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Specific Grant Agreement for the development of European Processor and Accelerators based on RISC-V

HORIZON-EUROHPC-JU-2024-DARE-SGA-04-01

Topic **Call for proposal**

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General information

Programme

Horizon Europe (HORIZON)

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Budget overview

Call

Specific Grant Agreement (SGA) for Developing large-scale European High Performance Computing (HPC) technologies based on RISC-V (HORIZON-EUROHPC-JU-2024-DARE-SGA-04)

Type of action

HORIZON-JU-RIA
HORIZON JU
Research and
Innovation Actions

Type of MGA

HORIZON Action
Grant Budget-Based
[HORIZON-AG]

Open For Submission

Deadline model

single-stage

Opening date

29 May 2024

Deadline date

29 August 2024
17:00:00 Brussels
time

Topic description

ExpectedOutcome:

- European capabilities in designing, developing, and producing IP related to high-end processors and accelerators based on RISC-V.
- A family of energy efficient high-end processors and accelerators for HPC based on RISC-V hardware and chiplet solutions, testbeds, and at least one prototype/pilot integrating these processors/accelerators.
- A vertically integrated software stack, including key elements such as programming models and runtimes (e.g. languages, compilers, programming environments, communication), libraries (e.g. mathematical, data analytics, AI frameworks), tools (e.g. debuggers, performance, system monitoring), operating system components (e.g. schedulers, workflows, software management, firmware, drivers, security), and other elements (e.g. for networking, software deployment, system-level composability and modularity of software, etc.).
- A small set of critical HPC applications ported and optimised for the new RISC-V based environment, based on a co-design approach.
- Interface specifications for the software and hardware stack, with clear definition of standardization and licensing schemes of the developed Intellectual Property (IP), with mechanism to guarantee that this IP remains in the EU.
- An agile product roadmap with a critical timeline, milestones and all the necessary activities that would be needed to guide the beneficiaries towards building and deploying post-exascale systems in Europe, using predominantly European technology.

Scope:

The DARE consortium is invited to submit a Research and Innovation Action (RIA) proposal for the 1st phase of research activities and roadmap defined in the FPA.

1. The proposal for the 1st phase of DARE will cover the design and development of European processors, accelerators and related technologies for extreme-scale, high-performance big-data, and emerging applications, in accordance with the research roadmap defined in the FPA. The proposal should leverage software/hardware co-design to achieve the next levels of performance and efficiency in RISC-V

based HPC. The proposed work should target performance levels, supported by appropriate KPIs, competitive to non-EU solutions by the end of the DARE initiative.

2. The aim of this SGA is to design and deliver energy efficient high-end tape-outs of a general-purpose processor and of two accelerators, an Artificial Intelligence (AI) Accelerator and a Vectorial Accelerator, for HPC based on RISC-V silicon and chiplet solutions with advanced memory interfaces.

3. The proposed action should cover the design, testing and development of the high-end processors and their integration in a pilot system in view of their roll-out, uptake and use in world-class competitive supercomputers.

4. The proposed action should also develop a functional RISC-V software stack, including key elements such as programming models, runtimes, libraries, tools, and operating system components.

The different lines of activity under consideration must be aligned, interact between themselves, and ensure reinforced cooperation and integration that result in continuous enhancements.

In particular, the proposal should cover the following points:

Hardware development Technical Areas:

1. General-Purpose CPU: Design and development of a high-end general-purpose CPU based on RISC-V. The design should represent an evolution of already existing European RISC-V designs. The target of the design should be to provide scalable and customisable high-performance RISC-V multi-core and multi-cluster CPU implementations delivering feature and cost competitive power-performance-area metrics. The CPU ought to deliver high performance over a wide range of HPC applications featuring combinations of both parallel and sequential code. Special attention should be given to the optimisation of the memory system bandwidth at all levels. The proposed work must target KPIs comparable to non-EU solutions and be feature and price competitive and energy efficient. A detailed comparison with other solutions including monolithic CPUs, chiplet-based CPUs, and closed-source proprietary CPU IP from non-EU providers should be presented.

2. Artificial Intelligence (AI) Accelerator: Design and development of a high-end RISC-V based accelerator designed for the efficient processing of AI workloads and applications. The design should be an evolution of existing European AI accelerator designs. Examples of applications that should be covered are AI-driven approximations of computationally expensive simulations (trained on existing data from full-scale HPC

simulations), large transformer-based language models, massive neural networks, etc. A key challenge is to balance computational performance with energy efficiency. The proposed work must target KPIs comparable to non-EU solutions and be competitive on price/performance and energy efficiency.

3. Vectorial Accelerator: Design and development of a high-end RISC-V based vectorial accelerator. The design should be an evolution of existing European vectorial accelerator designs. Capabilities should include high floating-point density, long vector and matrix architecture and wide data path. The applications targeted should include current and future HPC workloads requiring operations using 64-bit double precision floating-point support and other data types. The proposed work must target KPIs comparable to non-EU solutions and be competitive on price/performance and energy efficiency.

All software and hardware development technical areas should be industrially/commercially driven and use chiplet-based approaches providing mix-and-match customisation capabilities to address varying high-end computing workload requirements. They should target the realization of initial tape-outs of at least 7nm. within the timeframe of the first RIA. The node selection should be done based on a thorough cost/benefit analysis and corresponding industrial and market perspectives. Moreover, the consortium should indicate the advantages and disadvantages of using the target fabrication processes, assess the availability of relevant IP, availability of design tools, licenses, and also their resources and capabilities. The required EDA tools and IP should be described in detail and the timeline of the obtained licenses and cost should be detailed. EDA training requirements, availability, and experience of relevant engineering resources, etc should be taken into account.

RTL-freeze should be targeted for month 18. At this point, before moving to tape-out, the EuroHPC JU will assess the KPI^[1] achievements/projections including a competitive assessment with regards to non-EU solutions worldwide for each hardware development activity and decide whether a particular technological development should be continued or halted. A single mask-set for all chiplets should be considered to reduce tape-out costs. A detailed plan to synchronise the chiplets resulting from the hardware developments should be provided and a private shuttle with a single mask set should be preferably created.

Applications and Software Technical Area:

- Develop an optimised HPC software stack for the hardware development technical areas. The software stack should support single nodes as well as large configurations.
- Develop a hardware-software co-design simulation framework to facilitate native hardware support to application requirements.
- Port at least 3 realistic applications to the new hardware platforms. The selection of applications should be justified in detail with respect to coverage of projected future HPC workloads.

Pilots Technical Area

- Build / Upgrade Software Development Vehicles to support the Applications and Software technical area until actual silicon from the project is available.
- Once the projects' silicon is available, integrate the results from the hardware development technical areas in testbeds and at least one prototype/pilot in pre-operational environments in supercomputing centres for user testing and validation.
- Pilots with non-EU RISC-V off-the-shelf components are explicitly out of the scope of this initiative.

Management and Coordination: The proposal should implement a professional industrial project management approach. It should include an **industry technical coordination group**, consisting of the key industrial partners in the SGA, for closely overseeing technical progress in all the industrial activities related to the development of the proposed project's hardware solutions, tightly coordinating these activities and assisting the coordinator with the strategic decisions and orientations of the proposed project, including the R&I roadmap to implement the activities. The industry technical coordination group should maintain an up-to-date risk register with clear mitigation actions and escalation procedures.

In particular:

- The proposal should give a full product roadmap of how the HPC hardware developed through DARE will be competitive with current and future hardware coming from the worldwide competitors. This roadmap should be updated dynamically as necessary. The roadmap should include a description of all the activities that will be needed to build and deploy post-exascale systems in Europe based on the technology developed in the project.
- The proposal should demonstrate the capacity and industrial

commitment of the partners for carrying out and sustaining the technical development and maintenance as well as effective marketing and business development. It should include convincing plans for industrial exploitation of the targeted technology developments and long-term market perspectives.

- The role of each partner in the proposed project should be described in detail. The number of the partners should be limited to the ones necessary for the achievements of the goals of the SGA. The partners should describe how soon after signing the SGA they would be able to allocate resources to the project and how many additional resources would need to be recruited, and what is the estimated onboarding process timeline. The potential for long-term cooperation among partners should be described.
- The proposal should include a preliminary analysis of barriers to market entry and appropriate mitigation procedures. Additionally, it should provide the potential impact to the project.
- The proposal should include an end-user advisory board, consisting of a representative set of private and public end users, to provide the user requirements and additional guidance to the proposed project on its co-design activities related to the targeted processor and accelerator technology.
- The proposal should provide for appropriate progress control mechanisms, by establishing meaningful common milestones and KPIs, to monitor the progress of the different work streams towards the goals of the overall initiative, and continuously monitor the current state-of-the-art, and comparing it with the state of the RISC-V General Purpose Processor (GPP), Vector Accelerator, and AI Accelerator. In particular, the proposal should foresee an intermediate major milestone at month 18 (before tape-out) for a critical assessment of the project's progress against the objectives and time-plan. The proposal should plan monthly monitoring meetings between the JU and the project's management team.
- The proposal should describe in detail the mechanisms to guarantee that all IP generated in the initiative will stay in the EU. IP management should be submitted with a clear plan of how key IP would remain in EU and not shared with non-European entities.
- The proposal should give a detailed description of preceding work in European projects by the partners, in particular the baseline of the technology developed in those prior projects, how the outputs from those projects will impact upon the proposal, and the will to license such to the FPA partners under reasonable terms and conditions..
- The synergies with the ETP4HPC Strategic Research Agenda and the HiPEAC Vision should be provided.

- The proposal should provide a plan on how the consortium will establish interaction with the relevant stakeholders and RISC-V projects of the Chips JU to coordinate work on horizontal issues common to both communities and exploit synergies where relevant.

[1] The EuroHPC JU and the Consortium at the beginning of the action will define the KPIs and acceptance criteria in each technical area according to industrial standards.

[^ Show less](#)

Topic conditions and documents

General conditions

The call, including evaluation and award procedures, will be managed according to and the proposals should comply with the call conditions below and with the General Annexes to the Horizon Europe Work Programme 2023-2024 that shall apply mutatis mutandis to this call (with the exceptions introduced in the specific topic conditions). The conditions are described in Annex A of the General Annexes to the Horizon Europe Work Programme 2024-2025 which shall apply mutatis mutandis to the actions covered in this Work Programme.

If a topic deviates from the general conditions or includes additional conditions, this is explicitly stated under the specific conditions for the topic.

1. Admissibility conditions: described in [Annex A](#) and [Annex E](#) of the Horizon Europe Work Programme General Annexes

The conditions are described in Annex A.

The following exception applies:

The page limit of the application is 100 pages.

Proposal page limits and layout: described in Part B of the Application Form available in the Submission System

2. Eligible countries: described in [Annex B](#) of the Work Programme General Annexes

A number of non-EU/non-Associated Countries that are not automatically eligible for funding have made specific provisions for making funding available for their participants in Horizon Europe projects. See the information in the [Horizon Europe Programme Guide](#).

3. Other eligibility conditions: described in [Annex B](#) of the Work Programme General Annexes

The conditions are described in General Annex B. The following exceptions apply:

Partners of the SGA proposal must be members of the DARE FPA

4. Financial and operational capacity and exclusion: described in [Annex C](#) of the Work Programme General Annexes

5. Evaluation and award:

- **Award criteria, scoring and thresholds** are described in [Annex D](#) of the Work Programme General Annexes
- **Submission and evaluation processes** are described in [Annex F](#) of the Work Programme General Annexes and the [Online Manual](#)

The granting authority can fund a maximum of one project.

- **Indicative timeline for evaluation and grant agreement:** described in [Annex F](#) of the Work Programme General Annexes

6. Legal and financial set-up of the grants: described in [Annex G](#) of the Work Programme General Annexes

As an exception from General Annex G of the Horizon Europe Work Programme, the EU-funding rate for eligible costs in grants awarded by the JU for this topic will be up to 50% of the eligible costs. In case a Participating State decided to entrust the EuroHPC Joint Undertaking with the management of its national contributions, this funding rate will be increased by the additional national funding rate for the eligible entities of this country.

entities of this country.

Beneficiaries will be subject to the additional exploitation obligations:

Where justified, the grant agreement shall provide for the right for the EuroHPC JU to object to transfers of ownership of results, or to grants of an exclusive licence regarding results, if: (a) the beneficiaries which generated the results have received Union funding; (b) the transfer or licensing is to a legal entity established in a non-associated third country; and (c) the transfer or licensing is not in line with Union interests.

Beneficiaries will be subject to the additional exploitation obligations requiring that first exploitation of the results takes place in the European Union and the Participating States of the EuroHPC Joint Undertaking. Applicants must acknowledge this requirement in the proposal and Annex I to the Grant Agreement.

Beneficiaries will be subject to the following additional dissemination obligations:

Beneficiaries will be subject to the additional exploitation obligations requiring that first exploitation of the results takes place in the European Union and the Participating States of the EuroHPC Joint Undertaking. Applicants must acknowledge this requirement in the proposal and Annex I to the Grant Agreement.

Specific conditions

7. Specific conditions: described in the [EuroHPC Decision No 20/2024](#)

Documents

Call documents:

Standard application form — *call-specific application form is available in the Submission System*

[Standard application form \(HE RIA, IA\)](#)

[Standard application form \(HE FPA\)](#)

Standard evaluation form — *will be used with the necessary adaptations*

[Standard evaluation form \(HE RIA, IA\)](#)

[Standard evaluation form \(HE FPA\)](#)

[MGA](#)

[HE General MGA v1.0](#)

[Framework Partnership Agreement FPA v1.0](#)

[Call-specific instructions](#)

[Detailed budget table \(HE LS\)](#)

[Information on financial support to third parties \(HE\)](#)

[Guidance: "Lump sums - what do I need to know?"](#)

Additional documents:

[HE Main Work Programme 2023–2024 – 1. General Introduction](#)

[HE Main Work Programme 2023–2024 – 3. Research Infrastructures](#)

[HE Main Work Programme 2023–2024 – 7. Digital, Industry and Space](#)

[HE Main Work Programme 2023–2024 – 13. General Annexes](#)

[HE Programme Guide](#)

[HE Framework Programme and Rules for Participation Regulation
2021/695](#)

[HE Specific Programme Decision 2021/764](#)

[EU Financial Regulation](#)

[Rules for Legal Entity Validation, LEAR Appointment and Financial
Capacity Assessment](#)

[EU Grants AGA — Annotated Model Grant Agreement](#)

[Funding & Tenders Portal Online Manual](#)

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LEARs, Account Administrators or self-registrants can publish partner requests for open and forthcoming topics after logging into this Portal, as well as any user having an active public Person profile.

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To access the Electronic Submission Service, please click on the submission-button next to the **type of action** and the **type of model grant agreement** that corresponds to your proposal. You will then be asked to confirm your choice, as it cannot be changed in the submission system. Upon confirmation, you will be linked to the correct entry point.

To access existing draft proposals for this topic, please login to the Funding & Tenders Portal and select the My Proposals page of the My Area section.

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Please read carefully all provisions below before the preparation of your application.

Online Manual is your guide on the procedures from proposal submission to managing your grant.

Horizon Europe Programme Guide contains the detailed guidance to the structure, budget and political priorities of Horizon Europe.

Funding & Tenders Portal FAQ – find the answers to most frequently asked questions on submission of proposals, evaluation and grant management.

Research Enquiry Service – ask questions about any aspect of European research in general and the EU Research Framework Programmes in particular.

National Contact Points (NCPs) – get guidance, practical information and assistance on participation in Horizon Europe. There are also NCPs in many non-EU and non-associated countries ('third-countries').

Enterprise Europe Network – contact your EEN national contact for advice to businesses with special focus on SMEs. The support includes guidance on the EU research funding.

IT Helpdesk – contact the Funding & Tenders Portal IT helpdesk for questions such as forgotten passwords, access rights and roles, technical aspects of submission of proposals, etc.

European IPR Helpdesk assists you on intellectual property issues.

CEN-CENELEC Research Helpdesk and **ETSI Research Helpdesk**

– the European Standards Organisations advise you how to tackle standardisation in your project proposal.

The European Charter for Researchers and the Code of Conduct for their recruitment – consult the general principles and requirements specifying the roles, responsibilities and entitlements of researchers, employers and funders of researchers.

Partner Search Services help you find a partner organisation for your proposal.

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