Group

ETP 4 HPC

BDV BIG DATA VALUE ASSOCIATION

EuroHPC Joint Undertaking

First Phase EuroHPC Activities 2019-2020

■ Infrastructure + Operations

- *Acquisition & operations of at least 2 precursor-to-exascale systems*
- *Acquisition of at least 2 petascale systems*

■ Applications & Skills + R&I

- Technology and applications for exascale (incl. low-power processor);
- HPC Competence Centres

EC	**486 M€**
Participating States	**486 M€**
Total	**~1 B€**
Private Members (in kind)	*422 M€*

EuroHPC Joint Undertaking

Research calls RIA+IA 2019

- EuroHPC-01-2019: Extreme scale computing and data driven technologies
  - RIA - Min JU contribution 20M ==> Total min 40M€
  - Looking to exascale in parts: a) **node performance** - proj size 8M€, b) **storage** - proj size 8M€, c) **networking** - proj size 8M€,
    d) **programming model** - proj size 16M€, e) **approx computing** - proj size 4M€
- EuroHPC-02-2019: HPC and data centric environments and application platforms
  - IA - Min JU contribution 16M
  - HPC pilots and applications: Scientific, HPDA, AI/ML/DL - proj size 8M€
- EuroHPC-03-2019: Industrial software codes for extreme scale computing environments and applications
  - IA - Min JU contribution 8M
  - Renew of of terribly old codes - proj size 4M€
- Total JU contribution 55M€ (42M + 13M floating) - Total 55x2=110M€

Research calls 4-5 2019

- EuroHPC-04-2019: HPC Competence Centres & networks of competence centres (CSA)
  - 1 per PS located at Tier0/1 (PRACE) - 2M€ per PS
- EuroHPC-05-2019: Stimulating the innovation potential of SMEs
  - “Fortissimo” model - cascade funding
  - 10M€ - 100% EU funded

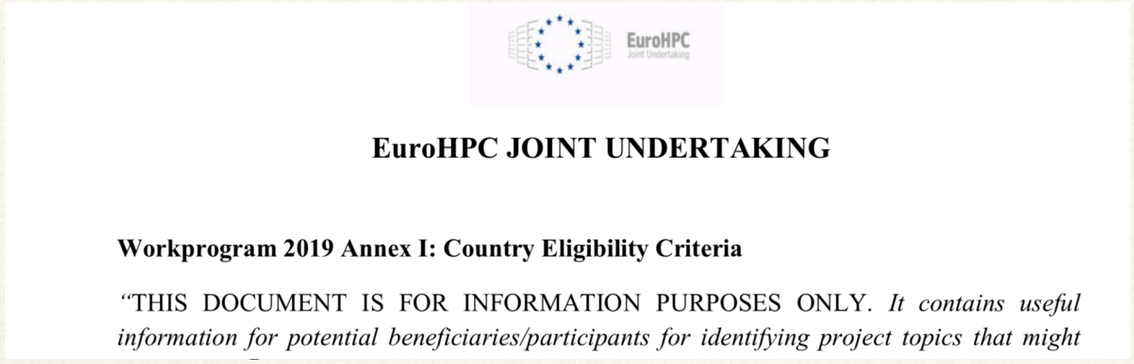
JU funding model basics

- Project calls and budget are proposed by advisory+governing boards
  - Voted by the Governing Board: 50% EU - 50% PS (weighted by PS population)
- Project review & funding rate is the same of H2020
  - Academia 100%, Industry 100% for RIA, 70% for IA
- EU contribute **up to 50%** to budget of the funded cost
  - The remaining 50% is up of PS of the partners participating to the funded project
  - Each PS declare a max budget (per call or global) -it can be fund in the appendix **(be careful!)**
  - PS can support any percentage **X%<50%** of the cost
- Funding model
  - Two different grant agreements (EU and PS, for all PS in the project) - Currently adopted
  - Options for the future: **1) advance transfer to EU of PS budget and financial management delegated EU**, 2) common pot (budget can be moved from one PS to another)

2. **Eligibility and admissibility conditions**: The conditions are described in General Annexes B and C of the Horizon 2020 Work Programme 2018-2020.
Please note that the JU funding rate for eligible costs in grants awarded under this topic will be 50% of the eligible costs. The level of matching funds of EuroHPC Participating States and corresponding national eligibility conditions are provided in the Annex of the EuroHPC Workplan 2019.

Example

- Suppose **Italy** allocated a budget of **1M€** for **call-1**
- Suppose 4 funded projects in call-1 include Italian partners (academia or industry)
  - say 6 partners It_1-It_6 (in different projects)
- It is expected $\sum Cost[It_i] < 2 \times 1M€$
  - What if not … not defined!
  - This is why Italy allocated 24M€



EuroHPC JOINT UNDERTAKING

Workprogram 2019 Annex I: Country Eligibility Criteria

"THIS DOCUMENT IS FOR INFORMATION PURPOSES ONLY. *It contains useful information for potential beneficiaries/participants for identifying project topics that might*

Current commitment

Some countries still did not declared their budget. The document "Annex1" will be regularly updated on the portal.

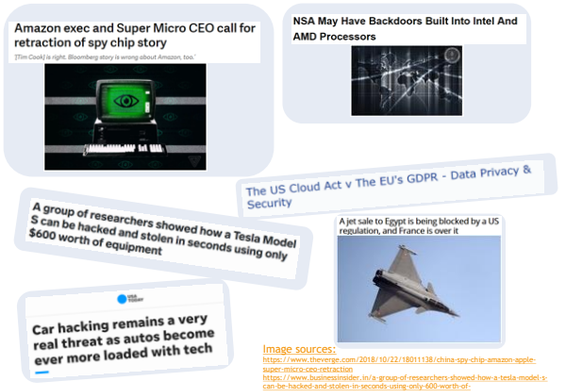
https://eurohpc-ju.europa.eu/documents/Annex1_National_Eligibility_Rules_Conditions_20190725.pdf

Financial Commitments of the EuroHPC Participating States for 2019 - Summary (Indicative)		
	Call topic	
EuroHPC Participating State	EuroHPC-01-2019 (RIA) EuroHPC-02-2019 (IA) EuroHPC-03-2019 (IA)	EuroHPC-04-2019 (RIA)
Austria		
Belgium		
Bulgaria		
Croatia	0 €	200 000 €
Cyprus		
Czech Republic		
Denmark	1 000 000 €	1 000 000 €
Estonia		
Finland		1 000 000 €
France		
Germany	13 000 000 €	1 000 000 €
Greece	2 500 000 €	900 000 €
Hungary		
Ireland		
Italy	23 000 000 €	1 000 000 €
Latvia		
Lithuania		
Luxembourg		
Norway	500 000 €	500 000 €
Poland		
Portugal	900 000 €	1 000 000 €
Romania		
Slovakia		
Slovenia	200 000 €	100 000 €
Spain		
Sweden	1 350 000 €	1 000 000 €
Switzerland	500 000 €	0 €
The Netherlands		
Turkey	750 000 €	1 000 000 €

EUROPEAN PROCESSOR INITIATIVE

WHY EUROPE NEEDS ITS OWN PROCESSORS

- Processors now control almost every aspect of our lives
- **Security** (back doors etc.)
- Possible **future restrictions on exports to EU** due to increasing protectionism
- **A competitive EU supply chain** for HPC technologies will create jobs and growth in Europe
- Sovereignty (data, economical, embargo)



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EUROPEAN PROCESSOR INITIATIVE

EPI PARTNERS

BMW GROUP, Rolls-Royce Motor Cars Limited, Atos, Infineon, Barcelona Supercomputing Center – Centro Nacional de Supercomputación, KALRAY, JÜLICH Forschungszentrum, semidynamics silicon design and verification services, TÉCNICO LISBOA, Fraunhofer, ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA, CHALMERS, UNIVERSITÀ DI PISA, FER, E4 COMPUTER ENGINEERING, CINECA, cea, SURF SARA, GENCI, FORTH INSTITUTE OF COMPUTER SCIENCE, ST, EXTOLL latency matters., ETH zürich, Elektrobit

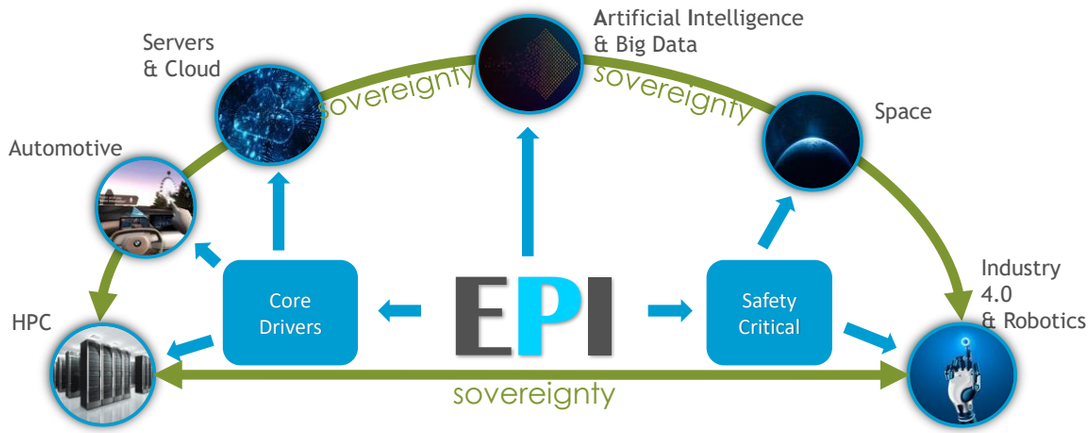
EUROPEAN PROCESSOR INITIATIVE

DRIVERS OF THE EPI PROPOSAL 2

- Connected mobility & **AD** *Autonomous Driving computing needs beyond 2023*
- Develop customized processors able to meet the performance needed for autonomous vehicles that would offer:
  - implementation of vehicle perception tasks in real-time in a fail-operational manner
  - increased computing performance, fail-operational, functional safety, cyber-security and real-time behaviour (RT)
  - compute resources with the same characteristics as their “big brothers” in exascale class supercomputers
- Sovereignty (data, economical, embargo)
- EU car manufacturing supremacy

EUROPEAN PROCESSOR INITIATIVE

SCALABILITY ALLOWS WIDE MARKET POTENTIAL COVERAGE



Workprogramme 2019-2020 - R&I priorities

Work in progress

2019	2020

HPC Technologies, Hardware, Software and Applications

Extreme scale technologies

HPC applications

EPI Phase 2

EPI Phase towards Exascale

Widening the HPC use + HPC Skills

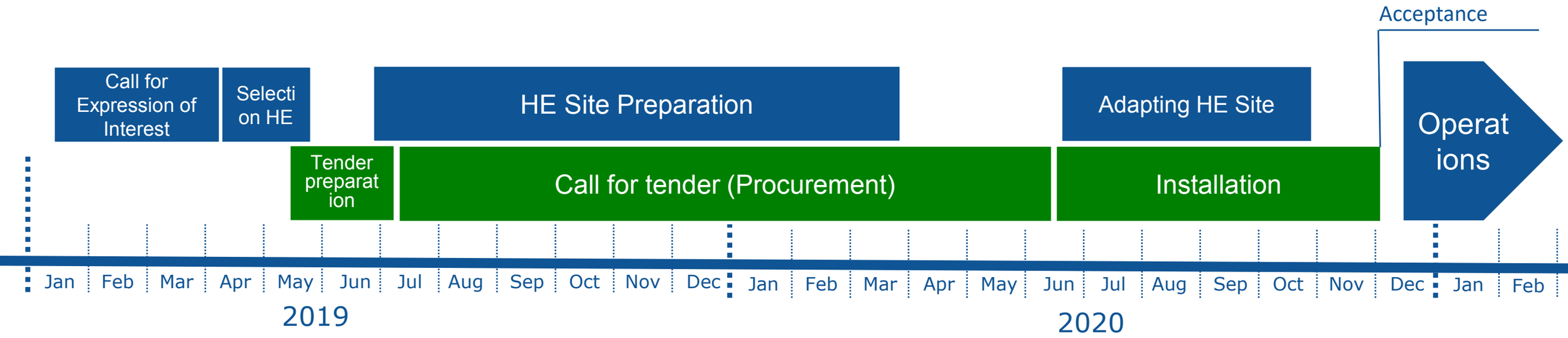
HPC Competence centres + Skills

Support to SMEs

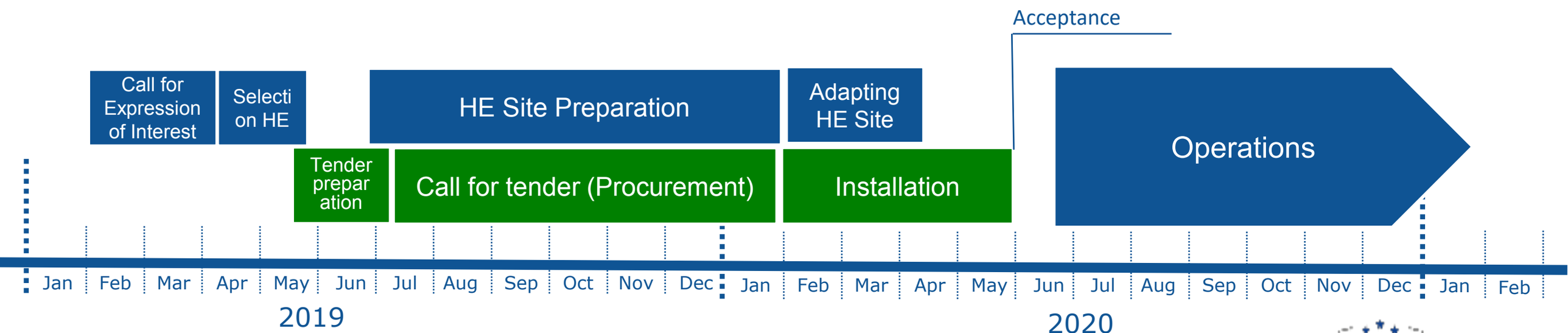
EuroHPC Joint Undertaking

Acquisition – Indicative timeline

Pre-exascale systems



Peta-scale systems



EuroHPC Joint Undertaking

Infrastructure: Supercomputers

Precursors to exascale

>150 Petaflops

At least 2 (hosted in EU)

Maximum EU contribution: 250 M€

EU contribution

≤50% of CAPEX + ≤50% of OPEX

(computing time for EuroHPC proportional to contribution to TCO)

Petascale

(2 - 100 Petaflops)

At least 2 (hosted in EU)

Maximum EU contribution: 30 M€

EU contribution

≤35% of CAPEX

(computing time for EuroHPC proportional to contribution to CAPEX.)

EuroHPC Joint Undertaking

EuroHPC in the next MFF (2021-2028)

Work in progress

Commission proposal for **Horizon Europe**

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

Pillar 1
Open Science

- European Research Council
- Marie Skłodowska-Curie Actions
- Research Infrastructures

Pillar 2
Global Challenges and Industrial Competitiveness

Clusters
- Health
- Inclusive and Secure Society
- Digital and Industry
- Climate, Energy and Mobility
- Food and natural resources

- Joint Research Centre

Pillar 3
Open Innovation

- European Innovation Council
- European innovation ecosystems
- European Institute of Innovation and Technology

Strengthening the European Research Area

- Sharing excellence
- Reforming and Enhancing the European R&I system

Advanced computing & Big Data

Second Phase EuroHPC Activities 2021-2027

Work in progress

EuroHPC
Joint Undertaking

EuroHPC in next Multiannual Financial Framework (2021-2027)

- **two exascale systems by 2022/2023,**
- **post-exascale infrastructure by 2027**
- **EuroHPC hyper-connectivity (~1 Tbps)**
- **Federation of HPC infrastructure**
- **Hybrid HPC/Quantum infrastructure by 2028**
- **emerging computing architectures (quantum/neuromorphic)**
- **novel applications in key areas, and synergies with Cybersecurity, AI**
- **advanced digital skills development**