EuroHPC JOINT UNDERTAKING

DECISION OF THE GOVERNING BOARD OF THE EuroHPC JOINT UNDERTAKING No 44/2023

Adopting the Joint Undertaking's Work Programme and Budget for the year 2024

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) 2018/1488[1], (hereinafter, "the Regulation"),

Having regard to the Statutes of the European High Performance Computing Joint Undertaking annexed to the Regulation (thereinafter "Statutes") and in particular to Articles 1(o), 7(3)(d), 7(4)(b), 7(5)(b), 7(6)(b), 7(7)(b), 9(4)(b) and (c) and 18 of thereof,

Having regard to Decision of the Governing Board of the EuroHPC Joint Undertaking No 3/2020, approving the Financial Rules of the EuroHPC Joint Undertaking[2],

WHEREAS

(1) The Statutes of the EuroHPC JU confer on the Governing Board the powers to adopt the annual work programme and its annual budget including the staff establishment plan.

(2) The Statutes of the EuroHPC JU confer on the Governing Board the powers to adopt the annual work plan and its annual budget including the staff establishment plan (Article 7(3)(d) of the Statutes). Pursuant to Article 3 of the Financial Rules of the EuroHPC JU, for each financial year, the budget of the EuroHPC JU shall forecast and authorise all revenue and expenditure considered necessary for the EuroHPC JU. It shall consist of: (a) the revenue of the EuroHPC JU, comprising: (i) its members' financial contributions to the administrative costs; (ii) its members' financial contributions to the operational costs; (iii) revenue assigned to specific items of expenditure; (iv) any revenue generated by the EuroHPC JU; (b) the expenditure of the EuroHPC JU, including administrative expenditure;

[1] OJ L 256, 19.7.2021, p. 3–51

[2] Readopted by Decision of the Governing Board of the EuroHPC Joint Undertaking No 17/2021, approving the re-adoption of Governing Board Decisions adopted under the framework of Regulation (EU) 2018/1488 and its updated Rules of Procedure in the view of Regulation (EU) 2021/1173

(3) The annual work programme of the EuroHPC JU shall provide the authorisation by the Governing Board for the operational expenditure of the EuroHPC JU on the activities it covers, provided that the elements set out in Article 33(4) of the Financial Rules of the EuroHPC JU are clearly identified;
(4) The Executive Director of the EuroHPC Joint Undertaking submitted the 2024 draft work programme to the Governing Board.

HAS ADOPTED THIS DECISION:

Article 1

The annual Work Programme and Budget of the EuroHPC Joint Undertaking for the year 2024 annexed to this decision is adopted.

Article 2

The Executive Director shall make the Annual Work Programme and Budget 2024 publicly available on the website of the EuroHPC Joint Undertaking.

Article 3

Flexibility clause

Cumulated changes to the allocations to specific actions not exceeding 20% of the maximum Union contribution set in the first paragraph of Article 2 of this Decision shall not be considered to be substantial for the purposes of Article 33(4) of the EuroHPC Financial Regulation, where those changes do not significantly affect the nature of the actions and the objective of the work programme. The increase of the maximum Union contribution set in the first paragraph of Article 2 of this Decision shall not exceed 20%.

The authorising officer responsible may apply the changes referred to in the first paragraph. Those changes shall be applied in accordance with the principles of sound financial management and proportionality.

Article 4

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

Done at Luxembourg, on 7 December 2023.

For the Governing Board

Rafal Duczmal

The Chair

Annex: European High Performance Computing Joint Undertaking Annual Work Programme and Budget 2023

WORK PROGRAMME and BUDGET

EuroHPC JOINT UNDERTAKING (JU)

2024

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DRAFT ANNUAL WORK PROGRAMME YEAR 2024

INTRODUCTION

The EuroHPC Joint Undertaking (hereinafter "EuroHPC JU" or "JU"), will contribute to the ambition of value creation in the Union with the overall mission to develop, deploy, extend and maintain in the Union an integrated world class supercomputing and quantum computing infrastructure and to develop and support a highly competitive and innovative High Performance Computing (HPC) ecosystem, extreme scale, energy-efficient, environmentally sustainable and highly resilient HPC and data technologies.

In July 2021, Council Regulation (EU) 2021/1173 (EuroHPC JU Regulation) was adopted, repealing Council Regulation (EU) 2018/1488, and provides the basis of the Work Programmes of the Joint Undertaking.

The Annual Work Programme 2024 contains the actions to be implemented in 2024. Calls to be launched in 2024 will be prepared by the JU and presented for adoption by the Governing Board by separate Governing Board Decisions.

For all activities implemented by the EuroHPC JU that are funded from the Horizon Europe (HE) budget, the Governing Board may decide to limit in the calls for proposals the eligibility of participants according to Horizon Europe Article 22(5).

For all activities implemented by the EuroHPC JU that are funded from the Digital Europe Programme (DEP) budget, the Governing Board may decide to limit in the calls for proposals or procurements the eligibility of participants according to Digital Europe Articles 12(6) and 18(4).

For all activities implemented by the EuroHPC JU that are funded from the Connecting Europe Facility (CEF) budget, the Governing Board may decide to limit in the calls for proposals or procurements the eligibility of participants according to Connecting Europe Facility Article 11(4).

All actions with Union contribution below 100% are EU Synergy calls. Grants and procurements can be linked with another grant funded from any other EU funding programme including the Recovery and Resilience Fund, provided that there is no double funding and that such support does not cover the same cost. The grants under both calls will be managed as linked actions.

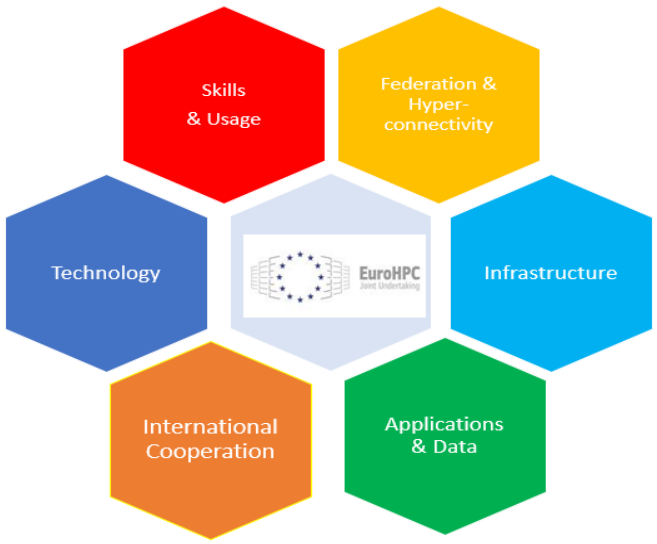
OPERATIONS

The key objective of the EuroHPC JU is to further deploy and provide access in the Union to a world leading service and data infrastructure with high-end supercomputers which are indispensable to run the most demanding and strategic applications, such as climate change, personalised medicine etc.

This action builds on the previous infrastructure activities undertaken by the EuroHPC JU since its creation in 2018. The Operational section of this Work Programme will be organised using the Pillars of activity as set out in Regulation

Pillars of Action (Regulation 2021/1173)

The following work programme will follow the different pillars of actions as set out in the Founding Regulation (2021/1173).



Since most actions are ongoing over more than one year, this work programme will summarise ongoing actions in each Pillar (if any) and then in a separate section introduce the Calls to be launch in 2023.

Table of Actions with budget allocation:

Pillar	**Actions**	**Programme**	**Type of action/ Funding rate**	**EU Contribution in 2024 (EUR)**	**Total Budget (EUR)**
Infrastructure	1st CFEI post-exascale Supercomputer	DEP (2025)	EU 50% (Capex +Opex) PS 50%	400 Million in 2025	800 Million in 2025
	2nd CEI for an Industrial HPC for AI or other applications of industrial relevance	DEP (2024)	EU 35% (Capex only)	45.6 Million	130.4 Million

	Upgrading EuroHPC systems to AI	DEP (2022 and 2023)	EU 35% PS 65%	60 Million	171 Million
	3rd CFEI Quantum Computing	DEP (2024)	EU 50% PS 50%	10 Million	20 Million
Connected and Federated	Connected HPC infrastructure and services	CEF-2 (2021)	EU 100 %	60 Million	60 Million
Technology	Enhancing competitive European microprocessor technology for HPC	Horizon Europe (2024)	EU 50% PS 50%	48.6 Million	97.3 Million
	Enabling Universal Access and Integration of Quantum Resources	Horizon Europe 2024	EU 50% PS 50%	10 Million	20 Million
	Development of new benchmarks for HPC, Quantum Computing, and AI	Horizon Europe (2024)	EU 50% PS 50%	10 Million	20 Million
	HPC/QC Middleware technologies	Horizon Europe (2024)	EU 50% PS 50%	20 Million	40 Million
Applications	Quantum application prizes	Horizon Europe (2023)	EU 100%	300k	300k
	HPC for AI Software Ecosystem	Horizon Europe (2024)	EU 50% PS 50%	8 Million	16 Million

	HPC Applications	Horizon Europe(2024)	EU 50% PS 50%	10 Million	20 Million
	Centres of Excellence to support the development of exascale applications	Horizon Europe(2024)	EU 50% PS 50%	10 Million	20 Million
	HPC/Cybersecurity/AI	DEP(2024)	EU 50% PS 50%	5 Million	10 Million
	Continuous integration and deployment platform (CI/CD)	DEP(2024)	EU 100%	3 Million	3 Million
Competences and Skills	EuroHPC Masters Programme (2nd call)	DEP(2024)	100%	10 Million	10 Million
	EuroHPC Summit 2025	DEP (2024)	100%	700K	700K
	User Day 2024	DEP (2022)	100%	150K	150K
International	Support EU Digital Partnership activities	Horizon Europe (2024)	100%	10 Million	10 Million

In 2024, the Legislative Financial Statement (LFS) provides the JU with **EUR 74,35 Million from DEP and EUR 126,68 Million** from Horizon Europe. This includes the deduction introduced by the Chip Act'.

In line with the LFS forecast for 2024, this Work Programme commits the credits as indicated in the LFS**.** All other projects will be funded from unused appropriations carried forward from 2021, 2022, 2023. More information to be provided in the Budget section of this Work Programme

INFRASTRUCTURE PILLAR

Ongoing activities:

The JU's Infrastructure strategy will continue to be implemented in 2024.

- The first exascale supercomputer to be located in Jülich Supercomputing Centre in Germany will be operational in 2024 in time for the TOP 500 ranking to be announced in late 2024.
- The JU will continue to provide technical guidance and administrative support to the four designated hosting entities (Greece, Ireland, Hungary and Poland) to procure a midrange supercomputer each.
- The JU will provide technical guidance and administrative support on the procurements of the two upgraded systems (Lisa/Leonardo and Discoverer +)
- In 2024, the JU will finalise the procurements of the six quantum computers.
- The JU will launch a procurement for a second exascale supercomputer, to be located in France, based on the selection of a Hosting Entity, presented by the Jule Verne Consortium and subsequently agreed by the Governing Board in 2023.
- In 2024, the JU will evaluate proposals to select hosting entities for the third set of mid-range supercomputers based on calls for expression of interest launched in 2023.
- The JU will evaluate proposals to select hosting entities for the second call for expression of interest of quantum computers launched in 2023 and will procure them in 2024.
- In order to develop a fully operational access capacity for users of EuroHPC Systems, the JU will update its access procedures in line with the amended access policy adopted in 2023.

Calls 2024

Call for expression of interest for the acquisition and operation of a post-exascale supercomputer.

The EuroHPC JU will launch a Call for Expression of Interest for a post-exascale supercomputer. With the support of independent external experts, the hosting entities will be selected by the Governing Board of the Joint Undertaking following the call for expression of interest.

This supercomputer will be hosted in national Supercomputing Centres (as a hosting entity or as a support to the hosting entity, depending on the national organization) already established in Member States that is a Participating State of the Joint Undertaking. The procurement of this supercomputer is foreseen for late 2026. The budget for this acquisition will be available to the JU and appear in Work Programme 2025[3]. This supercomputer should strive to incorporate to the maximum extent available European technology and applications for all core elements (CPUs and accelerators), be a system of at least 1 Exaflop computing performance, represent a significant step forward compared to EuroHPC Exascale systems,

[3] Council Regulation 2021/1173 – Legislative Financial Statement

and be able to accommodate post exascale[4], AI and other date intensive applications. Furthermore, the system could strive to include novel architectures which go beyond floating point operations.

The eligibility conditions are those established in the EuroHPC JU Regulation. The Governing Board may decide in the Work Programme, if duly justified for security reasons, to condition the participation of suppliers in the acquisition of the high-end supercomputers in accordance with Article 12(6) of Regulation (EU) 2021/694 or to limit the participation of suppliers for security reasons or actions directly related to the Union's strategic autonomy, in accordance with Article 18(4) of that Regulation. Applications to the call for expression of interest should therefore provide a first indication if the hosting entity would consider conditioning or limiting the participation of suppliers for security reasons and/or reasons related to the Union's strategic autonomy.

Budget: The total indicative budget of EUR 800 million for the acquisition and operation of a post-exascale supercomputer would be made up an EU contribution (DEP) of EUR 400 million committed in 2025 matched by a PS contribution of EUR 400 million.

SPECIFIC CONDITIONS FOR THE CALL FOR EXPRESSION OF INTEREST FOR THE ACQUISITION AND OPERATION OF A POST-EXASCALE HIGH END SUPERCOMPUTER (CFEI 2024; SELECTION OF HOSTING ENTITY 2025; PROCUREMENT 2026)	
Expected EuroHPC JU contribution per project	The EuroHPC JU estimates that an EU contribution of up to EUR 400 million matched by a PS contribution of up to EUR 400 million committed in 2025 would allow for the acquisition and operation of one post-exascale supercomputer.
Indicative budget	The total indicative budget for the EU contributions to the topic is up to EUR 400 million and will be committed in 2025
Type of Action	Call for expression of interest
Eligibility conditions	The eligibility conditions are those established in Article 11 of the EuroHPC JU Council Regulation (EU) 2021/1173. Article 12.6 of the Digital Europe Programme will apply, whereby in order to achieve the expected outcomes, and safeguard the Union’s strategic assets, interests, autonomy, or security, participation is limited to legal entities established in Member States and in the following Associated Countries to Horizon Europe: Iceland, Norway. Proposals including entities

[4] The Governing Board will define ‘post-exascale’ in 2024 and reflect this in the Call for Expression of Interest

	established in countries outside this scope specified in the topic/call/action will be ineligible.

Second Call for Expression of Interest for the selection of a Hosting Entity to acquire and operate an industrial grade EuroHPC Supercomputer for Artificial Intelligence (AI) or other applications of industrial relevance.

Scope: With the growing dependence on supercomputers to process ever increasing amounts of data, the JU will launch a Call for Expression of Interest to procure HPC systems to be co-owned and used by the industrial sector based in the European Union.

Article 13 of Regulation (EU) 1173/2021 states that the system should be at least a mid-range level system and should be hosted in existing EuroHPC Hosting Entity. EuroHPC JU will fund 35% of acquisition costs.

The Joint Undertaking should acquire, together with a consortium of private partners, at least mid-range level supercomputers, or partitions of EuroHPC supercomputers, primarily destined for use by industry for AI driven-applications and should co-own them with a consortium of private partners.

The Union financial contribution should cover up to 35 % of the acquisition costs of the EuroHPC supercomputers, or the partitions of the EuroHPC supercomputers. The remaining total cost of ownership of the EuroHPC supercomputers, or the partitions of the EuroHPC supercomputers, shall be covered by the consortium of private partners.

The selection of the supplier of an industrial-grade EuroHPC supercomputer should be based on tender specifications that should take into account the user requirements and the general system specifications provided by the selected hosting entity in its application for the call for expression of interest. The selection should also address the security of the supply chain. In addition, the system requirements will take into account needs of the industrial AI community and applications.

The Governing Board may decide in the work programme, if duly justified for security reasons, to condition the participation of suppliers in the acquisition of the industrial grade EuroHPC supercomputers in accordance with Article 12(6) of Regulation (EU) 2021/694 or to limit the participation of suppliers for security reasons or actions directly related to the Union's strategic autonomy, in accordance with Article 18(4) of that Regulation.

The EuroHPC supercomputers or the EuroHPC supercomputer partitions for industrial use should be hosted in a hosting entity of a EuroHPC supercomputer.

The Call for Expression of Interest will be launched in 2024 and the expected procurement will take place in 2025.

Indicative Budget: An indicative budget from DEP of EUR 45.6 million matched by a contribution of EUR 84.8 million from the consortium of private partners would allow for the acquisition and operation of one industrial grade EuroHPC Supercomputer.

SPECIFIC CONDITIONS: CALL FOR EXPRESSION OF INTEREST FOR THE ACQUISITION OF AN INDUSTRIAL EUROHPC SUPERCOMPUTER for AI OR OTHER APPLICATIONS OF INDUSTRIAL RELEVANCE (CFEI 2024; PROCUREMENT 2025)	
Expected EuroHPC JU contribution per project	The EuroHPC JU estimates that an EU contribution of up to EUR 45.6 million towards an industrial HPC would allow for the

	acquisition of one EuroHPC JU industrial supercomputers. The Consortium of private partners would contribute 65% of the procurement which is the equivalent of EUR 84.8 million
Indicative budget	The total indicative budget for one EuroHPC JU industrial supercomputers is up to EUR 130.4 million.
Type of Action	Call for expression of interest
Eligibility conditions	The eligibility conditions are those established in the EuroHPC JU Council Regulation (EU) 2021/1173, and in particular Article 13 of this Regulation. Article 12.6 of the Digital Europe Programme will apply, whereby in order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, participation is limited to legal entities established in Member States and in the following Associated Countries to Horizon Europe: Iceland, Norway. Proposals including entities established in countries outside this scope specified in the topic/call/action will be ineligible.

Call for expression of interest for the upgrade of EuroHPC JU supercomputers with Artificial Intelligence capacities to address the evolution of user needs

On 13 September 2023, the President of the Commission stated in her State of the Union address "*that the Union would deliver on the AI Act by guiding AI innovation in a responsible way and 'open-up' our high performance computers to AI start-ups to train their models"*. To support this EU strategic initiative, a call for expression of interest to upgrade current EuroHPC systems to provide enhanced and/or additional AI functionalities will be launched which will allow for eligible EuroHPC supercomputers to be accessible to train large responsible AI models. The call for expression of interest should define the specific eligibility conditions that should apply to a hosting entity which is already hosting a EuroHPC supercomputer'. Furthermore, article 15 of the EuroHPC JU Regulation states that 'The maximum EU contribution to such upgrades may not exceed EUR 150 million for the period 2021-2027'. In consequence, EuroHPC JU will launch Call for Expression of Interest for the selection of EuroHPC supercomputers to be upgraded that are owned or co-owned by EuroHPC JU, on the basis and in accordance with the Council Regulation (EU) 2021/1173, and taking into account the EU Financial Regulation.

The Union financial contribution for the upgrade shall cover up to 35 % of the acquisition costs of the upgrade, depreciated over the expected remaining lifetime of the original supercomputer and up to 35 % of the additional operating costs. The total cost of the upgrade shall not exceed 30 % of the total acquisition cost of the original EuroHPC supercomputer.

The share of the Union's access time to the upgraded EuroHPC supercomputer shall remain unchanged over the lifetime of the machine. If the upgrade entails an increase of capacity, the additional access time should be directly proportional to the Union contribution.

The Governing Board may decide in the Work Programme, if duly justified for security reasons, to condition the participation of suppliers in the upgrade of these supercomputers in accordance with Article 12(6) of Regulation (EU) 2021/694 or to limit the participation of suppliers for security reasons or actions directly related to the Union's strategic autonomy, in accordance with Article 18(4) of that Regulation.

Budget: An indicative budget will be allocated from the Digital Europe Programme of EUR 60 million (procurement of the upgrades will take place in 2025) for the upgrading of a number of EuroHPC supercomputers.

An indicative EU contribution of EUR 60 million (35% of acquisition and operating costs) will be matched by a PS contribution of EUR 111 (million 65% acquisition and operating costs) would allow for the upgrading of a number of EuroHPC supercomputers.

SPECIFIC CONDITIONS FOR THE CALL FOR EXPRESSION OF INTEREST FOR THE UPGRADING OF EUROHPC SUPERCOMPUTERS WITH ARTIFICIAL INTELLIGENCE TO ADDRESS THE EVOLUTION OF USER NEEDS (CFEI 2024; SELECTION OF HOSTING ENTITY 2025; PROCUREMENT 2026)	
Expected EuroHPC JU contribution per project	The EuroHPC JU estimates that an EU contribution of EUR 60 million would allow for the upgrading of eligible EuroHPC supercomputers

Indicative budget	The total indicative budget for the EU contributions to the topic is up to EUR 60 million (35% of acquisition and operating costs) will be matched by a PS contribution of EUR 111 (million 65% acquisition and operating costs) would allow for the upgrading of a number of EuroHPC supercomputers.
Type of Action	Call for expression of interest
Eligibility conditions	The eligibility conditions are those established in Article 15 of the EuroHPC JU Council Regulation (EU) 2021/1173. A hosting entity shall be eligible to respond to this call for expressions of interest at the earliest one year after the selection date of the hosting entity of the EuroHPC supercomputer. A EuroHPC supercomputer may be upgraded only once.

3rd Deployment of European quantum computers

This is a follow-up to the EuroHPC Work Programme 2022 and 2023 actions on the procurement and operation of the quantum computers for integration into HPC supercomputers.

The overarching goal is to establish in Europe a world-leading hyper-connected quantum computing service and data infrastructure ecosystem, and to enable the research community and European industry produce world-class outputs and to accelerate the broad exploitation and uptake of European research and technology across the Union.

The primary objective of this action is to make European quantum computers integrated with EuroHPC Participating States supercomputers, in a hybrid configuration, available to users in order to address a growing demand from European industry and academia for applications with industrial, scientific and societal relevance for Europe. The activities should leverage European technology, in particular quantum computing technologies developed within the Quantum Flagship, other European initiatives and national Quantum research programmes of the EuroHPC Participating States. The action should foster the emergence of real use case applications, and mature large-scale quantum computing in Europe. This will contribute to the development of an ecosystem of quantum programming facilities, application libraries and skilled workforce.

The action will cover the acquisition of the quantum computers, their integration with the HPC supercomputing infrastructure, and their operations. The aim is to support multiple proposals with diverse technologies to give European HPC users access to as many different quantum technologies as possible. The focus should be on technology approaches that are not

addressed by the successful hosting entities of the EuroHPC 2022 and 2023 Calls for Expression of interest.

The action should look for synergies and cooperation with the relevant projects at European or national level developing or testing the different layers of the software stack, quantum applications, or use cases, notably the projects resulting from previous EuroHPC Quantum Computer procurements and calls (EUROHPC-2022-CEI-QC-01, EUROHPC-2023-CEI-QC-01 and H2020-JTI-EUROHPC-2020-01) and the Quantum Flagship call HORIZON-CL4-2021-DIGITAL-EMERGING-02-10 Strengthening the quantum software ecosystem for quantum computing platforms, HORIZON-CL4-2021-DIGITAL-EMERGING-02-15: Framework Partnership Agreement for developing the first large-scale quantum computers (FPA)

Grants will be established, on the basis of Article 195 (f) of the Financial Regulation (EU, Euratom) 2018/1046, to cover costs for the integration of the quantum computer with the hosting entity's supercomputer based on solutions already developed in previous and ongoing calls. The reimbursement from the EuroHPC JU will be calculated on the basis of the declared costs up to the maximum total contribution of the EuroHPC JU or up to a ceiling of 50 % of the declared eligible costs, whichever is lower.

EUROHPC-2024-CEI-QC-01: Call for expression of interest for the hosting and operation of European quantum computers integrated in EuroHPC supercomputers

The EuroHPC Joint Undertaking (JU) will launch a call for expression of interest to identify hosting entities for the procurement and operation of quantum computers, their integration with HPC supercomputers and the development of a quantum software stack. Applicants could be either single European entities or consortia of European entities. The EuroHPC JU will initiate and manage the Calls for Expression of Interest for hosting quantum computers and evaluate the applications received, with the support of independent external experts. The hosting entities will be selected by the Governing Board of the Joint Undertaking following the call for expression of interest.

Following the selection of the hosting entities the EuroHPC JU will initiate the procurement of the quantum computers. The specific conditions of the procurement will be defined in a call for tender. For security related reasons and as the action is directly related to the Union's strategic autonomy, the participation of suppliers in the acquisition of the quantum computers will be subject to conditions in accordance with Article 12(6) of Regulation (EU) 2021/694, and in accordance with Article 18(4) of that Regulation.

The selected hosting entities will sign a hosting agreement with the EuroHPC JU, in accordance with Article 10 of the EuroHPC Regulation, and sign with the EuroHPC JU a grant to cover the Union's share of the operational costs. Pursuant to Article 10 of the Regulation 2021/1173, the EuroHPC JU will be the owner of the quantum computers.

The quantum computers should be hosted in national Supercomputer Centres already established in Member States that are Participating States of the Joint Undertaking. The selection will aim at ensuring a diversity in the technologies and architectures of the different quantum computers to be acquired. Preference shall be given to technology approaches not already part of or foreseen for the EuroHPC QC infrastructure.

The applications submitted to the call for expression of interest should enable the development of real use cases supporting the adoption of applications with scientific, industrial and societal relevance for Europe. Although identified applications do not need to provide a definite quantum advantage, they must allow the development of libraries for quantum computers/simulators in a HPC environment based on solutions already developed in previous and ongoing calls.

Furthermore, the applications submitted to the call for expression of interest should support the implementation and testing of quantum software stacks, libraries etc. that facilitate the link from a high-level description of algorithms to a low-level implementation on the hardware, for solving concrete problems and applications expected to demonstrate quantum advantage.

The Quantum/HPC integration should, whenever possible, rely on existing solutions developed, for example, by other EuroHPC initiatives or national projects.

The Union financial contribution to the EuroHPC JU shall cover up to 50 % of the acquisition costs, up to 50 % of the operating costs of the quantum computer, and up to 50% of the integration costs. The remaining total cost of ownership of the quantum computer (including VAT if applicable) shall be covered by the Participating State where the hosting entity is established or by the Participating States in the hosting consortium.

Grants will be established to cover the operating costs of the quantum computer. The reimbursement from the EuroHPC JU will be calculated on the basis of the declared costs up to the maximum total contribution of the EuroHPC JU or up to a ceiling of 50 % of the declared eligible costs, whichever is lower.

Grants will be established to cover costs for the integration of the quantum computer with the hosting entity's supercomputer based on solutions already developed in previous and ongoing EuroHPC or national initiatives. The reimbursement from the EuroHPC JU will be calculated on the basis of the declared costs up to the maximum total contribution of the EuroHPC JU or up to a ceiling of 50 % of the declared eligible costs, whichever is lower.

The costs related to the adaptation of the hosting site per se (e.g. costs related to the building infrastructure that will host the quantum computer) shall not be covered by the EuroHPC JU. However, the costs of the preparation of the hosting site incurred by the hosting entity that can be directly accounted to the installation of the quantum computer may be considered as part of the Total Cost of Ownership (TCO) and may thus be considered as eligible costs that can be covered by the EuroHPC JU.

The quantum computers can range from pilots and experimental systems to prototypes and operational systems. There is no restriction on the type of quantum computer to be included in the proposal. However, proposals should clearly identify the technical features of the targeted quantum computer including the quantum processing unit (qubits, entanglement capability, control etc.) and the integration (type interface, interconnection, software stack etc.) between the quantum computer/simulator and the rest of the HPC infrastructure based on solutions already developed in previous and ongoing calls.

The quantum computers should have at least 10 qubits, with an average of 2-qubit gate error rate of less than 1%, or equivalently with a 2-qubit gate fidelity at least above 99%, and allow for a maximum circuit depth and number of entangled qubits by the installation date. The quantum computers should integrate EU technologies and uptake research outputs emanating from Quantum Flagship projects or from national research programmes of the EuroHPC

Participating States. Applications to the call for expression of interest should clearly identify the technical features of the targeted quantum computer, including the quantum processing unit (qubits / individual quantum units, entanglement capability, control etc.) and the integration (type interface, interconnection, software stack etc.) between the quantum computer and the rest of the EuroHPC infrastructure.

Therefore, the application to the call for expression of interest should include the request for a grant to cover the integration of the quantum computer with the supercomputer of the hosting entity, including the necessary developments of quantum hardware and the software stack. The grant for the integration of the EuroHPC quantum computers awarded to hosting entities should achieve the objective of a standardised application programming interface for software libraries and applications which is independent of the quantum computing technology. This will require coordination and collaboration with previous selected proposals. Moreover, proposals should build on or seek collaboration with existing projects and develop synergies with other relevant European, national or regional initiatives, funding programmes and platforms.

The application should also explain how access to the quantum computer integrated in the HPC system of the hosting entity will be implemented in agreement with the EuroHPC JU Access Policy. This is of particular importance for applications from entities where the ownership of the HPC system and the quantum computer will be different and the EuroHPC JU does not own HPC resources.

The selected hosting entities should ensure to the extent possible cooperation with complementary projects launched, notably in the area of the EuroHPC-2020-01-b: "Pilot on quantum simulator, EUROHPC-2022-CEI-QC-01 and EUROHPC-2023-CEI-QC-01. Successful applicants", should establish from the beginning of this cooperation appropriate IP exploitation agreements. They should also contribute to spreading excellence across Europe, notably through the involvement of participants from EuroHPC Participating States currently developing their HPC/quantum infrastructure, and incorporating results emanating from the Quantum Flagship projects or national research programmes of the EuroHPC Participating States.

This action is an EU Synergy call. Grants and procurements can be linked with another grant funded from any other EU funding programme. The grants under both calls will be managed as linked actions.

Procurement and operation of the quantum computers for integration into HPC supercomputers

The EuroHPC JU will launch the procurement for the acquisition and operation of the quantum computers. The quantum computers will be hosted in the Hosting Entity selected in the Call for Expression of Interest EUROHPC-2024 - CEI-QC-01. The quantum computers should aim to incorporate to the maximum extent competitive European technology. The aim is to support multiple proposals with diversity in technology and applications, in order to give European HPC users access to as many different quantum technologies and applications as possible.

Pursuant to Article 12 of the EuroHPC JU Regulation, the EuroHPC JU will be the owner of the quantum computers. The Union's contribution from Digital Europe Programme (DEP) funds should cover up to 50% of the acquisition costs plus up to 50% of the operating costs of the quantum computer. The EuroHPC JU estimates that an EU contribution of up to EUR 10 million

and an equivalent EUR 10 million MS contribution would allow for the acquisition, operation and integration of at least one quantum computer.

For security reasons and as the action is directly related to the Union's strategic autonomy, the participation of suppliers in the acquisition of the quantum computers should be conditioned in accordance with Article 12(6) of Regulation (EU) 2021/694, and in accordance with Article 18(4) of that Regulation. The quantum computers will be hosted in the hosting entities selected in the Call for Expression of Interest. The action should cover: (i) the acquisition of the quantum computers/simulators, (ii) their installation in the supercomputer environment of the hosting entity, (iii) the hardware and software integration with the HPC supercomputing infrastructure, (iv) the operation, maintenance and dismantling of the quantum computers.

Expected Outcome: Acquisition, installation, operation and maintenance of at least three quantum computers, and provision and management of access to these systems for a wide range of public and private users.

Specific conditions	
Expected EuroHPC JU contribution per project	The EuroHPC JU estimates that an EU contribution of between EUR 8 – 10 million matched by a MS contribution of EUR 8 – 10 million per quantum computer would allow for the acquisition and operation of at least one quantum computer covering different qubit technologies. Applications must ensure the operation of the quantum computer for at least 4 years after successful acceptance.
Indicative budget	The total indicative EU budget for the topic is EUR 10 million. The total contribution will be EUR 20 million.
Type of Action	Call for expression of interest
Eligibility conditions	The eligibility conditions are those established in the EuroHPC JU Council Regulation (EU) 2021/1173. The JU will act as first user and acquire quantum computers or simulators that integrate technology primarily developed in the Union or Norway and Iceland. Article 12.6 of the Digital Europe Programme will apply, whereby, in order to achieve the expected outcomes, and safeguard the Union’s strategic assets, interests, autonomy, and security, it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions. Therefore, participation is limited to legal entities established in Member States that are members of the EuroHPC Joint Undertaking or Participating States Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible.

CONNECTED AND FEDERATED SUPERCOMPUTERS PILLAR

Ongoing activities:

Procurement of connected HPC infrastructure and services

On HPC connectivity, the JU will ensure that the Connectivity study procured in 2022 will be delivered in 2024. The results will be presented to the Governing Board and on the basis of this, the Governing Board will determine the type of action and funding in order to launch the implementation initiative before the end of 2023. On the basis of the study, the JU will procure Connected HPC infrastructure and services in 2024. The EuroHPC JU estimates that an EU contribution of EUR 60 million from the CEF-2 funds allocated in Work Programme 2021 would allow for the procurement of a Connected HPC infrastructure and services.

SPECIFIC CONDITIONS: CALL FOR TENDER FOR THE DEVELOPMENT AND IMPLEMENTATION OF A CONNECTED HPC INFRASTRUCTURE AND SERVICES ACROSS ALL THE EUROHPC JU SUPERCOMPUTERS (CFEI 2023; CALL IN 2024)	
Expected EuroHPC JU contribution to the tender is 100%.	The EuroHPC JU estimates that an EU contribution of up to EUR 60 million for the development of and implementation of a Connected HPC infrastructure and services across all the EuroHPC JU supercomputers.
Indicative budget	The total indicative budget for this initiative is EUR 60 million
Type of Action	Procurement
Eligibility conditions	The eligibility conditions are those established in the EuroHPC JU Council Regulation (EU) 2021/1173 and the rules of the Connected Europe Facility Regulation (EU) 2021/1153. In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, or security, participation is limited, as stated in Article 11.4 of the Connected Europe Facility Regulation (EU) 2021/1153. Legal entities established in the Union but directly or indirectly controlled by third countries or nationals of third countries or by entities established in third countries, are not eligible to participate in all or some of the actions

	under the specific objectives set out in Article 3(2), point (c), for duly justified security reasons. In such cases, calls for proposals and calls for tenders shall be restricted to entities established, or deemed to be established, in Member States and directly or indirectly controlled by Member States or by nationals of Member States.

Procurement of Federating Supercomputers and services

In 2023, the JU launched a call for tender for the deployment and operation of a platform for federating resources (including high performance computing, quantum computing and data management resources) providing Union-wide, cloud-based secure services for a wide range of public and private users across Europe. This procurement was launched in 2023 and will be fully operational across all EuroHPC Hosting Entities by 2025.

TECHNOLOGY PILLAR

"HPC Technologies research and innovation must be state-of-the art and reinforce strategic sovereignty (as indicated in Council Regulation (2021/1173). Furthermore, they must guarantee early access to European technologies and lead in development of European IP. … The JU shall invest in HPC technologies, including General Purpose Processors, accelerators and networks/interconnects, that are developed through EuroHPC JU calls must pursue energy efficiency goals, be innovative, be able to perform and compete globally, be production ready and whenever feasible be ready to be deployed in industrial settings" MASP 2023

Ongoing Activities in 2023

EuroHPC JU is currently managing 20 grants which have been selected in call H2020-JTI-EuroHPC-2019-1 and focus mostly on technology. The portfolio includes, for example, the development of software for future European supercomputer architectures, a European high-speed interconnect and a RISC-V based processor. Most of these projects will end in early 2024. A review of the different results and activities that have been delivered will be undertaken in 2024, in order to determine progress to delivering the objectives as set out in Regulation 2021/1173 and planning for future work programmes.

The JU launched a ***FPA RISC-V call*** *in 2023.*

A Pre-Commercial Procurement (PCP) focused on the development of European technology and their integration in pilot systems that demonstrate a significantly reduced energy footprint for typical expected workloads on EuroHPC systems. The action addresses R&D towards a technology readiness level (TRL) which delivers tangible solutions ready for procurement on a larger scale and within a timeframe of 2 years by the end of the action. Central selection criterion will be the expected benefits of the developed technology after scale-up to at least the size of current mid-range supercomputers. The PCP will be followed by a Public Procurement of Innovative solutions (PPI) to procure a system using the best developed solutions.

A call was launched **on *Innovation Action in Low Latency and High Bandwidth Interconnects*** which will, efficiently exploit the increasing available computation capabilities, inter-node networking (interconnect between compute nodes) in exascale and post-exascale systems.

The JU launched the ***HPC Energy efficiency R&I Call*** to develop new technologies that will reduce the energy consumption of future EuroHPC supercomputers.

Calls 2024:

RISC-V follow-up calls

After the signature of a Framework Partnership Agreement (FPA) for developing a large-scale European initiative for High Performance Computing (HPC) ecosystem based on RISC-V, the selected consortium will be invited to apply for a Specific Grant Agreements with the EuroHPC

JU. The total amount for the SGA(s) and the breakdown of budget into the different SGA(s) will be done after the selection of the FPA and the GAP process is completed.

Priorities and topics will be selected on the basis of the technology roadmap set out in the Description of Action of the awarded FPA. The exact timeline depends on the ongoing evaluation of the call for proposals HORIZON-EUROHPC-JU-2022-TECH-03. **When ready, the call texts to launch the SGAs will be included in Work Programme 2024 and the Governing Board will be asked to approve the launch of these calls.**

Indicative Budget

Horizon Europe (see WP22) Additional budget may be allocated in 2024 for SGAs which should complement the foreseen budget for SGAs in WP2022. The total amount for the SGA(s) and the breakdown of budget into the different SGA(s) will be done after the selection of the FPA and the GAP process is completed.

Enhancing competitive European microprocessor technology for HPC

The support for a sustainable and competitive exascale HPC ecosystem in Europe requires further action on the technology supply to develop extreme scale, power-efficient and highly resilient HPC and data technologies, contributing to the European digital autonomy and independent access to critical technology. This action should ensure complementarity to the Framework Partnership Agreement (FPA) for developing a large-scale European initiative for High Performance Computing (HPC) ecosystem based on RISC-V.

Proposals should be based on worldwide state-of-the-art processor developments which are a credible alternative to existing non-EU solutions for processors (and accelerators). Proposals are expected to be industry driven and deliver by the end of the project competitive solutions/systems proven in operational environments.

The objective is to provide scalable and customisable high-performance multi-core and multi-cluster processors implementations delivering competitive power-performance-area metrics. Expected work should build and rely on existing EU achievements and initiatives like for example the European Processor Initiative. The proposed action should cover the design and testing of and development of a high-end processors and integration in pilot systems in view of their roll-out, uptake and use in world-class competitive supercomputers.

The proposed work should target KPIs that will outperform non-EU solutions. A key aspect is to ensure that all the IP necessary to produce the solutions remains in the EU, effectively creating an independent European source of critical technology.

Indicative Budget:

An indicative budget will be allocated from the Horizon Europe of EUR 48.6 million

An EU contribution of EUR 48.6 Million (50% of total funding) will be matched by a PS contribution of EUR 48.6 million (50% of total funding)

Specific conditions	
Expected EuroHPC JU contribution per project	The EuroHPC JU estimates that an EU contribution of 48.6 million matched by a MS contribution of EUR 48.6 million
Indicative budget	The total indicative EU budget for the topic is EUR 48.6 million. The total contribution will be EUR 97.3 million.
Type of Action	Grant, Horizon Europe.
Eligibility conditions	In accordance with article 22.5 of the Horizon Europe Programme, and in order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, and security, it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions. Therefore, participation is limited to legal entities established in Member States that are members of the EuroHPC Joint Undertaking or Participating States Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible.

Broadening EuroHPC' s Quantum Ecosystem: Enabling Universal Access and Integration of Quantum Resources (local and remote) as HPC Accelerators

Background: This call for proposals targets emerging paradigms in quantum computing and high-performance computing integration. It introduces enhanced concepts of 'Universal Quantum Access' and 'Quantum Accelerators in HPC', with the aim of ensuring all-encompassing integration, operation, and access to diverse quantum computing resources within and beyond the EuroHPC network, using all possible means of access.

Objectives:

- To facilitate global access and utilization of diverse quantum computing resources within the EuroHPC framework, using all possible means of access.
- To enable seamless integration of quantum computers as accelerators in HPC workloads.
- To foster innovation and efficiency in leveraging quantum resources for advanced computational tasks, ensuring that EuroHPC facilities are used as effectively as possible.
- Mature cloudified access to quantum computing resources.

1. Implement universal access to local and remote QCs through resource managers/schedulers:

- Enable supercomputers to launch activities employing one or multiple local or remote quantum computers, enhancing the diversity and efficiency of computational tasks.
- Integrate advanced scheduling capabilities within resource managers/schedulers to efficiently allocate and utilize local or remote quantum resources in computational workloads.
- Develop and implement standardized interfaces and protocols for integrating quantum resources as accelerators in HPC workloads.

2. Expand secure quantum cloud platform:

- Widen access to quantum computers through a robust and secure cloud platform, enhancing accessibility and utilization.
- Further enhance the EuroHPC Quantum Cloud platform for secure and seamless access to diverse quantum computing resources.
- Establish secure and efficient communication networks and collaboration platforms for leveraging distributed quantum resources.
- Ensure that the expanded quantum ecosystem maintains the highest standards of security and operational efficiency.

3. Focus on specific applications:

- Identify and prioritize applications (such as quantum simulation, cryptography, and optimization) that may not require extensive classical computing resources but can significantly benefit from access to quantum computing resources.

Expected Outcomes:

- Universal access and integration of diverse local or remote quantum computing resources within the EuroHPC network.
- Enhanced efficiency, performance, and innovation in leveraging quantum resources for advanced HPC workloads.
- Strengthened and secure quantum ecosystem, promoting collaborative advancements and applications.

For security reasons and as the action is directly related to the Union's strategic autonomy, the action should be conditioned in accordance with Article 22.5 of Horizon Europe of Regulation.

One single grant will be selected.

Specific conditions	
Expected EuroHPC JU contribution per project	The EuroHPC JU estimates that an EU contribution of 10 million matched by a MS contribution of EUR 10 million

Indicative budget	The total indicative EU budget for the topic is EUR 10 million. The total contribution will be EUR 20 million.
Type of Action	Grant, Horizon Europe.
Eligibility conditions	In accordance with article 22.5 of the Horizon Europe Programme, and in order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, and security, it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions. Therefore, participation is limited to legal entities established in Member States that are members of the EuroHPC Joint Undertaking or Participating States Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible.

Development of new benchmarks for HPC, Quantum Computing, and AI

Expected Outcome:

The action will provide three sets of well documented, generally hardware agnostic benchmarks for exascale HPC, quantum computers and AI specific technology. The benchmarks will be application oriented, reflecting real use patterns to ensure the real capabilities and limitations of advanced HPC systems are captured. Based on the set of standardised tests, aggregated performance indicators can be defined to link system performance with real value for the targeted user communities.

Scope:

- Identification of suitable applications and algorithms in the three areas
- Selection of a representative set of applications and algorithms reflecting real use cases
- Develop reference implementations of algorithms where necessary
- Provide the required input and output data to run benchmarks
- Provide documentation for developers and users of the resulting benchmarks
- Coordinate with international collaborators as appropriate to establish common and objective benchmarking standards
- In Quantum, benchmarks will take into account specific problems covering optimization, machine learning, cryptography, material science, and should span various levels of quantum computing readiness, from NISQ to fault-tolerant quantum computing regimes.

Indicative Budget:

An indicative budget will be allocated from the Horizon Europe of EUR 10 million

An EU contribution of EUR 10 Million (50% of total funding) will be matched by a PS contribution of EUR 10 million (50% of total funding)

HPC/Quantum Computing Middleware technologies

Expected Outcome:

This action should build upon the HPC-QC integration efforts carried out in the HPCQS project and by the EuroHPC Hosting Entities of quantum computers.

Scope:

The developed reference software stack should, as far as technically feasible, expose a common and technology agnostic interface to developers of applications, resource

management software and system management and monitoring tools, in line with existing and established standards and contribute to the European standardization efforts.

The Action will implement mechanisms to establish a dialogue between the relevant European suppliers of QC technology, HPC operators and software developers.

The activities developed in this Action should also address in particular the challenges of scheduling of QC tasks, HPC-QC application development, system and user management and monitoring.

Indicative Budget:

HE (WP24): A total EU budget of EUR 20 Million to fund projects with a duration of 3 years.

An EU contribution of EUR 20 Million (50% of total funding) will be matched by a PS contribution of EUR 20 million (50% of total funding)

APPLICATIONS PILLAR

Ongoing Activities:

The EuroHPC JU Centres of Excellence selected in early 2023 will have their first review in 2024. The latest HPC Centres of Excellence selected in 2023 will begin operations in 2024. The European Quantum Excellence Centres (QECs) in applications for science and industry, launched in 2023 and the evaluations will take place in 2024. The EuroHPC Inducement Prize for Quantum Computing and Simulation Applications, which appears in Work Programme 2023, will be launched in 2024.

Calls 2024

As announced in President Von der Leyen in her State of the Union speech on 13 September 2023, Europe should lead global efforts on artificial intelligence. To do this, the EU will leverage one of its biggest assets: its public high-performance computing infrastructure.

In order to promote innovation in AI responsibly, EuroHPC computing power will be used to train and finetune the most advanced foundation models, as well as advances applications and software. The EU's mission is to lead global efforts on artificial intelligence and guide innovation. Access to Europe's supercomputing infrastructure will help start-ups, researchers and other users bring down the training time for their newest AI models from months or years to days or weeks. And it will help them lead the development and scale-up of AI responsibly and in line with European values. EuroHPC JU's strategy in 2024 will therefore include development of applications and software tools and techniques to support the Hosting Entities and of course, users.

AI Software Ecosystem for HPC

Expected Outcome:

Methodologies, programming environments and software stack (libraries, tools, workflows, etc.) facilitating the coupling of HPC with AI training processes and big data (e.g. for LLM), including:

- Development of HPC workflows supporting the parallelisation of AI applications for optimising the use of HPC capabilities, and their deployment in HPC systems
- Dynamically supporting scalability of AI and AI Data
- Generic reusable and transversal solutions across domains (no ad-hoc)
- Architecture agnostic and reflecting performance optimisation and energy efficiency in HPC systems
- Supporting AI-friendly features (e.g. interactivity, access to different large data sets, HPC elasticity, aggregation of many small jobs, etc.)
- Integration in EuroHPC federated services
- Complementary to the AI-oriented Support Centre

Indicative Budget:

An EU contribution from the Horizon Europe Programme of EUR 8 Million (50% of total funding) will be matched by a PS contribution of EUR 8 million (50% of total funding).

HPC Applications

Expected Outcome:

- Applications to support the efficient use of exascale resources. The developed application targets real needs and use cases of significant impact where exascale supercomputers are required ,e.g., AI, big data, machine learning, cybersecurity, conflict simulations, social sciences, challenges in transport and logistics, construction.
- Pooled expertise to support application development in Europe by providing common library and software components, frameworks and tools which facilitate and optimise the development and execution of complex and computationally intensive tasks at exascale.
- Enhanced performance, scalability, reliability and efficiency of HPC applications while reducing the development effort by development and adoption of common software libraries
- Significant improvements in the target software and codes, in terms of e.g. efficiency, scalability, refactoring, adaptation to new software engineering and programming environments and tools, and optimisation for novel HPC hardware and system software.
- Contribution to the adoption of modular design principles and to the interoperability of software components across applications

Scope:

This Action will focus on HPC applications and software libraries for the exascale era. Proposals should:

- Demonstrate advances of the targeted HPC applications towards highly scalable, optimised flagship codes and exascale performance (both computing and extreme data). This includes developing, maintaining, porting, optimising (if needed re-designing) and scaling HPC application codes, addressing the full scientific/industrial workflow, particularly covering data aspects; testing and validating codes and quality assurance.
- Develop HPC libraries, software components, frameworks and tools using state-of-the art programming models to achieve unprecedented performance, robustness and reliability. Extract, collect, adapt and consolidate common code from European HPC applications into a common library promoting modular design principles and standardisation for both scientific and industrial applications.
- Present a detailed software development plan and management plan with clear timeline for the implementation including quantitative KPIs, milestones and deliverables demonstrating the achieved improvements. This also includes acceptance test after every significant development part. The software development plan with concrete scaling targets, covering the identified application and codes, should be

central to the proposed work and most resources should be allocated to these activities.

- The software should be deployed at all EuroHPC systems. The continuous deployment and continuous integration of the software on EuroHPC machines should be included as soon as possible in collaboration with the EuroHPC CI/CD platform.
  This action provides complementary grants to other initiatives such as HORIZON-EUROHPC-JU-2021-COE-01, HORIZON-EUROHPC-JU-2023-COE-01, HORIZON-EUROHPC-JU-2023-COE-03. Applications and codes funded by these actions are excluded from funding.

Indicative Budget:

An EU contribution from the Horizon Europe Programme of EUR 10 Million (50% of total funding) will be matched by a PS contribution of EUR 10 million (50% of total funding).

Centres of Excellence to support the development of exascale applications

Scope

Adapting applications to exascale and future post-exascale performance is a major challenge that requires significant changes in application codes, in some cases involving a complete rethink or substantial code re-engineering and rewrite. Action at European level is needed to support this transition in collaboration with the relevant communities that are key for the evolution of the codes. Changes to support the exascale transition have to take into consideration the heterogeneity of most architectures, code scalability and resilience, and the management of complex workflows at exascale.

Centres of Excellence are advancing specific Lighthouse Exascale Applications, at the frontier of technology and relevant for the communities of HPC users, that enable and promote the use of upcoming exascale and post exascale computing capabilities in collaboration with other High Performance Computer (HPC) stakeholders**.** The action will address topics of strategic importance for the Union, which will be identified by the JU in 2024 and could address elements such as**:**

- Combustion
- Aeronautical Design
- Virtual Pre-clinical trials:
- Foundation Models for Science

Other topics could also be considered as long as there is no overlap with topics already covered in ongoing projects being undertaken in EuroHPC JU Centres of Excellence.

Indicative Budget:

An EU contribution from the Horizon Europe Programme of EUR 10 Million (50% of total funding) will be matched by a PS contribution of EUR 10 million (50% of total funding).

Call on HPC/Cybersecurity/AI

Scope

High-Performance Computing (HPC) is no longer a niche for compute-intensive simulations. Instead, we are witnessing an era where users leverage HPC to process large amounts of data, train highly-complex artificial intelligence (AI) models, and anywhere where HPC plays a vital role along the compute continuum. The convergence of HPC and AI has expanded the HPC domain into a comprehensive ecosystem, creating opportunities and challenges for various industries such as engineering or the automotive sector. As a consequence, the previously manageable domain of HPC enfolds into an entire ecosystem precisely due to the convergence with AI. There is no longer solely the risk that an attack gains access to the computing power but also gets access to privacy-sensitive data stored more often within the HPC ecosystem. There is also the need to integrate HPC next to Cloud and Edge along the compute continuum to seamlessly execute complex workflows.

While the risks and vulnerabilities of HPC systems are often under-represented in today's security conversations, the convergence of HPC and AI increases the importance of HPC systems as critical infrastructures as more diverse user communities exploit and integrate with HPC systems. However, with the convergence of HPC and AI comes an increased concern for security. The European HPC infrastructure will be prone to a cyber-attack's target. Proposals for this topic shall therefore investigate cybersecurity requirements for secure access and usage of HPC systems while strengthening the security of the European HPC landscape.

Expected Impact

Companies from sectors such as finance, healthcare, manufacturing, and energy are utilizing HPC to tackle data-driven challenges, optimize processes, and gain valuable insights from large-scale data analysis. The support from these industries underscores the growing importance of HPC across the compute continuum, and thus requires to guarantee highest security policies.

Projects funded under this topic will therefore contribute to the EU Cybersecurity Strategy by increasing cybersecurity for critical infrastructures supporting "protection of data and networks aspiring to technological sovereignty in this field, while respecting privacy and other fundamental rights; this should contribute to secure services, processes and products, as well as to robust digital infrastructures capable to resist and counter cyber-attacks and hybrid threats. This action will be implemented in line with relevant EU cybersecurity legislation.

More specifically, proposals shall contribute to one or more of the following impacts:

- Enhance risk reduction of cyber-attacks on critical EuroHPC infrastructures.
- Resist and counter cyber-attacks and hybrid threats on EuroHPC infrastructures.
- Improve methods for HPC cybersecurity testing, certification, and standards.
- Shared cybersecurity management in supercomputing Centres and culture among HPC users

Expected Outcome

Current and future HPC ecosystems must therefore guarantee cybersecurity requirements across several layers: hardware, software, applications, data, internal staff (e.g., system administrators and performance engineers), and users. Thus, projects will assess and implement instruments (e.g., technologies, policies, tools) and derive solutions to secure the HPC ecosystems.

Projects' results are expected to contribute to some or all of the following outcomes:

- Awareness and training of HPC users on security-related topics such as security-aware software development
- Seamless integration of security into typical HPC applications to increase robustness against threats without or minimally affecting the applications' performance
- Demonstrate secure interoperability and integration of HPC into the compute continuum
- Actively engage industry stakeholders, and fostering collaboration, to pave the way towards secure and resilient critical European HPC infrastructures
- Secure mechanisms addressing authentication and authorization, secure data transfer, processing and storage of privacy-sensitive data
- Mechanisms to securely continue or resume production after attack detection
- Real-time threat prediction and identification (e.g., unauthorized access, data breaches, viruses, malicious workloads or insider threats)

Proposals shall make of use of latest technologies including artificial intelligence (e.g., smart and automatic prediction and identification of threats), cryptography (e.g., on-the-fly encryption), cloud computing (e.g., virtualization or containerization), or quantum computing, to achieve the expected outcomes.

In accordance with article 12.6 of the Digital Europe Programme, and in order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, and security, it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions. Therefore, participation is limited to legal entities established in Member States that are members of the EuroHPC Joint Undertaking or Participating States Norway and Iceland. Proposals including entities established in countries outside the scope specified in the call/topic/action will be ineligible.

Indicative Budget:

An EU contribution of EUR 5 Million over 3 years from the Digital Europe Programme (50% of total funding) will be matched by a PS contribution of EUR 5 million (50% of total funding).

Continuous integration and deployment platform (CI/CD)

Expected Outcome:

This Action will provide users with access to a continuously updated, with improved efficiency, software stack. This Action will boost R&I, contribute to the reliability of numerical results, save energy and resources and ensure the security of the EuroHPC infrastructure. The use of

the CI/CD platform will also contribute to establishing best practices in software development and overall better visibility of the investments in HPC applications by the Union. By the end of the action, a broad and representative portfolio of HPC applications developed by the European HPC communities will be available to users at all EuroHPC systems, enabling the execution computations on any system using the same version of an application and, hence, a seamless and reliable transfer of workflows.

Scope:

This Action will develop an HPC Software Stack in the form of a common platform.

It will build on the pilot for a EuroHPC CI/CD platform for HPC applications which is currently developed by the European Centres of Excellence for HPC Applications. The technical implementation should ensure the most efficient use, in terms of application performance and energy consumption, of the available hardware by the deployed software.

The development and operation of a common continuous integration and deployment platform to deploy for applications to EuroHPC systems will ensure all users have access to the latest releases and experimental development versions of software. This action is complementary to the Application Support Teams funded by EuroHPC (call DIGITAL-EUROHPC-JU-2022-APPSUPPORT-01) who are expected to provide system specific support at the EuroHPC Hosting Entities for the integration of the CI/CD platform in the local system environment and related deployment, testing and benchmarking workflows.

Indicative Budget:

An EU contribution from the Digital Work Programme of EUR 3 Million (100% funding rate) over 5 years with the option to award small grants (up to EUR 60k) to application development teams for onboarding on the platform.

COMPETENCES AND SKILLS PILLAR

Ongoing activities:

In 2023, the new Competence Centres were established. The EUMaster4HPC Master programme will be in its 3rd year. More institutions will take part in the courses and more students will be recruited. In the summer of 2023, the first cohort of students (17 students) will have completed their first year.

Two calls, EuroHPC International HPC Summer School and the EuroHPC Training Platform addressing training and skills in HPC in academia and job placements in HPC sector were launched in 2023, and two proposals were selected. They will become operational in 2024.

EuroHPC Virtual Training Academy was launched in 2023.

The first User Day took place in December 2023.

Calls in 2024

Renewal of the EuroHPC Masters Programme

Expected Outcome:

The Purpose of this call is to continue and further develop the European MSc programme in High Performance Computing.

Scope:

The MSc programme should focus on academic excellence and bridge the gap to professional career paths by collaborating with the European HPC industry and academia.

Proposals should adopt the existing modular training portfolio and contribute to its standardization, certification and systematic extension. A central objective is to significantly increase the visibility of the programme among target groups and attract outstanding students with a geographically balanced intake. The programme should support the graduation of at least 100 students, provide financial support for mobility and compensation of differences in living costs. Students should change university and country as they enter the programme.

Indicative Budget:

An EU contribution from the Digital Europe Programme of EUR 10 Million contribution for a duration of 4 years (100% EU funded)

INTERNATIONAL COOPERATION PILLAR

The EuroHPC JU Regulation gives a mandate to the EuroHPC JU to implement cooperation and collaboration with third countries advancing the work on HPC applications in domains of common interest, including facilitating access for researchers to EuroHPC JU resources and co-development of HPC applications. EuroHPC JU will align its activities with the European Commission strategy on EU Digital Partnerships in order advance cooperation on digital issues with like-minded third countries.

Ongoing Activities

- In 2022 EuroHPC JU launched the call on collaboration on HPC with Japan
- In 2023, EuroHPC JU launched a call for collaboration on HPC with India
- EuroHPC JU will implement the HPC elements of EU-Japan Digital Partnership
- EuroHPC JU will allocate EUR 10 million from Horizon Europe to follow-up activities linked to the EU's Digital Partnership Strategy or similar actions

Call 2024:

Scientific collaboration on HPC and Quantum Computing with third countries

Expected Outcome:

In 2024, EuroHPC JU will launch a call with on international cooperation in HPC and quantum computing to implement the Union's Digital Partnerships.

Indicative Budget:

An EU contribution from the Horizon Europe Programme of EUR 10 Million contribution for a duration of 3 years (100% EU funded)

ADMINISTRATION

Communication and stakeholder engagement

In 2024, the EuroHPC will further develop and consolidate its public image.

- **Online Dissemination of EuroHPC JU Activities and Opportunities**

In 2024, the JU will upgrade its online presence thanks to an improved website, becoming the single gateway to find information on EuroHPC JU activities, calls, opportunities and request access EuroHPC supercomputers. It will also add features to support EuroHPC public and private members to provide funding information.

- **Organisation of workshops to support and promote operational EuroHPC JU activities**

The JU will organise a number of workshops in order to engage with stakeholders in the HPC and Quantum communities in order to promote operational activities.

The JU will host a regular monthly online meetings of the EuroHPC Hosting Entities. Up to two in person meetings may take place and be hosted, with support from the JU, in a Hosting Entity.

In addition, the JU will fund up to two in person RIAG and INFRAG meetings in 2024 in Luxembourg, Brussels and/or during the annual EuroHPC Summit.

- **EuroHPC Summit 2024**

The EuroHPC Summit 2024 will take place in Belgium on 18-21 March 2024, during the Belgian EU Presidency. The organisation of this event will begin in 2023 and will base itself on the best practice and experience of **EuroHPC Summit 2023.** A budget of 700,000 Euros will be allocated from DEP operational activities.

The event will gather key European HPC stakeholders from providers, to scientific and industrial users, to policy makers. As in 2023, a particular attention will be given to the students of the EUMaster4HPC and to the R&I projects of the JU.

The Summit will be an important moment to showcase the latest achievements and opportunities in the European supercomputing ecosystem, but also to discuss and reflect on the current and future challenges in HPC and quantum computing. The event will provide also a great opportunity for attendees to network and connect with the European HPC and quantum community

- **EuroHPC Summit 2025**

The EuroHPC Summit 2025 will take place in Poland, during the Polish EU Presidency. A budget of 700,000 Euros will be allocated from DEP operational activities.

- **Other Conferences in 2024**

    - **ISC High Performance 2024**

The EuroHPC JU will participate again in the event ISC 2024 as exhibitor. It will also support the ISC organisers to promote TOP 500 communication activities. In 2024, the event will take

place from May 12 to May 16 2024 in Hamburg, Germany. ISC is the largest forum in Europe for high performance computing, high performance data analytics and AI/machine learning and brings together vendors, public institutions, and startups. It is also one of the two moments in the year where the TOP 500 and Top Green 500 ranking lists to benchmark HPC systems are communicated to the HPC community.

Following a successful cooperation with around 30 EuroHPC R&I projects and 2 EuroHPC hosting entities to develop and showcase a joint EuroHPC stand of 40 sqm at ISC 2023, the JU aims to reiterate the invitation to its partners to develop a coordinated EuroHPC village showcasing European achievements.

The event is a great opportunity for the EuroHPC JU to showcase its opportunities, its supercomputers and R&I projects. ISC 2024 is also critical for the JU to consolidate its public image while increasing its network and its European users base. A budget of 150,000 Euros will be allocated from DEP operational activities.

- **Supercomputing Conference (SC24)**

The JU aims to promote its activities and achievements at SC24, the largest annual international HPC fora. SC24 will take place in the United States in November 2024. A budget of 150,000 Euros will be allocated from DEP operational activities.

- **User Day 2024**

Following the successful User Day event organised in 2023, User Day 2024 will be organised in order to disseminate results of projects that have had access to EuroHPC JU systems. A budget of 150,000 Euros will be allocated from DEP operational activities.

Other Communication activities

In addition, the EuroHPC JU will also ensure the following activities:

- Regular in-person meetings between key EuroHPC stakeholders (GB, RIAG, INFRAG, EuroHPC Users, the Hosting Entities, R&I partners) to ensure efficient and coordinated collaboration develop synergies and reach potential new EuroHPC users
- Inauguration of new EuroHPC supercomputers such as JUPITER in Germany
- Interactive publications of JU reports such as the Annual Activity Report, the Systems Report, to improve the attractiveness of the documents.

Legal and Internal Control

The JU is dependent on excellent legal support in order to do its work. It will procure, where necessary, external legal counsel to support it in implementing its operational activities. Furthermore, Internal Control activities of the JU will be prioritised.

IT and Office activities

EuroHPC JU will benefit from the shared IT services, provided on the basis of the Framework Contract signed between the Joint Undertakings and the contractor – Real Dolmen.

The JU will also cooperate with the network of JUs in sharing expertise between IT JU professionals in the context of the back-office arrangement, mainly in the following areas:

- Inter-JU IT governance,
- Management of ICT tools, services and contracts EC applications, tools and services, EC FWCs Other tools and services (TBC),
- Security and compliance management.

Finance, audit and budgetary discharge

The 2024 administrative budget structure of the JU is updated, compared to the 2023 budget structure, to better accommodate the various budget chapters and articles (also known as budget lines) to a more mature, agile and structured administration. The changes made are not significant, as they do not alter the budgetary envelope and perimeter of neither Title I nor Title II.

In particular, there are two changes under Title I. Chapter 11 (Salaries and allowances of staff) is subdivided into 3 articles for better clarity and reporting (Temporary agents, Contract agents, and thirdly SNEs, interims and trainees). Also a new chapter 15 is created, to gather under one line all HR administrative services (SLAs, BOAs, external HR legal advice).

In Title 2, the Postage and Telecommunications chapter is merged with chapter 23 (Current administrative expenditure), considering the small volume of that former Postage and Telecommunications line. Chapter 25 is renamed to Internal Meetings, in order to clarify and separate internal corporate meetings, such as the GB, from other operational related events booked under Chapter 27 (Communication, Information and Events). Chapter 26 is also renamed (Legal Services), as it is the case with Chapter 28 (Experts and associated costs). Finally, a new Chapter 24 is created to concentrate in one single line all auditing and external consultancy costs linked strictly to administrative matters (External administrative consultancy and auditing). All in all, the budget chapters better reflect the internal organisation structure, with clear budget owners per chapter and better monitoring and planning of the expenditure.

For clarity purposes, the expenditure tables 3 and 4, which can be found in the below section, already incorporate the updated budget structure of 2024, even if it applies also to the past 2023 and 2022 financial years.

In addition, starting already in 2023 and continuing in 2024, the JU will prepare to defend its performance towards the European Parliament at the 2022 discharge process.

During 2024, ex-post financial audits of grant beneficiaries will continue to be organised, along the guidelines of the various programmes the JU is operating.

1. Revenue

In accordance with the provisions of the legal framework applicable to the EuroHPC JU, the contributors to the budget of the JU are defined in article 5, 6, 7 and 8 of Council Regulation (EU) 2021/1173.

The 2024 budget presented below includes revenues allocated under Horizon 2020 and the Multi Annual Programmes 2021-2027 which are Digital Europe Programme, Horizon Europe and Connected Europe Facility.

Table 1 Revenue Commitment Appropriations

Table 1: Revenue Commitment Appropriations

REVENUE (EUR)	Final Budget 2022 (Amd. no. 4 in GB 33/2022, including C1+ C2 credits)	Final Budget 2023 (Amd no.6 in GB 42/2023, including C1+ C2 credits)	Proposal of Budget 2024 (GB Dec.44/2023)
1. Revenue from Fees and Charges			
2. EU Contribution with EFTA included	**996.751.641**	**816.096.561**	**208.833.817**
of which Regulation (EU) 2021/1173 Administrative (Title 1 and Title 2)	3.469.079	8.274.440	7.804.155
of which old Regulation (EU) 2018/1488 Administrative (Title 1 and Title 2)	4.747.645	4.317.372	
of which Regulation (EU) 2021/1173 Operations (Title 3)	905.345.771	803.471.748	201.029.662
of which old Regulation (EU) 2018/1488 Operations (Title 3)	83.189.145	33.000	
3. Third Country Contribution		-	-
of which EEA/EFTA		-	
supplementing Title 1 & 2		-	
supplementing Title 3		-	
of which Non-EEA		-	
4. Other Contributions	**377.705.000**	**320.000.000**	**10.000.000**
Participating States			
Contribution to the procurement MN5, Leonardo & Lumi	*75.705.000*	-	
PT contribution to procurement of petascale	-	-	
Contribution to the call of the 2nd high-end (exascale) supercomputer	250.000.000	300.000.000	
Contribution to the call of the quantum computers	52.000.000	20.000.000	10.000.000
Private Members		-	
Total REVENUE (EU + 3rd Countries + Participating States Contributions	**1.374.456.641**	**1.136.096.561**	**218.833.817**

Table 2 Revenue Payment Appropriations

Table 2: Revenue Payment Appropriations

REVENUE (EUR)	Final Budget 2022 (Amd. no. 4 in GB 33/2022, including C1+ C2 credits)	Final Budget 2023 (Amd no.6 in GB 42/2023, including C1+ C2 credits)	Proposal of Budget 2024 (GB Dec.44/2023)
1. Revenue from Fees and Charges			
2. EU Contribution with EFTA included	**506,849,819**	**893,398,194**	**189,818,557**
of which Regulation (EU) 2021/1173 Administrative (Title 1 and Title 2)	3,469,079	8,746,833	7,804,155
of which old Regulation (EU) 2018/1488 Administrative (Title 1 and Title 2)	4,716,459	4,274,324	
of which Regulation (EU) 2021/1173 Operations (Title 3)	334,654,340	711,569,924	149,655,108
of which old Regulation (EU) 2018/1488 Operations (Title 3)	164,009,941	168,807,113	32,359,295
3. Third Country Contributions		-	-
of which EEA/EFTA		-	
supplementing Title 1 & 2		-	
supplementing Title 3		-	
of which Non-EEA		-	
4. Other Contributions	**123,037,425**	**242,148,315**	**19,991,124**
Participating States Contributions			
Contribution to the procurement MN5, Leonardo & Lumi	57,520,788	69,265,880	19,991,124
PT contribution to procurement of petascale	2,266,638	4,032,435	
Contribution to the call of the high-end (exascale) supercomputer	63,250,000	153,250,000	
Contribution to the call of the quantum computers	-	15,600,000	
Private Members	-		
Total REVENUE (EU + 3rd Country + Participating States Contributions	**629,887,244**	**1,135,546,509**	**209,809,681**

Budget Expenditure

Titles 1&2: The EU funding share to these appropriations will be released according to the JU needs during the period of 2023–2027. The maximum foreseen amount under the current regulation is EUR 92.000.000. The currently available (and unspent) commitment credits will be re-activated in 2024 and the following years.

Title 3: The operational expenditure will be used for grants and procurements of the EuroHPC JU supercomputers. More details regarding commitment and payment appropriations are shown in tables 3 and 4. Tables 5a and 5b shows more details regarding the JU cash needs (expected pre-financings, interim and final payments).

Table 3 Expenditure Commitment Appropriations

(see next page)

Table 3: Expenditure Commitment Appropriations

COMMITMENT Appropriations (EUR)	Final Budget 2022 (Amd. no. 4 in GB 33/2022, including C1+ C2 credits)	Final Budget 2023 (Amd no.6 in GB 42/2023, including C1+ C2 credits)	Proposal of Budget 2024 (GB Dec.44/2023)
Title 1. Staff Expenditure	**4.699.801**	**8.173.633**	**6.185.868**
11 Salaries & Allowances	3.854.004	6.723.615	**5.266.868**
1100 - Salaries & Allowances Temparary Agents	2.058.140	*4.213.017*	*3.256.928*
1110 - Salaries & Allowances Contractual Agents	1.795.863	*2.510.598*	*1.709.940*
1120 - Interim, Trainees & Seconded National Experts			*300.000*
12 Expenditure relating to recruitment	66.329	94.377	**32.000**
13 Mission and travel expenses	211.971	221.434	**120.000**
14 Socio-medical expenditure and Professional development	567.498	1.134.207	**247.000**
1400 - CAS & EU School transports			82.837
1410 - Trainings (EU & external trainings)			89.464
1420 - Social measures for Staff			74.700
1500 - HR administrative services			**520.000**
Title 2. Building, Equipment and Operating Costs	**3.516.923**	**4.418.180**	**1.618.287,00**
20 Buildings and associated costs	270.806	397.085	80.000
21 Information Technology	580.980	607.340	245.000
22 Movable property and associated costs	17.162	33.226	37.000
23 Current administrative expenditure	694.962	1.274.438	200.000
24 External administrative consultancy & auditing	32.449	36.096	70.000
25 Internal Meetings	812.832	549.784	50.000
26 Legal services	251.214	284.847	150.000
27 Communication, Information & Events	150.038	196.318	365.000
28 Experts and associated costs	706.481	1.039.046	421.287
Total ADMIN (Tilte I and II)	**8.216.724**	**12.591.812**	**7.804.155**
Title 3. Operational Expenditure			
30 Grants, HPC Operations, R&I Activities	**294.999.999**	**325.466.438**	**144.677.949**
Regulation (EU) 2018/1488 Calls	***6.999.999***	***33.000***	-
EuroHPC-2019-1	-	33.000	
EuroHPC-2020 -3	6.999.999	-	
Regulation (EU) 2021/1173 Calls	***288.000.000***	***325.433.438***	***144.677.949***
c. Federation Pillar	45.000.000	30.000.000	
d. Technologies Pillar	135.000.000	194.000.000	88.677.949
e. Applications Pillar	50.000.000	40.392.350	36.000.000
f. Compentences & Skills Pillar	53.000.000	46.041.088	10.000.000
g. International Cooperation Pillar	5.000.000	15.000.000	10.000.000
31 HPC Infrastructure Activities	**1.071.239.917**	**798.038.310**	**66.351.713**
Regulation (EU) 2018/1488	***151.894.146***	-	-
LUMI - PreExscale Supercomputer	-	-	
LEONARDO - PreExscale Supercomputer	-	-	
MN5 - PreExscale Supercomputer	151.894.146	-	
Deucalion - Petascale Supercomputer	-	-	
Meluxina - Petascale Supercomputer	-	-	
Regulation (EU) 2021/1173	***919.345.771***	***798.038.310***	***66.351.713***
High-end (Exascale) supercomputer (2nd	500.000.000	600.000.000	
Midrange supercompter(s)	168.345.771	118.933.213	
Hyperconnectivity for HPC Resources call & Federation Call	100.000.000	-	
Upgrading EuroHPC supercomputers	33.000.000	-	
Quantum computers (1/2/3 calls)	104.000.000	40.000.000	20.000.000
Access and allocation of EuroHPC computing resources and services	-	600.000	
Industrial HPC (1+2)		12.260.601	45.651.713
EuroHPC Summit 2023 + Communications	1.000.000	500.000	
EuroHPC Summit 2024/2025+ Communications		700.000	700.000
Experimental Platform for European Technology		24.044.496	
Energy Crisis Call - cancelled	12.000.000	-	
User Forum	1.000.000	1.000.000	
Total OPERATIONAL (Title III)	**1.366.239.916**	**1.123.504.748**	**211.029.662**
TOTAL	**1.374.456.641**	**1.136.096.561**	**218.833.817**

Table 4 Expenditure Payment Appropriations

Table 4: Expenditure Payment Appropriations

PAYMENT Appropriations (EUR)	Final Budget 2022 (Amd. no. 4 in GB 33/2022, including C1+ C2 credits)	Final Budget 2023 (Amd no.6 in GB 42/2023, including C1+ C2 credits)	Proposal of Budget 2024 (GB Dec.44/2023)
Title 1. Staff Expenditure	**4.802.209,85**	**8.351.346,46**	**6.185.868**
11 Salaries & Allowances	3.863.897,45	6.765.314,85	**5.266.868**
1100 - Salaries & Allowances Temparary Agents	2.058.140,48	*4.213.016,99*	3.256.928
1110 - Salaries & Allowances Contractual Agents	1.805.756,97	*2.552.297,86*	1.709.940
1120 - Interim, Trainees & Seconded National Experts			300.000
12 Expenditure relating to recruitment	66.329,14	94.376,79	**32.000**
13 Mission and travel expenses	221.847,88	268.813,20	**120.000**
14 Socio-medical expenditure and Professional development	650.135,38	1.222.841,61	**247.000**
1400 - CAS & EU School transports			82.837
1410 - Trainings (EU & external trainings)			89.464
1420 - Social measures for Staff			74.700
15 - HR administrative services			**520.000**
Title 2. Building, Equipment and Operating Costs	**3.383.328,15**	**4.669.810,52**	**1.618.287**
20 Buildings and associated costs	270.805,92	396.054,18	100.000
21 Information Technology	687.273,43	713.249,12	245.000
22 Movable property and associated costs	17.161,84	33.225,92	17.000
23 Current administrative expenditure	694.962,11	1.324.937,94	250.000
24 External administrative consultancy & auditing	32.080,92	38.423,55	20.000
25 Internal Meetings	573.311,71	296.976,30	40.000
26 Legal services	306.190,28	348.565,37	225.000
27 Communication, Information & Events	150.037,67	196.317,51	300.000
28 Experts and associated costs	651.504,29	1.322.060,63	421.287
Total ADMIN (Tilte I and II)	**8.185.538,01**	**13.021.156,98**	**7.804.155**
Title 3. Operational Expenditure			
30 Grants, HPC Operations, R&I Activities	**250.398.387,50**	**312.928.104,42**	**97.662.136**
Regulation (EU) 2018/1488 Calls	***52.617.447,79***	***54.828.918,97***	***24.161.572***
EuroHPC-2019-1	5.316.281,25	5.581.602,81	4.984.165
EuroHPC-2019-2	6.987.159,67	3.993.503,60	
EuroHPC-2019-3	1.030.000,00	515.000,00	
EuroHPC-2020 -1	4.310.564,37	6.990.332,44	5.656.999
EuroHPC-2020 -2	15.075.942,50	13.198.893,80	
EuroHPC-2020 -3	5.600.000,00	1.866.667,18	8.552.615
Opex Grants (LUMI, LEONARDO, MN5)	14.297.500,00	22.682.919,14	4.967.793
Regulation (EU) 2021/1173 Calls	**197.780.939,71**	***258.099.185,45***	**73.500.564**
c. Federation Pillar	31.110.811,70	20.944.257,32	
d. Technologies Pillar	85.870.128,01	140.227.449,93	38.000.564
e. Applications Pillar	38.400.000,00	44.138.945,74	19.500.000
f. Compentences & Skills Pillar	42.400.000,00	41.788.532,47	8.000.000
g. International Cooperation Pillar	-	11.000.000,00	8.000.000
31 HPC Infrastructure Activities	**371.303.318,40**	**809.597.247,37**	**104.343.390**
Regulation (EU) 2018/1488	***171.179.918,40***	***187.276.509,29***	***28.188.847***
LUMI - PreExscale Supercomputer	63.304.262,33	66.631.749,16	4.062.505
LEONARDO - PreExscale Supercomputer	55.337.170,68	29.512.345,60	1.843.760
MN5 - PreExscale Supercomputer	47.647.136,27	87.099.980,03	22.282.582
Deucalion - Petascale Supercomputer	2.266.637,50	4.032.434,50	
Meluxina - Petascale Supercomputer	2.624.711,62		
Regulation (EU) 2021/1173	**200.123.400,00**	***622.320.738,08***	**76.154.543**
High-end (exascale) supercomputer	113.250.000,00	395.750.000,00	58.959.029
Midrange supercompter(s)	25.395.800,00	74.025.141,28	
Hyperconnectivity for HPC Resources call & Federation Call	30.000.000,00	80.000.000,00	
Upgrading EuroHPC supercomputers	9.900.000,00	9.900.000,00	
Quantum computers	15.600.000,00	37.200.000,00	
Access and allocation of EuroHPC computing resources and services	-	600.000,00	
Industrial HPC (1+2)	-	3.400.000,00	16.495.514
EuroHPC Summit 2023 + Communications	377.600,00	1.000.000,00	
EuroHPC Summit 2024/2025 + Communications		210.000,00	700.000
Experimental Platform for European Technology		19.235.596,80	
Energy Crisis Call - cancelled	4.800.000,00	-	
User Forum	800.000,00	1.000.000,00	
Total OPERATIONAL (Title III)	**621.701.705,90**	**1.122.525.351,78**	**202.005.526**
TOTAL	**629.887.243,91**	**1.135.546.508,76**	**209.809.681**

Table 5 Cash Flow Operational Budget – Title III

Table 5 Cash Flow - Operational Budget - Title 3
5a) EuroHPC Grants - 3000

FY 2023	Type of payment*	2024 - C1 Credits
EFLOWS4HPC -H2020-JTI-EuroHPC-2019-1	IP	357,666
ACROSS H2020-JTI-EuroHPC-2019-1	IP	399,912
NextSim H2020-JTI-EuroHPC-2019-1	IP	188,470
DComEX H2020-JTI-EuroHPC-2019-1	IP	135,938
RED-SEA H2020-JTI-EuroHPC-2019-1	IP	399,686
IO-SEA H2020-JTI-EuroHPC-2019-1	IP	399,798
MICROCARD H2020-JTI-EuroHPC-2019-1	IP	277,705
SPARCITY H2020-JTI-EuroHPC-2019-1	IP	130,274
DEEP-SEA H2020-JTI-EuroHPC-2019-1	IP	753,474
REGALE H2020-JTI-EuroHPC-2019-1	IP	330,929
eProcessor H2020-JTI-EuroHPC-2019-1	IP	399,999
ADMIRE H2020-JTI-EuroHPC-2019-1	IP	398,164
MAELSTROM H2020-JTI-EuroHPC-2019-1	IP	215,621
TIME-X H2020-JTI-EuroHPC-2019-1	IP	151,213
EXAFOAM H2020-JTI-EuroHPC-2019-1	IP	240,180
TEXTAROSSA H2020-JTI-EuroHPC-2019-1	IP	205,138
EuroHPC-2019-1		**4,984,165**
LUMI - CSC OPERATING GRANT - EUROHPC JU	IP	4,967,793
Opex Grants		**4,967,793**
Eupex_EuroHPC-2020-01a	IP	3,057,005
The European Pilot_EuroHPC-2020-01a	IP	2,333,328
HPCQS_EuroHPC-2020-01b	IP	266,667
H2020-JTI-EuroHPC-2020-01		**5,656,999**
EPI EuroHPC-2020-02	IP	8,552,615
H2020-JTI-EuroHPC-2020-02		**8,552,615**
Regulation (EU) 2018/1488		**24,161,572**
d) HPC/QC Middleware technologies	PP	10,000,000
d) Integration of technologies from European Processing Initiative in HPC systems (EPI3)	PP	18,000,564
d) Development of new benchmarks for HPC, Quantum Computing, and AI	PP	5,000,000
d) Enabling Universal Access and Integration of Quantum Resourses	PP	5,000,000
e) Continuous integration and deployment platform (CI/CD)	PP	1,500,000
e) HPC for AI Software Ecosystem	PP	4,000,000
e) HPC Applications	PP	10,000,000
e) HPC/Cybersecurity/AI	PP	4,000,000
f) EuroHPC Masters Programme	PP	8,000,000
g) International Cooperation (WP22/23/24)	PP	8,000,000
Regulation (EU) 2021/1173 Calls		**73,500,564**
Total		**97,662,136**

** IP - Interim Payments, PP - Pre-financing*

5b) EuroHPC Infrastructure Activities - 3100

FY 2023	Type of payment*	2024- C1 Credits	
		EU Contribution	PS Contribution
LUMI - PreExscale Supercomputer	IP	1,878,888	2,183,617
LEONARDO - PreExscale Supercomputer	IP	921,880	921,880
MN5 - PreExscale Supercomputer	IP	5,396,955	16,885,627
Regulation (EU) 2018/1488		*8,197,723*	*19,991,124*
High-end / Exascale supercomputers (1+2)	PP/IP	58,959,029	
EuroHPC Summit 2024/2025 + Communications	PP/IP	700,000	
Industrial HPC	PP/IP	16,495,514	
Regulation (EU) 2021/1173		*76,154,543*	*-*
Total EU Contribution/ PS Contribution		**84,352,266**	**19,991,124**
Total			**104,343,390**

** IP - Interim Payments, PP - Pre-financing*

2. Information of the use of EuroHPC JU financial resources

a) Title 1: Staff Expenditure

Chapter 11 – Salaries and Allowances

This chapter covers the expenditure for salaries, social security, pension contributions and other related allowances of staff. It covers the remuneration cost of establishment plan posts (temporary staff) and external personnel (contract staff, Seconded National Experts, interim agents and trainees), in accordance with the Staff Regulations.

Chapter 12 – Expenditure relating to recruitment

This chapter covers the expenditure regarding the recruitment process of new staff and the associated administrative costs.

Chapter 13 – Mission and travel expenses

This chapter covers travel agency fees and the reimbursements of costs of staff having to go on mission / travel for business. It covers travel expenses, daily subsistence allowances and ancillary or exceptional expenditure incurred by staff, whilst on mission, in the interest of the service. As part of its duties the JU staff will have to travel to various conferences, meetings and workshops related to the activities of the Joint Undertaking and to the actions funded.

Chapter 14 – Socio-medical expenditure and professional development

This chapter covers the JU contribution to the costs of the Comité des Activités Sociales, (e.g. the "crèche", the "garderie/centre d'études", the school bus), the medical service, the policy linked to financial assistance to disabled persons, the complementary health insurance, contribution of the home office (as per European Commission guidelines), and other related activities. It also covers the cost for professional development and training programme

Chapter 15 – HR administrative services

This chapter covers costs of all SLAs and working arrangements with other EU bodies for HR matters, together with specialised external HR legal costs, when required.

b) Title 2: Building, Equipment and Operating Costs

Chapter 20 – Building and associated costs

This Chapter covers costs related to the infrastructure including e.g. office overheads and insurance, cleaning and maintenance, security and surveillance (where not covered by the SLA with DG HR) and others. The office premises are provided by the JU hosting country.

Chapter 21 – Information Technology

This Chapter covers costs related to the purchase of computer equipment, video conference equipment, the cost of software and also software package maintenance, user support, and others. It includes the procurement and maintenance of programme packages and software licenses necessary for the effective operation of the JU, the expenditure on services contracts for analysis, programming and technical assistance necessary for the JU, the cost of external services contracts to manage and maintain the data and systems, training and other support activities.

Chapter 22 – Movable property and associated costs

This Chapter covers the necessary resources to cover the costs of the organisation of the office e.g. office furniture needs.

Chapter 23 – Current administrative expenditure

This Chapter covers the costs of miscellaneous services related to the agreements signed with other Commission offices/services e.g. the CdT (translations) DG BUDG (ABAC & treasury), BOA for Accounting Services, S.G. (HAN), EFSA (EUAN SSO), and others.

It also covers of office supplies, stationery, badges, office material and other consumables necessary for the operation of the office. It also includes all correspondence, postage, delivery services costs and telecommunication costs (fixed, mobile telephony).

Chapter 24 – External administrative consultancy and auditing

This chapter covers the costs for external audit, external consultancies linked to administrative matters & outsourced support.

Chapter 25 – Internal meetings

This Chapter covers any expenditure linked to formal and internal events and meetings. It covers necessary catering costs and any additional costs regarding the organisation.

Chapter 26 – Legal services

This Chapter covers the costs for legal assistance, data protection and other legal obligations.

Chapter 27 – Communication, Information & Events

This Chapter covers the costs regarding Communication activities, events organization, dissemination and publication activities in connection with operational activities. It will also cover the costs of internal communication expenses.

Chapter 28 – Experts and associated costs

This Chapter covers the fees for the work done by experts, travel expenses and daily allowances if applicable. It also includes the reimbursement of expenses (travel and accommodation) for experts invited by the Euro HPC to meetings/events. (e.g. INFRAG/RIAG members and other experts).

c) Title 3: Operational Expenditure

The main purpose of the Joint Undertaking is the indirect implementation of EU budget in the field of High-Performance Computing. Detailed description of the operational activities undertaken in 2021 are presented in the Work Programme below.

Chapter 30 – Grants, R&I Activities

In 2024, this appropriation related to all expenses linked to the EuroHPC JU R&I activities.

Table 5a above sets out contributions made to HPC R&I activities established under Regulation 2018/1488 and Regulation 2021/1173.

Chapter 31 – HPC Infrastructure Activities

In 2024, this appropriation relates to the ongoing procurement in exascale, the mid-range systems, the quantum systems and upgrades and the industrial supercomputers.

Supercomputer maintenance is also foreseen to be paid annually from 2022.

Table 5b above sets out contributions made to HPC Infrastructure activities established under Regulation 2018/1488 and Regulation 2021/1173.

HUMAN RESOURCES

In 2024, the JU should be fully staffed (with only standard turnover rates), and the last pending selection procedures should be finalised.

In 2023 tools and processes have been put in place in order to successfully integrate newly recruited colleagues within the teams and ensure their contribution to the JU's objectives as soon as possible. This process will continue in 2024, to create team coherence and clarity in terms of roles and responsibilities, in line with individual, unit and JU objectives.

The implementation of the HR tools, policies and procedures, in line with the Implementing Rules adopted by the Governing Board will continue. Effort will be made to consolidate the competencies and know-how within the JU, as well as identify and address any potential gaps. Efforts will also be made to stimulate cross-functional interaction and knowledge sharing between colleagues, as well as maintain good team spirit.

Internal communication will be further strengthened in the area of Human Resources, in particular by means of Intranet pages and dedicated info sessions.

The HR strategy of the JU will be finalised and rolled out in 2024.

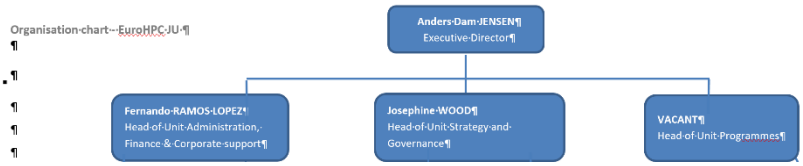
Emphasis will be put on providing sustainable working environment, as well as policies favouring staff well-being, personal and professional development and work/life balance.

The JU will also benefit from the shared expertise in the area of HR via the inter-agency network of HR professionals, as well as the Back Office Arrangement (BOA) with other JUs.

The JU will also benefit from sharing best practices via the EU Agencies network.

Official organigramme of the JU

The organigramme below presents the organisational structure of the JU, up to the Head of Unit level.



Priorities for the 2024 recruitments:

The remaining vacant posts should be filled in the course of 2024.

Human resources planning for the period of 2022-2027:

	2021	2022	2023	2024	2025	2026	2027

Establishment plan posts: TA	4	22	27	27	27	27	27
Total establishment plan posts	4	22	27	27	27	27	27
Contract Agents	11	25	27	27	27	27	27
Seconded National Experts	1	0	0	0	0	0	0
Total Staff	16**	47	54*	54*	54*	54*	54*

*Decrease in number of staff due to Chip Act

*Reduction in total staff from 2023 (adoption of the Chip Act)

** Posts allocated under Regulation (EU) 2018/1488

Breakdown of Temporary Staff by grade in 2023 and 2024

The table below will be amended with posts actually filled as of 31/12/2023 following this date. The 2024 posts represent the draft request for the JU included in the EU draft budget presented by the Commission on 7 June 2023, to be confirmed by the budgetary authority (European Parliament and Council of the EU) before the end of 2023.

Category and grade	2023 posts TA	2024 posts TA
AD 16		
AD 15		
AD 14	1	1
AD 13		
AD 12	1	1
AD 11		1
AD 10	2	1
AD 9	2*	2*
AD 8	10	10
AD 7	4	4
AD 6	5	5
AD 5		

Total AD	25	25
AST 4	2	2
Total AST/SC	2	2
TOTAL	27	27

* Modification based on art. 38 of the COMMISSION DELEGATED REGULATION (EU) 2019/715 of 18 December 2018 on the framework financial regulation for the bodies set up under the TFEU and Euratom Treaty and referred to in Article 70 of Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council

Breakdown of external staff by Function Group in 2023 and 2024. The table below will be amended with FTEs (full time equivalents) actually filled as of 31/12/2023 following this date.

External Personnel – Contract Agents	2023 FTEs	2024 FTEs
Function Group IV	12	12
Function Group III	14	14
Function Group II	1	1
SNE	0	0
Total Staff	27	27

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