EuroHPC
Joint Undertaking

EuroHPC R&I Programme

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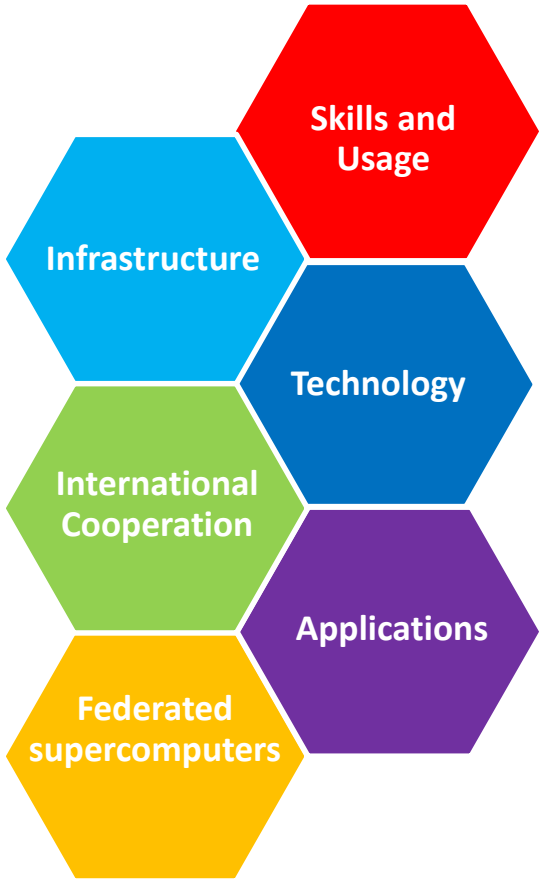
Head of Research & Innovation

The EuroHPC Joint Undertaking

2030 Digital Compass: the European way for the Digital Deca

Mission[1]

- develop, deploy, extend and maintain a **world-leading supercomputing and data infrastructure** in Europe
- support the development of **innovative supercomputing technologies and applications** and a **competitive European supply chain**
- widen the use of **HPC & quantum computer infrastructures** to a large number of public and private users wherever they are located in Europe and support the development of **key HPC skills** for European science and industry



[1]http://data.europa.eu/eli/reg/2021/1173/oj

Funding and operating budget

Co-funded by EuroHPC, Participating States and Private Members

European Union

Digital Europe
1.98 B€
- Infrastructure
- Federation of HPC services
- **Widening usage and skills**

Horizon Europe
900 M€
- **Technology**
- **Applications**
- **International cooperation**

Connecting Europe Facility
200 M€
- Hyperconnectivity
- Data connectivity

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Total investments
1.5 B€ in 2019-2020
7 B€ in 2021-2027

R&I and skills
350 M€ in 2019-2020
≈ 2 B€ in 2021-2027

BDV BIG DATA VALUE ASSOCIATION

QUIC European Quantum Industry Consortium

ETP 4 HPC EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

900 M€ in-kind contributions from 3 Private Members

3 B€ from 33 Participating States

The HPC value chain

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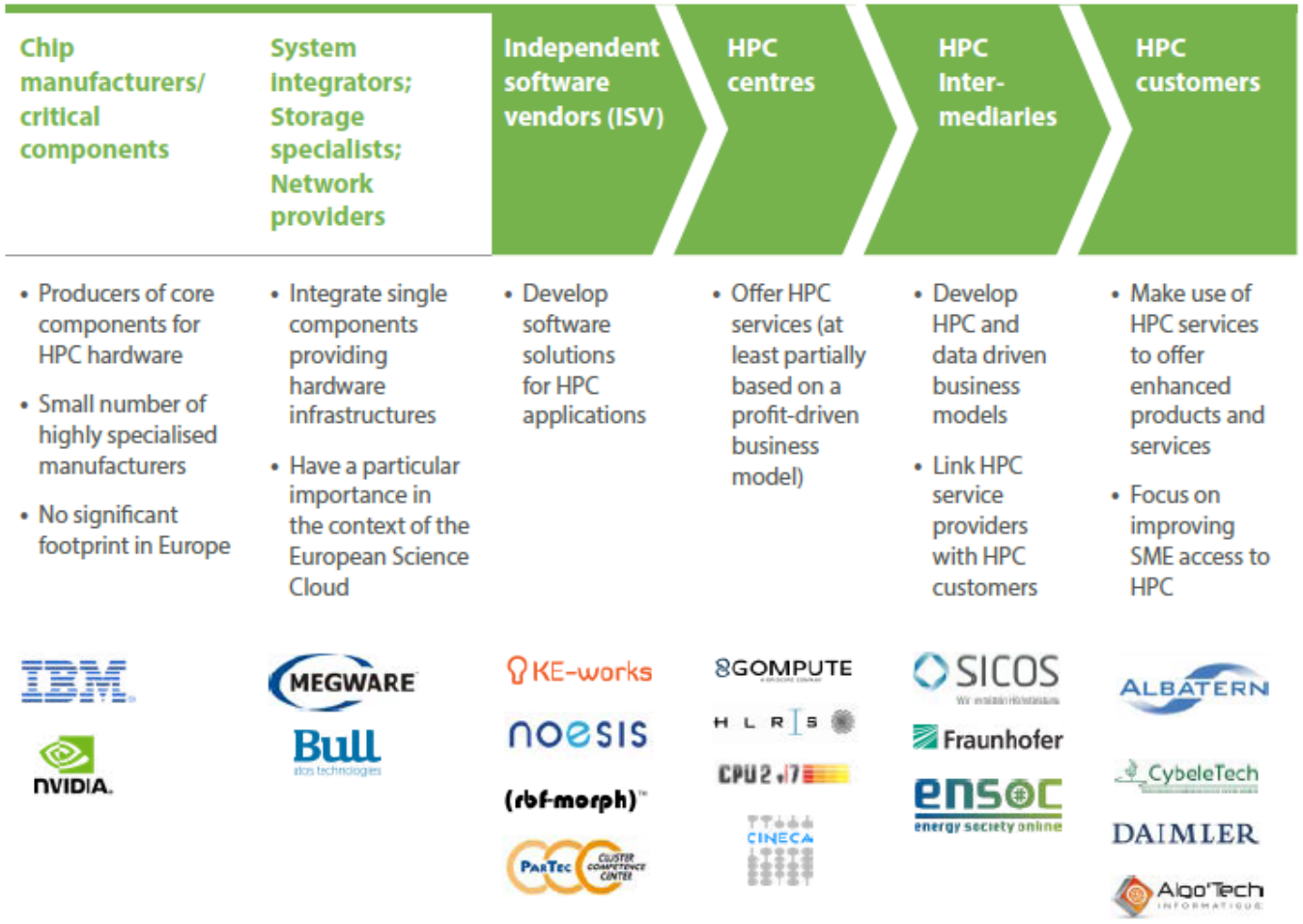


"Financing the future of supercomputing" EIB Advisory Services, 2018

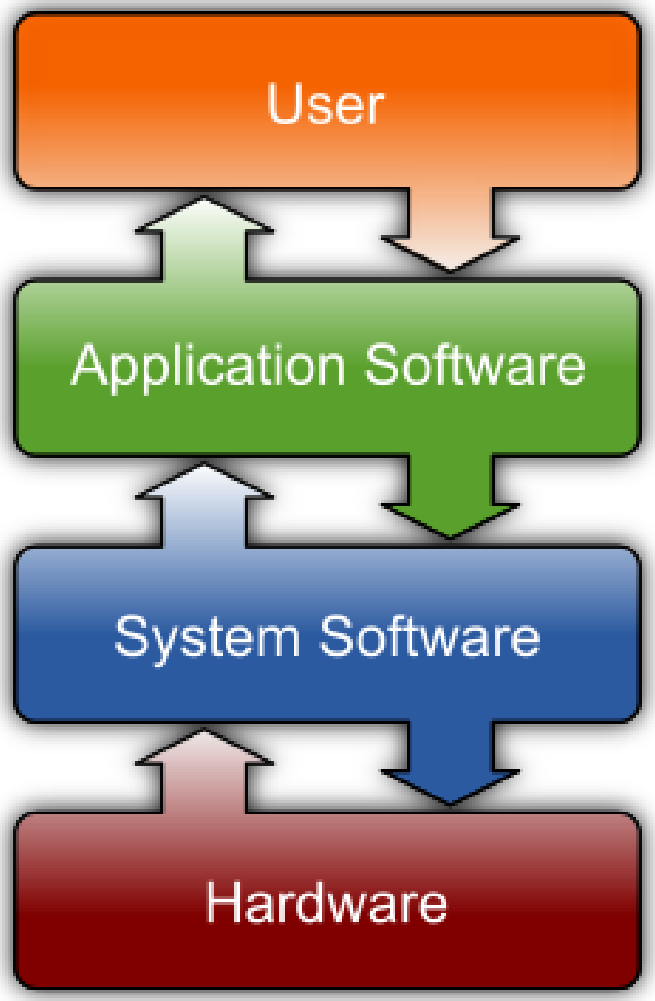
Strategic R&I – intervention areas

Leadership in Use & Skills
Competence Centres and training programmes in HPC commensurate with the labour market

Applications and Algorithms
Centres of Excellence for HPC Applications and new algorithms for European exascale technology

European Software Stack
Software and algorithms, programming models and tools for exascale and post exascale systems

European Open Hardware
Ecosystem for the low power high-end general purpose processor and accelerator



R&I actions in numbers

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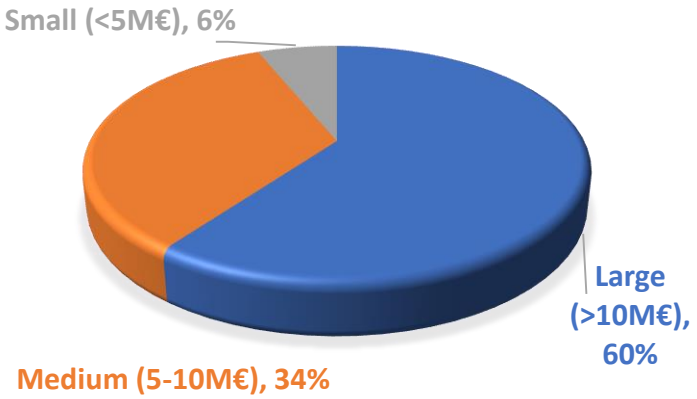
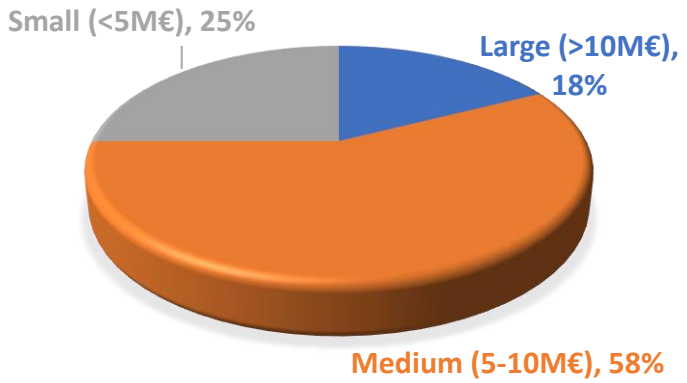
Grant Budget
(>490M € total)



No of Grants
(40 actions funded)



EuroHPC JU pools European resources to fund large strategic projects

- HPC hardware including advanced processors, accelerators, high-speed interconnect
- Software stack including programming models, resource management software, HPC services
- Applications for R&I covering many scientific domains and topics, engineering
- Skills, usage and HPC adoption supported by a pan-European network of Competence Centres

Industrial R&I funded by EuroHPC JU

Industrial software, HPC applications and workflows

LIGATE

LIgand Generator and portable drug discovery platform AT Exascale

Industrial partners

- DOMPE FARMACEUTICI SPA (IT)
- E4 COMPUTER ENGINEERING SPA (IT)
- tofmotion GmbH (AT)

Objective: Implement a computer-aided drug design solution for automated drug discovery

Budget: €5,938,656.25

NextSim

Next generation of industrial aerodynamic simulation code

Industrial partners

- AIRBUS OPERATIONS SAS (FR)
- OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES (FR)
- DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV (DE)

Objective: development of CODA - the new reference flow solver for aerodynamic applications inside AIRBUS group

Budget: €3,998,703.75

ACROSS

HPC Big DAta ArtifiCial intelligence cross Stack PlatfoRm TOwardS ExaScale

Industrial partners

- BULL SAS (FR)
- NEUROPUBLIC AE PLIROFORIKIS & EPIKOINONION (EL)
- GE AVIO SRL (IT)

Objective: Workflows and applications for aeronautics, climate and weather, and energy domains

Budget: €8,815,845.00

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exaFOAM

Exploitation of Exascale Systems for Open-Source Computational Fluid Dynamics by Mainstream Industry

Industrial partners

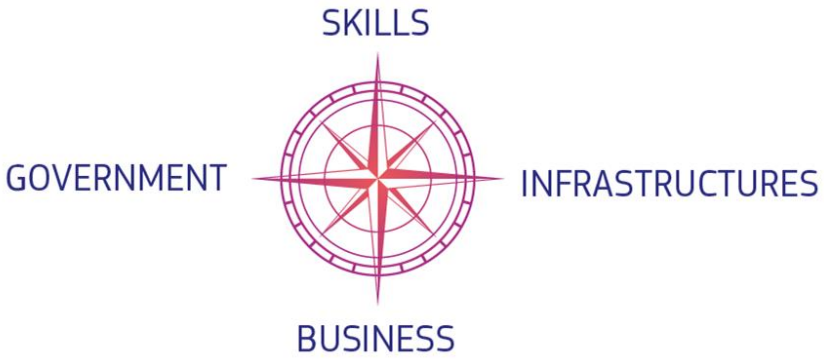
- ESI GROUP (FR)
- E4 COMPUTER ENGINEERING SPA (IT)
- UPSTREAM CFD GMBH

Objective: Improvement of the OpenFOAM software for computational fluid dynamics across the entire processing chain

Budget: €5,425,618.75

Next generation of HPC technology

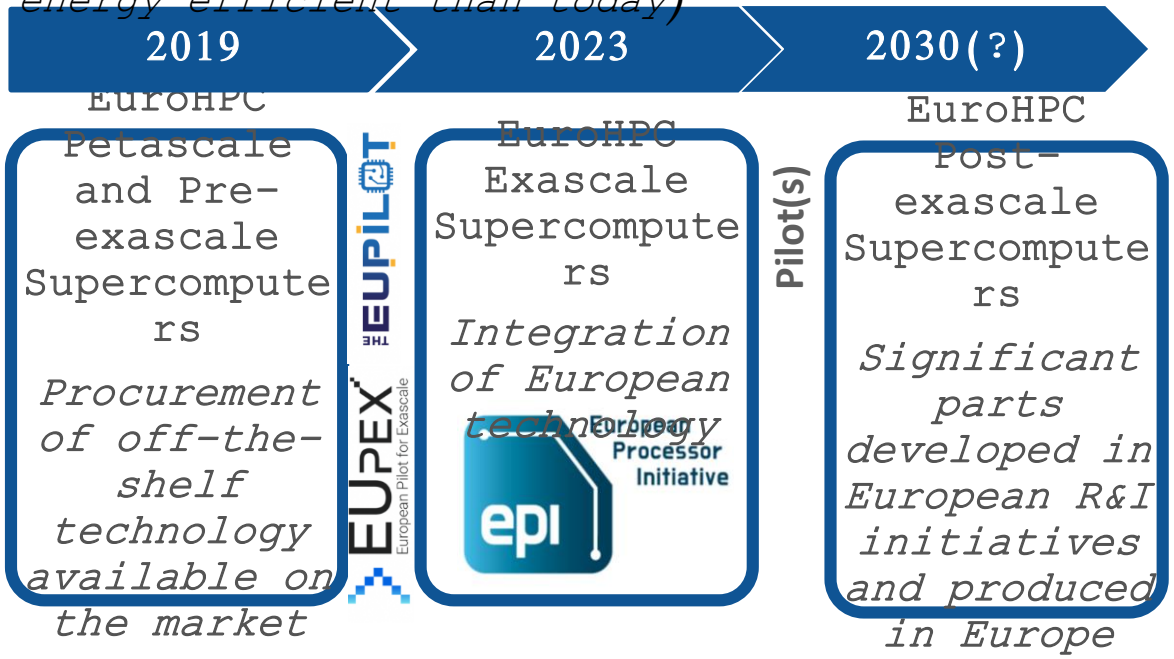
Large-scale European initiative for an HPC ecosystem based on RISC-V



„It is our proposed level of ambition that by 2030

The production of cutting-edge and sustainable semiconductors in Europe including processors is at least 20% of world production in value (meaning manufacturing capacities below 5nm nodes aiming at 2nm and 10 times more energy efficient than today)"

- **Strategic R&I roadmap to design and deliver energy efficient HPC technology**
- **Strong participation of the European HPC and server/cloud supplier industry**
- **Deliver at least one pilot integrating the developed components**



A new generation of HPC algorithms

Innovative algorithms for European exascale supercomputers

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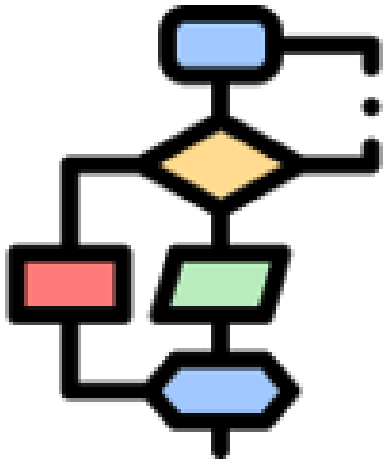
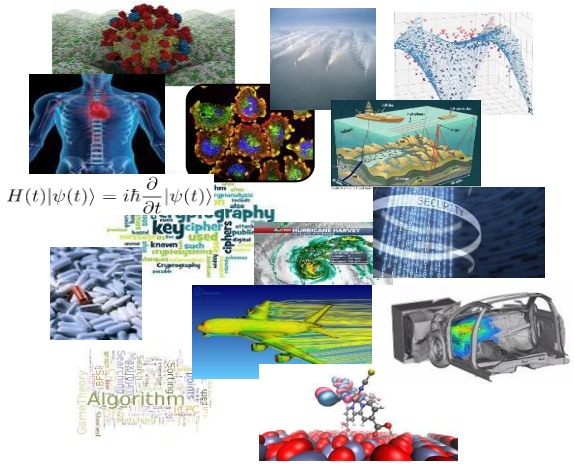
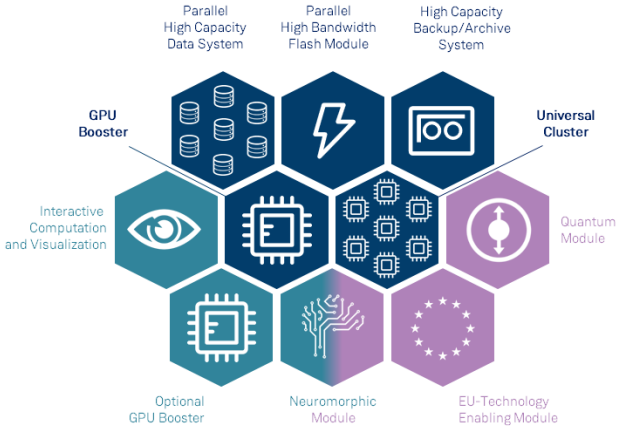


Algorithms

INNO4SCALE



Applications



JÜLICH Forschungszentrum | JÜLICH SUPERCOMPUTING CENTRE

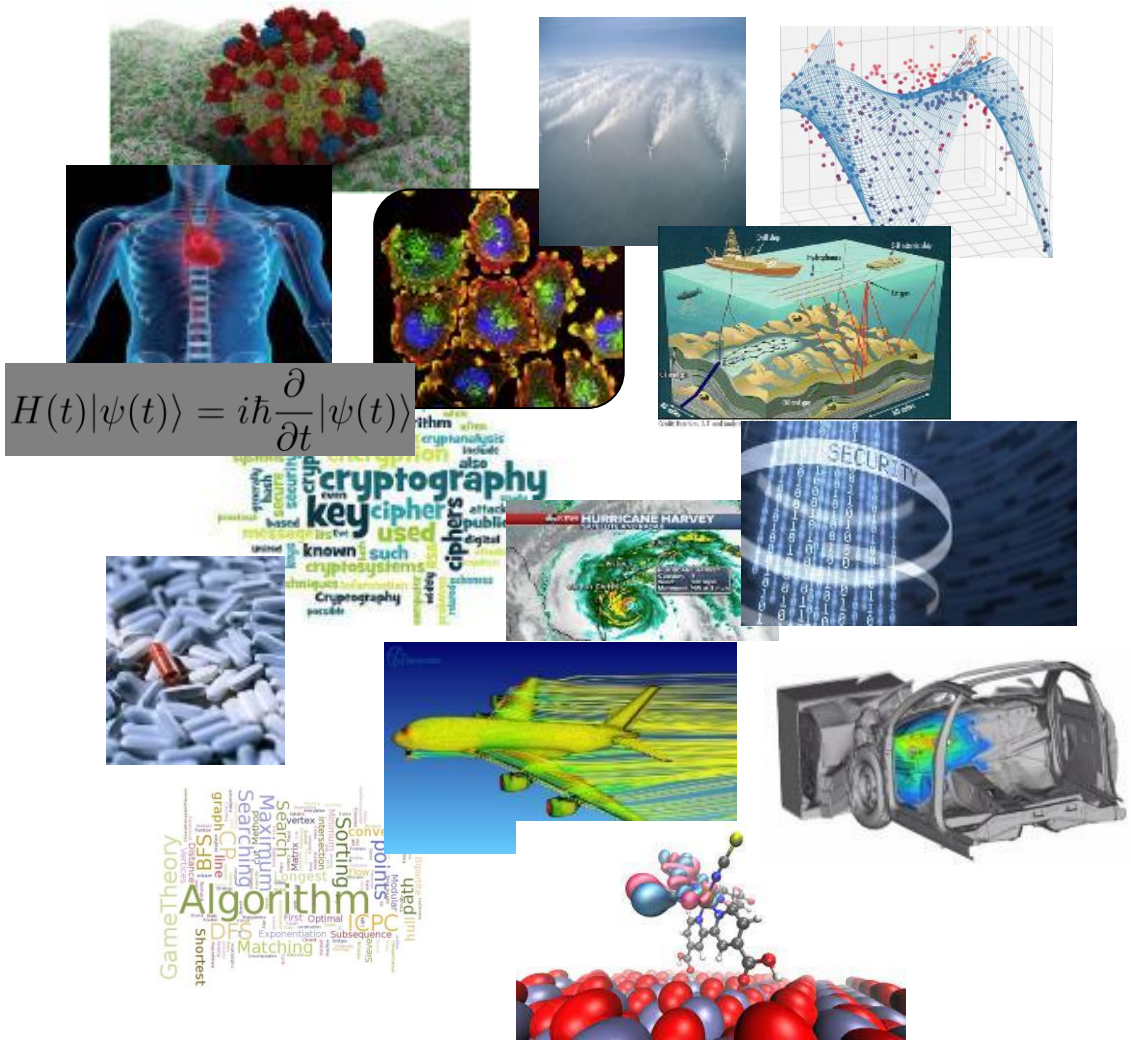
JUPITER THE ARRIVAL OF EXASCALE IN EUROPE

Open call for proposals for proof-of-concept implementations of new algorithms expected in 2023

- Target group — scientists and researchers with an existing concept for a new algorithm
- Bottom-up — open topic, but focused on impact for exascale supercomputing
- Outcome — portfolio of proof-of-concept implementations of new algorithms
- Objective — enable users to solve new problems and optimize resource consumption

Applications

Centres of Excellence for HPC Applications



MaX	Materials / Quantum Chemistry
SPACE	Astrophysics & Cosmology
Plasma-PEPSC	Plasma science
CEEC	Engineering, Aeronautics
ChEESE-2p	Earth Sciences
BioExcel-3	Bioinformatics, biomolecular
EXCELLERAT P2	Multidomain engineering
ESiWACE3	Meteorology and Climate change
HiDALGO2	Multidomain environmental challenges
MultiXscale	Tools for performance, productivity

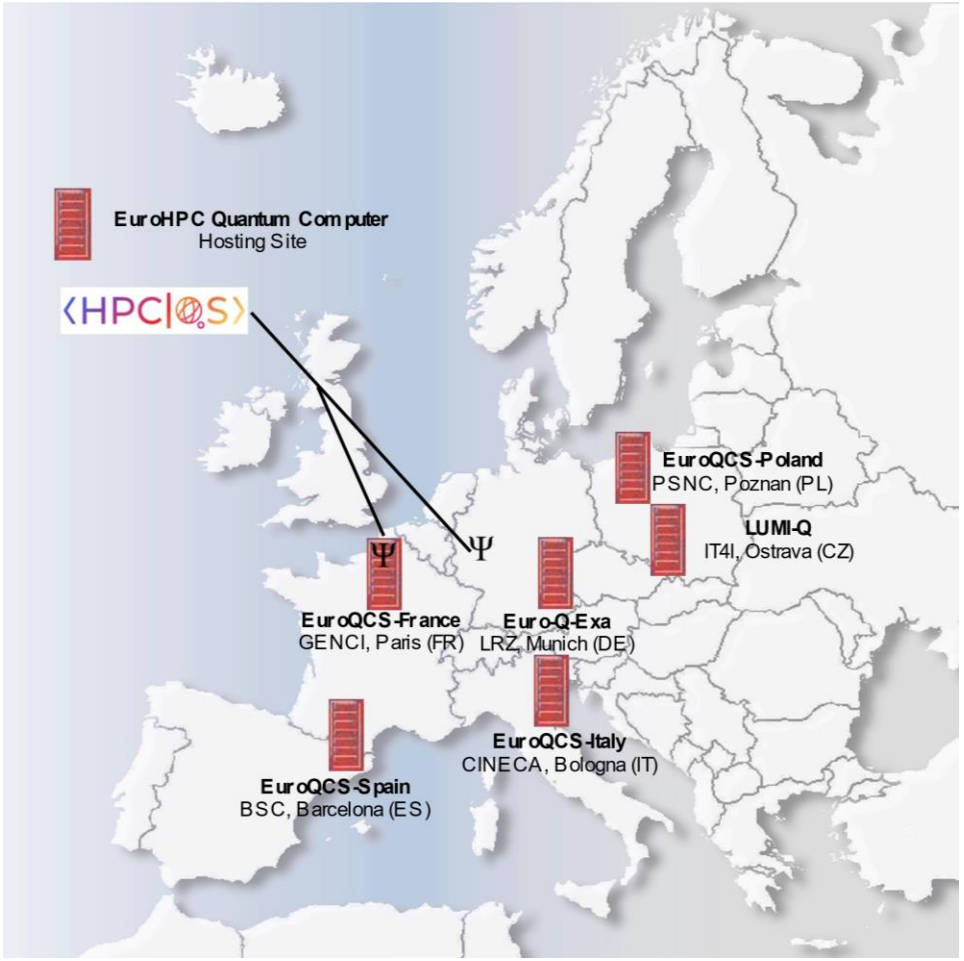
Topics under evaluation

- Personalised Medicine/ Digital twin of the human body
- Human Brain research & neurological disorders
- Optimising energy consumption and supporting the transition to clean energy
- Performance optimization: analysis, tools, services

Quantum computing

R&I objectives and upcoming EuroHPC infrastructure

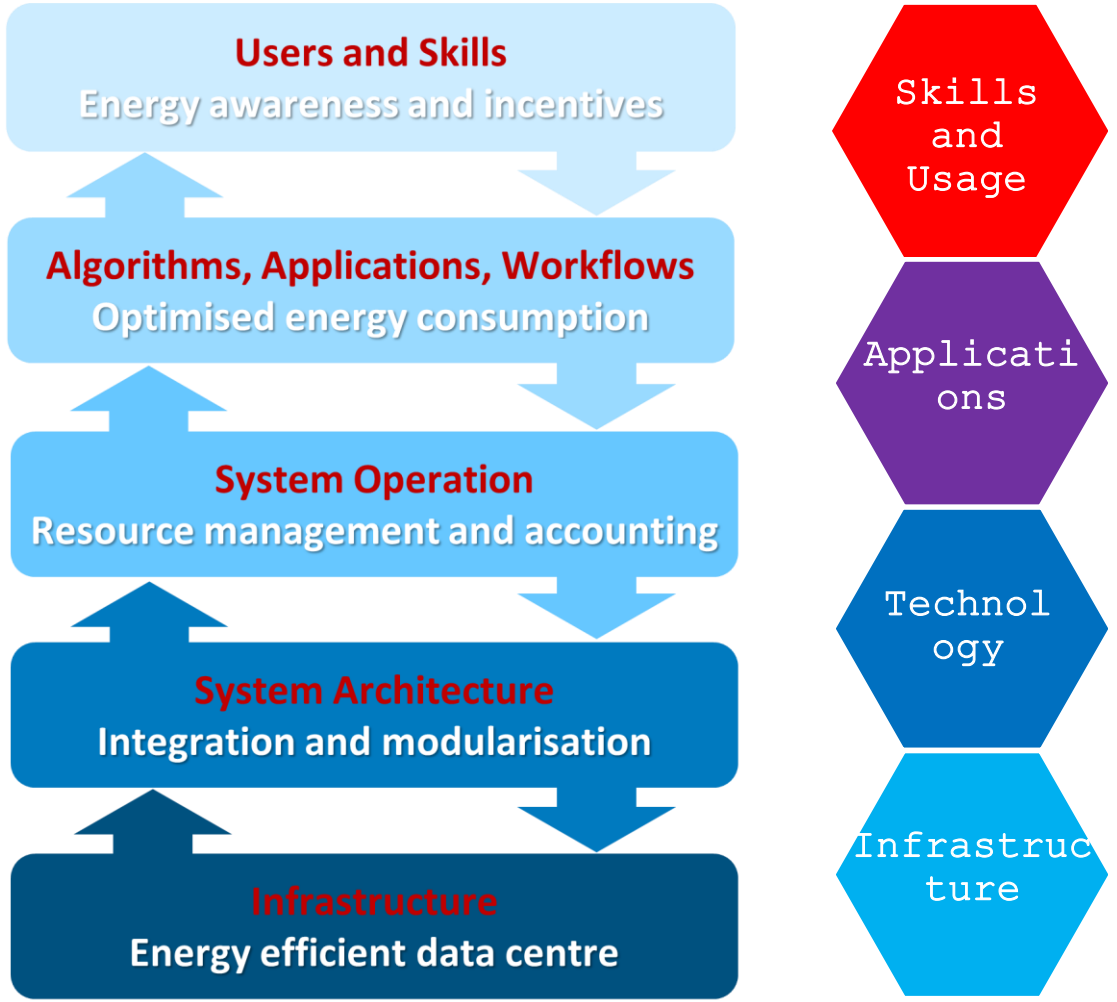
- Integration of QCs in supercomputers hosted at supercomputing centres
- Development of a technology agnostic software stack
- Identification of real use cases with high impact
- Development of HPC-QC algorithms and applications
- Development of meaningful benchmarks
- Promotion of interoperability of QC components and modular design principles
- Standardisation of QC components and interfaces



Energy efficient HPC

R&I for responsible resource consumption and lower carbon footprint

Contribute to the **European Green Deal** and **decrease costs** for HPC operations

- **Energy-to-solution: involves entire value chain from location of infrastructure to user skills**
- **Policies and performance metrics required**
- **R&I activities of JU address the ecosystem from HPC hardware to skills and usage**

Several actions on energy efficiency planned for the EuroHPC JU Annual Work Plan 2023