



EuroHPC JOINT UNDERTAKING

DECISION OF THE GOVERNING BOARD OF THE EuroHPC JOINT UNDERTAKING

No 27/2024

Approving the Consolidated Annual Activity Report 2023 including the corresponding expenditure

THE GOVERNING BOARD OF THE EUROHPC JOINT UNDERTAKING,

Having regard to Council Regulation (EU) 2021/1173 of 13 July 2021 on establishing the European High Performance Computing Joint Undertaking and repealing Regulation (EU) 2018/1488¹, (hereinafter, "the JU Regulation"),

Having regard to the Statutes of the European High Performance Computing Joint Undertaking annexed to the JU Regulation (thereinafter "JU Statutes") and in particular to Articles 7(3)(f) and 19(1) thereof,

Having regard to the Governing Board Decision no 3/2020 approving the Financial Rules of the EuroHPC Joint Undertaking², in particular Article 23 thereof,

WHEREAS

1. In order to comply with the operational and financial reporting obligations laid down in the Statutes, the Executive Director shall submit to the Governing Board for approval the consolidated annual activity report (CAAR) on the

progress made by the EuroHPC Joint Undertaking in the previous calendar year, in particular in relation to the work programme and budget for that year.

2. The Governing Board has carried out an assessment of the consolidated annual activity report 2022 including the corresponding expenditures.

3. During the 39th Governing Board meeting, the Governing Board discussed the following issue and the Governing Board

HAS ADOPTED THIS DECISION:

Article 1

The Consolidated Annual Activity Report 2023 as annexed to this Decision is hereby approved.

Article 2

The Executive Director shall make the Consolidated Annual Activity Report 2023 .

Article 3

This Decision shall enter into force on the date of its adoption.

Done at Luxembourg, on 19 June 2024.

For the Governing Board

Rafal Duczmal

The Chair

Annex 1: Consolidated Annual Activity Report 2023



EuroHPC
Joint Undertaking



CONSOLIDATED ANNUAL ACTIVITY REPORT 2023

**The European High Performance
Joint Undertaking**

Annex to the EuroHPC Governing Board Decision no.27/2024

EUROPEAN HIGH PERFORMANCE COMPUTING JOINT UNDERTAKING (EuroHPC JU)

CONSOLIDATED ANNUAL ACTIVITY REPORT 2023

In accordance with Article 19 of Council Regulation (EU) 2021/1173 of 13 July 2021 and with Article 23 of the Financial Rules of the EuroHPC JU.

The consolidated annual activity report will be made publicly available after its approval by the Governing Board.

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FACTSHEET

NAME OF THE JU	European High Performance Computing Joint Undertaking
OBJECTIVES	<p>Council Regulation (EU) No 2021/1173 of 13 July 2021:</p> <p>The Joint Undertaking shall have the following overall objectives:</p> <ul style="list-style-type: none">(a) to contribute to the implementation of Regulation (EU) 2021/695 and in particular Article 3 thereof, to deliver scientific, economic, environmental, technological and societal impact from the Union’s investments in research and innovation, so as to strengthen the scientific and technological bases of the Union, deliver on the Union strategic priorities and contribute to the realisation of Union objectives and policies, and to contribute to tackling global challenges, including the Sustainable Development Goals by following the principles of the United Nations Agenda 2030 and the Paris Agreement adopted under the United Nations Framework Convention on Climate Change(b) to develop close cooperation and ensure coordination with other European Partnerships, including through joint calls, as well as to seek synergies with relevant activities and programmes at Union, national, and regional level, in particular with those supporting the deployment of innovative solutions, education and regional development, where relevant;(c) to develop, deploy, extend and maintain in the Union an integrated, demand-oriented and user-driven hyper-connected world-class supercomputing and data infrastructure;(d) to federate the hyper-connected supercomputing and data infrastructure and interconnect it with the European data spaces and cloud ecosystem for providing computing and data services to a wide range of public and private users in Europe;(e) to promote scientific excellence and support the uptake and systematic use of research and innovation results generated in the Union;(f) to further develop and support a highly competitive and innovative supercomputing and data ecosystem broadly distributed in Europe contributing to the scientific and digital leadership of the Union, capable of autonomously producing computing technologies and architectures and their integration on leading computing systems, and advanced applications optimised for these systems;(g) to widen the use of supercomputing services and the development of key skills that European science and industry need

LEGAL BASIS	Article 187 of the Treaty on the Functioning of the European Union and <u>Council Regulation (EU) 2021/1173 of 13 July 2021 on establishing the European High Performance Computing Joint Undertaking and repealing Regulation (EU) 2018/1488</u>
EXECUTIVE DIRECTOR	Anders Dam Jensen
GOVERNING BOARD	Chair on 1 January 2023: Dr Herbert Zeisel, elected in October 2021. Mr Rafal Duczmal was elected as new chair of the Governing Board on the 6 of October 2023 for a period of two years. Members: one representative of the EU and each Participating States. ¹
OTHER BODIES	The Industrial and Scientific Advisory Board consists of the Research and Innovation Advisory Group (RIAG) and the Infrastructure Advisory Group (INFRAG) ²
STAFF NUMBER	36 full time employees including the Executive Director as of 31 December 2023. Recruitments ongoing to fill the posts planned for in the Legislative Financial Statement of the Regulation.
TOTAL BUDGET 2023³	Commitment appropriations : EUR 1,136,096,560 Payment appropriations EUR 1,057,793,103
BUDGET IMPLEMENTATION/EXECUTION	Commitment appropriations: EUR 1,136,096,560, consumed 83% <ul style="list-style-type: none"> • Title 1 – EUR 8,173,633, consumed 52% • Title 2 – EUR 4,418,179, consumed 33% • Title 3 – EUR 1,123,504,748, consumed 84% Payment appropriations: EUR 1,057,793,103, consumed 19% <ul style="list-style-type: none"> • Title 1 – EUR 8,351,346, consumed 49% • Title 2 – EUR 4,669,810, consumed 29% • Title 3 – EUR 1,044,771,947, consumed 19%
GRANTS	5 grants were signed in 2023, for a total value of up to EUR 28,995,485.97

¹ See Annex 4 for full list of Governing Board Representatives.

² Cf Annexes 5 and 6 for List of members of the Advisory Groups

³ Total budget includes operational budget (used for funding selected projects) & administrative (used for funding Programme Office activities)

<p>HPC INFRASTRUCTURE PROCUREMENT</p>	<p>The following systems are operational in 2023:</p> <ul style="list-style-type: none"> • Vega, hosted by IZUM in Maribor, Slovenia • MeluXina, hosted by LuxProvide in Bissen, Luxembourg • Discoverer, hosted by consortium Petascale Supercomputer Bulgaria in Sofia, Bulgaria • Karolina, hosted by IT4Innovations in Ostrava, Czech Republic • LUMI, hosted by CSC in Kajaani, Finland • Leonardo, hosted by CINECA in Bologna, Italy <p>The following systems were inaugurated in 2023 and are expected to become fully operational in 2024.</p> <ul style="list-style-type: none"> • Deucalion, hosted by MACC in Guimaraes, Portugal • MareNostrum 5, hosted by Barcelona Supercomputing Center in Spain <p>The following systems are underway:</p> <ul style="list-style-type: none"> • Exascale: Jupiter hosted by JSC, 2nd exascale system hosted by the Jules Vernes Consortium • Midranges: Daedalus hosted by GRNET in Greece; Arhenius hosted by Linkoping University in Sweden and three planned systems in Poland, Hungary and Ireland • Upgrades to Discoverer and Leonardo
<p>QUANTUM COMPUTING INFRASTRUCTURE</p>	<p>Following the selection of six hosting sites in 2022, all six Hosting Agreements were signed on 27/06/2023 with a total indicative acquisition cost of EUR 100,850,000.</p> <p>Two procurements were launched in 2023:</p> <ul style="list-style-type: none"> • EuroQCS-Poland (hosted by PSNC in Poznan) was launched on 09/10/2023 with a budget envelope of EUR 12,295,000 • Euro-Q-Exa (hosted by LRZ in Munich, Germany) which was launched on 22/11/2023 with a foreseen budget envelope of EUR 42,000,000. <p>All outstanding procurements will be launched in 2024.</p>
<p>RIAG STRATEGIC RESEARCH & INNOVATION AGENDA</p>	<p>EuroHPC RIAG Strategic Agenda 2019 0.pdf (europa.eu)</p>
<p>INFRAG MULTIANNUAL STRATEGIC AGENDA</p>	<p>Multiannual Strategic Agenda (europa.eu)</p>

<p style="text-align: center;">MASP MULTIANNUAL STRATEGIC PLAN</p>	<p>EuroHPC Decision 24_2021_MASP 2021-2027.docx (europa.eu)</p> <p>The MASP was developed during 2021 and adopted by the Governing Board in September 2021.</p> <p>An updated MASP was approved in 2023: EuroHPC JU Decision No 8/2023 - Approving the Multi-Annual Strategic Programme 2021-2027 (version 2023) (europa.eu)</p> <p>A second amendment to the MASP was proposed by the JU's Advisory Groups (RIAG and INFRAG) at the end of 2023 and approved in 2024: EuroHPC JU Decision No 09/2024 Amending the Joint Undertaking's Multi-Annual Strategic Plan 2021- 2027 (Amendment no. 2)</p>
<p style="text-align: center;">CALL IMPLEMENTATION</p>	<p>Number of calls launched in 2023: 8 Number of proposals submitted: 22 Number of eligible proposals: 12 Number of proposals granted: 9</p>
<p style="text-align: center;">PARTICIPATION, INCLUDING SMES</p>	<p>Total number of beneficiaries in funded projects:</p> <ul style="list-style-type: none"> • 11.54% of SMEs and 3.56 % of EU funding received by those SMEs • 6.15% of private for profit/large companies and 2.26 % of EU funding received by those companies • 11% of non-EU non-associated members' entities (openness) • 33% of newcomer entities

FOREWORD

It is with great pride that I present the 2023 Consolidated Annual Activity Report for the European High Performance Computing Joint Undertaking (EuroHPC JU).

In 2023, the EuroHPC JU celebrated the realisation of the first generation of EuroHPC supercomputers. With eight supercomputers now operational and ranked among the fastest in the world. We also approaching the halfway mark of the current funding period and we are now well-positioned to support European science and innovation in HPC technologies, applications and software.

Alongside the deployment of what is well and truly a world-class HPC infrastructure, we have also made significant strides in quantum computing. We are fulfilling our commitment to providing European users to some of the most innovative computing systems in the world, and providing them with a variety of architectures and technology on which to test new applications.

Interest in accessing EuroHPC systems has increased significantly with a total of 163 projects submissions under the Regular and Extreme Scale Access calls. In total, over 2,2 billion core hours of computational capacity was awarded to 96 successful projects in various scientific domains in 2023.

As you will read, we are continuing meet our commitments to support and uphold European excellence in application development for our future exascale systems, through our additional Centres of Excellences, and we have launched numerous initiatives in training and skills to build up European competence in HPC.

Our achievements in 2023 would not have been possible without the unwavering support and dedication of several key stakeholders and of course, the entire EuroHPC JU team, whose commitment and expertise have been instrumental in driving our progress.

I wish to thank our Governing Board for their favourable opinion of this Report and their ongoing guidance and support.

I would also like to express our sincere appreciation to the European Commission for its continuous support and collaboration and to the European Court of Auditors for their wise counsel in the start-up phase of the JU.

As we look ahead, we remain committed to delivering on our objectives and supporting European users and researchers with cutting-edge solutions to drive scientific discovery and technological innovation in HPC. Together, we will continue to build on our successes and pave the way for a brighter, more technologically advanced future for Europe.

Sincerely,

A handwritten signature in blue ink, consisting of several loops and a long tail, positioned below the word 'Sincerely,'.

*Anders Dam Jensen
Executive Director
EuroHPC JU*

EXECUTIVE SUMMARY

In 2023, the European High Performance Computing Joint Undertaking (EuroHPC JU) was in its 3rd full year of operation since its autonomy in September 2020.

After 3 years of operation, EuroHPC JU reached a key milestone: the realisation of the first generation of EuroHPC supercomputers. With eight supercomputers, powered up, operational and ranked among the fastest in the world and ready to serve European science and innovation, the EuroHPC JU is delivering on its mission to lead the way in European supercomputing.

With its third pre-exascale supercomputer (MN5) and fifth petascale supercomputer (Deucalion) inaugurated, the EuroHPC's global standing and recognition continue to improve. In November 2023, MareNostrum 5 entered the [TOP500 list](#) of the most powerful supercomputers in the world and was placed in 8th position. LUMI and Leonardo also remained ranked in the global Top 10, holding fifth and sixth place, respectively.

As well as delivering on the first wave of EuroHPC procurements, many new systems, both supercomputers and quantum are next to come online. Following the selection of a hosting entity to host the first EuroHPC exascale supercomputer in December 2022, the procurement procedure for JUPITER was launched in January 2023 and finalised in October 2023. The Governing Board of the EuroHPC JU also approved the choice of the Jules Verne consortium to host and operate the second exascale supercomputer, which will be located in France. The Governing Board selected Linköping University in Sweden as the Hosting Entity for Arrhenius, a new EuroHPC mid-range supercomputer.

The EuroHPC JU signed hosting agreements with the six Hosting Entities that will host the EuroHPC Quantum Computers (LUMIQ CZ, EUROQCS France, Euro-QExa Germany, EuroQCS Italy, EuroQCS Poland and EuroQCS Spain), and procurements were launched for the Polish quantum computer Euro-QCS-Poland, and the German quantum computer Euro-Q-Exa already in 2023.

The JU launched actions to support the development of HPC applications and uptake of HPC by new user communities. Most notably, ten Centres of Excellence for HPC Applications are operational and will support the development and adaptation of HPC applications for exascale computing. The applications will enable research in climate and weather, drug development, astrophysics and engineering. EuroHPC JU has also launched an initiative to operate a European network of national HPC competence centres. The competence centres will coordinate HPC expertise at national level and ease access to European HPC resources for SMEs, researchers, public administrations and industry.

The EuroHPC JU continued to establish itself within the European and international HPC communities. In March 2023, the EuroHPC hosted the first EuroHPC Summit organised fully by the JU. The Summit took place in Gothenburg in Sweden and was attended by over 500 participants from the HPC community, including researchers, vendors, students and representatives of the supercomputing centres and policy makers.

The EuroHPC JU team also continued to grow. By the end of 2023, it had 36 staff in post and 3 interim agents supporting the work of the JU. The JU has developed financial processes to manage procurements, R&I actions / projects, reporting of in-kind contributions (IKOP). Relations with other JUs have been excellent and the JU is now getting its accountancy services thanks to the successful Back-Office Arrangement (BOA) with EU-RAIL JU.

OPERATIONAL ACHIEVEMENTS

Operational EuroHPC Systems in 2023

In 2023, the following supercomputers were operational: Leonardo, LUMI, Vega, MeluXina, Karolina, and Discoverer.

Mare Nostrum 5 and Deucalion were in the pre-production stage in the second half of 2023 and were both inaugurated at the end of 2023.

All operational EuroHPC systems were ranked in the June and November editions of the TOP500 list.



NOV 2023	TOP500	Green500
LUMI	#5	#7
LEONARDO	#6	#18
MARENOSTRUM 5	#8	#6
MELUXINA	#71	#27
KAROLINA	#113	#25
DISCOVERER	#166	#258
VEGA	#198	#278

Source: [November 2023 | TOP500](#)

LUMI and Leonardo remained highly ranked among the world's most powerful supercomputers, sitting in fifth and sixth place. MareNostrum 5 entered the list for the first time at eighth place, making it the third Top10 EuroHPC system, while also receiving an impressive sixth place ranking on the Green500 list, making it the greenest supercomputer in Europe.

All operational EuroHPC systems ranked among the world's most powerful & energy efficient supercomputers and are accessible to users located in the European Union.

Access to EuroHPC Systems in 2023

In 2023, the JU organised a number of calls in order to provide European scientists and SMEs with access to the computing resources of the EuroHPC JU for large-scale European projects that have important needs in terms of compute time, data storage, and support resources. In 2023, 91 scientific projects were awarded in the fields of Biochemistry, Bioinformatics, Life Sciences, Physiology and Medicine, Chemical Sciences and Materials, Solid State Physics, Computational Physics: Universe Sciences, Fundamental Constituents of Matter and Engineering, Mathematics and Computer Sciences. From 2023 cut-offs of both Regular and Extreme Scale Access calls, 63 proposals are still under evaluation and will be awarded during 2024.

In 2023, almost 2 billion core hours of computing time were allocated to projects for Regular and Extreme Scale access.

Procurements

The final stages of the installation of MareNostrum 5 is ongoing. Phases 1, 2 and 3 are expected to be completed in Q1 2024. Phase 4 acceptance is expected by the end of 2024. For Deucalion, the first (ARM) partition has been accepted in December 2023. The acceptance of second and last partition (x86) is expected to be completed in March 2024. Leonardo partitions have also been accepted and are now operational, and final system acceptance is planned for June 2024. With the above, all 8 supercomputers purchased in the first round of EuroHPC procurements under Reg. 2018/1488 will be accepted and all systems will be operational and available to European Researchers.

The procurement process for JUPITER, the first EuroHPC exascale system, was launched in January 2023, and the procurement contract was signed with the selected vendor in October 2023.

Following a call launched in December 2022 to identify Hosting Entities for a second exascale supercomputer and one additional mid-range system, the EuroHPC Governing Board selected the Jules Verne consortium to host and operate the next exascale supercomputer in France. The Governing Board also selected Linköping University in Sweden to host an additional mid-range HPC system.

In October 2023, a procurement call was launched for hardware and software to upgrade Discoverer with increased storage, a GPU partition, and an additional Uninterruptible Power Supply (UPS).

The EuroHPC JU also launched a call for tender for the deployment and operation of a platform for federating European HPC resources.

The hosting agreements for six quantum computers to be located in Czechia, France, Germany, Italy, Poland and Spain were signed in June 2023. Thereafter the EuroHPC JU launched the procurements for the German and Polish quantum computers at the end of 2023. The remaining procurements are in preparation and will be launched in 2024.

In December 2023, the EuroHPC JU launched a new call for expression of interest to identify hosting entities for acquisition, integration and operation of additional quantum computers.

R&I Activities: Grant Agreements in 2023

2023 kicked off with the launch of EuroCC 2 and CASTIEL 2 on 1 January. The two linked projects work to coordinate cooperation across Europe to ensure a consistent skills base and build on the achievements of EuroCC and Castiel to further support to European HPC ecosystem.

EuroCC 2 establishes and runs a network 32 National Competence Centres (NCCs), which act as single points of access in each country between stakeholders and national and European

systems. The competence centres will coordinate HPC expertise locally and promote the use EuroHPC systems for research, SMEs, industry and the public sector.

CASTIEL 2 promotes interaction and exchange across the NCC network, to encourage collaboration as well as exchanges of knowledge, expertise and best practices between NCCs. This next phase of the project gives CASTIEL 2 the additional role of providing similar coordination support to the new EuroHPC-funded Centres of Excellence (CoEs).

Ten new Centres of Excellence (CoEs) for HPC Applications were launched in January 2023 to support the development and adaptation of HPC applications for exascale and post-exascale computing. The role of the CoEs is to gather HPC software development expertise for a particular sector or domain at European level.

To support the full exploitation of exascale and post-exascale supercomputers, EuroHPC launched the Inno4scale project in 2023. The consortium will finance the development of novel algorithms which demonstrate potential to address the exascale challenge in HPC applications.

New Calls Launched in 2023

Twelve new Research & Innovation calls were launched throughout 2023.

Two calls for additional Centres of Excellence were launched to cover the development of additional HPC applications for exascale and post-exascale computing not already covered in former calls.

The JU also launched a call for the development of quantum computing applications.

Three calls focused on training and education, targeting the development of a EuroHPC Training Platform and International HPC Summer School, the provision of Traineeships in Hosting Entities, CoEs, NCCs, SMEs and Industry, and the establishment of the EuroHPC Virtual Training Academy.

In line with the European Commission's Japan-EU Digital Partnership, the EuroHPC JU launched a call to strengthen cooperation in the field of HPC and facilitate access to resources between the EU and Japan.

A call was also launched to support the competitiveness and innovation potential of SMEs which supports the uptake of HPC to address business challenges.

The EuroHPC JU launched a call to support a Framework Partnership Agreement (FPA) with a consortium of industry, research organisations and HPC institutions to develop an innovative HPC ecosystem based on RISC-V.

The JU also launched a call to support innovation in low latency and high bandwidth interconnects, to develop innovative and competitive European HPC inter-node interconnect technology, to efficiently exploit exascale and post-exascale capabilities.

A call was launched to develop energy efficient HPC software tailored to exascale and post-exascale supercomputers, to address challenges associated with the energy efficient and energy constraint operation of heterogeneous and modular HPC systems. The main outcomes of the project funded under this call is a software stack including dynamic workload management and operational data analytics that will significantly improve improved energy efficiency of supercomputers at increased overall throughput and time to solution.

In November, the EuroHPC JU launched a call to establish a European support centre to assist European AI users in fully leveraging the innovation potential of supercomputers for advanced AI applications. In particular, the AI support centre will train and enable European AI communities to benefit from the use of advanced HPC capabilities for large-scale AI models. It will enable users and developers to scale up AI workflows using state of the art supercomputing resources, resulting in the development of complex models with significant impact in Europe such as foundation models for generative AI.

ADMINISTRATIVE UPDATE

Financial Reporting to Operational Activities

In 2023 EuroHPC JU continued to improve the mandatory reporting process regarding the contributions of Participating States and the IKOP reporting by Private Members on their contribution made to the JU's activities. Private Members reported estimated IKOP for 29 projects (estimated at EUR 3.9 M for 2023 - thus a total of EUR 14.9 M) for R&I indirect actions under the Horizon 2020 programme.

Moreover, 2023 was the first year that the private members reported an estimated IKOP for 13 projects under the Horizon Europe and Digital Europe Programmes after the [Corrigendum of the regulation 2021/1173](#) that was approved in April 2023. The estimated reported amount is EUR 526,000.

In compliance with our regulation the Participating States have reported estimated IKOP of EUR 13.7 M for 2023, thus a total of EUR 51.7 M for the operating costs incurred by the Hosting Entities.

Back Office Arrangement

EuroHPC JU Governing Board agreed that EuroHPC JU could, if appropriate⁴, engage in Back Office Arrangement (BOA) agreements with its sister JUs. In 2022, EuroHPC JU agreed to join the BOA Accountancy Services which is being provided by EU-RAIL JU. We also have established IT and Data Protection Arrangements in 2023.

⁴ As EuroHPC JU is not a part of the Single Basic Act regulation, it may decide to participate to BOA activities on case-by-case basis.

Budget and Budget Implementation

The EuroHPC JU budget revenue according to the final voted budget for 2023 was EUR 582 M. The cashed amount in 2023 is EUR 570 M.

The financial contributions made by the Participating to the procurements done by the JU were recovered from the Hosting Entities. The JU has recovered EUR 93.4 M, in line with the amounts indicated in the Administrative Agreements, from the following hosting entities:

- FCT – Deucalion Consortium (Petascale),
- CSC – LUMI Consortium and Czech Republic (Pre-Exascale),
- LUMI Q (Quantum),
- FJZ – JUPITER Consortium (high-end-exascale).

The EU contribution for the 3 funding programmes (DEP, HE and CEF2) and the legacy H2020 (Reg. 2018/1488) amounts to EUR 488 M for 2023.

IMPLEMENTATION OF THE ANNUAL WORK PROGRAMME 2023



The Joint Undertaking has continued to implement the objectives as set out by the EuroHPC JU's Regulation, which focuses on six pillars of activity:

- Infrastructure Pillar
- Federation of Supercomputing Services Pillar
- Technology Pillar
- Application Pillar
- Widening Usage and Skills Pillar
- International Cooperation Pillar

The priorities for 2023 included finalising procurements of HPC systems procured under Horizon 2020, launching new HPC and quantum infrastructure and hyperconnectivity procurements funded by DEP, as well as launching R&I calls that would support the development of new technologies, applications and support for users.

New activities related to Artificial Intelligence and HPC were added to the EuroHPC JU's Work Programme at the end of 2023, following the announcement from the President of the European Commission, Ursula Von der Leyen in her State of the Union speech in September 2023.

As more supercomputers have come online, the JU has started to focus on current and potential users of EuroHPC systems and on the research being undertaken on the systems. This work was showcased at the User Day 2023, an event organised by EuroHPC, which took place in Brussels in December 2023. Projects such as Destination Earth are already having an impact weather and climate prediction.

1.1. KEY OBJECTIVES 2023, ASSOCIATED RISKS AND CORRECTIVE MEASURES

The EuroHPC JU's key objectives for the year 2023 were established in the Annual Work Programme 2023 approved by the Governing Board. The 2023 Work Programme was amended seven times throughout the year by the Governing Board. This was done to ensure that EuroHPC JU's Work Programme remained fully updated and in line with the evolving landscape of the HPC industry and the European Union's priorities. The amendments included new activities such as an Artificial Intelligence support centre and updated activities such as the RISC-V FPA call, three training calls, a new call for Centres of Excellence and a call for international cooperation with India. Almost all actions proposed in the Work Programme 2023 were launched.

The other main objective was to continue to implement activities, projects and procurements launched, but not finalised since the JU's autonomy in September 2020 and, in particular, since the adoption of Regulation 2021/1173, and the consequent late approval of Work Programmes 2021 and 2022.

The JU focused on planning for 2024 and the Governing Board asked the two Advisory Groups – INFRAG and RIAG – to review and update the Multi-Annual Work Programme (MASP) to ensure it included the latest technological developments. The input that was provided was integrated into the Annual Work Programme 2024.

Key Objectives of Pillars in 2023

In 2023, the following objectives were established at operational level for the Infrastructure Pillar:

- The completion of a procurement procedure for the acquisition and operation of the first EuroHPC high-end (exascale) supercomputer to be located in Germany,
- Ongoing work to prepare for the acquisition and operation of the second eurohpc high-end supercomputer to be located in France,
- Ongoing work to prepare for the acquisition of midrange supercomputers,
- The signature of the hosting agreements of six European quantum computers integrated in EuroHPC supercomputers and ongoing work to prepare for the procurements of these quantum computers
- Ongoing work to prepare the procurements to upgrade two EuroHPC supercomputers in Italy and in Bulgaria,
- The preparation for launch a Call for Expression of interest to host an industrial high-performance computer.

Access to EuroHPC JU the supercomputers was fully deployed and [calls](#) were opened to allow researchers, SMEs, the public sector and industry to access computing time on the supercomputers. The EuroHPC JU Peer-Review team now fully manages the evaluation process to select the best projects. The EuroHPC JU would like to thank PRACE for their

invaluable support to make this possible. In addition, the Governing Board approved an updated Access Policy to ensure it could assess AI applications

A procurement for a contractor to provide IT support for the EuroHPC Access Platform was also launched.

The objectives defined under the Federation of Supercomputing Services Pillar included the selection of a distributed European-wide high-performance computing application support service, the launch of a procurement for a platform for federating resources (including High Performance Computing, quantum computing and data resources) providing Union-wide, cloud-based secure services for a wide range of public and private users across Europe, and a procurement of a study for hyper-connectivity for HPC resources was completed and a service provider was contracted to undertake the work.

The objectives related to the Technology (Research & Innovation) Pillar included the call on the Framework Partnership Agreement (FPA) for developing a large-scale European initiative for High Performance Computing (HPC) ecosystem based on RISC-V, which was evaluated in 2023.

For the International Cooperation Pillar, the objective was to continue to work with international partners. The JU finalised the project for cooperation with Japan and a call was prepared to develop a collaboration in HPC with India to support the implementation of the India-EU Digital Partnership and strengthen cooperation with Japan in the field of HPC.

Concerning the Applications and Skills Pillars, the objectives were to prepare for Exascale with the adoption of two calls on Centres of Excellence for HPC applications, preparing applications in the exascale era, a call to promote energy-efficient applications and technologies and a call to develop quantum applications. The JU continued to focus on skills and launched a call to develop an HPC Virtual Academy that could develop HPC training schemes.

A risk assessment exercise was carried out at entity level and risks were identified for the mentioned objectives. Specific corrective measures were implemented. The main associated risks in 2023 were:

The general geopolitical situation has impacted energy prices which affects the operation of HPC system and caused general supply issues linked to disrupted distribution routes.

The delivery of these ambitious objectives with a growing team of human resources/full-time equivalents (FTEs).

Finally, the ongoing post-COVID economic situation has meant that national budgets are stretched and as a consequence, expected national contributions have not been confirmed in all cases. In addition, difficulties in implementing RRF funds to avoid double funding have slowed down some of EuroHPC JUs activities.

Activities in the Work Programme 2023 were mostly implemented except for the third call for expression of interest on mid-range high performance computers, the quantum prize and experimental platform for European technologies.

At the end of 2023, the Governing Board decided that these calls would be reviewed in 2024.

In 2023, the JU met the Key Performance Indicator (KPI)⁵ ‘Number of EuroHPC systems installed in the EU ranking among the top 10 in the world’ in 2023 by having three supercomputers in the top 10 of the [TOP500](#). As indicated in the other parts of this Report, they are LUMI, Leonardo and MareNostrum 5 which all rank in the Top 10 of the most powerful supercomputers in the world.

The JU is working to meet the following target which is that ‘the Union has, by 2025, its first computer with quantum acceleration’, paving the way for the Union to be at the cutting edge of quantum capabilities by 2030.^{6 7}

In 2023, as already indicated, the JU signed hosting agreements with six hosting entities to accommodate six quantum computers which will be procured in 2023/2024. Two procurements were launched in 2023:

- The procurement for EuroQCS-Poland, to be hosted by PSNC in Poznan, was launched in October 2023 to procure a digital, gate-based quantum computer offering 20-plus physical qubits.
- The procurement for Euro-Q-Exa, to be hosted by LRZ in Munich, Germany, was launched in November 2023. This quantum system will be a digital quantum computer based on superconducting qubits and state-of-the-art entangling capabilities that will offer 50 physical qubits in a first stage and at least 100 qubits in a second stage.

1.2. RESEARCH & INNOVATION ACTIVITIES

1.2.1. Calls for Proposals Launched in 2023

Under Regulation 2021/1173, Research & Innovation activities in 2023 focused on the following calls:

HORIZON-EUROHPC-JU-2023-COE-01-01	2023
HORIZON-EUROHPC-JU-2023-INTER-02	2023
DIGITAL-EUROHPC-JU-2023-SME-01	2023
HORIZON-EUROHPC-JU-2023-COE-01-03	2023
DIGITAL-EUROHPC-JU-2023-ACADEMY-02	2023
HORIZON-EUROHPC-JU-2023-ENERGY-04	2023
HORIZON-EUROHPC-JU-2023-QEC-05	2023

⁵ Strategic plan 2020-2024 – DG Communications Networks, Content and Technology - Ares (2020) 4565545 02/09/2020

⁶ Communication on 2030 Digital Compass: The European wWy for the Digital Decade: COM (2021) 118 final

⁷ Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030

DIGITAL-EUROHPC-JU-2023-AISC-03	2023
HORIZON-EUROHPC-JU-2023-INCO-06	2023
HORIZON-EUROHPC-JU-2023-PCP-07	2023

- Call [HORIZON-EUROHPC-JU-2023-COE-01](#) focused on Centres of Excellence. The Centres of excellence are responsible for the development of HPC applications for exascale and post-exascale computing in specific scientific domains. EuroHPC JU launched this call to close gaps in the portfolio of scientific domains: Personalised Medicine/ Digital twin of the human body, Human Brain research & neurological disorders, Energy: optimising energy consumption and supporting the transition to a reliable and low carbon and clean energy society; Performance optimisation: analysis and assessment, tools and optimisation and productivity services for HPC academic and industrial code(s) (including support to selected Centres of Excellence). The call opened on 8 March 2023 and closed on 8 June 2023.

[Funding & tenders \(europa.eu\)](#)
- Call [HORIZON-EUROHPC-JU-2023-INTER-02-01](#) was launched to support “Innovation Action in Low Latency and High Bandwidth Interconnects”. Expected Outcome: Contribution towards European technological sovereignty, by establishing, maintaining and implementing a strategic R&I roadmap that fosters the European capabilities to design, develop and produce inter-node interconnects. Delivering scalable energy efficient inter-node interconnect for exascale and post exascale supercomputers. The development of European interconnect should prepare the technology for its future uptake and integration in post-exascale supercomputers to be acquired at a later stage by the EuroHPC JU targeting systems incorporating European technologies. A suitable software stack, including configuration, installation and management tools. The call opened on 01 August 2023 and will close on 31 January 2024.

[Funding & Tenders \(Europa.eu\)](#)
- Call [DIGITAL-EUROHPC-JU-2023-SME-01](#) was launched to support the competitiveness and innovation potential of SMEs. The consortium selected under this call is expected to define an outreach approach for identifying and attracting SMEs whose innovation potential and competitiveness will be significantly increased by the uptake of advanced HPC services. The JU has evaluated submissions for the Call and invited the successful proposal to grant agreement preparation in early 2024.

[Funding & tenders \(europa.eu\)](#)
- Call [HORIZON-EUROHPC-JU-2023-COE-03](#) focused on Centres of Excellence. The Centres of Excellence are responsible for the development of HPC applications for exascale and post-exascale computing in specific scientific domains. EuroHPC JU launched this call to close gaps in the portfolio of scientific domains: Personalised

Medicine/ Digital twin of the human body, Human Brain research & neurological disorders. The call opened on 20 September 2023 and will close on 9 January 2024.

[Funding & tenders \(europa.eu\)](#)

- Call [DIGITAL-EUROHPC-JU-2023-ACADEMY-02](#) covered the EuroHPC Academy. The Academy will contribute to the development of coordinated HPC education. The action will ensure the availability of common quality and qualification standards in HPC, the compatibility of training modules and learning objectives as well as the uptake of standardisation of training and education in the European HPC ecosystem. The call opened on 7 November 2023 and will close on 6 June 2024.
[Funding & tenders \(europa.eu\)](#)
- Call [HORIZON-EUROHPC-JU-2023-ENERGY-04](#) was launched to develop hierarchical workload management software solution tailored to exascale and post-exascale supercomputers, to address challenges associated with the energy efficient and energy constraint operation of heterogeneous and modular HPC systems.
[Funding & tenders \(europa.eu\)](#)
- Call [HORIZON-EUROHPC-JU-2023-QEC-05-01](#) to create two European Quantum Excellence Centres in applications, covering science and industry, which will establish a one-stop-shop for industry, academia, and the wider quantum technology user community. The aim of this call is to further strengthen the European user community and foster hybrid high-performance and quantum computing skills and literacy in Europe. The call was launched on 7 November 2023 and will close on 14 May 2024.
[Funding & Tenders \(europa.eu\)](#)
- Call [DIGITAL-EUROHPC-JU-2023-AISC-03](#) was launched to establish a European support centre to assist European AI users in fully leveraging the innovation potential of supercomputers for advanced AI applications. This initiative aligns closely with the EU's focus on establishing leadership in large-scale AI models.
[Funding & tenders \(europa.eu\)](#)
- Call [HORIZON-EUROHPC-JU-2023-INCO-06-01](#) to develop a collaboration in HPC with India, advancing the optimisation and co-development of HPC applications in domains of common interest, promoting the exchange of researchers and engineers between India and the EU. This call was prepared in 2023 and will be launched in Early 2024.
[Funding & Tenders \(europa.eu\)](#)

In 2023, the EuroHPC JU launched remaining calls which had been included under the Work Programme 2022:

- Call [DIGITAL-EUROHPC-JU-2022-TRAINING-02](#) to develop a EuroHPC training platform which will be a portal that will provide a central database of HPC training and to support an International Summer School in HPC. The call was launched on 26 January 2023 and closed on 4 April 2023. [Funding & Tenders \(europa.eu\)](#)
- Call [DIGITAL-EUROHPC-JU-2022-TRAINING-03](#) with the objective to train future HPC specialists to acquire the necessary advanced digital skills needed for the deployment of a specific technology, by providing traineeships in either an HPC competence centre, companies or SMEs using HPC systems or EuroHPC Hosting Entities. The call was launched on 26 January 2023 and closed on 12 April 2023. [Funding & Tenders \(europa.eu\)](#)
- Call [DIGITAL-EUROHPC-JU-2022-APPSUPPORT-01](#) aimed at establishing a distributed European-wide HPC application support service. The selected project should bring together Application Support Teams (AST) established primarily in current or future EuroHPC Hosting Entities, operating the EuroHPC supercomputers. The call was launched on 1 February 2023 and closed on 3 May 2023. [Funding & Tenders \(europa.eu\)](#)
- Call [HORIZON-EUROHPC-JU-2022-TECH-03](#) is for a Framework Partnership Agreement (FPA) for European hardware and software technologies based on RISC-V. The action is expected to deliver high-end processors and/or accelerators and systems based on a strategic research roadmap, the realisation of test-beds, pilots and/or demonstrators, integrating these processors. The call specifically covers high-end chips needed for data centres and supercomputers. It is aligned with the vision of the EuroHPC technology pillar to develop European critical energy-efficient exascale and post-exascale technologies, architectures and systems technology and their integration in pilot systems, complemented with the deployment of world-class competitive exascale and post-exascale supercomputers based on this technology. The call opened on 26 January 2023 and closed on 31 August 2023. [Funding & tenders \(europa.eu\)](#)
- Call [HORIZON-EUROHPC-JU-2022-INCO-04](#) concerned international cooperation to support the implementation of the Japan-EU Digital Partnership to strengthen cooperation with Japan, addressing the priority domains of the HPC collaboration identified in the Partnership. The call opened on 2 February 2023 and closed on 4 April 2023. [Funding & tenders \(europa.eu\)](#)

The following table shows funding rates according to the types of organisation receiving EuroHPC funding. Each grant agreement specifies the grant reimbursement rate of:

- the eligible costs of the beneficiaries that are non-profit making legal entities;
- the eligible costs of the beneficiaries and the affiliated entities (such as SMEs) that are profit making legal entities.

CALL/TOPIC	FOR-PROFIT	NON-PROFIT
DIGITAL EUROPE		
DIGITAL-EUROHPC-JU-2022-APPSUPPORT-01		
DIGITAL-EUROHPC-JU-2022-APPSUPPORT-01-01		
DIGITAL-EUROHPC-JU-2022-HPCQC-04-IBA		
DIGITAL-EUROHPC-JU-2022-HPCQC-04-01-IBA		
DIGITAL-EUROHPC-JU-2022-TRAINING-02		
DIGITAL-EUROHPC-JU-2022-TRAINING-02-01		
DIGITAL-EUROHPC-JU-2022-TRAINING-03		
DIGITAL-EUROHPC-JU-2022-TRAINING-03-01		
DIGITAL-EUROHPC-JU-2023-AISC-03		
DIGITAL-EUROHPC-JU-2023-AISC-03-01	50%	50%
DIGITAL-EUROHPC-JU-2023-SME-01		
DIGITAL-EUROHPC-JU-2023-SME-01-01	100%	100%
HORIZON EUROPE		
HORIZON-EUROHPC-JU-2022-INCO-04		
HORIZON-EUROHPC-JU-2022-INCO-04-01		
HORIZON-EUROHPC-JU-2022-TECH-03	100%	100%
HORIZON-EUROHPC-JU-2022-TECH-03-01		
HORIZON-EUROHPC-JU-2023-COE-01		
HORIZON-EUROHPC-JU-2023-COE-01-01	100%	100%
HORIZON-EUROHPC-JU-2023-COE-03		
HORIZON-EUROHPC-JU-2023-COE-03-01	100%	100%
HORIZON-EUROHPC-JU-2023-ENERGY-04		
HORIZON-EUROHPC-JU-2023-ENERGY-04-01	100%	100%
HORIZON-EUROHPC-JU-2023-INTER-02		
HORIZON-EUROHPC-JU-2023-INTER-02-01	50%	35%

Table 1: Funding rates for all calls managed in 2023.

1.2.2. Summary and state of play of each call launched in earlier years

Call DIGITAL-EUROHPC-JU-2023-SME-01 (Supporting competitiveness and innovation potential of SMEs)

The initiation of DIGITAL-EUROHPC-JU-2023-SME-01 aims to bolster the competitiveness and innovation capabilities of SMEs. The consortium chosen through this initiative is tasked with devising a strategy to reach out and engage SMEs whose potential for innovation and competitiveness can be greatly enhanced through the utilization of cutting-edge HPC services.

Furthermore, the consortium will administer financial support to SMEs through open calls. The open calls will focus on two topics: 1. Uptake of HPC by SMEs to address specific business challenges and 2. Adoption of large scale HPC resources (e. g. pre-exascale and exascale supercomputers) for the development of generative Artificial Intelligence (AI) models such as foundation models and Large Language Models (LLMs).

The call as published on 07 September 2023 and was closed on 07 November 2023. A budget of up to EUR 30 M was allocated to the action. One eligible proposal was received in response to the Call. After evaluation, the consortium was invited to prepare a grant agreement, which is currently in progress.

Call HORIZON-EUROHPC-JU-2023-ENERGY-04 (Energy Efficient Technologies in HPC)

This call provides funding for the creation of a unified vision and technology roadmap for an integrated and modular scheduling and resource management framework. This includes establishing a single comprehensive software stack, composed of both existing and newly developed components, that effectively meets the needs of all participating HPC operators while avoiding redundant functionalities.

The main outcomes of the project funded under this call is a software stack including dynamic workload management and operational data analytics that will significantly improve improved energy efficiency of supercomputers at increased overall throughput and time to solution.

The call as published on 07 November 2023 and was closed on 07 February 2024. A budget of up to EUR 20 M was allocated to the action. One eligible proposal was received in response to the Call. Evaluation is currently in progress.

Call DIGITAL-EUROHPC-JU-2023-AISC-03 (Support Centre for HPC-powered Artificial Intelligence (AI) Applications)

The launch this Call aims to establish a European AI support centre, aiding European AI users in maximizing the innovation potential of supercomputers for advanced AI applications. This initiative closely aligns with the EU's emphasis on leading in large AI models.

In particular, the AI support centre will train and enable European AI communities to benefit from the use of advanced HPC capabilities for large-scale AI models. It will enable users and developers to scale up AI workflows using state of the art supercomputing resources, resulting in the development of complex models with significant impact in Europe such as foundation models for generative AI.

The call as published on 28 November 2023 and was closed on 27 February 2024. A budget of up to EUR 5 M was allocated to the action.

Call Id	Number of managed projects per call
DIGITAL-EUROHPC-JU-2022-NCC-01	2
H2020-JTI-EuroHPC-2019-1	20
H2020-JTI-EuroHPC-2019-2	1
H2020-JTI-EuroHPC-2019-3	1
H2020-JTI-EuroHPC-2020-02	1
H2020-JTI-EuroHPC-2020-03	1
H2020-JTI-EuroHPC-2020-1	2
H2020-JTI-EuroHPC-2020-2	1
HORIZON-EUROHPC-JU-2021-COE-01	10
HORIZON-EUROHPC-JU-2022-ALG-02	1
Grand Total	40

Call ID/Project	Project Start Year	Project End Year
DIGITAL-EUROHPC-JU-2022-NCC-01		
CASTIEL 2	2023	2025
EuroCC 2	2023	2025
H2020-JTI-EuroHPC-2019-1		
ACROSS	2021	2024
ADMIRE	2021	2024
DComEX	2021	2024
DEEP-SEA	2021	2024

eFlows4HPC	2021	2024
eProcessor	2021	2024
exaFOAM	2021	2024
HEROES	2021	2023
IO-SEA	2021	2024
LIGATE	2021	2024
MAELSTROM	2021	2024
MICROCARD	2021	2024
NextSim	2021	2024
OPTIMA	2021	2023
RED-SEA	2021	2024
REGALE	2021	2024
SCALABLE	2021	2023
SPARCITY	2021	2024
TEXTAROSSA	2021	2024
TIME-X	2021	2024

H2020-JTI-EuroHPC-2019-2

FF4EuroHPC	2020	2023
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H2020-JTI-EuroHPC-2019-3

MEEP	2020	2023
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H2020-JTI-EuroHPC-2020-02

EPI	2022	2026
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H2020-JTI-EuroHPC-2020-03

EUMaster4HPC	2022	2025
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H2020-JTI-EuroHPC-2020-1

EUPEX	2022	2025
The European PILOT	2021	2025

H2020-JTI-EuroHPC-2020-2

HPCQS	2021	2025
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HORIZON-EUROHPC-JU-2021-COE-01

BioExcel-3	2023	2026
CEEC	2023	2026
ChEESE-2P	2023	2026
ESiWACE3	2023	2026
EXCELLERAT P2	2023	2026
HiDALGO2	2023	2026
MaX	2023	2026

MultiXscale	2023	2026
Plasma-PEPSC	2023	2026
SPACE	2023	2026
HORIZON-EUROHPC-JU-2022-ALG-02		
Inno4Scale	2023	2025

EVALUATION PROCEDURES AND OUTCOMES:

The evaluation of proposals for calls under Horizon and Digital programme followed a set of rules and procedures. The evaluation criteria were based on three standard criteria, namely excellence, impact, and implementation.

The evaluation process involved external experts who were selected based on their skills, experience, and knowledge in the areas of the call. The experts carried out an initial individual evaluation, followed by a consensus group, and concluded with a panel review. Each admissible and eligible proposal was evaluated by at least three external experts to ensure a high level of quality. To ensure a well-balanced composition, the selection of external experts considered factors such as skills, experience, knowledge, geographical diversity, gender, and affiliation with organizations in the private and public sector.

CALL	Eligible proposals	Successful proposals
DIGITAL-EUROHPC-JU-2022-APPSUPPORT-01	1	1
DIGITAL-EUROHPC-JU-2022-TRAINING-02	1	1
DIGITAL-EUROHPC-JU-2022-TRAINING-03	1	1
DIGITAL-EUROHPC-JU-2023-SME-01	1	1
HORIZON-EUROHPC-JU-2022-ALG-02	1	1
HORIZON-EUROHPC-JU-2022-INCO-04	1	1
HORIZON-EUROHPC-JU-2022-TECH-03	1	1
HORIZON-EUROHPC-JU-2023-COE-01	5	2

Table 2: Number of submitted, eligible, successful proposals, success rate, average Time-to-Inform (TTI), Time-to-Sign (TTS), Time-to-Grant (TTG) and Time-to-Pay (TTP) in calls fully evaluated in 2023.

PARTICIPATION AND AWARDED GRANTS

The calls for proposals received applications from a diverse range of European countries, and the successful consortia comprised beneficiaries from 20 countries. While the participation of SMEs (Small and Medium Enterprises) and LEs (Large Enterprises) is relatively lower than that of public institutions (Other), the evaluation process was conducted in an unbiased manner, ensuring a fair representation of different types of participating entities in successful proposals. "Participations" refers to all applicants from eligible proposals (where one applicant can be

counted multiple times if they are involved in multiple proposals) and “applicants” refers to distinct applicants from eligible proposals.

PARTICIPATIONS SME, PARTICIPATIONS LE and PARTICIPATIONS OTHER

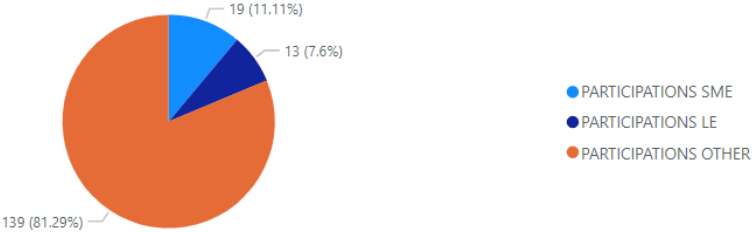


Figure 1: Number of participations (legal entities) by type in calls fully evaluated in 2023.

APPLICANTS SME, APPLICANTS LE and APPLICANTS OTHER

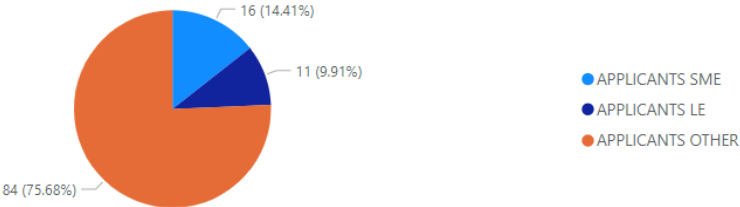


Figure 2: Number of applicants (legal entities) by type in calls fully evaluated in 2023.

SUCCESSFUL SMEs, SUCCESSFUL LEs and SUCCESSFUL OTHER

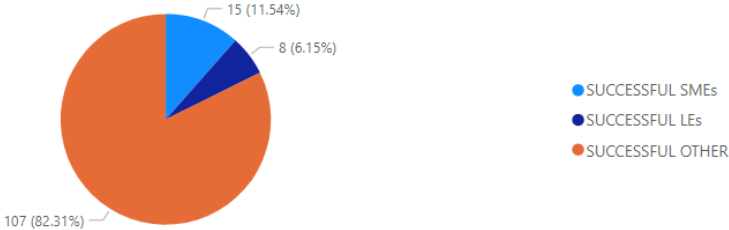


Figure 3: Number of applicants successful entities by type in calls fully evaluated in 2023.

111 legal entities participated as applicants in proposals which were evaluated in 2023. Most legal entities (82%) participated in only one proposal, while only one entity participated in more than 5 proposals (3%). The distribution of requested EU grants among the participants also reflects the high participation frequency of a few entities while 78 applicants requested a total EU grant for all participations up to EUR 1 M.

Participations	No. of legal entities
1	101
2	11
3	6
4	3
5	1
Total	111

Table 3: Participation histogram

Requested grant participant	No. of legal entities
01: 0-1 M€	78
02: 1-2 M€	1
05: 4-5 M€	2
19: 26-28 M€	1
Total	78

Table 4: Applicant requested budget histogram

Eligible proposals spread over requested budget bins

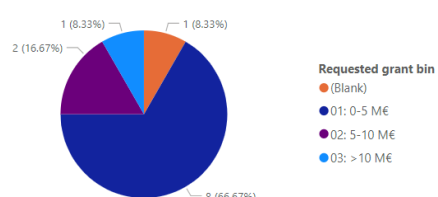


Figure 4: Distribution of eligible proposals over requested budget bins.

Retained proposals spread over requested budget bins

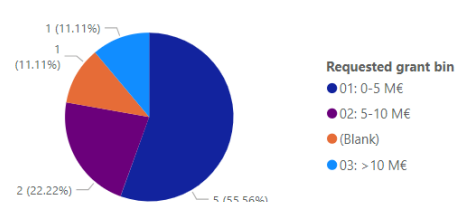


Figure 5: Distribution of retained proposals over requested budget bins.

Accumulated requested grant of eligible proposals per grant bin

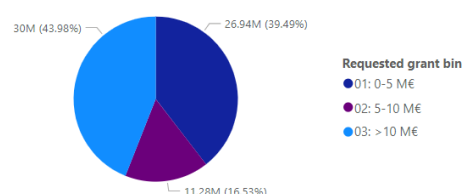


Figure 6: Distribution of accumulated requested budget of eligible proposals over requested budget bins.

Accumulated requested grant of retained proposals per grant bin

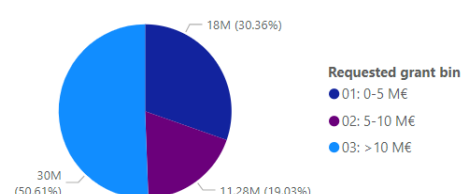


Figure 7: Distribution of accumulated requested budget of retained proposals over budget bins.

CALL	Successful proposals	Total budget	Requested grant (EU contribution)	Requested grant by SMEs	Requested grant by LEs
HORIZON-EUROHPC-JU-2023-COE-01	2	€ 11,995,687.50	€ 5,997,841.76	€ 54,107.00	€ 149,000.00
HORIZON-EUROHPC-JU-2022-TECH-03	1				
HORIZON-EUROHPC-JU-2022-INCO-04	1	€ 5,000,000.00	€ 5,000,000.00		
HORIZON-EUROHPC-JU-2022-ALG-02	1	€ 4,999,999.50	€ 4,999,999.50	€ 202,000.00	
DIGITAL-EUROHPC-JU-2023-SME-01	1	€ 29,999,678.81	€ 29,999,678.81	€ 1,605,600.27	
DIGITAL-EUROHPC-JU-2022-TRAINING-03	1	€ 5,993,326.80	€ 5,675,469.80		€ 132,680.00
DIGITAL-EUROHPC-JU-2022-TRAINING-02	1	€ 1,999,798.97	€ 1,999,768.97	€ 250,776.97	
DIGITAL-EUROHPC-JU-2022-APPSUPPORT-01	1	€ 11,207,116.87	€ 5,603,558.44		€ 1,059,835.00
Total	9	€ 71,195,608.45	€ 59,276,317.28	€ 2,112,484.24	€ 1,341,515.00

Table 5: No of retained (successful) proposals submitted under calls evaluated in 2023 and corresponding financial information including breakdown per entity type.

Country	Num of. beneficiaries	Num. of SMEs	Num. of Large Enterprises (LEs)
AT	8	5	1
BE	4	1	
BG	2		
CH	6	2	
CY	3	1	
CZ	3		
DE	42	14	3
DK	1		
EE	1		
EL	10	4	1
ES	20	6	1
FI	2		
FR	32	10	10
HR	4		
HU	3		
IE	2		
IS	2		
IT	37	9	7
LT	1		
LU	2		
LV	1		
NL	7	1	1
NO	9		3
PL	2		
PT	5		
RO	1		
SE	5		
SI	5	1	
SK	1		
TR	4		
UK	2		1
Grand Total	227	54	28

Table 6: Beneficiaries, SMEs and LEs participating in all awarded projects/grants active in 2023.

	Total cost	Requested grant (EU Contribution)	Requested grant SME	Requested grant LE
AT	€ 6,423,087.94	€ 3,220,050.14	€ 1,572,249.71	€ 52,040.63
BE	€ 12,244,837.95	€ 8,366,342.71	€ 1,177,635.58	
BG	€ 3,462,357.50	€ 1,958,522.50		€ 256,265.00
CH	€ 10,847,265.00	€ 5,386,207.76	€ 313,468.75	
CY	€ 4,634,055.00	€ 2,323,277.50	€ 210,625.00	
CZ	€ 9,401,526.75	€ 4,830,222.75		
DE	€ 130,892,378.95	€ 86,073,627.87	€ 7,777,078.38	€ 349,631.25
DK	€ 5,283,819.00	€ 2,626,597.00		
EE	€ 3,999,999.06	€ 1,999,999.53		
EL	€ 20,416,999.00	€ 10,018,900.50	€ 1,054,031.25	€ 2,009,263.25
ES	€ 69,417,350.60	€ 38,323,521.72	€ 4,643,374.50	€ 180,625.00
FI	€ 7,528,177.46	€ 4,111,262.24		
FR	€ 121,715,259.51	€ 61,640,093.86	€ 13,075,647.08	€ 29,059,942.65
HR	€ 5,976,491.00	€ 2,986,995.51		
HU	€ 4,765,369.55	€ 2,394,392.53		
IE	€ 5,377,611.00	€ 3,035,927.50		
IS	€ 2,822,228.95	€ 1,411,114.10		
IT	€ 57,374,972.03	€ 28,316,575.91	€ 5,852,967.76	€ 3,465,533.88
LT	€ 1,284,999.99	€ 642,500.00		
LU	€ 8,783,843.70	€ 5,443,028.23		€ 774,680.00
LV	€ 2,000,000.00	€ 1,000,000.00		
ME	€ 1,000,000.00	€ 500,000.00		
MK	€ 1,825,870.00	€ 912,935.00		
NL	€ 6,616,439.93	€ 3,254,469.97	€ 192,500.00	€ 1,912,164.97
NO	€ 8,256,230.40	€ 4,128,115.21		€ 1,525,265.83
PL	€ 7,595,817.85	€ 4,099,178.82		
PT	€ 5,740,877.72	€ 3,020,220.48		
RO	€ 4,097,200.00	€ 2,048,600.00		
SE	€ 18,991,293.80	€ 9,923,645.41		
SI	€ 7,563,949.79	€ 4,240,745.55	€ 1,023,180.80	
SK	€ 3,198,415.20	€ 1,599,207.60		
TR	€ 3,610,485.00	€ 1,809,023.75		
UK	€ 8,012,852.50	€ 4,109,863.75		€ 521,875.00
Total	€ 571,162,062.13	€ 315,755,165.40	€ 36,892,758.81	€ 40,107,287.46

Table 7: Breakdown of awarded projects/grants by country as indicated by the participants since 2020.

1.2.3. Portfolio analysis

In 2023, a variety of activities have been undertaken, covering a broad spectrum of topics. These activities include the development of new technologies, the creation of novel applications, and the provision of training and skill-building initiatives. In addition to these general R&I efforts, specific actions have been launched to address the needs of European small and medium-sized enterprises. These efforts are intended to support these businesses as they seek to grow and expand, and to help them compete effectively in the global marketplace. A more detailed breakdown of the individual R&I projects active in 2023, including information on agreements that have been signed, is provided in the following table.

CALL	Project Acronym	Coordinator country	Project Free Keywords	GA Signature Year
H2020-JTI-EuroHPC-2019-1	ACROSS	IT	Complex workflows, Big Data, petascale, exascale, Neuromorphic Processors, Multi-level Orchestration, Cross-Stack convergence	2020
H2020-JTI-EuroHPC-2019-1	ADMIRE	ES	High-performance I, O, ad-hoc storage systems, malleability, I, O scheduling, intelligent I, O tuning, cross-layer data analytics, heterogeneous dataset, applications co-design, Exascale	2020
H2020-JTI-EuroHPC-2019-1	DComEX	EL	Data Driven Computational mechanics, Exascale Computing, Manifold Learning, Fault Tolerance, Scalability, Heterogeneous CPU+GPU computing, Bayesian analysis, Uncertainty Quantification	2020
H2020-JTI-EuroHPC-2019-1	DEEP-SEA	DE	Programming environment, co-design, exascale, compute and memory heterogeneity, Modular Supercomputing Architecture, software stack, performance analysis, modelling, resource management, scalability	2020
H2020-JTI-EuroHPC-2019-1	eFlows4HPC	ES	Scientific and Industrial Workflows, Convergence High-Performance Data Analytics, Machine Learning and High-Performance Computing, Distributed and heterogeneous computing, Widening HPC usage	2020
H2020-JTI-EuroHPC-2019-1	eProcessor	ES	open-source hardware, software, energy efficiency, hardware, software co-design, high-performance data analytics, mixed precision, AI, deep learning, machine learning, extreme-scale computing	2020
H2020-JTI-EuroHPC-2019-1	HEROES	FR	Hybrid platforms, Energy Efficiency	2020
H2020-JTI-EuroHPC-2019-1	IO-SEA	FR	Data Processing, exascale, HPC, Object Store, Hierarchical Storage Management, , Data Placement,	2020

			performance optimization, energy efficiency optimization	
H2020-JTI-EuroHPC-2019-1	LIGATE	IT	Drug Discovery, Computer Aided Drug Design, Molecular Dynamics, auto-tuning, portable, artificial intelligence, Machine Learning	2020
H2020-JTI-EuroHPC-2019-1	MAELSTROM	UK	scalable machine learning, hardware, software co-design, compute system design	2020
H2020-JTI-EuroHPC-2019-1	MICROCARD	FR	exascale, runtime, solvers, preconditioners, GPU, cardiac electrophysiology, cardiac arrhythmia	2020
H2020-JTI-EuroHPC-2019-1	OPTIMA	EL	Heterogeneous HPC Systems, FPGAs, Accelerators, Industrial HPC Applications, Open-source Libraries	2020
H2020-JTI-EuroHPC-2019-1	RED-SEA	FR	Interconnect Network	2020
H2020-JTI-EuroHPC-2019-1	SCALABLE	FR	Computation Fluid Dynamics, Lattice-Boltzmann Methods	2020
H2020-JTI-EuroHPC-2019-1	SPARCITY	TR	Sparse Computation, Graph Algorithms, Performance Modeling, Co-design, Performance Tuning, Sparse Linear Algebra, Exascale Computing, Hardware Accelerators, IPU, GPUs	2020
H2020-JTI-EuroHPC-2019-1	TIME-X	BE	time-parallel methods, forward-in-time simulation, optimisation, uncertainty quantification	2020
H2020-JTI-EuroHPC-2019-2	FF4EuroHPC	DE	High Performance Computing, High Performance Data Analytics, Artificial Intelligence, Fortissimo, Experiments, SMEs, Business, Success Stories	2020
H2020-JTI-EuroHPC-2019-1	exaFOAM	FR	exascale OpenFOAM HPC Parallel-io CFD algorithms	2021
H2020-JTI-EuroHPC-2019-1	NextSim	ES	aerospace engineering, numerical analysis, simulation, optimization, modelling tools, computational engineering and computer aided design, high-performance computing	2021
H2020-JTI-EuroHPC-2019-1	REGALE	EL	Next generation HPC applications, resource management, workflows	2021

H2020-JTI-EuroHPC-2019-1	TEXTAROSSA	IT	energy efficiency, heterogenous computing, power and thermal management, innovative cooling	2021
H2020-JTI-EuroHPC-2020-1	EUPEX	FR	Pilot HPC Exascale EPI	2021
H2020-JTI-EuroHPC-2020-1	The European PILOT	ES	hardware, energy efficiency, scalability, accelerator, machine learning	2021
H2020-JTI-EuroHPC-2020-2	HPCQS	DE	quantum simulator, hybrid quantum-HPC computation, modular supercomputer architecture, cloud access, Tier-0, federated quantum-HPC infrastructure, co-design, use case, ATOS QLM, Pasqal Fresnel	2021
DIGITAL-EUROHPC-JU-2022-NCC-01	CASTIEL 2	DE	Competence Centres, Centres of Excellence, Training, Networking, European Collaboration, Twinning, Mentoring, EuroHPC, Artificial Intelligence, High Performance Data Analytics	2022
DIGITAL-EUROHPC-JU-2022-NCC-01	EuroCC 2	DE	National Competence Centres, Competence, Excellence, Artificial Intelligence, High Performance Data Analytics, Exascale, Petascale, Industry, Academia, Public Administration	2022
H2020-JTI-EuroHPC-2020-02	EPI		EPI	2022
H2020-JTI-EuroHPC-2020-03	EUMaster4HPC	LU	High Performance Data Analytics, Digital Transformation, Education, Research, Innovation	2022
HORIZON-EUROHPC-JU-2021-COE-01	BioExcel-3	SE	Biomolecular Life Science, Drug Discovery, Biotechnology, Exascale, HPC, Automation and Data Integration	2022
HORIZON-EUROHPC-JU-2021-COE-01	CEEC	SE	CFD, Exascale, Algorithms	2022
HORIZON-EUROHPC-JU-2021-COE-01	ChEESE-2P	ES	Solid Earth, code optimization, services, geohazards, urgent computing	2022
HORIZON-EUROHPC-JU-2021-COE-01	ESiWACE3	ES	Weather, climate, exascale, HPC, scalability, portability, simulation, co-design, profiling and	2022

			optimisation, workflow, computer science, data analysis, large data volume, optimisation services	
HORIZON-EUROHPC-JU-2021-COE-01	EXCELLERAT P2	DE	Centre of Excellence, Engineering, EuroHPC, Exascale, High Performance Computing, Artificial Intelligence, Data Analytisc	2022
HORIZON-EUROHPC-JU-2021-COE-01	HiDALGO2	PL	global challenges, global systems science, exascale, air quality, wildfire, meteo-hydrological forecasting, renewable energy, scalability, benchmarking, co-design, HPC, HPDA, AI, novelty architectures	2022
HORIZON-EUROHPC-JU-2021-COE-01	MaX	IT	Lighthouse materials science codes at the exascale, Co-design based on materials science codes, Energy efficiency in materials science codes, Training on HPC for materials research	2022
HORIZON-EUROHPC-JU-2021-COE-01	MultiXscale	SI	multiscale processes, materials modelling, biophysics, application deployment	2022
HORIZON-EUROHPC-JU-2021-COE-01	Plasma-PEPSC	SE	Flagship Plasma Simulations, Exascale, Extreme Scale, Extreme Data, Heterogeneous Systems, Co-design, EPI	2022
HORIZON-EUROHPC-JU-2021-COE-01	SPACE	IT	Astrophysics, Cosmology, Exascale, GPU computing	2022
HORIZON-EUROHPC-JU-2022-ALG-02	Inno4Scale	ES	Exascale, Algorithms, EuroHPC, Open Call	2023

Table 8: R&I projects active in 2023.

1.2.4. Experts

Overall 30 experts from different European countries contributed to the evaluations of proposals. A total number of 22 proposals were submitted to calls evaluated in 2023 and a greater female than male presence was detected (60% to 40%). On average, each expert evaluator assessed three proposals on average, ensuring a robust and unbiased evaluation process.

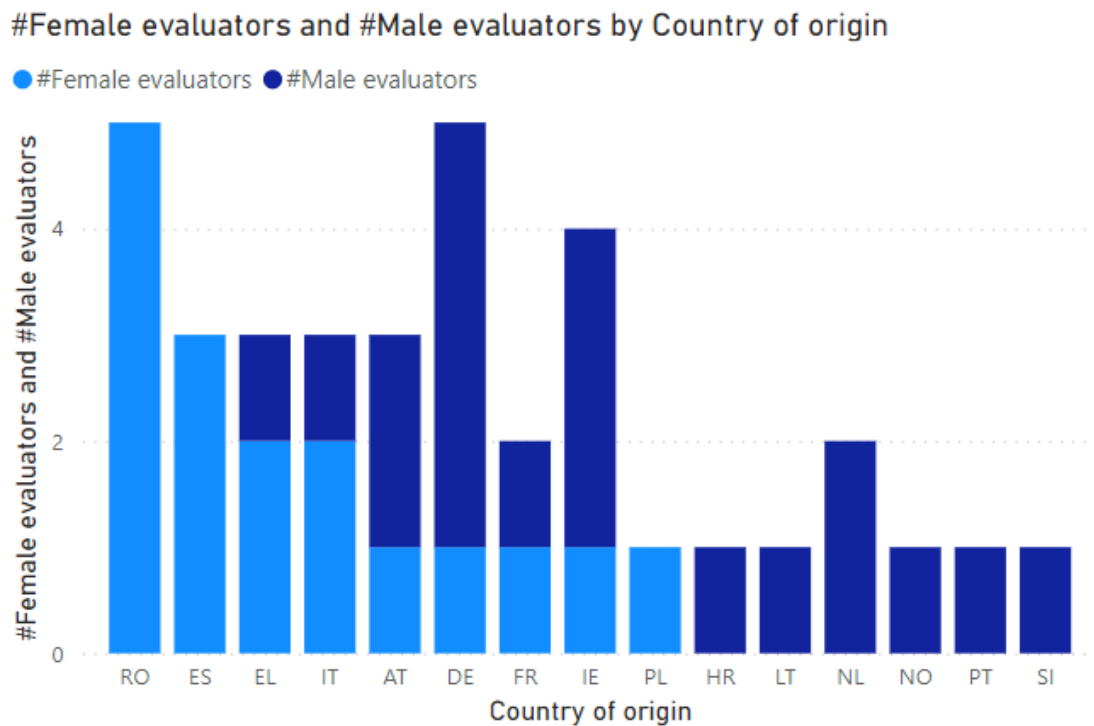


Figure 8: Distribution of evaluators over countries of origin that participated evaluations performed in 2023.

1.3. HPC INFRASTRUCTURE ACTIVITIES

1.3.1. Calls for tenders and procurements of supercomputers – Horizon Europe

In 2023, the following EuroHPC supercomputers were operational: LUMI in Finland, Leonardo in Italy, Vega in Slovenia, MeluXina in Luxembourg, Karolina in Czech Republic, and Discoverer in Bulgaria and all made the TOP500 list⁸ of the world most powerful supercomputers in the world. All operational EuroHPC systems ranked among the world's most powerful & energy efficient supercomputers and are accessible to users located in Europe.

Two supercomputers were inaugurated in 2023. The inauguration of Deucalion, EuroHPC system located in Portugal, took place at the university of Minho in Guimarães on 6 September 2023. The Deucalion system, which is a unique petascale supercomputer combining different cutting-edge technologies, is in the process of its final acceptance as of December 2023. Deucalion is expected to be fully operational in Q1 of 2024.

On 21 December 2023, the inauguration of MareNostrum 5 (MN5) took place. MN5 is a EuroHPC pre-exascale supercomputer hosted and operated by the Barcelona Supercomputing Center (BSC). MN5 is EuroHPC's third pre-exascale supercomputer and shortly ahead of its inauguration, entered the Top500 list⁸ of the most powerful supercomputers in the world in 8th place. MN5 is not only very powerful but also the greenest supercomputer in Europe and the 6th greenest supercomputer in the world, according to the latest Green500 list. MN5 is expected to be fully operational in Q2 of 2024 and will be made available to European users as all other EuroHPC supercomputers have been.

MN5 is expected to be fully operational in Q2 2024.



Inauguration of Deucalion in Minho, Portugal on 6 September 2023

⁸ The November 2023 edition of the [TOP500 list](#).

1.3.2. Calls for tenders and procurements for upgrades of supercomputers – Digital Europe Programme

Following a call for expressions of interest⁹ launched in 2022 to upgrade EuroHPC supercomputers, the EuroHPC Governing Board selected Discoverer and Leonardo to receive financial contributions to make upgrades to their existing systems.¹⁰

The consortium applied to receive the upgrade mainly due to the fact that the supercomputer currently consists only of CPU partitions, in order to enhance the system with a GPU partition as well. The Hosting Agreement and Joint Procurement Agreement were signed with the Hosting Entity, Sofia Tech Park, in the first half of 2023 and consequently the call for tenders for Discoverer+ was launched as an open procedure in September 2023. With the deadline of the call set in December 2023, the evaluations of the submitted tenders will be carried out in Q1 of 2024 with the aim to have the new GPU partition in place before the end of 2024.

Leonardo is the second machine to receive financial contributions in 2024 to upgrade the existing system. “LISA”, the upgrade to Leonardo, will lead to an extension of the supercomputer’s lifetime, increase its operational performance and provide new functionalities to address the growing evolution of user needs.

In 2023, EuroHPC JU worked closely with Leonardo’s Hosting Entity, CINECA, to finalise the Hosting Agreement and the Joint Procurement Agreement for Lisa. Due to the uncertainties surrounding the RRF (Recovery and Resilience Funds), the signing of the agreements has been postponed to the first quarter of 2024 with the procurement launch to follow shortly after. The EuroHPC JU has now received written confirmation from the European Commission indicating the process to be followed in order to launch of the procurement.

Due to the upcoming changes to the EuroHPC Regulation¹¹ to ensure a sustainable and durable access to European supercomputing capacity for European AI start-ups, CINECA and the EuroHPC JU have taken the opportunity of the delay to collaborate to redefine the upgrade to Leonardo with a focus on AI to support the further development and scalability of AI models and position the European Union as a global competitive leader. The official request will be submitted by CINECA in 2024.

⁹ EUROHPC-2022-CEI-UPG-01

¹⁰ DECISION OF THE GOVERNING BOARD OF EuroHPC JOINT UNDERTAKING No 28/2022 On the selection of EuroHPC supercomputers to be upgraded

¹¹ [Commission launches AI innovation package to support Artificial Intelligence startups and SMEs \(europa.eu\)](https://europa.eu)

1.3.3. Calls for tenders and procurements of mid-range supercomputers – Digital Europe Programme

In 2023, the procurement procedures were ongoing for the four new petascale supercomputers to be located at GRNET in Greece, KIFU in Hungary, NUI Galway in Ireland, and Cyfronet in Poland.

The hosting agreement for GRNET has been signed, and preparations for the system procurements have been initiated. The agreements for the rest of the Hosting Entities are in progress. The additional midrange supercomputers will have sustained performance targets of 15 to 60 petaflops.

On 19 June 2023, Linköping University (LiU) in Sweden was selected to host and operate a new supercomputer, following a call for expression of interest for a new EuroHPC mid-range system. Named Arrhenius, this machine will be able to tackle Artificial Intelligence/Machine Learning and other applications requiring high memory bandwidth and fast data transfer to disk. The procedures for signing the hosting agreement as well as the joint procurement agreement were initiated in Q4 2023. The aim is to have the fully operational system in place in 2025.

Procurement for the systems located in KIFU in Hungary, NUI Galway in Ireland, and Cyfronet in Poland will be launched once each Hosting Entity has secured funding.

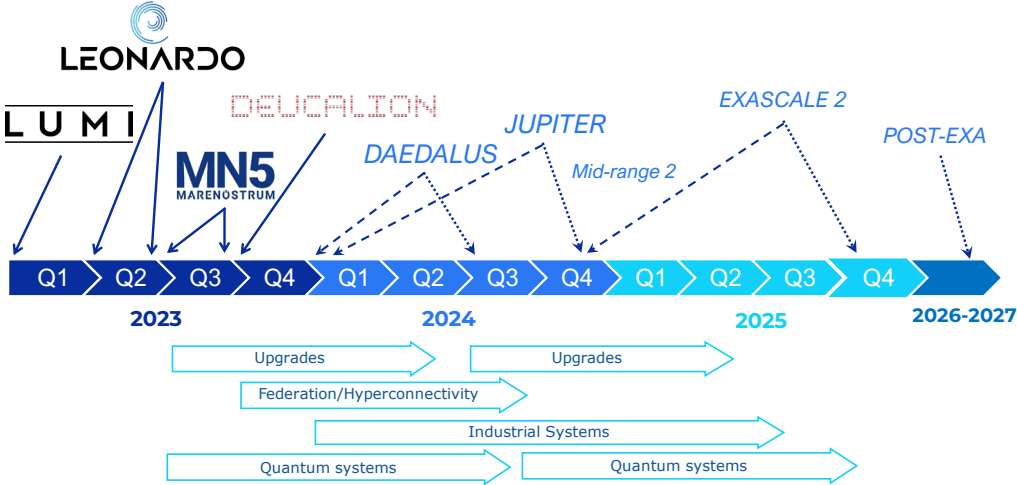
1.3.4. Calls for tenders and procurements of exascale supercomputers – Digital Europe Programme

The hosting agreement for JUPITER was signed between EuroHPC JU and the Jülich Supercomputing Centre (JSC) on 14 December 2022. Following this, the procurement was launched soon after in January 2023 and the procurement contract signed on 3 October 2023, with the tender awarded to a consortium comprising of two European companies: Eviden and Par-Tec. JUPITER, which is the first EuroHPC supercomputer capable of exascale performance, will be located at the Forschungszentrum Jülich campus in Germany and operated by the JSC. JUPITER's general-purpose cluster module will be based on the new Rhea processor, a European-designed CPU, developed in the framework of the European Processor Initiative (EPI). Installation is due to begin at the start of 2024.

Following the announcement on 20 June 2023 of the selection of the Jules Verne consortium to host and operate the second EuroHPC exascale supercomputer, which will be hosted in France, the process continues to progress through the following phases, namely the competitive dialogue and procurement, with a view to bringing the system into operation in 2025. This new exascale supercomputer will be managed by GENCI (as a hosting entity), the French national agency for High Performance Computing, and operated at the TGCC

computing centre by the CEA (as a hosting site), the French Commission for Alternative Energies and Atomic Energy Commission, in Bruyères-le-Châtel.

EuroHPC JU’s regulation provides for the procurement of supercomputers with exascale and post-exascale capabilities (“high-end” supercomputers), as shown in the below timeline the second exascale system is expected to come in 2025. Plans for the procurement of post-exascale systems will be forthcoming from 2024 onwards.



1.3.5. Global standing of EuroHPC systems

As of November 2023, three EuroHPC supercomputers were ranked in the top ten of the TOP500 list¹² of the world’s most powerful supercomputers.

LUMI remains the fastest supercomputer in Europe and fifth fastest in the world, with a High Performance Linpack (HPL) performance of 379,70 petaflops per second while Leonardo’s 238,70 petaflops per second put the system in second place in Europe and sixth place globally. MareNostrum 5 entered the TOP500 in the November 2023 edition at 8th place.

All available EuroHPC petascale supercomputers, Meluxina, Vega, Discoverer and Karolina, have placed in the global rankings, securing positions among the top 200 supercomputers ranked in the TOP500.

In the table below we list the ranking and performance in Petaflops of all ranked EuroHPC supercomputer, as of the latest editions of the TOP500 and Green500 lists.

¹² [November 2023 | TOP500](#)

System Name	Linpack Performance (PFlops)	Top500 Ranking (November 2023)	Top500 First Ranking	Green500 Ranking
LUMI	379.70	5	3	7
LEONARDO	238.70	6	4	18
MareNostrum 5 ACC	138.20	8	8	6
MareNostrum 5 GPP	40.10	19	19	79
MeluXina Accelerator Module	10.52	71	36	27
Karolina GPU	6.75	113	71	25
LUMI – C	6.30	125	76	103
DISCOVERER	4.52	166	91	258
VEGA CPU	3.82	198	106	278
VEGA GPU	3.10	268	134	326
Karolina CPU	2.84	302	149	94
MeluXina Cluster Module	2.29	421	230	87

Vega, Karolina, MeluXina and Discoverer, were fully operational at the end of 2021. The LUMI supercomputer installation was completed in 2022 with the addition of the LUMI-G partition, the GPU-based partition of the supercomputer. The installation of Leonardo was also completed and the HPL test was run on the system in Autumn 2022.

The installation of MareNostrum5 was completed in 2023 is expected to become available for access in 2024. The ARM partition of Deucalion was installed in 2023, with the x86 partition planned for installation in Q1 of 2023. Once the installation is completed, Deucalion will be made available through EuroHPC access calls. This is expected for Q2 of 2024.

Following the signature of the procurement contract for JUPITER, installation began at the end of 2023 and is expected to be completed in 2024.

Below are the technical specifications of the procured petascale and precursor to exascale supercomputers.

LUMI



[LUMI](#) is a Cray EX supercomputer supplied by Hewlett Packard Enterprise (HPE) and located in Finland.

Sustained Performance:	386 petaflops
Peak Performance:	539.13 petaflops
Compute Partitions:	GPU partition (LUMI-G), x86 CPU-partition (LUMI-C), data analytics partition (LUMI-D), container cloud partition (LUMI-K)
Central Processing Unit (CPU):	LUMI-C partition: 3rd generation AMD EPYC™ CPUs 64-core, LUMI-G partition: AMD Trento 64-core
Graphics Processing Unit (GPU):	LUMI-G based on the future generation AMD Instinct™ GPU
Storage Capacity:	LUMI's storage system consists of three components. First, there is a 7-petabyte partition of ultra-fast flash storage, combined with a more traditional 80-petabyte capacity storage, based on the Lustre parallel filesystem, as well as a data management service, based on Ceph and being 30 petabytes in volume. In total, LUMI has a storage of 117 petabytes and a maximum I/O bandwidth of 2 terabytes per second.
Applications:	AI, especially deep learning, and traditional large scale simulations combined with massive scale data analytics in solving one research problem.

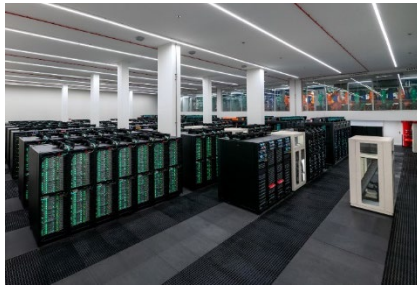
LEONARDO



[Leonardo](#) is supplied by EVIDEN, based on a BullSequana XH2000 supercomputer and located in Italy.

Sustained Performance:	249.4 petaflops
Peak Performance:	315.74 petaflops
Compute Partitions:	Booster, hybrid CPU-GPU module delivering 240 PFlops, Data-Centric, delivering 9 Pflops and featuring DDR5 Memory and local NVM for data analysis
Central Processing Unit (CPU):	Intel Ice-Lake (Booster partition), Intel Sapphire Rapids (Data-centric partition)
Graphics Processing Unit (GPU):	13824 "Da Vinci" GPUs (based on NVIDIA Ampere architecture) delivering up to 10 exaflops of FP16 Tensor Flow AI performance
Storage Capacity :	Leonardo is equipped with over 100 petabytes of state-of-the-art storage capacity and 5PB of High Performance storage
Applications:	The system targets: modular computing, scalable computing applications, data-analysis computing applications, visualization applications and interactive computing applications, urgent and cloud computing

MARENOSTRUM 5



MareNostrum 5 is a pre-exascale EuroHPC supercomputer to be located in Barcelona, Spain. The system is supplied by Bull SAS combining Bull Sequana XH3000 and Lenovo ThinkSystem architectures. MareNostrum 5 is hosted by Barcelona Supercomputing Center (BSC).

Sustained Performance:	215.4 petaflops
Peak Performance:	295.81 Petaflops
Compute Partitions:	GPP (General purpose partition), ACC (Accelerated partition), NGT GPP (Next Generation Technology General Purpose partition and NGT ACC (Next Generation Technology General Purpose partition). Additional smaller partitions for pre- and post-processing.
Central Processing Unit (CPU):	The GPP, ACC partitions both rely on Intel Sapphire Rapids CPUs. NGT ACC is based on Intel Emerald Rapids and the NGT GPP is based on NVIDIA Grace.
Graphics Processing Unit (GPU):	The ACC partition is based on NVIDIA Hopper whereas the NGT ACC partition is built on Intel Rialto Bridge.
Storage Capacity :	MareNostrum 5's storage provides 248PB net capacity based on SSD/Flash and hard disks, and an aggregated performance of 1.2TB/s on writes and 1.6TB/s on reads. Long-term archive storage solution based on tapes will provide 402PB additional capacity. Spectrum Scale and Archive will be used as parallel filesystem and tiering solution respectively.
Applications:	MareNostrum5 is a highly versatile system, with a special focus on medical applications, drug discovery as well as digital twins (earth and human body), energy, etc. Its large general-purpose partition provides an environment well suited for most current

Other Details:

applications that solve scientific/industrial problems. In addition, the accelerated partition provides an excellent environment for large scale simulations, AI and deep learning.

MareNostrum 5 is located in BSC's new facilities, next to the Chapel which is hosting previous systems. The datacentre has a total power capacity of 20MW, and cooling capacity of 17MW, with a PUE below 1,08.

MELUXINA

[MeluXina](#) is an Bull BullSequana XH2000 supercomputer, installed in Luxembourg. The system implements a modular architecture, offering multiple partitions incorporating different technologies to satisfy most of the processing requirements of scientific and industrial HPC applications. MeluXina is the most powerful of the EuroHPC petascale supercomputers with an aggregated performance of 12.81 petaflops.



Sustained Performance:	12.81 petaflops
Peak Performance:	18.29 petaflops
Compute Partitions:	Accelerator - GPU (500 AI PetaFlops), Cluster (3 PetaFlops peak), Accelerator - FPGA and Large Memory Modules
Central Processing Unit (CPU):	AMD EPYC
Graphics Processing Unit (GPU):	NVIDIA Ampere A100

Storage Capacity:	20 petabytes main storage with all-flash scratch tier at 600GB/s, Tape archival capabilities
Applications:	Traditional Computational, AI and Big Data/HPDA workloads, Quantum Simulations
Other Details:	Modular Supercomputer Architecture, Cloud Module for complex use cases and persistent services, Infiniband HDR interconnect, high speed links to the RESTENA NREN and GÉANT network, Luxembourg Internet Exchange and Public Internet

KAROLINA



[Karolina](#) is a petascale EuroHPC supercomputer located in Ostrava, Czechia. It is supplied by Hewlett Packard Enterprise (HPE), based on an HPE Apollo 2000Gen10 Plus and HPE Apollo 6500 supercomputers. Karolina is hosted by [IT4Innovations National Supercomputing Center](#).

Sustained Performance:	9.59 petaflops
Peak Performance:	12.91 petaflops
Compute partitions:	<p>The supercomputer consists of 6 main parts:</p> <ul style="list-style-type: none"> • a universal part for standard numerical simulations, which will consist of approximately 720 computer servers with a theoretical peak performance of 3.8 PFlop/s, • an accelerated part with 72 servers and each of them being equipped with 8 GPU accelerators providing a performance of 11 PFlop/s for

	<p>standard HPC simulations and up to 150 PFlop/s for artificial intelligence computations,</p> <ul style="list-style-type: none"> • a part designated for large dataset processing that will provide a shared memory of as high as 24 TB, and a performance of 74 TFlop/s, • 36 servers with a performance of 131 TFlop/s will be dedicated for providing cloud services, • a high-speed network to connect all parts as well as individual servers at a speed of up to 200 Gb/s, • data storages that will provide space for more than 1 PB of user data and will also include high-speed data storage with a speed of 1 TB/s for simulations as well as computations in the fields of advanced data analysis and artificial intelligence.
Central Processing Unit (CPU):	More than 100,000 CPU cores and 250 TB of RAM
Graphics Processing Unit (GPU):	More than 3.8 million CUDA cores / 240,000 tensor cores of NVIDIA A100 Tensor Core GPU accelerators with a total of 22.4 TB of superfast HBM2 memory
Storage capacity:	More than 1 petabyte of user data with high-speed data storage with a speed of 1 TB/s
Applications:	Traditional Computational , AI, Big Data

VEGA



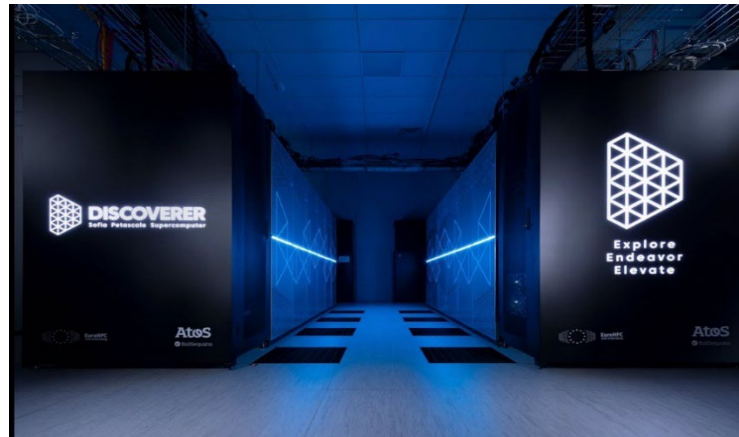
[Vega](#) is a petascale EuroHPC supercomputer located in Maribor, Slovenia. It was the first EuroHPC supercomputer to become operational.

It is supplied by Eviden, based on the BullSequana XH2000 supercomputer and hosted by [IZUM](#).

Sustained Performance:	6.92 petaflops
Peak Performance:	10.05 petaflops
Compute Partitions:	CPU partition: 960 nodes with 2CPUs and 256GB memory/node (20% 1TB/node), 1x HDR100 & GPU partition: 60 nodes with 2CPUs and 512GB memory, 2x HDR100, 4x Nvidia A100/node
Central Processing Unit (CPU):	2040x CPUs AMD EPYC 7H12 (64c, 2.6-3.3GHz), 130.560 cores on CPU and GPU partition
Graphics Processing Unit (GPU):	240x Nvidia A100 with 40 GB HBM2 (+4 on GPU login nodes), 6912 FP32 CUDA cores and 432 Tensor cores per GPU
Storage Capacity:	High-performance NVMe Lustre (1PB), large-capacity Ceph (23PB)
Applications:	Traditional Computational, AI, Big Data/HPDA, Large-scale data processing

DISCOVERER

Discoverer is a BullSequana XH2000 supercomputer, located in Sofia, Bulgaria. It comprises of a single CPU-based partition offering 4.5 Petaflops of sustained performance. Compared to the rest of the EuroHPC petascale systems, it offers the largest and most powerful CPU-only partition and is an excellent platform for traditional computational applications that do not benefit from GPU accelerators.



Sustained Performance:	4.52 petaflops
Peak Performance:	5.94 petaflops
Compute Partitions:	One partition providing 1128 nodes, 4.44 petaflops
Central Processing Unit (CPU):	AMD EPYC "Rome" 7H12 64core, 2.6GHz, 280W (Code name Rome)
Graphics Processing Unit (GPU):	None
Storage Capacity:	2 petabytes
Applications:	Traditional Computational

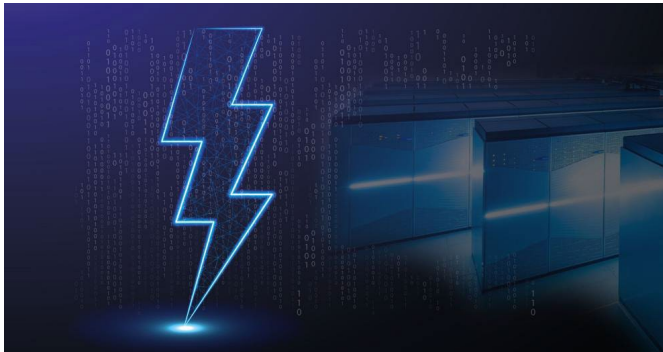
DEUCALION



Deucalion is a petascale EuroHPC supercomputer located in Guimarães, Portugal. It is supplied by Fujitsu Technology Solutions combining a Fujitsu PRIMEHPC (ARM partition) and Eviden Bull Sequana (x86 partitions). Deucalion is hosted by [MACC](#).

Sustained Performance:	3.96 petaflops
Peak Performance:	5.01 petaflops
Compute partitions:	ARM Partition: 1632 nodes, 3.8 PFLops ; x86 Partition: 500 nodes, 1,62 PFLops ; Accelerated: 33 nodes, 1,72 PFLops
Central Processing Unit (CPU):	A64FX (ARM partition), AMD EPYC (x86 partitions)
Graphics Processing Unit (GPU):	NVidia Ampere
Storage capacity:	430 TB High-speed NVMe partition, 10.6 PB high-speed based Parallel File System partition.
Applications:	Traditional Computational, AI, Big Data

JUPITER



JUPITER will be the first EuroHPC exascale supercomputer. The system will be located at the [Forschungszentrum Jülich](#) campus in Germany and operated by the [Jülich Supercomputing Centre](#). It will be based on Eviden's BullSequana XH3000 direct liquid cooled architecture.

Sustained Performance	1 Exaflop
Compute Partitions:	Booster Module (highly-scalable GPU accelerated) Cluster Module (general-purpose, high memory bandwidth)
Central Processing Unit (CPU):	The Cluster Module will utilise the SiPearl Rhea1 processor (ARM, HBM), integrated into the BullSequana XH3000 platform.
Graphics Processing Unit (GPU):	The Booster Module will utilise NVIDIA technology, integrated into the BullSequana XH3000 platform.
Storage Capacity:	JUPITER will provide a 20-petabyte partition of ultra-fast flash storage. The spinning disk and backup infrastructure capacity will be procured separately and subject to change.
Applications:	JUPITER will be designed to tackle the most demanding simulations and compute-intensive AI applications in science and industry. Applications will include training large neural networks like language models in AI, simulations for developing functional materials, creating digital twins of the human heart or brain for medical purposes, validating quantum computers, and high-resolution simulations of climate that encompass the entire Earth system.

1.3.6. Support of EuroHPC systems users

To support the users of EuroHPC JU systems, a call was launched to establish a dedicated higher TRL user support services across all EuroHPC hosting entities. As a result of this call a successful application was selected with an aim to establish the High-Level Support Team (HLST) called EPICURE.

The project will start in 2024 and will aim at improving the user support services for successful applicants to EuroHPC JU systems access calls. Until now, the responsibility to provide support services to awarded projects has rested on the Hosting Entities of EuroHPC JU supercomputers, which are the facilities that host and operate the supercomputers. These services include help-desk support for daily operational issues and problems (Level 1).

The EPICURE project will establish Application Support Teams (ASTs) in current and future EuroHPC Hosting Entities. These will encompass application porting, optimisation, and scalability improvements. In addition, EPICURE will also organise specialised training, events and workshops in the context of high-profile European HPC events. These services will be extended to awarded projects which have secured access to the supercomputers through EuroHPC JU's peer-review process.

1.4. ACCESS TO EUROHPC SUPERCOMPUTERS

Since 2021, EuroHPC has been providing scientists, SMEs and industry located in Europe with access to operational EuroHPC Systems. The JU manages the access time (from 35% for petascale systems up to 50% of pre-exascale systems total capacity) of EuroHPC supercomputers.

In 2023, EuroHPC JU organised a number of calls in order to provide European scientists and SMEs with access to its computing resources for large-scale European projects.

1.4.1. Calls for Access to EuroHPC Systems

In 2023, EuroHPC JU provided four Access Modes, categorised according to several parameters such as the volume of resources offered, the complexity of the evaluation process that is applied, the type and maturity of applications targeted by each mode, and the periodicity of cut-off dates.

A call for access involves an evaluation process. For Access Modes allocating large proportions of system resources, a Peer-Review evaluation is required to rank the applications based on the established evaluation criteria.

These modes are:

- Extreme Scale Access
- Regular Access

These modes require the involvement of large number external experts which support the Access Resource Committee to conclude the final ranking of proposals. The result of this rigorous process is that a number of applications may be rejected due to lower ranking. This is because the JU must first allocate resources in order of ranking, with the highest ranked proposals receiving resources first until the latter are exhausted.

Two Access Modes follow a simplified approach to application evaluation to accelerate the review process and reduce the time to inform the results and start of allocation period. These modes are:

- Benchmark Access
- Development Access

In addition to the above modes, allocations can be granted following exceptional procedures as foreseen by the Special Access type.

Benchmark mode:

The Benchmark access mode is meant for users to collect performance data on a target system in order to document the technical feasibility of their applications to be submitted to other access modes.

Development Access mode:

The Development access mode is meant for projects focusing on code and algorithm development and developing a science portal or other infrastructure software components.



EuroHPC
Joint Undertaking

Benchmark and Development Access

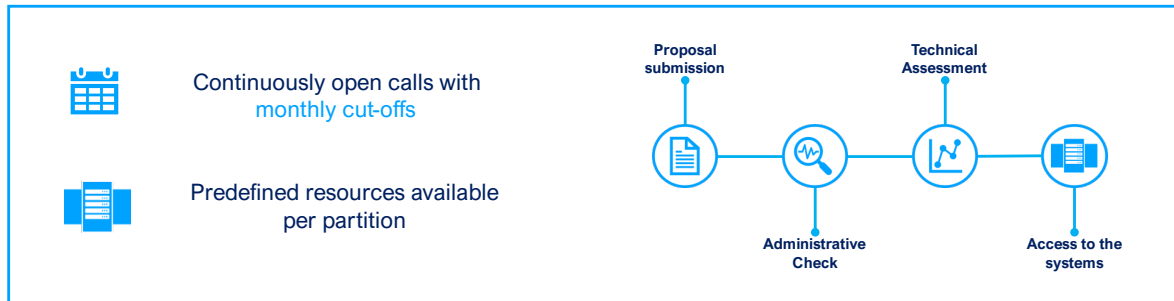


Benchmark Access

Scaling tests & benchmarks
Allocation duration – 2 or 3 months

Development Access

Code and algorithm development
Allocation duration – 6 or 12 months



Regular Access mode:

This access mode, open to all fields of science, will call for applications with a case to enable progress of science in the domains covered. These applications are expected to be able to justify the need for large allocations in terms of compute time, data storage and support resources because they are significantly contributing to the progress in their domain.

Regular Access



Continuously open call with 3 cut-off dates per year: **March, July, November**
Next cut-off date: 7 July 2023, 10:00 CEST

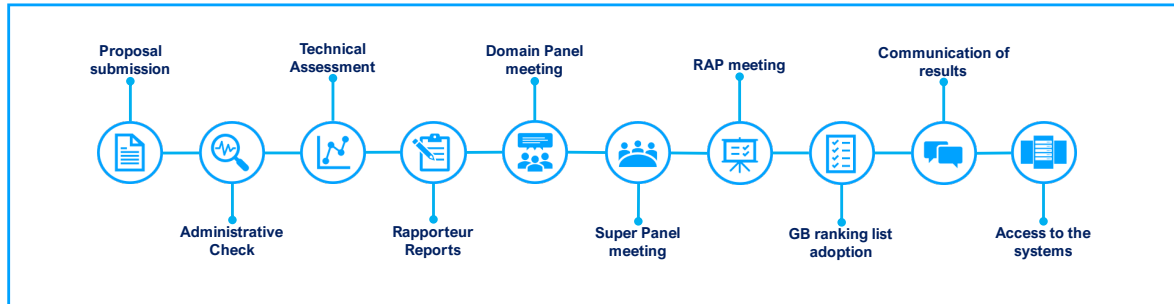
Intended for projects that require large-scale HPC resources

Peer-Review process duration: **4 months**



Available resources on petascale and pre-exascale systems

Eligibility: Principal Investigators and Team Members from countries associated to Horizon 2020



Extreme Scale Access mode:

This access mode calls for applications with high-impact, high-gain innovative research and is open to all fields of science and industry justifying the need for and the capacity to use extremely large allocations in terms of compute time, data storage and support resources.

Extreme Scale Access



Continuously open call with 2 cut-off dates per year: **April, October**
Next cut-off: 12 May 2023, 10:00 CEST

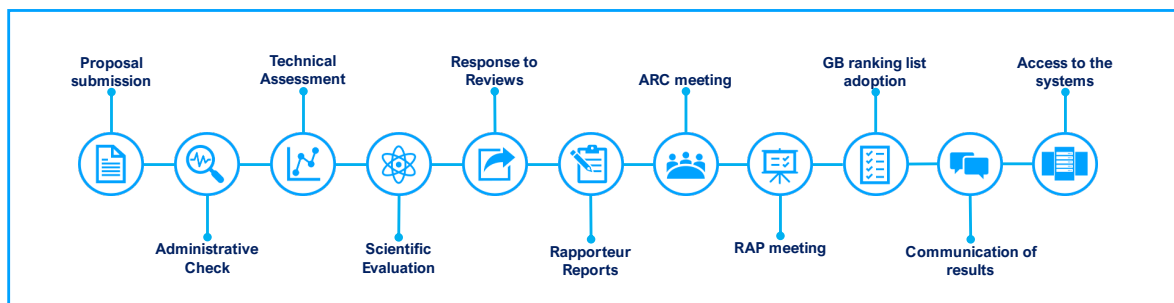
Intended for high-impact, high-gain projects that require extremely large-scale HPC resources

Peer-Review process duration: **6 months**



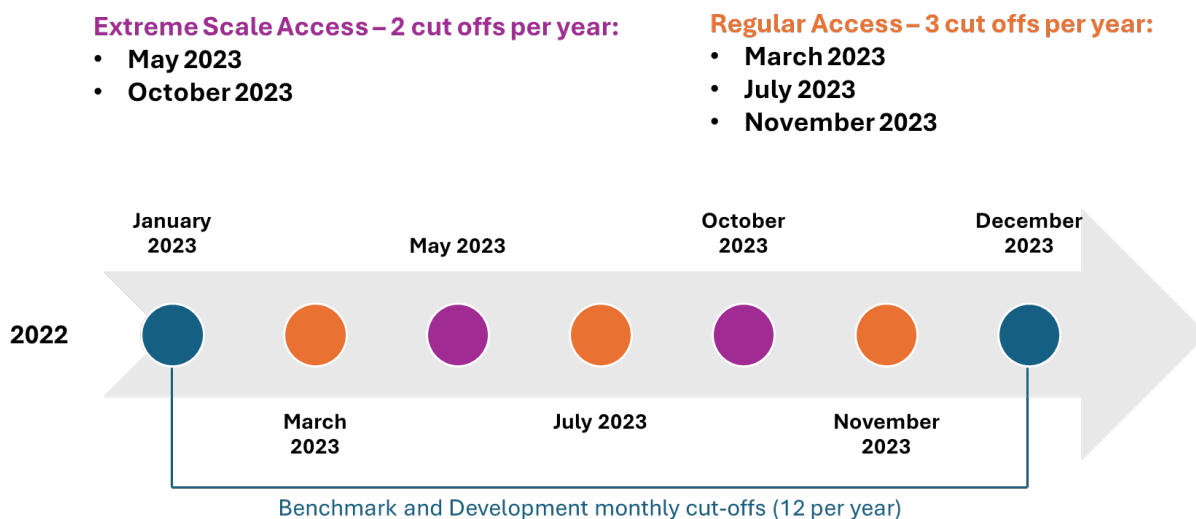
Available resources on pre-exascale systems

Eligibility: Principal Investigators and Team Members from countries associated to Horizon 2020



Access to EuroHPC system is undertaken based on a peer review process which is managed by the Joint Undertaking.

Regular and Extreme Scale Access – Timelines



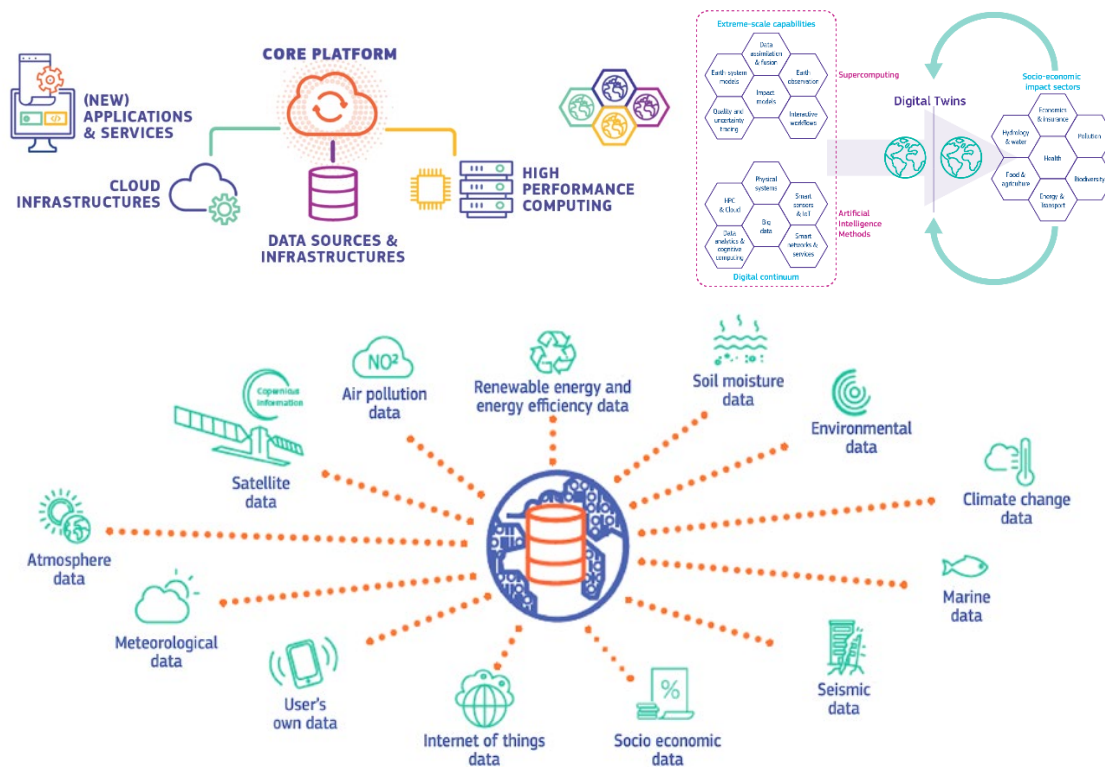
Special Access and Destination Earth

EuroHPC JU can grant special access free of charge to strategic European Union initiatives considered to be essential for the public good, or in emergency and crisis management situations.

In 2022, the Destination Earth project, also known as DestinE, became the first such initiative to be granted Special Access. The targeted EuroHPC supercomputers are Lumi, Leonardo, MareNostrum5 and MeluXina.

The project aims to develop a highly accurate digital model of the complex Earth system – a digital twin (DT) – to monitor, simulate and predict environmental change and human impact to support more sustainable developments and support corresponding European policies supporting the European Green Deal.

Users will have cloud-based access to Destination Earth models, algorithms, applications and natural and socioeconomic data to exploit and test their own models. The DestinE initiative has been divided into three major components: the Data Lake, the Core Service Platform and the Digital Twin Engine supporting the first two digital twins of the Earth system. The overall system and its components will be user-friendly and flexible to adapt to a wide spectrum of user needs and scenarios.



Source: Destination Earth

1.4.2. Awarded access to EuroHPC supercomputers

In 2023, there were three cut offs for the Regular access call, in March, July and November and 2 cut-offs for the Extreme-Scale access call, in May and October. Each cut-off triggers a review of the applications received before the deadline.

Within the 2023 cut-off periods, 163 projects were submitted under the Regular and Extreme Scale Access calls out of which 96 were awarded so far. The proposals received under the October 2023 cut-off for the Extreme-Scale Access call remain under evaluation until April 2024.

The proposals belong to various domains, including Biochemistry, Bioinformatics, Life Sciences, Physiology and Medicine, Chemical Sciences and Materials, Solid State Physics, Computational Physics: Universe Sciences, Fundamental Constituents of Matter and Engineering, Mathematics and Computer Sciences.

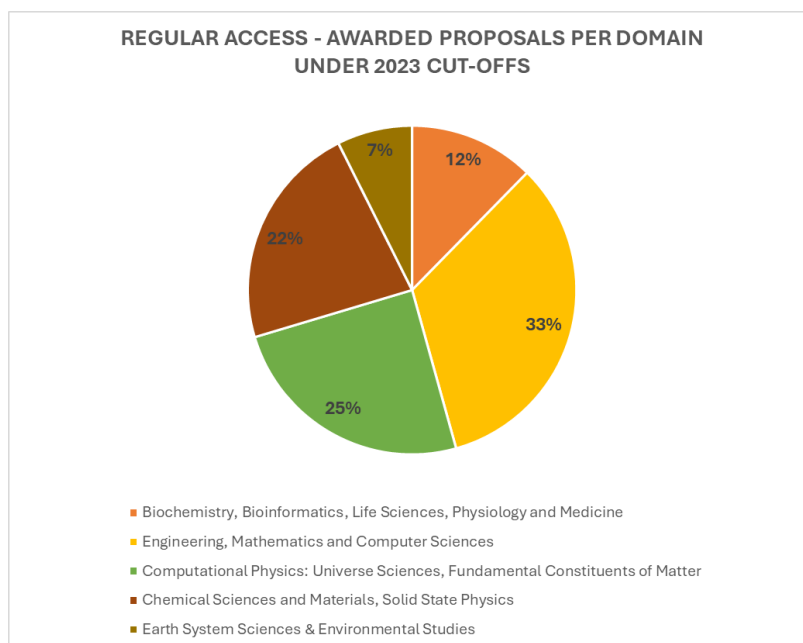
EuroHPC JU has allocated 28,060,689 node hours and 2,210,009,322 core hours on the HPC systems to the successful projects.

Regular Access – State of Play

In 2023, a total of 135 proposals for Regular Access on EuroHPC supercomputers were submitted, with 81 of these being awarded. The awarded proposals received a significant amount of resources, amounting to 9,620,752 node hours or 1,039,918,410 core hours. The Vega CPU and Discoverer CPU partitions were the most awarded, with 1,819,623 and 2,411,005 node hours respectively. The projects spanned various domains, with 33% belonging to engineering, mathematics, and computer sciences, followed by 25% in computational physics, and 22% in chemical sciences and materials.

Success Story

One project receiving compute time through the Regular Access call, "Advancing Radiotherapy," aims to optimise spatially fractionated radiation therapy to improve cancer treatment by targeting tumours more precisely and reducing side effects. Radiotherapy is a widely used treatment method, with over 50% of cancer patients undergoing this treatment. Despite significant advancements, the main limitation remains the tolerance of normal tissues to radiation. Led by New Approaches in Radiotherapy (NARA), the project has significant societal benefits, offering safer and more effective treatments. From November 2022 to October 2023, the project ran on the Vega CPU partition, utilizing 16,146,936 core hours of compute time. Access to high-performance computing resources has been crucial for the success of this innovative research.



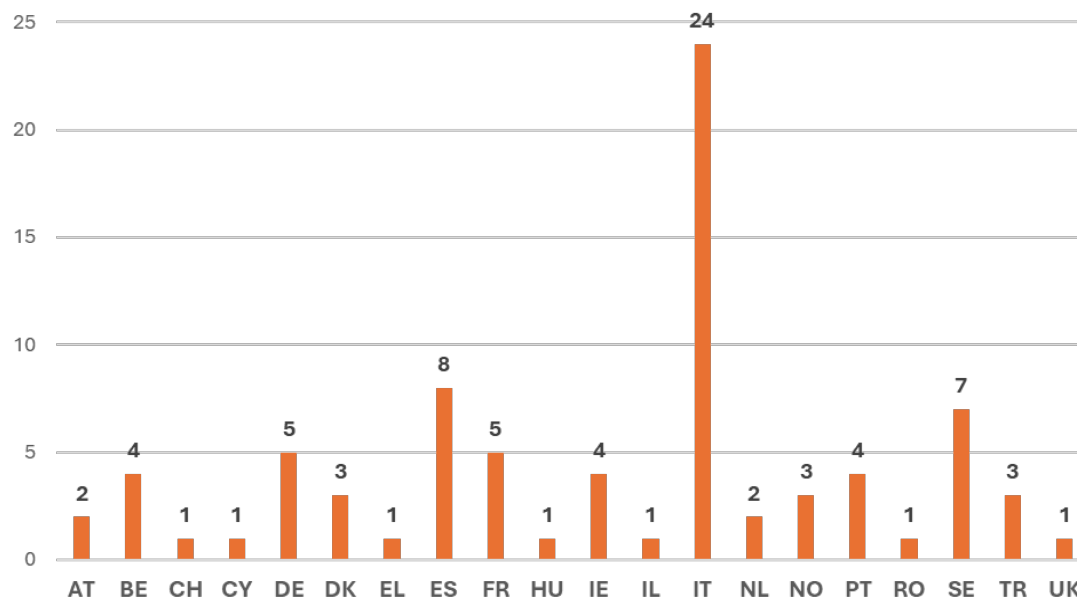
REGULAR ACCESS SYSTEM AWARDS IN 2023 CUT-OFFS *

CUT-OFF	Vega CPU	Vega GPU	MeluXina CPU	MeluXina GPU	Karolina CPU	Karolina GPU	Discoverer CPU	LUMI-C	LUMI-G	Leonardo Booster	Leonardo DCGP	MareNostrum5 GPP	MareNostrum5 ACC
Mar 2023	763,573	0	493,753	125,781	468,750	46,875	990,005	N/A	N/A	N/A	N/A	N/A	N/A
Jul 2023	451,650	15,866	110,000	174,650	86,240	21,828	325,000	177,000	288,807	296,810	53,177	36,938	0
Nov 2023	604,400	50,000	511,719	190,320	493,900	48,000	1,096,000	386,500	547,520	300,563	140,000	38,724	286,404
TOTAL	1,819,623	65,866	1,115,472	490,751	1,048,890	116,703	2,411,005	563,500	836,327	597,373	193,177	75,662	286,404

HOSTING ENTITY	NODE HOURS AWARDED IN 2023 CUT-OFFS
IZUM	1,885,489
LUXPROVIDE	1,606,223
IT4INNOVATIONS	1,165,593
SOFIATECH	2,411,005
CSC	1,399,827
CINECA	790,550
BSC	362,065
TOTAL	9,620,752

CUT-OFF	NODE HOURS AWARDED PER CUT-OFF (2023)
Mar-23	2,888,737
Jul-23	2,037,966
Nov-23	4,694,050

REGULAR ACCESS - PI AFFILIATION DISTRIBUTION - NUMBER OF AWARDED PROPOSALS UNDER 2023 CUT-OFFS



* Figures provided in node hours

Extreme Scale Access – State of Play

In 2023, the Extreme Scale access call type received 28 proposals, with 15 being awarded¹³. These awarded projects received a total of 18,439,937 node hours or 1,170,090,912 core hours¹⁴. Extreme Access provides access exclusively to the partitions of LUMI, Leonardo, and MareNostrum5.

LUMI was the most awarded, with 3,411,468 node hours for LUMI-C and 7,891,000 for LUMI-G.

Three research domains are represented across these projects: Computational Physics, Engineering, Mathematics and Computer Science, and Chemical Sciences and Materials, with Computational Physics being the most represented domain, accounting for 53% of the projects.

Success Story

The STREAM project (Spontaneous REArrangement of ice Motion in ice sheets) focuses on understanding polar ice dynamics using advanced modeling systems. Running on the EuroHPC supercomputer since May 2023, this project is critical for predicting glacier movements in Antarctica and Greenland, which are key to accurate sea-level rise projections. Rapid glacier movement leads to faster ice melting and contributes to rising sea levels, a major consequence of climate change.

By providing precise simulations of ice dynamics, STREAM aims to improve sea-level rise predictions, benefiting coastal communities and global economies. These insights are essential for developing effective mitigation strategies and ensuring societal adaptation in the face of climate change.

The project, which has been allocated 80,000,000 core hours on the LUMI-G partition, enabling large-scale simulations that drive groundbreaking research and offer crucial benefits for society.

¹³ For October 2023 cut-off, proposals will be under evaluation until April 2024

¹⁴ For October 2023 cut-off, proposals will be under evaluation until April 2024

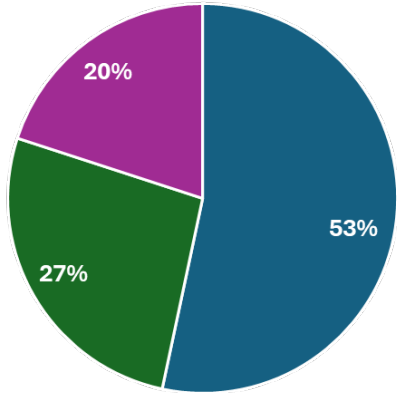
EXTREME SCALE ACCESS SYSTEM AWARDS IN 2023 CUT -OFFS (MAY 2023 CUT-OFF) *

CUT-OFF	Leonardo DCGP	Leonardo Booster	LUMI-C	LUMI-G	MareNostrum5 GPP	MareNostrum5 ACC
May 2023	N/A	4,520,594	3,411,468	7,891,000	N/A	2,616,875
TOTAL	0	4,520,594	3,411,468	7,891,000	0	2,616,875
Total per Hosting Entity	CINECA: 4,520,594		CSC: 11,302,468		BSC: 2,616,875	

EXTREME SCALE ACCESS SYSTEM REQUESTS IN 2023 CUT -OFFS (OCTOBER 2023 CUT-OFF) *

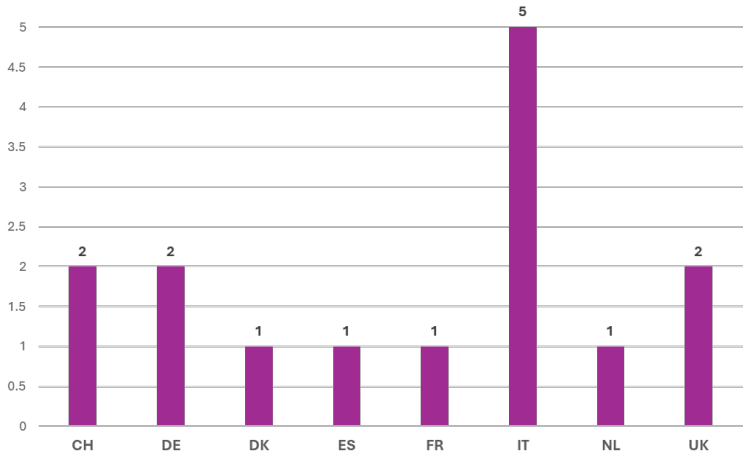
-	Leonardo DCGP	Leonardo Booster	LUMI-C	LUMI-G	MareNostrum5 GPP	MareNostrum5 ACC
REQUEST	0	6,384,427	1,952,917	11,607,068	900,000	7,485,341
OFFER	1,852,863	4,207,883	3,955,550	7,755,983	3,955,550	4,207,883

EXTREME SCALE ACCESS - AWARDED PROPOSALS PER DOMAIN UNDER 2023 CUT-OFFS (MAY 2023)



- Computational Physics: Universe Sciences, Fundamental Constituents of Matter
- Engineering, Mathematics and Computer Sciences
- Chemical Sciences and Materials, Solid State Physics

EXTREME SCALE ACCESS - PI AFFILIATION DISTRIBUTION OF AWARDED PROPOSALS UNDER 2023 CUT-OFFS (MAY 2023)



* Figures provided in node hours

1.4.3. User Requirements Study

In 2022, the JU launched a call for expression of interest to procure a data driven analysis of High Performance Computing services uptake by academic/SME/industrial and commercial end-users in European Participating States who are members of EuroHPC JU. The procurement was finalised in 2023. With this study, EuroHPC JU seeks to understand what specific technical, legal, financial and commercial considerations shape academic/industrial/commercial end-user requirements and how these requirements influence the business decisions of HPC users (academic, industrial and/or SMEs) to access high-performance computing solutions and services. The results of this study will be available in 2024.

1.5. QUANTUM INFRASTRUCTURE ACTIVITIES

The EuroHPC Joint Undertaking is committed to advancing the European supercomputing and quantum computing capabilities towards a world-leading hybrid HPC-QC infrastructure for open research and development.

As part of this deployment, the six Hosting Entities Euro-Q-Exa, LUMI-Q, EuroQCS-Italy, EuroQCS-Spain, EuroQCS-France and EuroQCS-Poland, comprised of 30 European partners, were selected in a first Call-for-Expression-of-Interest (EUROHPC-2022-CEI-QC-01) to operate and integrate different Quantum Computing platforms into their respective co-localised supercomputers that allow for hybrid HPC-QC workflows. The respective Hosting Agreements were signed on the 27 June 2023 in at the EuroHPC JU offices in Luxembourg.

Alongside these procurements, a dedicated action (DIGITAL-EUROHPC-JU-2022-HPCQC-04-IBA) for the hard- and software integration at all Hosting Sites was launched on 28 April 2023. One of the main goals of this integration project is to establish a harmonised and hardware-agnostic user experience among the different systems.

All partners will closely collaborate to find synergies between their integration strategies and a key result clearly foreseen by EuroHPC is the development of a common scheduler for hybrid workflows. In addition, the integration project also aims at establishing a joint Technical Support Team (TST) forum that will support potential European end-users to capitalise on these new hybrid systems and in the adoption of the technology, the development of common hybrid applications and benchmark suites and eventually to validate the HPC-QC integration efforts across all platforms.

A global coordination effort between the Hosting Entities will also favour the exchange of best practices in terms of HPC-QC integration to ultimately push joint European standards. A core deliverable of the project is the development of a hardware-agnostic system software, which will encompass elements like an application programming interfaces and all relevant system management interfaces, integrated into existing solutions to ensure full compatibility with established supercomputer standards.

To expand the quantum computer and -simulator fleet, a second Call-for-Expression-of-Interest (EUROHPC-2023-CEI-QC-01) was launched on 19 December 2023 anticipating two additional systems with complementary technologies.

1.6. OTHER OPERATIONAL ACTIVITIES

1.6.1. Hyperconnectivity Study

EuroHPC JU has appointed the "EuroHyPerCon" consortium to perform a study on hyper-connectivity of HPC resources in line with its policy framework.

Since its inception, EuroHPC JU has made significant investments in developing, deploying, and sustaining a world-class integrated supercomputing and data infrastructure in Europe, composed of a series of national and multinational HPC systems. The aim is to create a hyper-connected, federated, and secure HPC and quantum computing service and data infrastructure ecosystem. Therefore, the hyper-connectivity of the EuroHPC ecosystem, i.e. the ultra-fast connectivity across the different EuroHPC systems, along with the interconnection of other major national or regional HPC/data centres across Europe that are not part of EuroHPC JU, is crucial for creating such an ecosystem.

The expected outcome of the study is to provide a comprehensive analysis of the communication and/or connectivity needs between EuroHPC systems and other relevant European and national supercomputing and data infrastructures (e.g., European common data spaces), the available technology and service providers, and the landscape of users and their connectivity needs. It should also facilitate a view of the implementation options, including the description of services to be provided, network architecture, implementation instruments, and budgeting. Finally, the study should provide detailed specifications for the provisioning of the hyper-connectivity services to be provided to EuroHPC JU. The results of the study will be presented to the Governing Board.

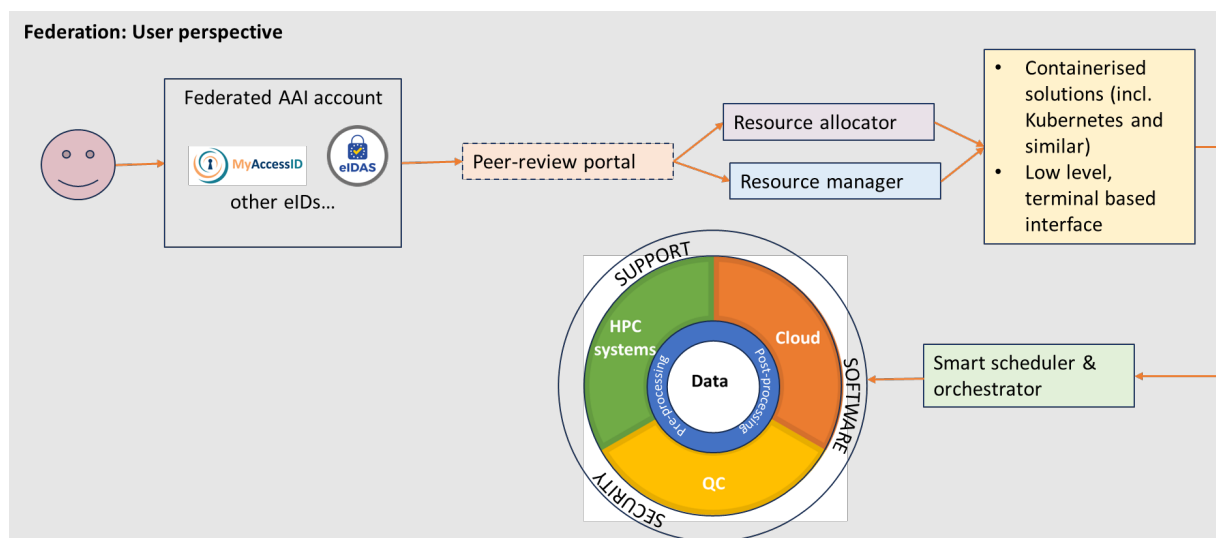
1.6.2. Federation

To fulfil EuroHPC JU's goal to develop, deploy, maintain, and extend in the European Union a world-leading federated and secure supercomputing, quantum computing service, a market study was conducted during the first half of 2023 to understand and explore the existing federation solutions and platforms in the European ecosystem.

The results of this five-month study were presented to the EuroHPC JU Governing Board and consequently, based on the Governing Board decision, a call for the procurement of the EuroHPC Federation Platform was launched in September 2023. The call for procurement was closed in December 2023 and the evaluations of the submitted proposals will be carried out in 2024.

The public procurement action is to build and deploy a fully operational infrastructure federation solution for EuroHPC JU supercomputers, providing access to a rich portfolio and professional-quality services in all relevant domains from access to pre-processing, computing, analysis, post-processing and storing. The procurement also covers operations, maintenance and support of the federation solution and services for five years.

The EuroHPC Federation Platform, should be robust, secure, scalable, flexible and user centric. It should constantly be improved and upgraded following user feedback and the state-of-the-art of the underlying core technologies. It should be open enough to be able to accommodate all EuroHPC JU supercomputers and quantum computers including the future industrial supercomputers. It intends to offer high quality of service management compliant with industrial standards. The proposed federation should also provide a superior user experience, usability, and ease of use for a large number of users.



1.6.3. Legal Proceedings

In July 2023, a lawsuit was filed before the General Court of the European Union against EuroHPC JU (Case T-328/23) seeking the annulment of the two Decisions, the Decision of 11 August 2022 rejecting a proposal submitted by a consortium under the Call for proposals for Centres of Excellence preparing applications in the Exascale era (HORIZON-EUROHPC-JU-2021-COE-01-01) and the Decision of 4 April 2023 rejecting the evaluation review requested by the consortium. At the end of 2023, the legal process was still on-going.

1.7. PROGRESS AGAINST KPIS

1.7.1. Progress Against JU-Specific KPIS

Identification of Key Performance Indicators (KPIs) linked to Horizon Europe and Digital Europe Programme by the Joint Undertaking and the Commission is ongoing.

The following two KPIs below are however in line with the Decisions taken by the Governing Board and EuroHPC JU's Regulation and are being tracked by the JU.

- In 2023, the JU met the KPI¹⁵ 'Number of EuroHPC systems installed in the EU ranking among the top 10 in the world' in 2023 by having three supercomputers in the top 10 of the [TOP500](#). As indicated in the other parts of this Report, they are LUMI, Leonardo and MareNostrum 5 which all rank in the Top 8 of the most powerful supercomputers in the world.
- The JU is working to meet the following target which is that 'the Union has, by 2025, its first computer with quantum acceleration, paving the way for the Union to be at the cutting edge of quantum capabilities by 2030.'^{16 17} Following the selection of six Hosting Entities for quantum computers in 2022, EuroHPC JU began to launch the procurement processes for the quantum computers in 2023. The procurements for EuroQCS-Poland and Euro-Q-Exa were launched at the end of 2023, with the remaining four procurements due to be launched in 2024.

¹⁵ Strategic plan 2020-2024 – DG Communications Networks, Content and Technology - Ares (2020) 4565545 02/09/2020

¹⁶ Communication on 2030 Digital Compass: the European way for the Digital Decade: COM (2021) 118 final

¹⁷ Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030

1.7.2. Dissemination and Information About Project Results

EuroHPC encompasses different types of projects within its scope. Firstly, research and innovation projects which directly receive grants under one of the funding programmes (“R&I Projects”). These projects were listed in Section 1.2 of this Report. The second type of projects are those receiving computing time on the EuroHPC supercomputers (“Awarded User Projects”). While these projects are not directly receiving funds from the JU, their work is being enabled by the resources provided free of charge by the EuroHPC initiative.

With regards to EuroHPC R&I projects, most were ongoing at the end of 2023, with only three having reached the end of their funding periods in the last quarter of the year. For two years in a row, EuroHPC JU has worked the Publication Office of the European Commission to produce “Project Information Packs”, to highlight some of the flagship ongoing projects and provide some information about their work and objectives. At the end of 2023, in anticipation of several more projects reaching the end of their funding periods in 2024, EuroHPC JU started planning for its first “Project Results Pack” in order to disseminate information about the results of the recently ended projects.

One such project, which will reach the end of its funding in 2024, is the EUMaster4HPC¹⁸ programme. Launched in January 2022, the EUMaster4HPC initiative is a flagship project under EuroHPC JU’s Skills and Usage Pillar, with a mission to train the future generation of HPC experts. In its two years of operation, the project has developed a pan-European curriculum in HPC, in collaboration with eight European universities, and the first cohort of EUMaster4HPC students will graduate from their degrees in June 2024.

The European Processor Initiative (EPI 2)¹⁹ is, as of 31 December 2023, halfway through its lifespan, however is already delivering promising results. With an objective to develop European microprocessor technology with improved performance and power ratios, and strengthening the competitiveness of European industry in such technologies, the project has developed a general purpose microprocessor, Rhea-1. Based on Arm technology and developed by French company SiPearl, the chip will power a future EuroHPC exascale supercomputer: JUPITER.

In terms of EuroHPC Awarded User Projects, over 100 projects have received computing time on EuroHPC supercomputers to date, with many of them contributing to scientific journals and publications. In 2023, EuroHPC JU began listing all awarded projects on the EuroHPC website under the Awarded Projects²⁰ section, categorised by domain, call and system partition. The JU has also launched a Success Stories page, to highlight particular achievements from the projects.²¹

One project which receives access to EuroHPC JU systems is Destination Earth²² (DestinE), a flagship initiative of the European Commission to develop a highly accurate digital model of the

¹⁸ [EUMaster4HPC - European Commission \(europa.eu\)](https://europea.eu/eumaster4hpc)

¹⁹ [The European Processor Initiative \(EPI\) - European Commission \(europa.eu\)](https://europea.eu/european-processor-initiative)

²⁰ [Awarded Projects - EuroHPC Joint Undertaking \(europa.eu\)](https://europea.eu/awarded-projects)

²¹ [Success Stories - The EuroHPC Joint Undertaking \(europa.eu\)](https://europea.eu/success-stories)

²² [Destination Earth \(destination-earth.eu\)](https://destination-earth.eu)

Earth on a global scale. Using EuroHPC JU compute power, this model will monitor, simulate and predict the interaction between natural phenomena and human activities. It will contribute to achieving the objectives of the twin transition, green and digital as part of the European Commission's [Green Deal](#) and [Digital Strategy](#).

In December 2023, the JU organised a User Day event in order to disseminate the results of the scientific projects that have had access to EuroHPC resources. A procurement was launched to get publication services in a peer review journal to publish the best projects. The contract with a provider was signed in 2024 and publication of EuroHPC projects will begin in 2024.

2. SUPPORT TO OPERATIONS

2.1. COMMUNICATION ACTIVITIES

In 2023, the EuroHPC Joint Undertaking (JU)'s communication team doubled in size, leading to a significant expansion of activities and possibilities. Thanks to continued efforts to raise EuroHPC JU's profile in the European HPC communities, EuroHPC JU has started to be recognised as a key player in HPC. Key milestones such as three EuroHPC supercomputers being ranked in the global top 10 on the TOP500 list, the signature of six Hosting Agreements to take steps towards investing into novel quantum computing technologies, or the inauguration of new supercomputers, were promoted and leveraged to build EuroHPC's standing in the supercomputing community, in Europe and internationally.

In June 2023, the Governing Board adopted the JU's [Communication Strategy](#), in line with its founding Regulation, which sets out the different activities presented in this section.

One of the main objectives of this strategy is to increase the JU's presence at key events and taking control of the JU's own flagship events have also strongly contributed to the organisation's recognition and reputation in the industry.

Events

The flagship event in EuroHPC JU's event calendar is the EuroHPC Summit. The 2023 edition, held from the 20th to the 23rd of March in Gothenburg, under the Swedish presidency of the European Union, was a particularly significant event as the JU took the lead in the organisation and funding of the event for the first time, chairing the Programme Committee and taking charge of the logistics, with great support from DG SCIC, the department responsible for interpretation and organising conferences in the EU Commission. The Summit attracted 589 participants, with over 480 joining the event in person, and it was an opportunity for the JU to present its achievements and upcoming programme. Attendees came from all areas of the European HPC community, from researchers to industrial players to policy makers.

The event was composed mostly of plenary and parallel sessions, focusing on high-level topics of political importance and more technical topics respectively. The programme was elaborated by the EuroHPC Summit Programme Committee, which was composed of EuroHPC JU (as chair and observers), representatives from the European Commission, the JU's two advisory

boards (INFRAG and RIAG), two of EuroHPC's private members, ETP4HPC and QuIC,²³ and the host country of Sweden. The programme was developed to highlight the JU's areas of activity and the results of its work, promote opportunities within the JU's ecosystem and shine a light on all the projects, partners and individuals who contribute to EuroHPC JU's mission.

The first cohort of students from the EUMaster4HPC programme were invited to attend the Summit as HPC Ambassadors, to provide logistical support throughout the event and to serve as a bridge between HPC experts and non-experts.

The EuroHPC DemoLab was developed, to give participants a clearer understanding of the potential of the EuroHPC supercomputers, wherein participants could witness live demonstrations of HPC use-cases. The HPC Ambassadors worked together with the supercomputing centres in the lead-up to the Summit to create demonstrations showing how to use and access the systems and the possibilities presented by such machines. The event was very well received by the EuroHPC community.

In May 2023, EuroHPC JU attended the annual ISC conference and exhibition in Hamburg. ISC High Performance is the largest supercomputing event held in Europe and following the success of the EuroHPC's first attendance in 2022, and taking into account the JU's increasing presence in the HPC industry, it was decided that the JU's participation should be repeated and expanded upon. The EuroHPC JU booth at ISC 2023 was a significant increase in visibility, with 28 EuroHPC-funded projects and two supercomputers (the Luxembourg-based Meluxina and the upcoming Jupiter) represented on the stand.

Following the success of EuroHPC JU's attendance at ISC in 2023 and 2022, it was decided that EuroHPC JU should also be represented at SC 2023 in Denver, USA. As the largest supercomputing event in the world, attending and being represented at this event is an opportunity for the JU to bolster its image not only on a global level but also towards European communities that opts to participate in SC over ISC due to its size. The participation to SC 2023 allowed the JU to increase its visibility among the HPC community and enabled new possible users from industry and academia to discover more about the JU's systems and how to access them.

In December, EuroHPC JU hosted its first User Day event. With more EuroHPC supercomputers becoming operational throughout 2023 and an increasing number of projects receiving access time on the systems, the User Day represented an opportunity to highlight the innovative and beneficial work done using EuroHPC resources, as well as creating stronger links with the EuroHPC user base and among the community. More than 30 projects were showcased during the event, focusing on several domains, including universe science, computational chemistry, engineering, artificial intelligence and computer science. Following the event, plans have been put in place to create a book of proceedings wherein projects

²³ The third Private Member in EuroHPC, BDVA was invited to join the Programme Committee, however a representative was not nominated.

having received computing time on EuroHPC supercomputers will be able to publish their research and results. This book of proceedings is expected to be published in 2024.

Two supercomputers' inaugurations took place in 2023. Deucalion was inaugurated on 6 September 2023, by the Portuguese Prime Minister Antonio Costa at the University of Minho in Guimarães. The Portuguese Minister of Science, Technology and Higher Education, Elvira Fortunato, the President of the Portuguese Foundation for Science and Technology (FCT), Madalena Alves, the Deputy Director General for Communication Networks, Content and Technology of the European Commission (CNECT), Thomas Skordas and EuroHPC JU's Executive Director, Anders Dam Jensen, also participated in the ceremony.

MareNostrum 5 is EuroHPC JU's third pre-exascale supercomputer to be inaugurated, and the final supercomputer in the first wave of EuroHPC supercomputer procurement. This significant event took place on 21 December 2023 at the Barcelona Supercomputing Center, attended by Pedro Sánchez, the President of the Government of Spain, Rafal Duczmal, the chair of EuroHPC JU Governing Board, Anders Dam Jensen, EuroHPC JU's Executive Director and Roberto Viola, Director General for Communication Networks, Content and Technology, European Commission (CNECT).

As each year, the JU participated in the Europe Day fair in Luxembourg on 9 May. Europe Day is an opportunity to promote the activities of the JU and engage with the general public, creating in-person links with European citizens and showing the human faces behind the work the JU undertakes.

As well as the key events listed above, the JU also ensures a strong representation at a maximum number of events throughout the year, attending conferences, workshops, webinars and summits hosted by EuroHPC JU's partners, projects, supercomputers or related organisations.

Social Media

In tandem with its expansion and increasing global profile, EuroHPC JU intensified its social media presence, particularly on LinkedIn, Twitter/X and YouTube.

This strategic focus led to a substantial increase in content production and posting regularity, resulting in heightened audience engagement and a continually expanding follower base across platforms, with over 6,300 followers on LinkedIn by December 2023.

The production of more visual content, and particularly videos (interviews, after movies, etc.), enabled by the expanded team, further enriched the digital narrative of EuroHPC's initiatives and achievements.

Website

Aiming to further improve its online presence and transparency of information, EuroHPC JU embarked on a comprehensive restructuring of its website to enhance accessibility, clarity, and transparency.

This endeavour saw the integration of previously external content into the EuroHPC website, alongside the introduction of new sections such as Access, Supercomputers, and Research & Innovation.

Notable additions included a blog launched in May and an Awarded Projects and Success Stories page, bolstering the platform's utility and engagement, and an increase in channels for the dissemination of information about the EuroHPC's activities and achievements outside of the classical format of press releases.

Internal Communication

As EuroHPC JU's communication team expanded, so did its focus on internal communication. The intranet website was restructured and restyled, to improve accessibility, clarity and transparency, for better access to information and documents from the inside of the organisation.

The development of an internal communication strategy throughout 2023 reflected a concerted effort to foster dialogue and information dissemination within the organisation. This initiative, made possible by the increased team capacity, aimed to cultivate a cohesive and informed workforce aligned with the JU's objectives, as well as formalised policy for information storing and sharing. The internal communication strategy is expected to be adopted in 2024.

Press

Reflecting a continued effort to increase its profile, in 2023 EuroHPC JU aimed to increase ties with the press, both within the HPC sector and the mainstream press. To this end, a briefing with local and European press was organised during the inauguration of MareNostrum 5, to share information on the supercomputer itself but also give an insight into the bigger picture framework of EuroHPC JU.

Features in esteemed publications like Le Monde and The Economist underscored the JU's growing influence and impact within the global HPC community.

Publications

In its efforts to continue to communicate effectively about its projects, EuroHPC JU released the second edition of its “Projects Information Pack” brochure, offering insights into its ongoing projects and comprehensive Research & Innovation strategy.

Additionally, the development of stickers, posters, flyers and factsheets for specific events or general use aimed to provide comprehensive information on the EuroHPC's activities and ways of working, bridging the gap between complex concepts and wider understanding.

With several EuroHPC JU-funded projects scheduled to finish in 2023, the JU is aiming to produce a “Project Results Pack” brochure, which will be published in summer 2024. This brochure will highlight the outcomes of the Research and Innovation projects ending between late 2023 and early 2024, offering a comprehensive overview of achievements and progress resulting from these projects.

2.2. LEGAL FRAMEWORK

The legal framework refers to:

- Council Regulation (EU) 2021/1173 of 13 July 2021
- Regulation (EU) 1291/2013 and its Rules for Participation establishing Horizon 2020;
- Regulation (EU) 2021/695 of The European Parliament and of The Council of 28 April 2021 establishing Horizon Europe;
- The CEF Regulation (EU) 1290/2013;
- Regulation (EU) 2021/1153 of the European Parliament and of the Council of 7 July 2021 establishing the Connecting Europe Facility;
- The Digital Europe Programme 2021-2027, established by Regulation (EU) 2021/694 of the European Parliament and of the Council of 29 April 2021;
- The Financial Rules adopted by the EuroHPC Governing Board on 20 February 2020 and re-adopted by the Governing Board on 30th September 2021

2.3. BUDGETARY AND FINANCIAL MANAGEMENT

The Financial Rules establishes that the Accounting Officer shall be independent in the performance of his or her duties, enforcing an effective separation of duties between this position and that of Authorising Officer. Since 2022, with the agreement of EuroHPC JU Governing Board, that EuroHPC JU could, if appropriate, engage in BOA agreements with its sister JUs EuroHPC JU has joined the BOA Accountancy Services which is provided by EU-RAIL JU. With the GB decision 38/2022 the Accounting Officer of the EU-Rail JU is appointed as the Accounting Officer for EuroHPC JU and this was continued in 2023.

The budget of EuroHPC JU is divided into 3 titles as follows:

- Title 1: Staff Expenditure
- Title 2: Administrative Expenditure
- Title 3: Operational Expenditure

Budget Revenue:

EuroHPC JU budget revenue according to the final voted budget for 2023 was EUR 582M. The cashed amount in 2023 is EUR 570M. Two debit notes for an amount of EUR 12M, were sent to Barcelona Super Computing Centre late in 2023 which explains the difference between the total budget revenue of EUR 582M and the cashed amount of EUR 570M.

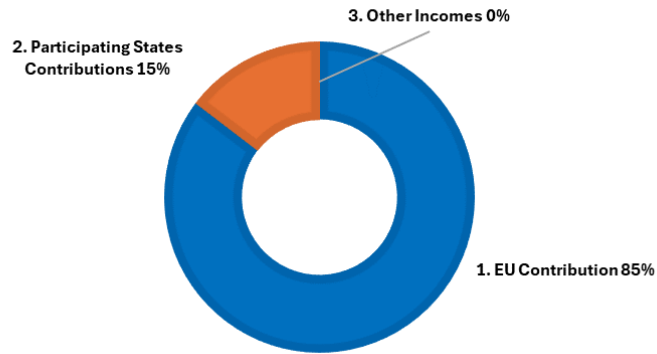
The financial contributions made by the Participating States to the procurements implemented by the JU amounted to a total of EUR 93M. They were collected from the Hosting Entities which act on behalf of the consortium of the Participating States. The JU has recovered the amounts indicated in the Administrative Agreements from the following Hosting Entities:

- FCT – Deucalion Consortium (Petascale)
- CSC – LUMI Consortium and Czech Republik (Pre-Exascale)
- LUMI Q (Quantum)
- FJZ – JUPITER Consortium (High-End-Exascale)

The EU contribution for the three funding programmes (DEP, HE and CEF2) and the legacy H2020 (Reg. 2018/1488) amounts to EUR 489M for 2023.

The chart and table below show the contributions made in 2023 from the EU and the Participating States:

REPARTITION OF ENTITLEMENTS



Contributions from EU and Participating States 2023

EU Administrative Contribution	7,894,134 €
EU H2020 Administrative	1,691,352 €
EU HE Administrative	2,560,011 €
EU HE Administrative Experts Managed by REA	23,535 €
EU Recoveries from expenses	1,877 €
EU DEP Administrative	3,617,359 €
EU Operational Contribution	480,723,610 €
EU H2020 Operational	67,328,950 €
EU HE Operational	137,598,280 €
EU DEP Operational	225,796,380 €
EU CEF2 Operational	50,000,000 €
Total EU Contribution	488,617,744 €
DEUCALION Petascale Project	4,032,435 €
LUMI Pre-exascale Project	2,183,617 €
PS MareNostrum	11,920,023 €
JUPITER Exascale Project	73,250,000 €
LUMI Q Quantum Project	2,041,500 €
Total Participating States Contribution	93,427,575 €
EU + Participating States Contributions - Total Cashed	570,125,296 €
EU + Participating States Contributions - Total Not Cashed	11,920,023 €
Other Incomes	1,477 €
Total Revenue Cashed	570,126,773 €

a) Administrative Expenditure (Titles 1 and 2):

In compliance with the financial rules of the JU, and, in particular, of the n+3 guidelines of the Commission, the JU has not only used C1 (fresh 2023 credits) but also C2 (reactivated credits).

Budget implementation under titles 1 and 2 (C1 and C2 appropriations) is as follows:

Situation of Commitment and Payment Appropriations - Title 1

Commitment Appropriations (CA)		Payment Appropriations (PA)	
Received	8,173,633 €	Received	8,351,346 €
Consumed	4,278,053 €	Consumed	4,055,875 €
	52%		49%

Situation of Commitment and Payment Appropriations - Title 2

Commitment Appropriations (CA)		Payment Appropriations (PA)	
Received	4,418,179 €	Received	4,669,810 €
Consumed	1,449,089 €	Consumed	1,357,028 €
	33%		29%

In line with the Joint Undertaking N+3 rule, unused appropriations will be carried over to 2024. The tables above show the C1 and C2 appropriations.

b) Operational Expenditure (Title 3):

The situation in 2023 continued to be influenced by the relatively late adoption of the regulation 2021/1173 (August 2021), which means that EuroHPC JU was not able to launch all calls foreseen in the WP 2022 and those had to be launched and implemented during 2023 in addition to the calls launched in 2023.

Regarding the CEF programme, the JU signed a contract regarding a study on Hyperconnectivity for HPC resources (EUR 775,083). The result will set the roadmap regarding the implementation of the hyperconnectivity for HPC resources. Conclusions of the report will be available in the 2nd half of 2024, therefore we are expecting the follow up procurement calls in 2024 and corresponding payments in the coming years (respecting the n+3 rule).

The full acceptance of the pre-exascale supercomputer Leonardo took place in December 2023. Following the procurement contract as amended, the final payment (EUR 16M) will take place in 2024 even though the computer was fully accepted in 2023. Also, the OPEX grant payments will be postponed to 2024 as the Hosting Entity can request payments only once the supercomputer is operational.

The delivery and acceptance of the phases 1-3 of MareNostrum5 were foreseen in 2023. However, in November 2023 after the benchmarking period (entering into the top 500 list) a new scenario for the deployment process was provided and the phases 1-4 will be fully delivered and accepted only in 2024. Therefore, the payments foreseen in 2023 have been postponed to 2024 (EUR 87M).

The payments related to the acquisition of the pre-exascale LUMI were concluded after the successful instalment of the phases 2 and 3 of the supercomputer. Also, the 2nd interim payment for the OPEX grant was performed during the year 2023.

At the end of 2023, the JU received some requests for interim payments for the R&I Grants. The JU will only finalise the payment procedure once the expert technical evaluations are delivered and accepted by the R&I team, at the beginning of 2024.

EuroHPC’s Governing Board awarded the RISC-V FPA to the DARE project at the end of 2023. The award for the FPA will be signed in 2024 and the SGA call will be launched in 2024. Therefore, the pre-financing payment foreseen under this action will take place in 2024.

Some calls under the R&I (under HE and DEP) were launched in the last quarter of 2023, therefore the pre-financing payments foreseen (in 2023) will be paid in 2024.

Situation of Commitment and Payment Appropriations - Title 3

Commitment Appropriations (CA)		Payment Appropriations (PA)	
Received	1,123,504,748 €	Received	1,044,771,947 €
Consumed	941,526,017 €	Consumed	200,424,046 €
	84%		19%

In line with the Joint Undertaking N+3 rule, unused appropriations will be carried over to 2024. The tables above show the C1 and C2 appropriations.

c) Global Budget Execution (Titles 1, 2 and 3):

All titles considered, the total budget executed by EuroHPC JU in 2023 was EUR 947M in terms of commitments, which represent an execution rate of 83% of the total credits activated and available during the 2023 financial year. Similarly for payments, the global execution rate for all titles was of 19%, equivalent to EUR 206M. The reasons for the lower budget execution in payments than in commitments are explained in the chapter above (Operational expenditure).

The EuroHPC JU has taken additional budget control measures to progressively improve its budget execution rates in 2024 and forthcoming years.

JU Budget	Commitment Appropriations (CA)		Payment Appropriations (PA)	
	Credits	Consumed	Credits	Consumed
Title1	8,173,633 €	4,278,053 €	8,351,346 €	4,055,875 €
Title 2	4,418,179 €	1,449,089 €	4,669,810 €	1,357,028 €
Title 3	1,123,504,748 €	941,526,017 €	1,044,771,947 €	200,424,046 €
Total	1,136,096,560 €	947,253,159 €	1,057,793,103 €	205,836,949 €
Budget Implementation rate		83%		19%

Financial, budgetary and accounting details are provided in the Report on budgetary and financial management 2023, and also in the 2023 financial statements.

2.3.1. Financial and In-Kind Contributions

Reporting:

In compliance with the Article 7 (5) of Council Regulation (EU) 2021/1173, paragraphs 1 the following Participating States reported on the value of the contributions for the operational activities made in this financial year:

Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Latvia, Malta, Poland, Portugal, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland (EU Regulation 2018/1488), The Netherlands and Turkey.

Israel joined the JU at the end of the 2023, therefore this Participating State will start reporting next year.

10 Participating States have not reported their contributions for the operational activities made.

Regarding the Private Members, the JU has received the reports from DAIRO, ETP4HPC and QuIC.

Contribution per Programme in 2023 (amounts in thousands of EUR):

A) Overview:

Programme	EU cash validated	EU cash not validated	Participating States cash validated	Participating States cash not validated	Participating States estimated IKOP	Participating States estimated financial contributions	Private Members estimated IKOP	Total
H2020 / CEF1	445,044	-	129,644	-	51,932	356,779	18,406	1,001,805
HE	28,997	207,948	-	-	-	40,905	361	278,212
DEP	71,681	369,092	36,637	101,905	-	249,388	408	829,110
CEF2	-	80,000	-	-	-	-	-	80,000

Explanation of the table is as follows:

Column “EU Cash Validated” and “Participating States Cash Validated”

The EU and Participating States validated cash comprising of the contributions of the Union received by the JU for the programme Horizon 2020 and the contributions implemented by the JU through payments for the programmes Horizon Europe, Digital Europe and Connecting Europe Facility.

Column “EU Cash Not Validated” and “Participating States Cash Not Validated”

The EU and Participating States not validated cash comprising the contributions of the Union received by the JU for the programmes Horizon Europe, Digital Europe and Connecting Europe Facility, which have not been implemented through payments and are thus held as received pre-financing.

Columns “Participating States estimated IKOP” and “Private Members estimated IKOP”

The Participating States and Private Members estimated IKOP category comprising of the Joint Undertakings estimate of the in-kind contributions due in relation to the projects for which the necessary reporting and certification requirements were not yet met in order to validate these contributions.

Column “Participating States estimated financial contributions”

The Participating States estimated financial contributions comprising of the total estimated commitments based on signed agreements for which the contributions have not yet been

provided to the Joint Undertaking or are not provided directly to the Joint Undertaking. The amounts include the co-funding contributions of the Participating States to projects funded through grant agreements; the co-funding contributions for the purchase of supercomputers owned by the JU or co-owned with the JU; and the co-funding of the operational costs of the supercomputers currently in operation.

B) Ongoing activities under Horizon 2020 & CEF 1 programmes

Overall, the achievement rate for funding on the Council Regulation 2018/1488 is at a level expected from a programme approaching its sunset period. The EU funding has reached 83% of its Regulation target while the Participating States contributions (cash provided to the JU and estimated in-kind and financial contributions) has met its regulatory target and even exceeded it by 13%.

C) Horizon Europe, Digital Europe and Connecting Europe facility programmes

The information presented for the HE, DEP and CEF programmes is in line with the financing expectations from a programme that in reality started for the JU in 2022. The funding from the Union, compared to the total planned MFF funding, has reached 25% while the Participating States contributions (cash provided to the JU and estimated in-kind and financial contributions) is at an estimated 14%. The difference in the pace of contributions between members in the beginning of the programme is expected as the Union's financing in the form of cash is required for the prefinancing of activities and must be provided before any other type of contribution.

2.3.2. Administrative Procurement and Contracts

The majority of EuroHPC JU's administrative contractual commitments in 2023 were concluded on the basis of existing multiannual framework contracts (FWCs). In terms of volume, the FWCs most used were in the field of IT and audit services. When these contracts were not available to EuroHPC JU or they had expired, it was necessary to launch specific tender procedures, most of them for low-value contracts. All procedures were administered in compliance with EuroHPC JU Financial Rules to ensure fair competition amongst economic operators, and the most sound and efficient use of EuroHPC JU funds.

In addition, throughout 2023, EuroHPC JU used Service Level Agreements (SLAs) in force with the European Commission and other EU bodies. Several other contracts were concluded for less than EUR 15,000 each, while the following Table shows contracts concluded in 2023 for single amounts higher than EUR 15,000:

Contractor Official Name	Title/purpose of the contract/grant	Procedure Type/ Legal Basis Desc	Date	Contracted Amount (EUR)
ARENDR & MEDERNACH SA	SERVICES OF LEGAL REPRESENTATION OF EUROHPC/COJ - CASE T-328/23	(FR2018) Negotiated procedure without prior publication (Annex 1 - 11.1)	08/12/2023	150,000
MS AUTOMATEN SERVICES SARL	SUPPLY OF COFFEE MACHINES AND WATER DISPENSER SERVICES	(FR2018) Negotiated procedure low value contract (Annex 1 - 14.3)	01/12/2023	24,157
PROMETEUS	BOOKING EUROHPC JU EXHIBITION SPACE AT ISC 2024 - 12-16 MAY 2024 - HAMBURG/ GERMANY & BIENNIAL PUBLICATION OF TOP500 LIST ON A WEBSITE	(FR2018) Negotiated procedure without prior publication (Annex 1 - 11.1)	27/04/2023	100,460
STUDIO NOVA LTD	EUROHPC JU STAND BUILDING AND DISMANTLING SERVICES AT ISC HIGH PERFORMANCE 2023 EVENT – HAMBURG-GERMANY 21-25/05/2023	(FR2018) Negotiated procedure low value contract (Annex 1 - 14.3)	13/04/2023	41,480
BLUE OCEAN SUSTAINABLE SOLUTIONS LDA	STUDY ON HPC ACADEMIC /SME /INDUSTRIAL /COMMERCIAL END-USER REQUIREMENTS IN THE EUROPEAN UNION	(FR2018) Negotiated procedure low value contract (Annex 1 - 14.3)	01/12/2023	55,000

2.4. IT AND LOGISTICS

In addition to the usual day-to-day tasks of user support and maintenance of the Microsoft Cloud platform, the year 2023 was marked by:

- The expansion of EuroHPC JU's offices doubling the JU's capacity to accommodate all remaining new colleagues;
- Increased recruitment in terms of staff
- Measures to improve the quality of IT processes and the services provided.

The preparatory work for establishing the ICT BOA (Back Office Arrangements) between the JUs took place throughout 2023 and was completed at the end of the year. This resulted in improved collaboration and synergy between all the participating JUs, enabling them to align their ICT policies and improve the joint implementation of ICT processes, security, data protection strategies and, in general, compliance with the control authorities.

The ICT BOA has also enabled EuroHPC JU to join the "IT Managed Services Framework Contract", coordinated by CAJU, and establish its own specific contract with the external contractor Real Dolmen, covering the provision of the most of the day-to-day user support. In 2023, EuroHPC JU installed videoconference systems in two new meeting rooms at the JU's offices, allowing for the growing demand from staff and stakeholders to organise simultaneous meetings (physical or hybrid) on the premises.

Following the general return of colleagues to the office as well as the continual expansion of EuroHPC JU team in 2023, EuroHPC offices' internet line was improved. The SLA was updated

to establish two additional 1 GB/s lines, thus avoiding any risk of saturation or cut-off of access to the Internet and, therefore, EuroHPC resources.

2.5. HUMAN RESOURCES

i. HR Management

Recruitment

During 2023, 16 selection procedures were finalised, of which:

- 11 selection procedures were launched in 2023
- 5 procedures launched during the last quarter of 2022 and were finalised in 2023.

As a result, EuroHPC JU team grew from 23 staff to 36 staff members in 2023. All selection procedures for the temporary agent posts were external. 3 staff members left the JU in 2023 (<10% of turnover).

Vacancies were actively promoted on the EuroHPC JU's website and additional multiplier websites (e.g. EPSO, EU Agencies Network, etc.), as well as on social media (e.g. LinkedIn). Additional channels are used to promote specialised profiles.

The HR Sector, with support of the Communication team, also participated in the Interinstitutional job fair promoting job opportunities and giving more exposure to the JU's selection procedures.

Staff Needs Assessment

In 2023 the JU initiated the process of internally assessing its existing staff needs, in view of optimising the available resources across the organisation. The exercise was linked, inter alia, with the upcoming new mandate of the JU, related to the Artificial Intelligence.

Implementing Rules

In the course of 2023, the HR Sector also implemented the rules and guidelines on conflict of interest, as well as the Commission tool (Ethics module in Sysper) to manage this type of procedure. The Ethics officer was also appointed by the Executive Director. No new implementing rules were adopted in 2023.

Learning and Development

EuroHPC organised, with the support of OLAF, two training sessions throughout 2023 on Anti-Fraud awareness. The training was open to staff of all Joint Undertakings. It reached approximately 80 staff (from all JUs).

The JU newcomers followed the mandatory training.

The JU provided staff with Learning and Development opportunities, in order to strengthen the skills required for the different profiles.

Newcomers' Onboarding

The JU has further strengthened its onboarding process, in order to ensure that newcomers obtain the necessary support and guidance, as well as the training required for the particular post.

HR Tools and Processes

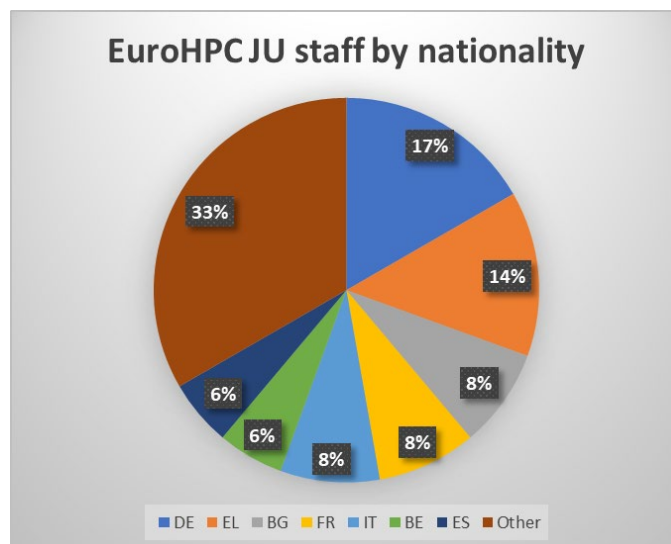
Four new SYSPER (Commission's HR management tool) modules were implemented by the JU during 2023: Ethics, Job Descriptions, Objectives, and Resignation. The JU participates in the working groups covering the upcoming implementation of new HR tools, such as HRT.

Staff Committee

The Staff Committee is established and performs its tasks. Regular meetings with ED, general staff assemblies and consultations with Staff Committee take place.

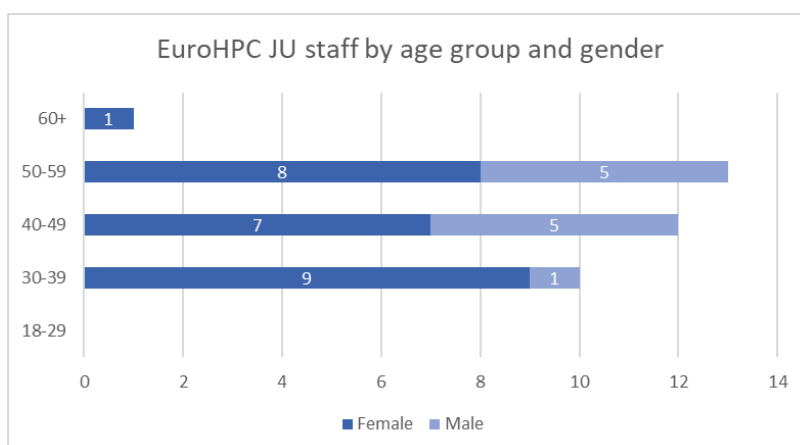
Diversity and Inclusion

EuroHPC JU, adopted the EU Agencies Network (EUAN) Charter on Diversity and Inclusion. In December 2023, JU staff represented 17 different nationalities. German nationals are the largest population in EuroHPC JU (6 staff members), followed by Greek (5 staff members), Bulgarian, French and Italian (3 staff members of each nationality).



Staff geographical diversity as of 31/12/2023

In terms of the gender balance, 70% of staff are female and 30% male. With regard to middle management, the gender balance is 50% male and 50% female.



Staff situation as of 31/12/2023

Health and wellbeing

Following the increase in staff, the JU extended its office space. Several staff members completed specific training for fire wardens, as well as first-aid training.

The JU joined the series of anti-harassment trainings organised for all JUs, which was mandatory for all staff. Dedicated sessions were organised for staff and for managers.

The JU organised for the first time the Team building for all JU staff, in order to facilitate the integration of the newcomers in the team, as well as increase team's cohesion and internal communication.

ii. Efficiency gains and synergies

The JU paid particular attention to the efficient and optimal allocation and management of its resources. In 2023, it started the internal staff needs assessment, constituting the basis for the allocation of posts and interfaces across the organisation.

EuroHPC decided to join the inter-JU Back-Office Arrangements (BOAs), in order to strengthen the collaboration with other Joint Undertakings through mechanisms of pooling expertise in key areas, such as accounting, IT, procurement and HR, as well as identifying the best practices in those areas.

More specifically in the area of HR, in 2023, EuroHPC optimised efficiency gains and synergies with the other JUs by,

Sharing reserve lists to shorten time to recruit; (ii) providing expertise and resources of EuroHPC JU staff to be panel members in several selection procedures of other JUs (iii) supporting new Joint Undertaking during their on-boarding/start-up phase providing guidance, advice and templates

- organising training courses of general interest for all JUs (e.g. anti-fraud); (v) contributing to the development of a common legal framework among JUs by sharing ED and GB decisions on diverse regulatory topics

- Supporting the communication campaign on the role of confidential counsellors and presentation of the newly appointed CCs to all JU's staff members. The JUs are also jointly assessing the implementation of additional common tools, e.g. in the area of recruitment.

EuroHPC JU is sharing information and best practices with the different JUs through meetings and working groups e.g. the Executive Directors, Heads of Resources, HR officers, Legal officers, EUAN meetings etc.

In the case of the Procurement BOA, the JU is currently co-leading the working group, providing expertise and sharing and learning best practices.

With regard to IT JU, the JU participates in the IT Governance meetings, which provide a platform for exchanging views, sharing best practices and providing the overview of the current and future projects of common interest. They also provide the opportunity to review the performance of the external service provider in the area of IT user support, as well as address the challenges, e.g. related to the obligations in the area of cybersecurity.

The JU is also participating in various EU Agencies' Network working groups, e.g. related to the HR strategy or performance management. These working groups constitute an excellent opportunity for sharing the best practices among EU decentralised agencies and bodies.

3. GOVERNANCE

3.1. MAJOR DEVELOPMENTS

Rafal Duczmal, Polish representative at the Governing Board (GB) of the EuroHPC Joint Undertaking (EuroHPC JU), was elected as the new chair of the board for a period of two years, during the 34th GB meeting held in October 2023 in Luxembourg. Rafal Duczmal succeeds Dr Herbert Zeisel, who stepped down after having served as EuroHPC JU Chair for four years.

In addition, Israel joined the Joint Undertaking in October 2023.

3.2. GOVERNING BOARD

At the end of 2023, the EuroHPC JU had 34 Participating States, following the Governing Board decision to accept Israel as a new member in October 2023.

The Governing Board met six times in 2023, at the occasion of the 31st, 32nd, 33rd, 34th, 35th and 36th meetings. The meetings took place in a hybrid way, online and in Luxembourg, to make it possible to all GB members to follow the meetings. The Governing Board adopted 52 decisions in total, 28 during the GB meetings and 24 by written procedures. Major decisions taken by the Governing Board included the amendment of the Multi-annual Strategic Programme, the selection of hosting entities for new EuroHPC supercomputers, in particular the second high-end (exascale) system in France and the selection of hosting entities for mid-range supercomputers to be integrated in existing supercomputers across Europe. Additionally the GB approved decisions on the access to the EuroHPC JU part of the supercomputers for European researchers.

3.3. EXECUTIVE DIRECTOR

In 2023 Anders Dam Jensen, Executive Director of the EuroHPC Joint Undertaking, continued to lead the Joint Undertaking.

3.4. INDUSTRIAL AND SCIENTIFIC ADVISORY BOARD OF THE EUROHPC JU

The EuroHPC JU Industrial and Scientific Advisory Board is composed of two Advisory Groups: The Research and Innovation Advisory Group (RIAG), chaired by Jean-Philippe Nominé, and the Infrastructure Advisory Group (INFRAG), chaired by Sinead Ryan.²⁴

During 2023, the EuroHPC JU Advisory Board continued its intensive work on the Multiannual Strategic Plan (MASP) document. The two groups had two formal face-to face meetings: one during the EuroHPC JU Summit in March 2023 and the other a full day dedicated meeting in September 2023 at the EuroHPC JU premises in Luxembourg.

Additionally, the advisory groups continued the unofficial weekly meetings in online form to discuss and brainstorm about the state of play and the needs of the European HPC ecosystem. The EuroHPC JU supports supporting the Advisory Groups by setting up collaboration environments such as a common document repository, mailing lists and the organisation of in-person meetings.

During the first half of 2023, the Advisory Groups finalised the update of the MASP which was consequently submitted for the GB acceptance. As the MASP is a living document and the EuroHPC ecosystem is constantly evolving, the Advisory Groups continued the work on the MASP with the aim to have the next updated version in Q1 of 2024.

This work was accompanied by several public consultations the JU Private Members, ETP4HPC, BDVA and QUIC as well as with different European initiatives such as ELIS, CLAIR and other AI European initiatives. These consultations were organised with the help of EuroHPC JU.

²⁴ Annexes 5 and 6: RIAG and INFRAG Membership Lists

4. FINANCIAL MANAGEMENT AND INTERNAL CONTROL

This section reports the control results and other relevant information that supports management's assurance on the achievement of the financial management and internal control objectives. It includes the information necessary to establish that the available evidence is reliable, complete and comprehensive. It reports on the performance of internal control system covering all activities, programmes and management modes relevant to the JU. The internal control system and the risk management in place are described, together with the assessment of their effectiveness, efficiency, and compliance.

4.1. Control results

This section reports on the assessment of elements that were identified by the JU management to support the assurance on the achievement of the internal control objectives: (i) effectiveness, efficiency and economy of operations; (ii) reliability of reporting; (iii) safeguarding of assets and information; (iv) prevention, detection, correction and follow up of frauds and irregularities. The internal control objective 'adequate management of risks relating to the legality and regularity of the underlying transactions' is described in section related to the assessment of the internal control system and more precisely in section 4.3.2.

The assessment on the cost-effectiveness of controls is described at the end of this section.

4.1.1. Effectiveness of controls

4.1.1.1. Legality and regularity of the financial transactions

EuroHPC JU uses internal control processes to ensure sound management of risks relating to the legality and regularity of the underlying transactions it is responsible for, taking into account the multiannual character of programmes and the nature of the payments concerned.

The current Financial Rules of the JU were adopted by the Governing Board in 2020²⁵ and re-adopted in 2021²⁶ in compliance with the Art. 19 of the Council Regulation 1173/2021. The Manual of Financial Procedures of the JU was adopted by the Executive Director in 2020²⁷ and

25 Decision of the GB No. 3/2020.

26 Decision of the GB No. 17/2021

27 Decision of the Interim ED No. 4/2020

states financial responsibilities and circuits for the sound management of underlying transactions.

Regarding the accounting services, the treasury function is still provided by the Commission, whilst a new Accounting Officer was appointed at the end of 2022. The new Accounting Officer was appointed within the framework of the common back-office agreement (BOA SLA) established among the joint undertakings, and EU-RAIL was tasked for the leading role of accounting service providers (complemented by CA JU and SESAR JU).

The control objective is to ensure that the JU has reasonable assurance on the legality and regularity of the financial transactions authorised during the reporting year. To conclude that the principle of sound financial management was applied, a review of implemented ex-ante and ex-post controls were carried out.

Ex-ante controls were regularly performed for the whole population of underlying transactions at all stages of the authorisation process (initiation, verification, authorisation and payment). Processes and procedures to adequately perform controls are in place and comply with the JU Manual of Financial Procedures. No material weaknesses were identified for the reporting year with exception of the rate of late payments, that was slightly above the 5% target (5,4%).

Ex-post controls were covered by the H2020 Audit Strategy, implemented by the Common Audit Service (CAS) of Commission DG RTS, in line with the operating rules for the Common Implementation Centre (CIC). EuroHPC JU was integrated in this ex-post chain in the 2nd semester of 2022 and CAS finalised the first slot of selected audits at the end of 2023.

The results of ex-post controls were measured to give reasonable assurance on the legality and regularity of financial transactions in the reporting year. The review of ex-post audits results showed that:

- The EuroHPC JU detected error rate is 1.26% (direct coverage only)
- The EuroHPC JU residual error rate is 0.0% (1.53% considering direct and indirect coverage)

Overall, CAS calculated that for the whole H2020 framework programme the cumulative representative error rate is 2,57% and the cumulative residual error rate is 1,55%²⁸.

The methodology applied is described in Annex 5.10 'Materiality criteria'. Calculation of the cumulative error rates for the framework programme are detailed in the Commission AAR.

The results of the performed controls shows that EuroHPC JU error rates are below the Legislator expectations. A reservation on the financial transaction for the reporting year is not necessary.

4.1.1.2. Fraud prevention, detection, and correction

The EuroHPC JU Anti-Fraud Strategy 2023-2025 had been adopted by the Governing Board in the reporting year²⁹. It provides a practical guidance to fight frauds. It also discloses roles and responsibilities and aims to enhance awareness on anti-fraud principles, the methodology and the process cycle in place to prevent, detect and manage frauds. In addition, two workshops were held to raise awareness among staff.

The strategy includes an action plan to ensure its implementation and KPIs to annually monitor and reporting on selected actions. In the reporting year, all actions except one were duly implemented. In 2023, action No. 6 of the plan (Tighten precautions against conflicts of interest), that was assessed through KPIs No. 6 and 7, was not fully implemented due to delays in the signing of Conflict of interest declarations by some experts evaluating projects proposals. Identified weakness did not disclose any material impact and does not require a reservation.

In the reporting year, no fraud cases involving EuroHPC JU were identified. There were not OLAF investigations reported to the JU management.

Based on the above-mentioned information, the JU has reasonable assurance that the anti-fraud measures and controls in place are effective and efficient.

4.1.1.3. Assets and information, reliability of reporting

In 2023, the following controls were performed to monitor the safeguarding of assets and information and the reliability of reporting in the JU:

- The accounting officer carried out the annual evaluation of the local financial management systems in EuroHPC JU. The report was finalised in November. The evaluation methodology was adapted taking into account the results of previous years' assessments. The evaluation reviewed the available information regarding the follow-up of the 2022 evaluation, the analysis of a sample of the operations authorised during the 2022 and the 1st semester of 2023 financial years, and key performance indicators. The evaluation did not identify any internal control weakness which would have a material impact on the accuracy, completeness and timeliness of the information required to draft the annual accounts and produce reliable reporting.
- The periodic validation of access rights granted in ABAC had been finalised in October 2023 by the Commission DG BUDG and resulted in any access right inconsistency identification.

In addition, EuroHPC JU supports its activities with a number of corporate tools ensuring adequate safeguard of information and reliability of reporting. Financial and accounting activities are carried out through ABAC, Projects are managed on Compass, Sygma, Simba. Treasury of EuroHPC is integrated into the Commission Treasury system. Ares is used for document management. Sysper and RCAM/JSIS are in use for HR matters.

IT assets and security matters had been managed by the JU IT sector. The register of IT incident had been duly filled in and reported two main incidents. Both incidents were promptly

²⁹ Decision of the GB No. 38/2023

identified and tackled by the IT sector with no relevant consequences on the safeguard of confidentiality, integrity or availability of the JU information systems.

The JU IT system was subject to the following incidents:

- a network/internet connection lost due to a defective cable in the JU premises;
- a phishing attack that caused a breach consisting in the divulgation of the real corporate e-mail address of one manager.

In the reporting year, no material issues and/or weakness in the internal control system were identified. Overall, The JU has reasonable assurance on the effectiveness of controls to the safeguard of assets and the reliability of reporting.

4.1.2. Efficiency of controls (“Time to”)

The efficiency of controls in EuroHPC JU is measured through the analysis of indicators stated in the EU financial regulation: time-to-inform, time-to-sign, time-to-grant (Art. 194) and time-to pay (Art. 116).

From the analysis of a sample of grants procedures having closure date of calls in 2023, the following had been measured:

- Time to Inform was 96 days on average with a maximum value of 139 days
- Time to sign was 115 days on average with a maximum value of 131days
- Time to grant was 218 days on average with a maximum value of 258 days

The values measured for the management of grants did not disclose any weakness in the control system and provide reasonable assurance on the efficiency of controls.

The JU carried out 835 payments in 2023, among which 45 were delayed. Most of delays were consequence of already identified weaknesses in the management of expert contracts. More in details, the time-to-pay indicator disclosed that the average length for the 33 late payments having 30 days threshold was 39 days. The average length of 12 late payments having 90 days threshold was 120 days.

The identified delays in payments did not cause a material impact to the JU that is reasonably assured on the efficiency of controls in place.

4.1.3. Economy of controls

The estimated cost of controls for EuroHPC JU in 2023 is EUR 2,074,000. The calculation method has been based on the approach used in the Commission and includes the estimated average salary costs (including social charges) of the staff involved in the key control systems such as the operational, the legal and financial verification as well as in other internal, budgetary and accounting controls. The estimation takes into account the costs paid by the JU for evaluation performed by external experts and external audits.

In 2023 the overall cost of control as a percentage of annual expenditure is 1%, as for the table below.

EuroHPC JU Payments of the year	EUR 205,836,949
Estimated costs of controls (staff)	EUR 1,550,000
External cost of controls (experts evaluations and audits)	EUR 524,000
Total cost of controls	EUR 2,074,000
Total cost of controls as a percentage of total expenditure of the year	1%

4.1.4. Conclusion on the cost-effectiveness of controls

In 2023, EuroHPC JU has designed and implemented effective and efficient controls to fulfil its control objectives as stated in the current Financial Rules adopted by the Governing Board. Controls in place adequately ensured the legality and regularity of financial transactions, the reliability of information, the identification of weaknesses and effectively supported the achievement of the JU targets.

Overall, in 2023, the controls implemented in the JU were:

- Cost-efficient, as the JU executed a high number of payments with a relatively low cost of controls,
- Cost-effective, as the control system in place ensured that risks related to the achievement of the JU's objectives were mitigated at all levels and led to a residual error rate of 0%.

4.2. AUDIT OBSERVATIONS AND RECOMMENDATIONS

This section reports on the observations and recommendations pointed out by the internal Auditor (IAS) and the European Court of Auditors (ECA). It summarises about the actions

selected and implemented by EuroHPC JU to tackle the weaknesses identified by auditors and assess the overall impact on the achievement of the internal control objectives.

4.2.1. Internal Audit

The IAS finalised the first audits in EuroHPC JU at the end of October 2022. The audit topic was on HR management and resulted in the following recommendations:

Rec	Severity	Title
1	Very important	Staffing plan: from design to implementation
2	Important	Finalisation of the setup of the HR and ethics functions
3	Important	Improve internal communication and the documentation of recruitments

The agreed action plan was implemented and followed up. Recommendations No. 1 and 3 had been regularly closed at the end of 2023. They were followed up by the IAS that declared both recommendations adequately and effectively implemented on March 2024³⁰. Recommendation No. 2 had been postponed to Q2 of 2024, due to the ongoing design and implementation of the HR strategy (remaining sub-actions are already implemented).

An audit on planning, budgeting, monitoring and reporting had been launched in October 2023 and is still in the fieldwork phase.

4.2.2. Audit of the European Court of Auditors

The ECA did not carry out specific audits on EuroHPC since its establishment, but it does carry out regular annual financial audits.

Opinions on the reliability of accounts and legality and regularity of underlying transactions, revenues and payments released in the annual reports on EU Joint Undertakings (financial years 2020, 2021 and 2022), were unqualified (clean).

Findings in the above-mentioned annual reports have been regularly followed up. The assessment of findings implementation discloses the following status:

Findings pointed out in the 2020 report had been implemented with exclusion of the delays in recruitment of staff (reported also in 2021 and 2022, major improvements were reached and full implementation is foreseen at the end of 2024).

Findings disclosed in the 2021 report which implementation is still ongoing are:

30 Ares(2024)2172047 of the 22/03/2024

- Action 6 on a time recording system and action 7 on staff needs model (a collective dialogue between all JUs and the European Court of Auditors is ongoing in relation to these 2021 horizontal audit observations)

Findings disclosed in the 2022 report which implementation is still ongoing are:

- Actions 2 and 3, on monitoring and reporting of members' contributions (implementation will be finalised in the present CAAR)
- Action 1, time scheduled action plan for project implementation
- Actions 5 and 7, risk-based approach to controls
- Action 6, structured reinforced monitoring on participants

Overall, most of findings reported in the ECA JUs annual reports had been adequately tackled, few of them are ongoing. Controls to ensure monitoring of findings implementation are in place and effective.

4.2.3. Overall Conclusions

In 2023 as well as in previous reporting years, no critical recommendations or findings were reported by IAS and ECA for EuroHPC JU. The ECA released unqualified opinions on the reliability of accounts and legality and regularity of underlying transactions of the JU.

EuroHPC JU systematically addressed identified weaknesses and fully implemented most of planned actions. Some remaining actions are disclosed in this section and planned to be finalised by the end of 2024, at pace with the growing rate of the JU.

The recommendations of auditors and the actions had been assessed to evaluate to effectiveness and efficiency of the JU internal control system. Overall, the assessment gives reasonable assurance on the adequate functioning of the internal control system. Conclusions on the assurance are detailed in section 4.4.

4.3. ASSESSMENT OF THE EFFECTIVENESS OF INTERNAL CONTROL SYSTEMS

EuroHPC JU applies, likewise the European Commission and other EU Institutions, the COSO Internal Control Framework model since 2020³¹. The Executive Director with Decision No. 30/2023 had adopted the JU Internal Control Strategy 2023-2031. The strategy deploys the roles and responsibilities, the roadmap to implement the internal control framework and the guidelines to carry out the periodic internal control self-assessment. The objectives of the JU internal control system are stated in the financial rules.

The Executive Director steers and supervises the management of the JU internal controls and risks, implemented at all levels of the JU during the reporting period.

The self-assessment of the JU internal control system is carried out annually with the aim to provide reasonable assurance that all internal control principles, components and the overall system are present and functioning in an integrated manner. The assessment relies on the analysis of several sources of information, such as continuous control activities performed throughout the year, specific controls and the monitoring of internal control indicators (Internal Control Monitoring Criteria, ICMCs). For each one of the 17 internal control principles stated in the model, strengths and deficiencies are identified and combined to reach the assessment. The five components and the overall assessments are based on the results of principles evaluations.

In the reporting year, the overall assessment of EuroHPC JU internal control system provided reasonable assurance on its presence and effective functioning but major improvements are needed for the component No. 3, 'Control activities' and more in detail for principles 10 and 12. Overall, 13 out of 17 principles and 4 out of 5 components are present and functioning, minor improvement are needed for principles 1 (component No. 1) and 6 (component No. 2). An action plan to tackle identified weaknesses was set up and will be implemented during the current year.

4.3.1. Continuous Monitoring

The continuous monitoring of the JU activities over the reporting year is ensured by several financial and non-financial controls and procedures. Continuous controls are built into business processes and implemented by staff. They provide timely information on the presence of weaknesses and allow prompt reaction to tackle them. Some of the most relevant continuous controls in place are: ex-ante and ex-post controls, monitoring of EU funded programme KPIs,

31 Decision of the Governing Board No. 13/2020 adopting the EuroHPC JU Internal Control Framework

identification and reporting of exception and non-compliance events, monitoring and reporting of IT incidents, quarterly review of the risk register, quarterly monitoring of the internal control and risk mitigation action plans.

The continuous monitoring and reporting of performance are adequately supported by Corporate IT tools such as Compass, SyGMA, Audex, ABAC, ARES, Sysper, Mips and Jsis.

The internal control and audit officer monthly reports on the status of the internal control system to the Executive Director. Regular reporting is provided to the Governing Board at its meetings.

Overall, continuous monitoring and reporting in EuroHPC JU is present and adequately functioning, some improvements are needed related to the formalisation and integration of controls in place.

4.3.2. Risk Assessment and Management

In the reporting year, the Executive Director had adopted the JU Risk management implementation guide. The guide is aligned with the Commission instruction for identification, assessment and management of risks and with the Component 2 of the JU Internal control Framework.

In 2023 EuroHPC carried out two risk assessment exercises. The first exercise was launched and finalised in the first semester of 2023 and no critical risks at residual level were identified. The risk register and action plan were drafted and communicated to staff, a review was carried out in September, the final assessment on the implementation of selected actions took place in January 2024 and was reported in the Internal Control Annual Self-assessment report for 2023. Most of actions planned to mitigate risks during the 2023 had been timely and adequately implemented (out of 37, one not implemented, four postponed).

The second exercise was promptly launched in October 2023 and finalised in December, it resulted in the draft of risk register and risk mitigation action plan for 2024. IT and Fraud risk assessment were included in the exercises, as established in the JU guide. No critical risks at residual level were identified.

The approach selected to carry out the JU risk assessment was bottom-up, all staff and management were involved in the exercises. The launch of exercise begins with an internal workshop aiming at rise awareness and present responsibilities, duties, process and timeline. The risk register and action plan were approved by the Executive Director and communicated across the JU. Responsibility to implement actions in the risk mitigation action plan were assigned, reviews are performed quarterly with the coordination of the Internal control and audit officer and reported to the Executive Director. The latest available risk register is taken into consideration for the draft of the JU Annual Working Programme (AWP).

Overall, the management of risks in EuroHPC JU did not disclose weaknesses that have a material impact on the presence and functioning of the internal control system or that could affect the achievement of the JU objectives.

4.3.3. Prevention of Conflict of Interest

Rules on Conflict of interest (Col) for the members of the Governing Board (GB) and the Advisory Boards (INFRAG and RIAG) are in place and effectively applied since their adoption in 2022. The secretariat of the GB manages the declarations according to established rules. Templates are in place and used for declarations. In 2023, no conflicts of interest were reported on members of the Boards but a minor deficiency regarding the regular collection of the GB members' Col declarations was identified and promptly tackled.

Rules on prevention of conflict of interest for EuroHPC staff are stated in the GB Decision No. 16/2022 and regularly applied. In addition, the Ethics module in Sysper had been activated; it enabled the digital submission of Col declarations, enhances management of declarations and ensures better monitoring and prevention. In the reporting period, there were no conflict of interest detected among staff.

In the course of 2023, EuroHPC JU had reasonable assurance that the overall measures in place to prevent conflicts of interest were effective.

4.4. CONCLUSION ON THE ASSURANCE

Based on the elements reported above, the management of EuroHPC JU has reasonable assurance that, overall, the internal control system is present and adequately functioning. Control activities are in place but partially functioning and need to be revised, formalised and integrated. Therefore, in his capacity, the Executive Director has signed the declaration of assurance presented in the section 4.5.2 remarking a reservation.

4.5. STATEMENT OF ASSURANCE

4.5.1. Assessment of the Annual Activity Report by the Governing Board

BACKGROUND

The Executive Director submits the draft Consolidated Annual Activity Report (CAAR) 2023 to the Governing Board for assessment and approval. The Governing Board approves the CAAR together with the annual accounts. Once approved by the GB, the CAAR is made publicly available. No later than 1 July 2024, the CAAR together with its assessment will be sent by the Executive Director to the European Court of Auditors and to the European Commission.

The members of the Governing Board of the EuroHPC Joint Undertaking took note of the Annual Activity Reports 2021, 2022 and 2023. The presented document is the fourth Annual Activity Report of the EuroHPC JU since its autonomy in September 2020.

The EuroHPC Joint Undertaking was established on 28 September 2018 by Council Regulation No 2018/1488, published in the Official Journal of the EU on 8 October 2018 and entered into force on 28 October 2018. Following the adoption of the new Council Regulation 2021/1173 in July 2021, the JU's objectives were updated and now reads as follows:

- to contribute to the implementation of Regulation (EU) 2021/695 and in particular Article 3 thereof, to deliver scientific, economic, environmental, technological and societal impact from the Union's investments in research and innovation, so as to strengthen the scientific and technological bases of the Union, deliver on the Union strategic priorities and contribute to the realisation of Union objectives and policies, and to contribute to tackling global challenges, including the Sustainable Development Goals by following the principles of the United Nations Agenda 2030 and the Paris Agreement adopted under the United Nations Framework Convention on Climate Change
- to develop close cooperation and ensure coordination with other European Partnerships, including through joint calls, as well as to seek synergies with relevant activities and programmes at Union, national, and regional level, in particular with those supporting the deployment of innovative solutions, education and regional development, where relevant;
- to develop, deploy, extend and maintain in the Union an integrated, demand-oriented and user-driven hyper-connected world-class supercomputing and data infrastructure;
- to federate the hyper-connected supercomputing and data infrastructure and interconnect it with the European data spaces and cloud ecosystem for providing computing and data services to a wide range of public and private users in Europe;
- to promote scientific excellence and support the uptake and systematic use of research and innovation results generated in the Union;

- to further develop and support a highly competitive and innovative supercomputing and data ecosystem broadly distributed in Europe contributing to the scientific and digital leadership of the Union, capable of autonomously producing computing technologies and architectures and their integration on leading computing systems, and advanced applications optimised for these systems;
- to widen the use of supercomputing services and the development of key skills that European science and industry need.

WORK OF THE GOVERNING BOARD AND ADVISORY COMMITTEES

The Governing Board continues its works according to the mission given by the Council Regulation. In 2021, the composition of RIAG and INFRAG was rearranged due to the updated mission and their main work in 2022 and 2023 was to recommend an updated Multi-Annual Strategic Plan for the Governing Board to decide upon in 2023. In the end of 2023 an additional amendment was proposed to be approved in 2024 by the Governing Board.

Five regular Governing Board meetings were held throughout 2023, additionally several informal Governing Board meetings were held. One new Participating State applied to join EuroHPC JU in 2023, Israel was accepted during the Governing Board meeting in 5-6 October 2023. 2023 saw the expansion of the JU's team to 36 staff members with additional staff planned for, in the Legislative Financial Statement of the Regulation, to join in early 2023. The JU received its European Court of Auditors (ECA) feedback on its budget and accounting over 2022. For the most part this feedback was very positive, EuroHPC JU systematically addressed identified weaknesses and fully implemented most of planned actions.

The Board is of the opinion that the Consolidated Annual Activity Report sets out the relevant highlights of the execution of the 2023 activities defined for the Joint Undertaking from both an operational and administrative point of view. The report will be sent to the European Parliament, 96 Council of Ministers, Commission and Court of Auditors. It will form the basis of the discussion with the European Parliament in the preparation of the Budgetary Discharge in 2024.

HIGHLIGHTS OF EUROHPC JU MAIN ACHIEVEMENTS IN 2023

The Board is pleased to note that in 2023 EuroHPC JU had 6 operational systems and inaugurated 2 new systems, Deucalion in Portugal and the pre-exascale supercomputer MareNostrum 5 in Spain. Additionally, the exascale supercomputer Jupiter, hosted in Germany, is currently being built and the Jules Verne Consortium is working on setting up the procurement of the second exascale supercomputer in France. Furthermore, several midrange supercomputers are underway, namely Deadelus in Greece and Arhenius in Sweden, additionally Poland, Hungary and Ireland have a midrange system planned for acquisition. Finally, with regards to HPC infrastructure the upgrades of Discoverer (Bulgaria) and Leonardo (Italy) are being acquired.

This expanding infrastructure continually paves the way for a world-class HPC ecosystem in Europe that addresses relevant and important societal challenges. In 2023 EuroHPC JU was able to sign all six Hosting Agreements with the hosting entities for Quantum Computing infrastructure, additionally two procurements were launched. The first was EuroQCS-Poland and the second was Euro-Q-EXA (Germany), the other four procurements will be launched in 2024.

EuroHPC supercomputers provide services for users from academia as well as from the private and public sectors. In 2023 a call was launched to strengthen the competitiveness and innovation potential of SMEs. In December 2023 EuroHPC JU held its first User Day, an important action aimed at better understanding of the evolving needs of its user community. Building on the experience gained in the process of granting access to the EuroHPC supercomputers, also amended Access Policy has been proposed and adopted to be effective in the beginning of 2024. It is a significant step towards broadening the user community and adjusting the application process to be simple and effective as possible, with new focus also on the fast-growing group of AI oriented users. Furthermore, EuroHPC is aiming to establish a European support centre to assist European AI users in fully leveraging the innovation potential of supercomputers for advanced AI applications. In the last quarter of 2023 discussion started on providing more access to academia and SMEs for AI-applications. This discussion and actions have resulted in preparations for an amendment of the EuroHPC Regulation to include an AI-Pillar of activities, that is expected to be adopted and take action in 2024.

During 2023, EuroHPC JU launched 12 new R&I calls in addition to the access and procurement calls. These include two calls for additional Centres of Excellence, the development of quantum computing applications and several calls on training and education. These training and support actions aim to support current users of HPC in all sectors and foster the next generation of HPC users. By supporting and coordinating training and support actions across Europe, EuroHPC aims to build European critical mass in all aspects of HPC as well as utilize competence in all Participating States. The calls included the development of a EuroHPC Training Platform, an International HPC Summer School, a EuroHPC Virtual Training Academy and Traineeships in Hosting Entities, CoEs, NCCs, SMEs and Industry.

In regard to international cooperation a call was launched to strengthen cooperation in the field of HPC and facilitate access between the EU and Japan.

In 2023, EuroHPC JU also took steps to support Europe's competitiveness computing hardware technology and applications. Mainly by launching a call for a Framework Partnership Agreement (FPA) with a consortium of industry, research organizations and HPC institutions to develop an innovative HPC ecosystem based on RISC-V.

EuroHPC JU also invested in technologies and software to improve performance and efficiency of the HPC-systems. This was done by launching a call to support innovation in low latency and high bandwidth interconnects and a call on the development of energy efficient HPC software tailored to exascale and post-exascale supercomputers, to address challenges associated with the energy efficient and energy constraint operation of heterogeneous and modular HPC systems.

An important and extensively discussed document in 2023 was the Multiannual Strategic Plan (MASP), the regular update was approved in the first half of the year and a second amendment was proposed by the RIAG and INFRAG in the end of 2023 to be approved in 2024.

The Governing Board saw an important change in its organization as well. The Chairmanship of Dr. Herbert Zeisel passed onto Mr. Rafał Duczmal on the 6th of October after his election.

CONCLUSIONS BY THE GOVERNING BOARD

The Governing Board is pleased about the excellent implementation of the JU's activities and notes that no critical risks have been identified regarding the JU's main business processes and internal controls and is pleased to note the further development and strengthening of the risk management approach, in particular enhancing the systematic monitoring of technical and financial risks in the projects, as well as strengthening internal control capabilities and procedures. The Governing Board takes note that the JU has fulfilled its monitoring tasks through the implementation and usage of dedicated key performance indicators (KPIs) for the achievement of strategic objectives.

In 2023 the JU continued to improve the mandatory reporting process regarding the contributions of Participating States and the IKOP reporting by Private Members on their contribution made to the JU's activities. EuroHPC JU has also established IT and Data Protection Arrangements in 2023.

4.5.2. Declaration of Assurance

I, the undersigned, Anders Dam Jensen

Executive Director of EuroHPC Joint Undertaking

In my capacity as authorising officer by delegation,

Declare that the information contained in this report gives a true and fair view.

State that I have reasonable assurance that the resources assigned to the activities described in this report have been used for their intended purpose and in accordance with the principles of sound financial management, and that the control procedures put in place give the necessary guarantees concerning the legality and regularity of the underlying transactions.

This reasonable assurance is based on my own judgement and on the information at my disposal, such as the results of the self-assessment, ex-post controls, the work of the internal control and audit officer, the observations of the Internal Audit Service and the lessons learnt from the reports of the Court of Auditors for years prior to the year of this declaration.

Confirm that I am not aware of anything not reported here which could harm the interests of the Joint Undertaking.

However, the following reservation should be noted:

The design, set up and implementation of the JU control activities shall be revised, formalised and integrated according to the recently adopted EuroHPC JU Control Strategy.

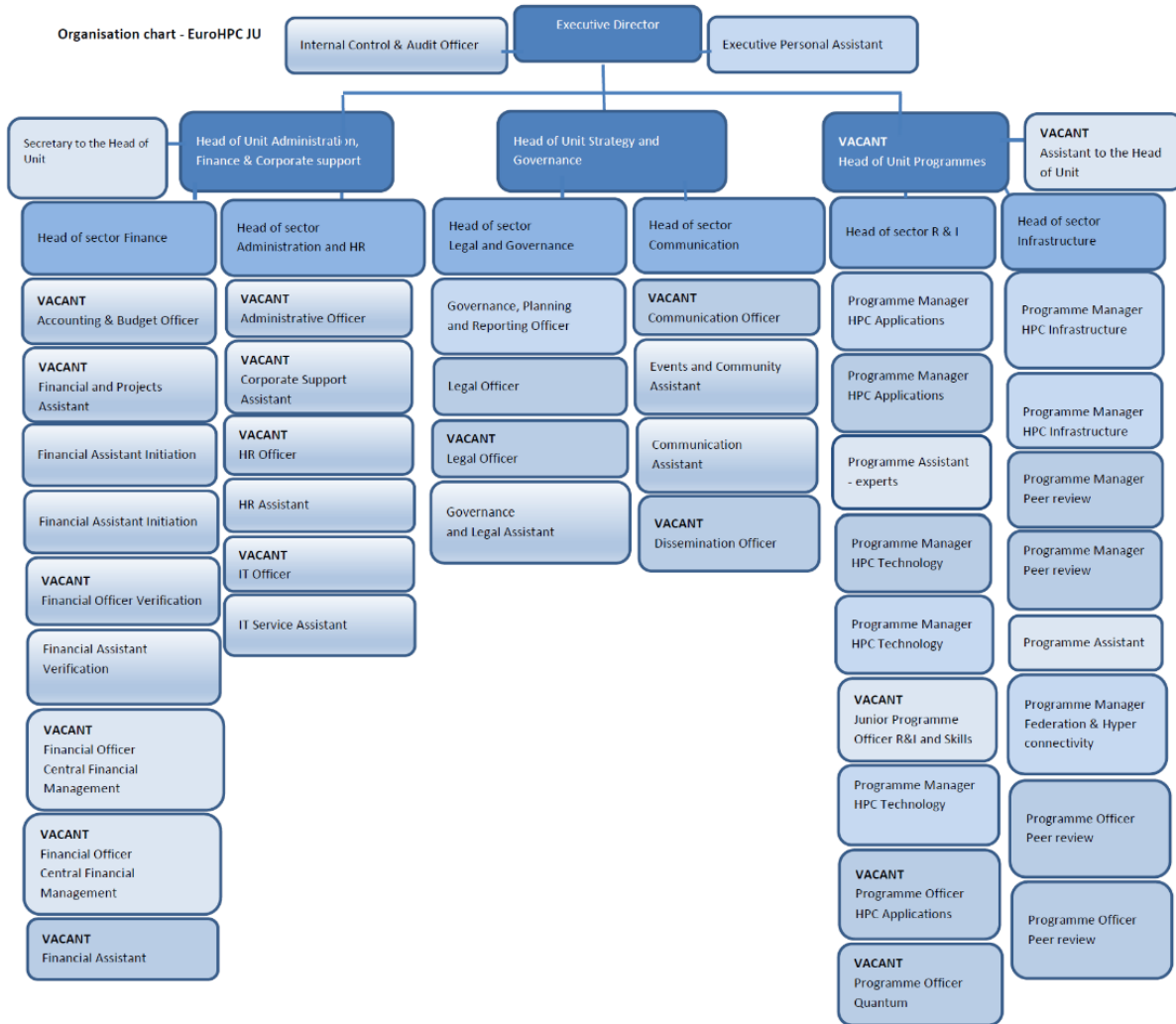
Luxembourg, 15-06-2024



Anders Dam Jensen

5. ANNEXES

i. ORGANISATIONAL CHART



Staff situation as of 31/12/2023

ii. ESTABLISHMENT PLAN AND ADDITIONAL
INFORMATION ON HR MANAGEMENT

<i>Function group and grade</i>	YEAR N-1				YEAR N			
	Authorised		Actually filled as of 31/12		Authorised		Actually filled as of 31/12	
	Perma nent posts	Tempo rary posts	Perm. posts	Temp. posts	Perm. posts	Temp. posts	Perm. posts	Temp. posts
AD 16								
AD 15								
AD 14		1		1		1		1
AD 13								
AD 12		1		0		1		1
AD 11								
AD 10		2		1		2		1
AD 9		1		0		2		2
AD 8		13		2		10		4
AD 7		2		3		4		10
AD 6		1		0		5		3
AD 5								
TOTAL AD		21		7		25		22
AST 11								
AST10								
AST 9								
AST 8								
AST 7								
AST 6								
AST 5								
AST 4		1		0		2		2
AST 3								
AST 2								
AST 1								
TOTAL AST		1		0		2		2
GRAND TOTAL		23		7		27		24

Contract Agents**Authorised****Actually filled as of
31/12/2023**

<i>Function Group IV</i>	12	2
<i>Function Group III</i>	14	9
<i>Function Group III</i>	1	1
<i>Function Group I</i>	0	0
TOTAL	27	12
Seconded National Experts	Authorised	Actually filled as of 31/12/2023
TOTAL	0	0

iii. LIST OF EUROHPC PARTICIPATING STATES

(AS OF 31 DECEMBER 2023)

Austria	North Macedonia
Belgium	Norway
Bulgaria	Poland
Croatia	Portugal
Cyprus	Romania
Czech Republic	Serbia
Denmark	Slovak Republic
Estonia	Slovenia
Finland	Spain
France	Sweden
Germany	The Netherlands
Greece	Turkey
Hungary	
Iceland	
Ireland	
Israel	
Italy	
Latvia	
Lithuania	
Luxembourg	
Malta	

iv. LIST OF EUROHPC GOVERNING BOARD MEMBERS

(AS OF 31 DECEMBER 2023)

CHAIR: RAFAL DUCZMAL

COUNTRY	REPRESENTATIVE
Austria	Stefan Hanslik
Belgium	Geert Van Grootel
Bulgaria	Ivan Dimov
Croatia	Ana Butkovic
Cyprus	Evgenios Epaminondou
Czech Republic	Vít Vondrák
Denmark	René Michelsen
Estonia	Toivo Räm
Finland	Erja Heikkinen
France	Laurent Crouzet
Germany	Stefan Mengel
Greece	Nectarios Koziris
Hungary	István Erényi
Iceland	Morris Riedel
Ireland	Peter Healy
Israel	Dan Seker
Italy	Paola Inverardi
Latvia	Sarmite Mickevica
Lithuania	Tadas Juknevičius

Luxembourg	Mario Grotz
Malta	Antonella Gatt
North Macedonia	Boro Jakimovski
Norway	Ulrike Jaekel
Poland	Mariusz Sterzel
Portugal	Paulo Quaresma
Romania	Monica Alexandru
Serbia	Bojan Jakovljevič
Slovak Republic	Lukáš Demovič
Slovenia	Karolina Schlegel
Spain	Joaquin Serrano Agejas
Sweden	Magnus Friberg
The Netherlands	Marjan van Meerloo, Jelle Stronks
Turkey	Memhmet Mirat Satoglu

v. LIST OF RIAG MEMBERS

Jean-Philippe Nominé (Chair)	French Alternative Energies and Atomic Energy Commission (CEA)
Thomas Lippert (Vice-Chair)	Jülich Supercomputing Centre (JSC)
Mateusz Tykierko	Wroclaw Centre for Networking and Supercomputing
Martin Danek	DAITEQ s.r.o.
Are Magnus Bruaset	SIMULA Research Lab
Barbara Krašovec	SLING (Slovenian National Supercomputing Network)
Mateo Valero	Barcelona Supercomputing Center (BSC)
Axel Auweter	MEGWARE, Computer Vertrieb und Service GmbH
Daniele Cesarini	CINECA (Interuniversity Consortium for Automatic Computing in North Eastern Italy)
María S. Perez-Hernandez	Universidad Politécnica de Madrid (UPM)
Jeanette Nilsson	Research Institutes of Sweden AB (RISE)
Benno Broer	PASQAL

vi. LIST OF INFRAG MEMBERS

Sinéad M. Ryan (Chair)	Trinity College Dublin
Claus Axel Müller (Vice-Chair)	Gauss Center for Supercomputing (GCS)
Branislav Jansík	IT4 Innovations National Supercomputing Center
Sanzio Bassini	CINECA (Interuniversity Consortium for Automatic Computing in North Eastern Italy)
Minna Palmroth	University of Helsinki
Stephane Requena	Grand équipement national de calcul intensif (GENCI)
Gunnar Bøe	Uninett Sigma2
Erwin Laure	Max Planck Computing and Data Facility (MPCDF)
Pedro Almeida Alberto	University of Coimbra
Norbert Meyer	Poznan Supercomputing and Networking Center (PSNC)
Nuria López	Institut Català d'Investigació Química (ICIQ)
Peter Hans Michielse	SURF BV

vii. SCOREBOARD OF HORIZON EUROPE COMMON KEY IMPACT PATHWAY INDICATORS (KIPS)³²

The European Commission IT central service is developing a centrally managed dashboard to collect the micro-data behind the Key Impact Pathway indicators for all parts of the Programme. EuroHPC JU will report on the Key Impact Pathway indicators as soon as the central dashboard will be available and EuroHPC JU data will be exportable.

³² (based on Annex V to Regulation 2021/695/EU)

viii. SCOREBOARD OF KPIS SPECIFIC TO EUROHPC JU

KPI Name	Unit of measurement	Baseline	Target 2023	Target 2025	Target 2027	Ambition >2027	Status
Resources (input), processes and activities							
Number of operational supercomputers	#	0	8	14	15	18	On track
Number of operational Quantum computers	#	0	0	8	10	10	On track
Number of projects accessing EuroHPC JU supercomputers	#	0	150-200	300-400	400-500	>500	On track
Number of newcomers per year/reporting period	#	0	10	12	14	>15	On track
Number of R&I calls launched per year/reporting period	#	0	6	6	6	6	On track
Number of countries per R&I call	#	0	10	10	10	10	On track
Accessibility of EuroHPC JU supercomputers	%	0	95	95	95	95	TBD
Energy efficiency of the supercomputers	%	0	10	10	10	20	On track
Projects from countries without own pre-exascale/exascale supercomputer infrastructure	#	50	100	150	200	250	On track

ix. MATERIALITY CRITERIA

The 'materiality' concept provides the Executive Director with a basis for assessing the importance of the weaknesses/risks identified and thus whether those weaknesses should be subject to a formal reservation to his declaration.

When deciding whether something is material, both qualitative and quantitative terms have to be considered. In qualitative terms, when assessing the significance of any weakness, the following factors have been taken into account:

- The nature and scope of the weakness;
- The duration of the weakness;
- The existence of compensatory measures (mitigating controls which reduce the impact of the weakness);
- The existence of effective corrective actions to correct the weaknesses (action plans and financial corrections) which have had a measurable impact.

In quantitative terms, in order to make a judgement on the significance of a weakness, the potential maximum (financial) impact is quantified.

Whereas EuroHPC JU control strategy is of a multiannual nature (i.e. the effectiveness of the JU's control strategy can only be assessed at the end of the programme, when the strategy has been fully implemented and errors detected have been corrected), the Executive Director is required to sign a declaration of assurance for each financial year. In order to determine whether to qualify his declaration of assurance with a reservation, the effectiveness of the JU's control system must be assessed, not only for the year of reference, but more importantly, with a multiannual perspective.

The control objective for EuroHPC JU is set out in the Commission proposal for the Council Regulation on EuroHPC Joint Undertaking. The objective is to ensure that the 'residual error rate', i.e. the level of errors which remain undetected and uncorrected, on an annual basis, does not exceed 2% by the end of the multiannual programme. Progress towards this objective is to be (re)assessed annually, in view of the results of the implementation of the ex-post audit strategy.

As long as the residual error rate is not (yet) below to 2% at the end of a reporting year within the programme life cycle, the Executive Director may also take into account other management information at his disposal to identify the overall impact of the situation and determine whether or not it leads to a reservation.

If an adequate calculation of the residual error rate is not possible, for reasons not involving control deficiencies, the consequences are to be assessed quantitatively by estimating the likely exposure for the reporting year. The relative impact on the declaration of assurance would then be considered by analysing the available information on qualitative grounds and

considering evidence from other sources and areas (e.g. information available on error rates in more experienced organisations with similar risk profiles).

Assessment of the effectiveness of controls

The starting point to determine the effectiveness of the controls in place is the 'representative detected error rate' expressed as the percentage of errors in favour of the JU, detected by ex-post audits, measured with respect to the amounts accepted after ex-ante controls.

However, to take into account the impact of the ex-post controls, this error level is adjusted by subtracting:

- Errors detected and corrected as a result of the implementation of audit conclusions.
- Errors corrected as a result of the extension of audit results to non-audited contracts with the same beneficiary.

This results in a residual error rate, which is calculated as follows:

$$\text{ResER}\% = \frac{(\text{RepER}\% * (P - A)) - (\text{RepERsys}\% * E)}{P}$$

where:

ResER% residual error rate, expressed as a percentage.

RepER% representative error rate, or error rate detected in the common representative sample, expressed as a percentage. The RepER% is composed of complementary portions reflecting the proportion of negative systemic and non-systemic errors detected. This rate is the same for all implementing entities, without prejudice to possibly individual detected error rates.

RepERsys% portion of the RepER% representing negative systemic errors, (expressed as a percentage). The RepERsys% is the same for all entities and it is calculated from the same set of results as the RepER%

P total requested EC contribution (€) in the auditable population (i.e. all paid financial statements).

A total requested EC contribution (€) as approved by financial officers of all audited financial statements. This will be collected from audit results.

E total non-audited requested EC contribution (€) of all audited beneficiaries.

This calculation will be performed on a point-in-time basis, i.e. all the figures will be provided as of a certain date.

The Executive Director must also take into account other information when considering if the overall residual error rate is a sufficient basis on which to draw a conclusion on assurance (or

make a reservation) for specific segment(s) of the EU Programmes. This information may include the results of other ex-post audits, ex-ante controls, risk assessments, audit reports from external or internal auditors, etc. All this information may be used in assessing the overall impact of a weakness and considering whether to make a reservation or not.

x. LIST OF ACRONYMS

ABAC – Accrual Based Accounting

AI – Artificial Intelligence

AST – Application Support Team

AWP – Annual Work Programme

BOA – Back-Office Arrangement

CAAR – Consolidated Annual Activity Report

CEF – Connecting Europe Facility

CoE – Centre of Excellence

CoI – Conflict of Interest

COSO – Committee of Sponsoring Organisations

CSA – Coordination and Support Actions

DEP – Digital Europe Programme

DG CNECT – Directorate-General Communications Networks, Content and Technology

DG RTD – Directorate-General Research and Innovation

EC – European Commission

ECA – European Court of Auditors

ED – Executive Director

EFTA – European Free Trade Association

ERDF – European Regional and Development Fund

EU – European Union

EuroHPC JU – European High Performance Computing Joint Undertaking

FPA – Framework Partnership Agreement

FR – Financial Regulation

FTE – Full-time Equivalent

GB – Governing Board

H2020 – Horizon 2020 Programme

HE – Horizon Europe Programme

HPC – High Performance Computer

HW - Hardware

ICF – Internal Control Framework

ICP – Internal Control Principles

INFRAG – Infrastructure Advisory Group

JTI – Joint Technology Initiatives

JU – Joint Undertaking

KPIs – Key Performance Indicators

LE – Large Enterprise

MASP - MultiAnnual Strategic Programme

MFF – Multiannual Financial Framework

MN5 – MareNostrum 5

NCC – National Competence Centre

RIA – Research and Innovation Actions

RIAG – Research and Innovation Advisory Group

RRF – European Recovery and Resilience Fund

SME – Small and Medium Enterprises

SMEs – Small and Medium Enterprises

SRIA – Strategic Research and Innovation Agenda

SW – Software

TRL – Technology Readiness Level

TST – Technical Support Team

TTG – Time to grant

TTI – Time to inform

TTP – Time to pay

WP – Work Programme
