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EuroHPC Joint Undertaking resources for Polish researchers

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Abstract

This article explores the opportunities available to Polish researchers thanks to access to the EuroHPC Joint Undertaking supercomputers. The EuroHPC JU initiative aims to create a unified high-performance computing (HPC) infrastructure across Europe, offering researchers access to powerful computational resources for scientific and industrial advancements. Polish researchers benefit from this initiative, gaining access to supercomputing resources to support all fields of science, industry, and the public sector.

The article details the various types of EuroHPC JU access calls, including Extreme Scale Access calls for high-impact and high-gain innovative research, Regular Access calls for scientific innovation in respective domains, Development Access calls for code and algorithm development and optimization, Benchmark Access calls for code scalability or AI applications testing, and, leveraging the AI Factories network, the AI and Data-Intensive Applications Access call for ethical artificial intelligence, machine learning, and data-intensive applications.

In particular, the article describes additional ways to get access to LUMI, one of the fastest supercomputers in Europe, provided via the PLGrid portal thanks to Poland's participation in the LUMI consortium.

Keywords:

EuroHPC JU, HPC, PLGrid initiatives, Polish experiences

1. Introduction

The emergence of high-performance computing (HPC) as a cornerstone of scientific discovery and technological innovation has transformed the research landscape across Europe, establishing new paradigms for computational science and industrial applications. As the demand for increasingly sophisticated computational resources continues to grow, the European Union has positioned itself at the forefront of this technological revolution through the establishment of the EuroHPC Joint Undertaking (JU), representing "a unique pan-European transformative initiative for supercomputing" that provides unprecedented access to world-class HPC infrastructure [1].

The strategic importance of HPC infrastructure extends beyond mere computational capacity, encompassing the broader vision of European technological sovereignty and scientific excellence. As demonstrated by recent advances in artificial intelligence and machine learning applications, the integration of HPC resources with emerging technologies has become essential for maintaining competitive advantage in the global research ecosystem [2]. The European approach to exascale computing reflects this comprehensive understanding, emphasizing not only the deployment of advanced hardware systems but also the development of accessible, user-driven platforms that serve diverse scientific, industrial, and public sector communities.

The EuroHPC JU represents a paradigmatic shift in European supercomputing strategy, moving from fragmented national initiatives toward a coordinated, federated infrastructure model. This transformation has been particularly significant for member states such as Poland, which has leveraged its participation in the initiative to enhance national research capabilities while contributing to the broader European HPC ecosystem [3]. The establishment of National Competence Centers and the integration of resources through platforms like PLGrid demonstrate how European collaboration can amplify individual member states' computational capabilities while maintaining national research priorities.

1.1. Introduction to EuroHPC JU

The EuroHPC JU is a strategic collaboration established in 2018 [4] between the European Union, 32 member and associated countries, and private partners (including ETP4HPC, BDVA, and QuIC). With a budget of €7 billion for 2021–2027, it aims to position Europe as a global leader in supercomputing while ensuring technological sovereignty. The initiative deploys a federated infrastructure of pre-exascale ($\geq 10^{17}$ calculations/second) and petascale ($\geq 10^{15}$ calculations/second) systems, reserving part of the resources for competitive allocation across scientific, industrial, and public domains. Poland's membership since 2018 enables direct access to systems like LUMI (Finland), Leonardo (Italy), and MareNostrum5 (Spain), facilitating research in a wide range of applications, including climate modeling, quantum chemistry, industrial innovation, AI, and machine learning.

Table 1: Geographic distribution of EuroHPC JU systems across the EU

System type	System name	Hosting site	Country
Exascale	JUPITER	Forschungszentrum Jülich	Germany
Pre-exascale	LUMI	CSC	Finland
	LEONARDO	CINECA	Italy
	MareNostrum 5	BSC	Spain
Petascale	Arrhenius	NAISS	Sweden
	Daedalus	GRNET	Greece
	Deucalion	MACC	Portugal
	Discoverer	Sofiatech/PSB	Bulgaria
	Karolina	IT4Innovations	Czech Republic
	MeluXina	LuxProvide	Luxembourg
	Vega	IZUM	Slovenia

The EuroHPC Joint Undertaking thus provides Polish researchers with structured access to a unique portfolio of world-class supercomputers. Its policy framework and allocation mechanisms build on best practices from earlier distributed computing programs, and support effective integration, innovation and scientific excellence across the continent [5]. The following sections examine the main access mechanisms and special calls, together with Poland's strategic integration through the LUMI consortium and the PLGrid portal.

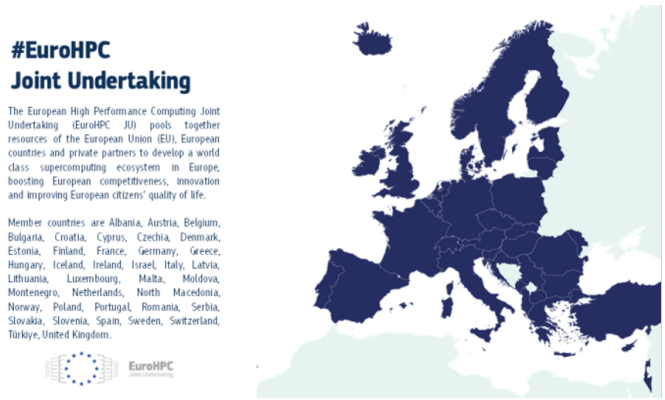

Figure 1: EuroHPC JU participating countries.

2. EuroHPC JU access calls

The allocation of supercomputing resources is governed by the EuroHPC JU Access Policy, which ensures fair, transparent, and efficient distribution of resources, balancing the needs of scientific excellence, industrial competitiveness, and societal challenges. Access is open to researchers and organizations from EU Member States and associated countries, with a substantial portion of each system's capacity (typically 35–50%) reserved for competitive calls managed by EuroHPC JU.

The Access Policy defines several types of calls, each tailored to different user profiles and project scales.

2.1. Extreme Scale Access Call

Extreme Scale Access is reserved for the most ambitious research endeavors—those that require more than 50 million core-hours and can demonstrate exceptional scientific or societal impact. These projects often address "grand challenges" such as high-resolution climate simulations, large-scale genomics, or advanced materials research. Only pre-exascale and exascale systems (such as LUMI, Leonardo, and Jupiter) are eligible for Extreme Scale Access. The allocation period for Extreme Scale projects is one year, and resource access is provided up to 6 month after the cut-off date, with cut-off dates twice a year [6]. A single extension of up to three months (and no more than 20% of the original allocation) may be granted, subject to a positive progress review and formal approval. This limited renewal policy ensures that resources remain available for new, high-impact projects.

2.2. Regular Access Call

Designed for sustained large-scale projects requiring substantial resources, the Regular Access call supports scientific, industrial and public sector projects. Resources are allocated from both petascale (Vega [7], Karolina [8], MeluXina [9], Discoverer [10], Deucalion [11]) and from pre-exascale systems (LUMI [12], Leonardo [13], and MareNostrum5 [14]) with a cap of $\leq$ 20 million CPU core-hours annually. The call operates with biannual deadlines, with upcoming cut-offs available on the call website [15]. Successful projects receive a 12-month allocation period (within 4 months after the cut-off date). According to the 2025 Access Policy, a single extension of up to three months (not exceeding 20% of the original allocation) may be granted, but only upon justified request and approval. This renewal option is designed to allow projects to complete essential work or respond to unforeseen challenges, but it is not intended for ongoing, indefinite use of resources.

2.3. Call for AI for Science and Collaborative EU Projects

The call is a dedicated to supporting AI applications in scientific research, with a focus on ethical AI, machine learning, and the development of cutting-edge foundation models and generative AI, including large language models. This access mode is intended for scientific users (regardless of their funding source), public sector users, and industrial users participating in EU-funded research and innovation projects (such as those under Horizon Europe or the Digital Europe Programme). This call leverages the advanced GPU and AI capabilities of EuroHPC's pre-exascale systems, including LUMI, Leonardo, MareNostrum5, and MeluXina.

The call operates with four cut-off dates throughout the year [16], with maximum time-to-resources of 1 month after the cut-off date, allowing for continuous intake of high-quality proposals. Projects are evaluated on scientific merit, technical feasibility, and their alignment with the ethical and strategic priorities of the EuroHPC JU.

2.4. Development Access Call

This continuous-access program serves as an entry point for researchers and developers who wish to port, optimize, or develop codes and algorithms for EuroHPC systems. This call is especially relevant for those preparing for future Regular or Extreme Scale projects, as it provides a controlled environment for technical development.

Researchers from eligible countries can apply monthly throughout the year [9] for small-scale allocations (node-hours) on petascale/pre-exascale systems. Development Access projects are typically granted for six to twelve months, depending on the scope and justification. However, Development Access cannot be renewed. This limitation is intended to promote turnover and ensure that development resources are accessible to a broad user base.

2.5. Benchmark Access Call

Focused on scalability testing and AI application validation, this call provides limited resources (node-hours) for up to three month-long projects. Applicants must detail technical challenges in scalability or ethical AI implementation. Benchmark Access is designed for users who need to test the scalability or performance of their codes on EuroHPC systems. This access mode is particularly important for researchers preparing applications for larger-scale calls or for those validating new algorithms and workflows. Benchmark projects are short-term, with

a maximum duration of three months and a modest allocation of resources (typically up to 10,000 GPU-hours or equivalent). Unlike scheduled calls, submissions are accepted continuously (with monthly cut-offs) [10], with technical feasibility assessed by hosting entities.

Crucially, Benchmark Access does not allow for any extension or renewal. Once the allocated time or resources are exhausted, the project is concluded, and users must reapply if further testing is needed. This policy encourages efficient, focused benchmarking and prevents resource bottlenecks.

2.6. AI for Industrial Innovation

With the rise of artificial intelligence and data-driven science, EuroHPC JU has introduced dedicated calls for AI and Data-Intensive Applications. These calls are open to both the public and private sectors and are designed to support projects involving machine learning, generative AI, large language models, and other data-intensive workflows. Importantly, the "AI for Industrial Innovation" calls are implemented through the AI Factories initiative, a program that federates GPU-intensive resources, tools and expertise dedicated to AI workloads and experimental AI services. AI Factories provide industrial users with a harmonized entry point to EuroHPC resources, combining access to computing power with onboarding support and, in some cases, domain-specific consultancy.

For industrial users, the AI for Industrial Innovation stream offers three tracks [17]:

- **Playground Access** mode for entry-level testing, offering first in, first out (FIFO) access within two working days with onboarding services provided by the hosting AI Factory. It is strictly limited to three months and cannot be renewed.
- **Fast Lane Access**, for AI activities requiring up to 50,000 GPU-hours, and up to 3 months. It is continuously open, providing access within 4 working days, but with no possibility for renewal. Additionally, selected AI Factories provide expert support.
- **Large Scale Access**, for AI models and applications requiring more than 50,000 GPU-hours for up to a year, renewable once for up to three months and 10% of the original allocation. With bimonthly cut-off dates and access granted within 10 working days from cut-off date, its pre-requisite is either a Playground or Benchmark allocation.

Comparative summary of access calls

Table 2: Summary of EuroHPC JU access calls for scientists

Call Type	Target Workloads	Cut-offs	Resource Scale
Extreme Scale Access	Exascale-ready simulations	biannual	>50M core-hours
Regular Access	Sustained large-scale R&D	biannual	≤20M core-hours
AI for Science and Collaborative EU Projects	Foundation Models and Generative AI	4 times a year	GPU-intensive
Development Access	Code optimization	monthly	Small-scale testing
Benchmark Access	Scalability/AI validation	monthly	Task-specific

2.7. Renewal policies: A critical distinction

A key feature of the EuroHPC JU Access Policy is the differentiation between calls that allow for project renewal and those that do not. Regular Access, Extreme Scale Access, AI for Science, and Large Scale AI for Industry all permit a single, limited extension (three months, capped at 10–20% of the original allocation) upon justified request. In contrast, Benchmark Access, Development Access, Fast Lane AI, and Playground AI are strictly non-renewable. This structure ensures that the largest allocations remain dynamic and competitive, while short-term and developmental resources are cycled efficiently among users.

3. Polish projects using EuroHPC JU resources

A prominent example of successful Polish use of EuroHPC JU resources is the project led by professor Agnieszka Janiuk, from the Center for Theoretical Physics at the Polish Academy of Sciences in Poland. The team obtained 15,000 node hours on the LUMI-C system, awarded by Development Access call, and the resulting paper "Relativistic magnetohydrodynamics (MHD) simulations of merging and collapsing stars" was recognized as Best Paper at EuroHPC User Day 2024 [18].

4. PLGrid access to LUMI resources

LUMI, located in Finland, is a flagship EuroHPC JU supercomputer with a sustained computing power of 380 petaflops [19]. Poland, represented by ACK Cyfronet

AGH, is one of the eleven consortium countries. Thanks to financial contributions and technical collaboration, Polish scientists can use LUMI's resources for large-scale simulations, big data analytics, and advanced AI research.

Access for Polish users is managed through the PLGrid infrastructure [20], which ensures that only researchers affiliated with Polish scientific institutions can apply for LUMI resources. This national allocation is distinct from the broader EuroHPC JU calls and is tailored to the needs and priorities of the Polish research community. Each year, a dedicated share of LUMI resources is reserved for Poland; this is distributed through competitive national calls and typically supports several dozen projects from universities and research institutes.

4.1. Types of LUMI grants available through PLGrid

There are two main types of access available through PLGrid. The first is the **LUMI Test Grant** [21], which is ideal for short-term, preparatory work such as code testing, benchmarking, or initial feasibility studies. This grant is easy to apply for, available year-round, and provides a modest allocation of computing resources for a period of one month. It's a great way for researchers to become familiar with LUMI's environment before embarking on larger projects.

For more substantial research needs, the **LUMI Computing Grant** [22] offers access to significant computational and storage resources for up to one year. Calls for applications are announced twice annually, and proposals are evaluated for their scientific merit, technical feasibility, and the experience of the research team. The application process is competitive and must be completed in English, reflecting the international nature of LUMI's user community. In recent years [23], the grants have supported, among others, projects on argon cluster scattering as a tool for measuring surface stiffness and roughness, graph-based methods for modeling and preventing the spread of threats and predictions for EIC physics, demonstrating the breadth of Polish research benefiting from LUMI.

4.2. Application process, software integration and support

The application process begins with logging in to the PLGrid portal, activating the LUMI service, and registering with the Puhuri portal for secure authentication. Once a grant is awarded, researchers gain access to LUMI's powerful infrastructure and are expected to report on their results at the end of the project.

From a software perspective, PLGrid and LUMI are tightly integrated. Many widely used scientific applications (e.g. Gaussian, GROMACS, VASP, CP2K, OpenFOAM) are available on both Polish clusters and LUMI, which simplifies porting; users can prepare and test workflows on local PLGrid machines and then scale the same scripts and modules on LUMI without significant modifications. Additionally, joint training events and documentation are developed by the Cyfronet, PLGrid, and LUMI teams, ensuring a consistent user experience and reducing the learning curve for new projects.

Support is available throughout the process via the PLGrid Helpdesk [24], and all relevant documentation and deadlines are published on the PLGrid [25] and Cyfronet [26] websites. This national access pathway ensures that Poland's scientific community can fully leverage LUMI's potential, contributing to both national and European research excellence.

PLGrid not only streamlines the application process but also reduces administrative latency compared to the central EuroHPC application system. This efficiency is particularly beneficial for Polish teams seeking rapid access to LUMI's powerful resources for time-sensitive research.

Since LUMI became available, eight Polish competitions have been completed, including two initial pilot calls. The results are presented in a Table 3 [27].

Table 3: Summary of Polish LUMI computing grants awarded via PLGrid.

Competition	grants awarded
Pilot phase: GPU	3
Pilot phase: CPU	2
PLL/2022/03	5
PLL/2023/04	10
PLL/2023/05	7
PLL/2024/06	9
PLL/2024/07	6
PLL/2025/08	5

5. Strategic and practical implications

The multi-tiered structure of EuroHPC JU access calls allows Polish researchers to align their computational needs with the most appropriate resource pathway. For high-impact, long-term projects, Regular and Extreme Scale Access provide significant allocations with the possibility of limited extension. For code development, benchmarking, and AI experimentation, shorter-term, non-renewable calls ensure that resources are available for innovation and testing.

The explicit distinction between renewable and

non-renewable calls in the 2025 Access Policy forces careful planning of project scope and timelines, especially for Development and Benchmark Access where extensions are not possible. In this context, PLGrid and NCC Poland play a crucial role in advising users, sharing best practices, and helping them navigate the diverse access modes to make the most efficient use of both national and EuroHPC infrastructures.

6. Conclusions

As HPC converges with AI, machine learning and big data analytics, the integrated EuroHPC JU infrastructure and access model form a key foundation for Europe's technological sovereignty, scientific competitiveness and industrial leadership. Maintaining and strengthening this position will require continued coordination across member states, combined with strong national initiatives such as PLGrid that connect local communities to European-scale resources. Ultimately, the EuroHPC JU framework not only empowers Polish researchers but also fortifies Europe's position at the forefront of global high-performance computing innovation, ensuring sustained progress in addressing complex scientific and societal challenges.

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