HPC User Forum
7 - 10 September 2021

Developments in the European Union – EuroHPC

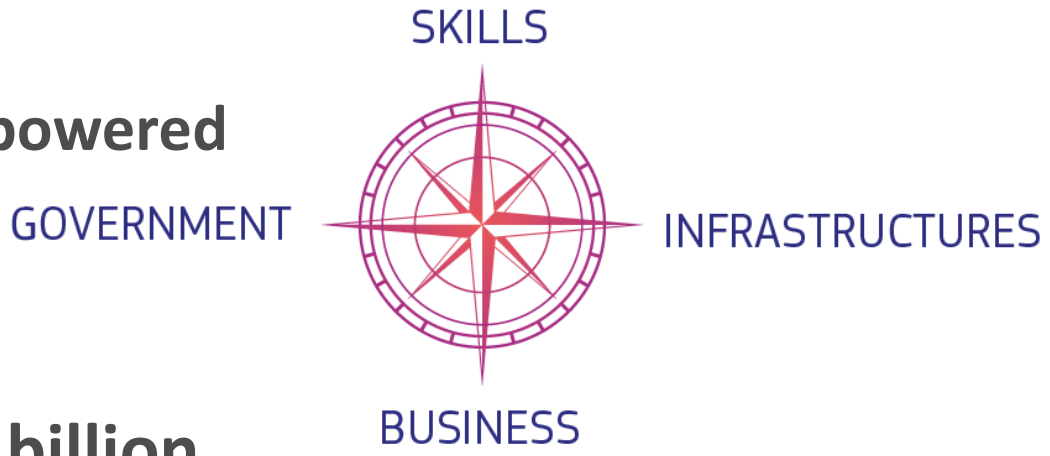
Leonardo Flores Añover
Senior Expert
DG CNECT, HPC & Quantum Technology Unit - European Commission

- New developments – drivers of the EU strategy in HPC
- HPC State of play in the EU – the EuroHPC JU
- EuroHPC JU in the next decade

- **New developments – drivers of the EU strategy in HPC**
- HPC State of play in the EU – the EuroHPC JU
- EuroHPC JU in the next decade

Digital – a critical element for the EU's future

Europe's Digital Decade: towards a digitally empowered Europe by 2030



- **HPC : a key element for the EU's digital strategy**

- **The EU Recovery and Resilience Facility €672,5 billion for investment and reforms in EU countries**
  - **20% in each country for the digital transition**
- **Digital sovereignty**
  - **increasing dependency on critical, often non-EU based, technologies and infrastructures**
- **European Green Deal**

European Commission

Main drivers for HPC strategy in the EU

- EU investments are not at the level of its economic importance
- HPC applications are key contributors to the digitisation of industrial sectors (~53% of the Union's GDP)
- Exponential growth of data and computing
- Exascale performance and convergence in computing continuum
- Quantum computing technologies
- No EU processor technology in the top 500 supercomputers

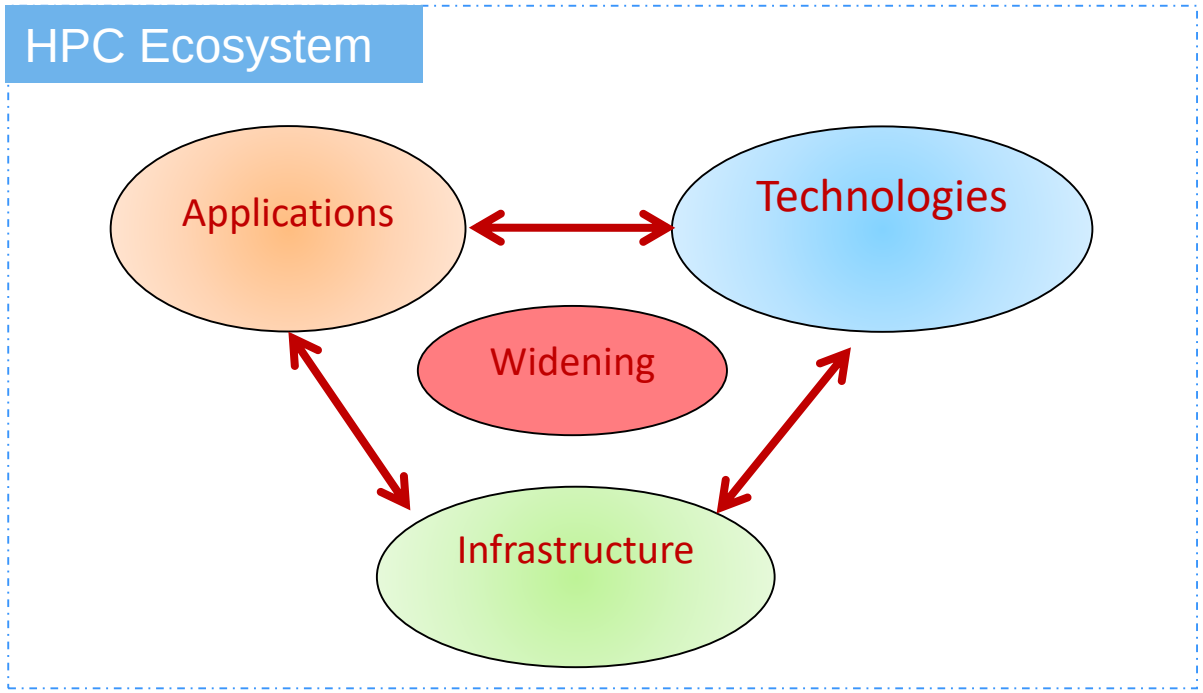
- New developments – drivers of the EU strategy in HPC
- **HPC State of play in the EU – the EuroHPC JU**
- EuroHPC JU in the next decade

The EuroHPC Joint Undertaking 2019-2020

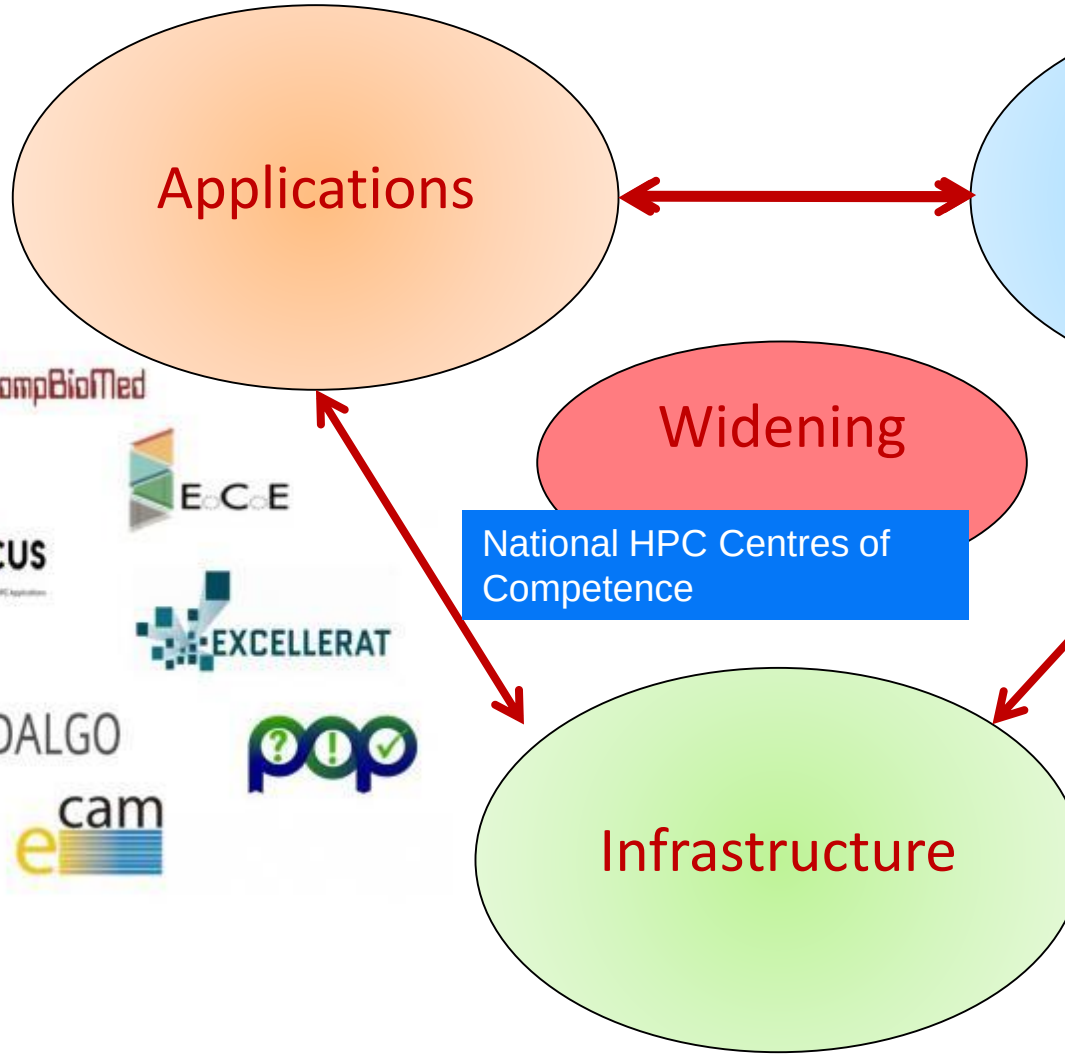
Mission: An integrated world-class supercomputing & data infrastructure and a highly competitive and innovative HPC and Big Data ecosystem

A legal and funding agency

- 33 Participating States (All EU MS) + EU + 2 Private Members (ETP4HPC & BDVA)
- Budget: 1.5 B€ (~1.1 B€ (536 m€ from EU) + In-kind from Private partners)



Pillar activities in 2019-2020



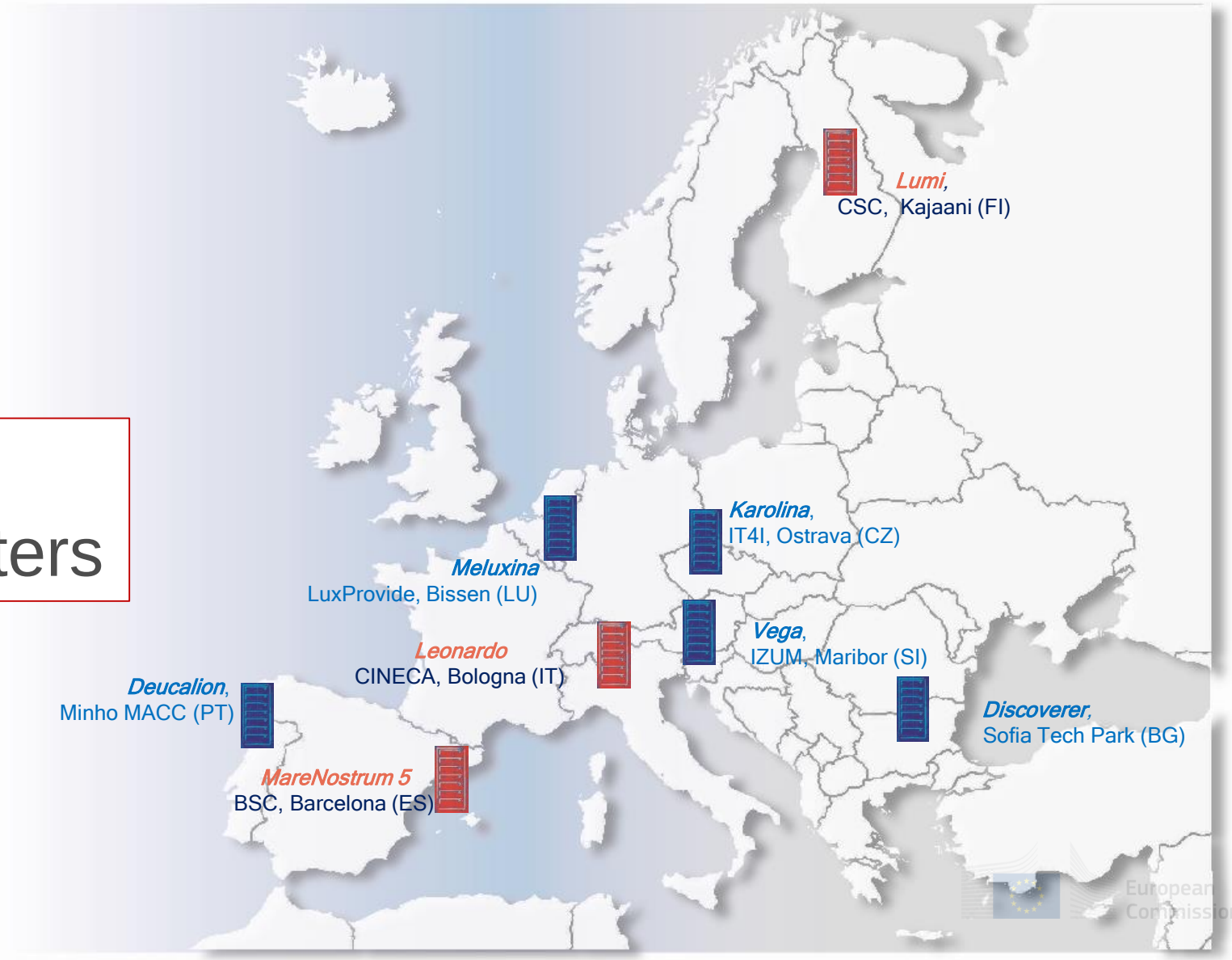
European Processor Initiative

Pilots towards Exascale

Infrastructure – Supercomputers

Acquisition **~510 m€**

Hosting entities of EuroHPC supercomputers



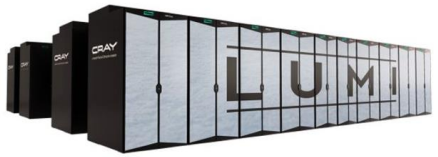
Pre-exascale

Petascale

EuroHPC Supercomputers Timeline

VEGA - Operational
IZUM, Maribor, SI
6.9 PF, Atos BullSequana
Top500: #106 & #134

Karolina - Operational
IT4I, Ostrava, CZ
9 PF, HPE Apollo
Top500: #69 & #149



LUMI
CSC, Kajaani, FI
***550+/375 PF**, HPE Cray EX*

LUMI-C
AMD EPYC

LUMI-G
AMD Instinct

MareNostrum 5

2022

Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May

2021

MeluXina - Operational
LuxProvide, Bissen, LU
12.8 PF, Atos BullSequana
Top500: #36 & #230

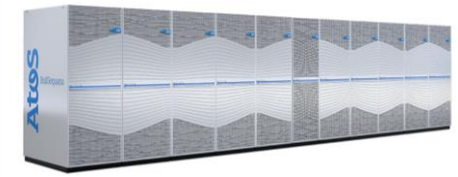
Discoverer - Operational
PSB, Sofia, BG
4.5 PF, Atos BullSequana
Top500: #91

Deucalion
FCT/MACC, Barco, PT
***7.2 PF**, Fujitsu FX700*

Booster
NVIDIA A100

DC&GP
Intel Ice Lake

Leonardo
CINECA, Bologna, IT
***249.5 PF**, Atos BullSequana*



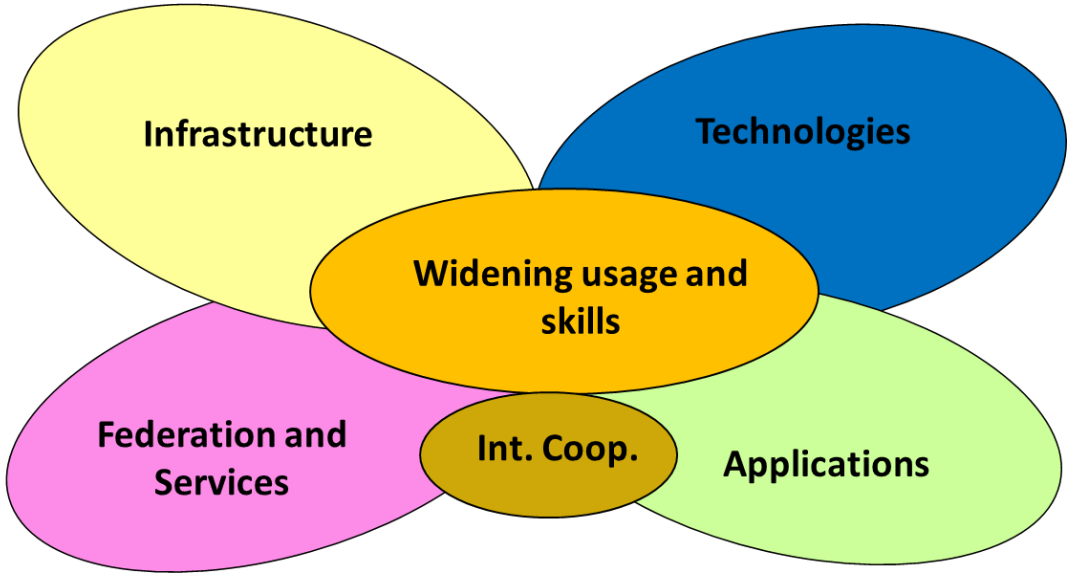
- New developments – drivers of the EU strategy in HPC
- HPC State of play in the EU – the EuroHPC JU
- **EuroHPC JU in the next decade**

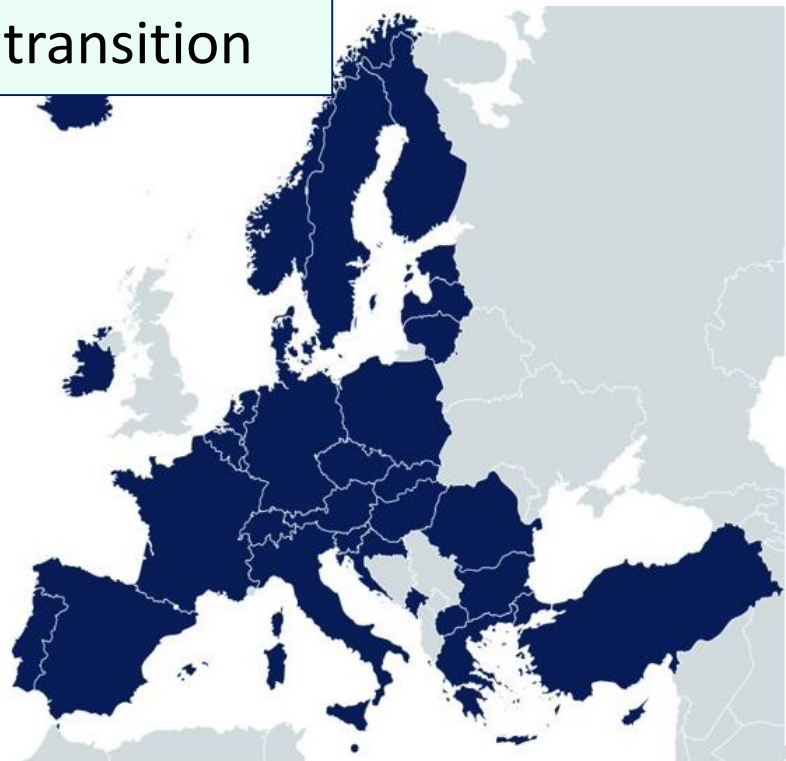
EuroHPC renewed mission

7 B€ expected public and private total investment.

New elements

- Infrastructure - HPC, quantum / Federation – hyperconnected
- Technologies – systems and its supply chain
- Applications – optimised for the systems
- Widening – support climate neutrality and digital leadership transition





Infrastructure - HPC & Quantum

- (pre- and post-) Exascale supercomputers
- Quantum Computing
- Industrial-grade supercomputers

	2019 & 2020	2021	2022	2023	2024	2025	2026	2027
HPC Infrastructure	3 pre-exascale + 5 petascale systems	Several mid-range, pre-exascale and *2* exascale systems				exascale and post-exascale HPC systems		
Quantum Infrastructure	Pilot Quantum simulators interfacing with HPC systems (100+ Quantum units)		QComputer/ QSimulators (NISQ) with Basic HPC integration		QComputer/ QSimulators (NISQ) with Full HPC integration - HPC Accelerators		Prototype QComputers fitted with Error Correction and robust Qbits	

QUANTUM – R&I and INFRASTRUCTURE

R&I

Quantum emulators & Quantum testbed facilities for hardware developers

Quantum application libraries(verification/ validation, algorithms, apps)

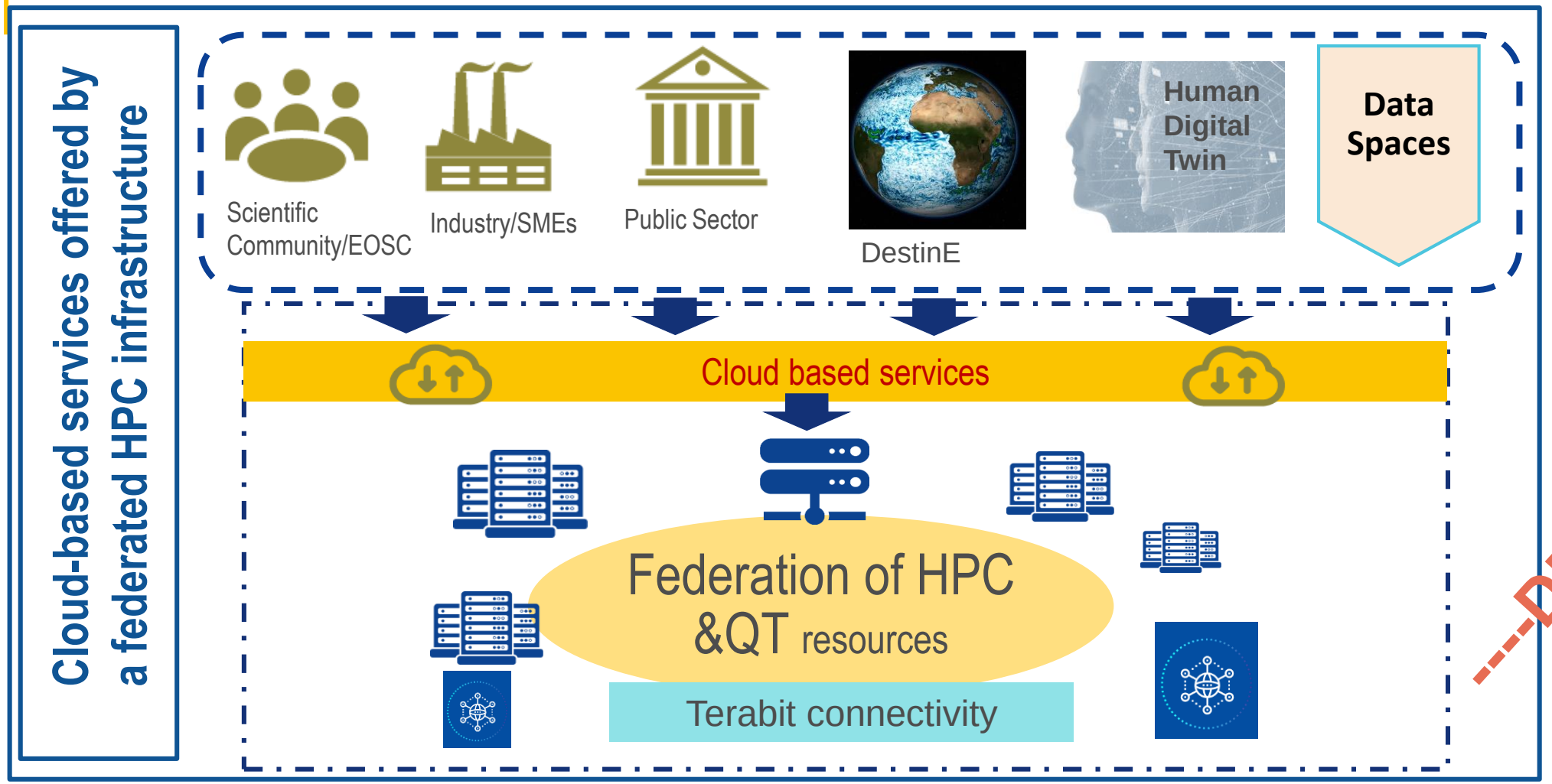
EuroHPC Joint Undertaking

Acquisition and operation

Quantum computation and simulation hardware (NISQ) with Basic and full HPC integration (HPC Accelerators)

Long term: Prototype Quantum Computers fitted with Error Correction and robust Qubits

Federation



---DRAFT---

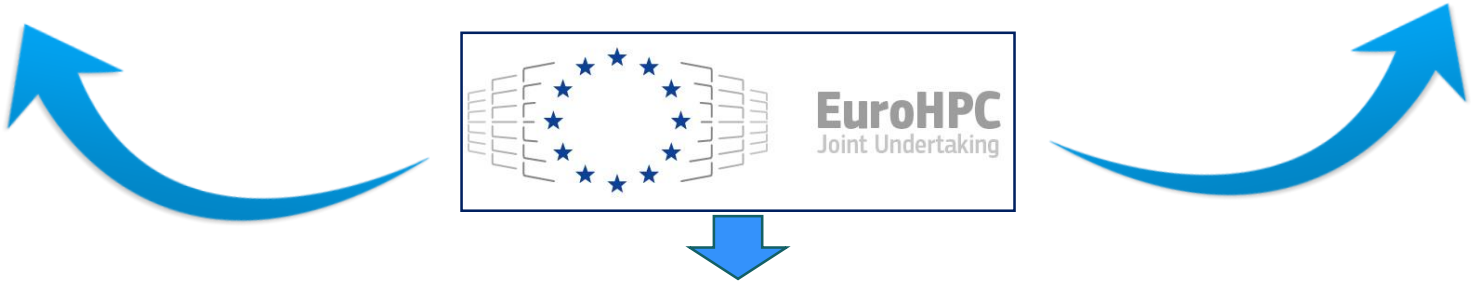
Strengthening the HPC Ecosystem Technologies, Applications, Widening

Technologies for EU's strategic autonomy

- HW and SW and system integration, energy-efficiency
- Low-power (EPI/ARM, RISC-V), OpenSW Stack
- Algorithms, software technologies and tools
- Emerging computing paradigms and interconnection/integration with HPC systems

Applications for Excellence & Leadership

- HPC codes & applications for extreme computing and data (AI, HPDA, cloud, etc.) – Digital twins
- Centres of Excellence in HPC applications
- Code Industrialisation and deployment
- Large-scale HPC-enabled industrial pilots and test-beds



Widening use and skills

- Industrial access and use of HPC infrastructure
- Capabilities and skills in HPC/Quantum/Data
- National Competence Centres
- EU industrial users in HPC

---DRAFT---

European Commission

Thank you!

leonardo.flores@ec.europa.eu