Innovative Algorithms for Applications on European Exascale Supercomputer

D2.1 – Report on the Inno4scale Open Call

WP2: Management of call for proposals

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Executive Summary

Inno4scale is funded by the EuroHPC Joint Undertaking (EuroHPC JU) within the section of its work programme covered by the call HORIZON-EUROPE-JU-2022-ALG-02, topic HORIZON-EUROPE-JU-2022-ALG-02-01, “New algorithms for applications on European exascale supercomputers”. The Inno4scale project supports the EuroHPC JU in achieving the efficient use of its supercomputing resources through fostering the development of novel algorithms for applications on those resources. This is implemented by funding a set of focused Innovation Studies targeting proof-of-concept demonstrators of fundamentally new and innovative algorithms with a clearly identified potential impact through integration and use in important applications. The “acquisition” of these Innovation Studies was achieved through the execution of an open call for proposals. This deliverable explains the procedures used in the open call, including conditions for proposers and proposals, and provides an overview of the call results, including both statistics on proposals received and information about the Innovation Studies selected.

List of Abbreviations

AI	*Artificial Intelligence*
AMG	*Algebraic Multigrid Method*
CFD	*Computational Fluid Dynamics*
CG	*Conjugate Gradient*
CoE	*Centre of Excellence*
CoI	*Conflict of Interest*
CR	*Consensus Report*
DoA	*Description of Action*
EC	*European Commission*
ESR	*Evaluation Summary Report*
EU	*European Union*
EuroHPC JU	*The European High-Performance Computing Joint Undertaking*
GA	*General Assembly*
FAQ	*Frequently Asked Questions*
HPC	*High-Performance Computing*
IAR	*Individual Assessment Report*
M	*Month (project month)*
ML	*Machine Learning*
NCCs	*National Competence Centres*
NGO	*Non-governmental Organisation*
TRL	*Technology Readiness Level*
WP	*Work Package*

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1. Introduction

Inno4scale is funded by the EuroHPC Joint Undertaking (EuroHPC JU) within the section of its work programme covered by the call HORIZON-EUROPE-JU-2022-ALG-02, topic HORIZON-EUROPE-JU-2022-ALG-02-01, "New algorithms for applications on European exascale supercomputers". The Inno4scale project supports the EuroHPC JU in achieving the efficient use of its supercomputing resources through fostering the development of novel algorithms for applications on those resources. This is implemented by funding a set of focused Innovation Studies targeting proof-of-concept demonstrators of fundamentally new and innovative algorithms with a clearly identified potential impact through integration and use in important applications. The "acquisition" of these Innovation Studies was achieved through the execution of an open call for proposals. This deliverable explains the procedures used in the open call, including conditions for proposers and proposals, and provides an overview of the call results, including both statistics on proposals received and information about the Innovation Studies selected.

The execution of the Inno4scale open call followed the best practices developed in the open calls for the "Fortissimo projects"[1] (the projects Fortissimo, Fortissimo-2[2] and FF4EuroHPC[3]), naturally with some details adapted for the specific aspects of the research-oriented Innovation Studies. All requirements for proposals and conditions for proposers were carefully detailed in the call documentation and formed the basis of the guidelines for the independent experts involved in the evaluation process. Each proposal was evaluated by two independent experts (evaluators) and any potential conflict of interest was eliminated by the assignment of European experts associated with countries different to those of the organisations participating in a proposal. The independent evaluation by each expert was followed-up by the production of a consensus report representing the combined evaluation, which report was created through consensus meetings moderated by the work package 2 (WP2) leader, scapos. The experts assigned to proposals were taken from an overall set of experts identified by the whole Inno4scale consortium which set effectively covered all

[1] Which calls were also managed by the Inno4scale partner scapos AG
[2] https://www.fortissimo-project.eu/
[3] https://www.ff4eurohpc.eu/

application areas and technologies occurring in the proposals received. The WP2 leader was responsible for the coordination of the open call evaluation, including provision of consensus meeting moderators, and for preparing the ranking of evaluation results that was used by the Inno4scale General Assembly to endorse the selection of highest ranked proposals for funding.

The Inno4scale open call was opened on July 28th, 2023 and closed on September 28th, 2023, resulting in 50 submissions, 49 eligible proposals evaluated and 22 Innovation Studies retained for funding. The total budget available for funding Innovation Studies was just over € 4.1 Million, each proposal could ask for a maximum funding of € 200,000 covering all participants. The maximum duration of the Innovation Studies was expected to be no longer than 12 months and the maximum level of effort for a proposed Innovation Study was 24 person months in total.

This document constitutes Deliverable D2.1 of Inno4scale, with the title "Report on the Inno4scale Open call". It lists all details about the open call, covers the approach taken, the execution of the open call, the evaluation process and the result of the open call and the selected Innovation Studies.

The sections of this document are:

- Introduction
- Section 2 (Open Call Setup and Execution) describes the call objectives, conditions, execution, promotion activities and results, plus the evaluation and selection process, and identifies lessons learnt.
- Section 3 (Open Call Results) presents the results of the open call, in the form of statistics about geographical spread, technical approaches and application domains, and lists the 22 selected Innovation Studies.
- Section 4 (Summary) gives a concise rundown of the document contents, and discusses lessons learnt.
- Lists all publications referenced in the document.
- Relevant documents are reproduced in the Appendix.

Inno4scale WP2, responsible for the open call and lead by scapos, was composed of two distinct tasks: T2.1 involved scapos and PRACE (taking care of the online platform that was used for the submission of the proposals) and was concerned with the execution and management of the open calls, and T2.2 (involving all partners) focused on open call promotion and proposer support.

2. Open Call Setup and Execution

This section describes the set up and the execution of the Inno4scale open call for Innovation Studies. After a short introduction to the open call conditions and eligibility criteria, the open call and consensus meeting methodology employed for the evaluation of the submitted proposals is described.

2.1. Open Call Conditions and Eligibility Criteria

The open call for Innovation Studies was open to all organisations (universities, research organisations or companies) located in the EuroHPC JU member states.

All participants in a consortium with an accepted proposal were to be made Third Parties of Inno4scale, with contractual and financial management by the Inno4scale coordinator BSC.

The total budget for available funding was € 4 Million, each proposal could ask for a maximum funding of € 200,000 covering all participants. The maximum duration of the Innovation Studies was expected to be no longer than 12 months and the maximum level of effort for a proposed innovation study was 24 person months in total.

The concrete expectations for the Innovation Studies – focusing on novel concepts that can be used for important applications and on exascale architectures – were described in detail in the open call documents which are included in the appendix of this deliverable. The call documentation particularly highlighted interaction with, and participation of, under-represented research communities with regard to HPC use. As research communities with little prior HPC exposure are typically lacking HPC expertise, a collaboration of researchers from these fields with HPC experts was encouraged in the call text.

All open call documents were made available to proposers via the project website: call announcement and proposer's guide (PDF document), proposal template (Word document), proposer-evaluator checklist and FAQ (the latter two provided as website sub-pages).

For handling the open call for Inno4scale Innovation Studies the PRACE peer review platform at https://pracecalls.eu/ was used. A dedicated call was created including all steps for running the proposal selection process which is detailed in Section 2.2 below:

- Proposal Submission
  - Administrative details (PART A)
  - Project details (PART B)
  - Feedback to the project
  - Acceptance of the Terms of Reference
- Administrative Verification
- Individual Assessment Report
- Consensus Report
- Evaluation Summary Report
- Final result for proposal in waiting list

For all steps correspondent forms and e-mail templates were created and tested. In order to ensure a transparent process and smooth communication, notification emails were sent to the different actors involved in the various steps. Applicants for example were notified after the submission of the proposal, the administrative verification and with the final result when Evaluation Summary Report was submitted.

2.2. Introduction to the Consensus Review Methodology

This section provides a short overview about the methodology that was used for the evaluation and selection process of the submitted proposals. The rough timeline in Figure 1 shows the main parts:

- Submission of proposals at the end of the open call via the PRACE peer review platform[4], which was also used for the subsequent evaluation process.
- Assignment of external experts as evaluators to proposals and individual evaluation of proposals by external experts.
- Consensus Meetings resulting in a common evaluation (consensus report) for each proposal used to compile a ranked list of all proposals which was presented to the Inno4scale General Assembly on November 28th, 2023.

The following subsections provide more information about the execution of the individual evaluations and the subsequent consensus meetings.

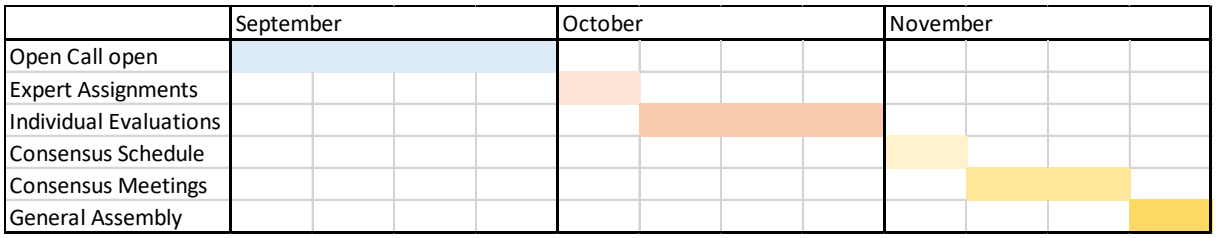


Figure 1: Timeline of Open call Evaluation (note that the call opened on July 28th)

Expert Assignment and Individual Evaluation of external experts

Before assignment of experts to proposals, an administrative check was performed for all submitted proposals so that ineligible proposals were excluded from the evaluation process. The administrative check addressed: the total funding amount and effort, the page counts of proposals, and the locations of organisations requesting funding.

Thereafter, the external evaluators were assigned (from a pool of experts assembled by the full consortium and contacted before the closing of the call) to the submitted proposals, taking care that the expertise of the respective evaluator matched the application and implementation knowledge required to evaluate the proposal while also making sure that no conflicts of interest (CoI) arose. The following best-practice rules were applied for the

[4] https://pracecalls.eu/

selection of the evaluators. Firstly, experts coming from a (local[5]) institution that was partner in a submitted proposal were excluded from evaluation altogether. All evaluators had to accept a CoI declaration online in the PRACE platform before getting access to the proposals. They also had to sign a Service Agreement which included the CoI declaration. Further, assignments of evaluators to proposals were subject to the following boundary conditions:

- Evaluators needed to come from a different country from any proposal participant (considering both nationality and location of work);
- The two evaluators for a proposal should not be from the same country or institution.

Finally, the call management had evaluators check any undiscovered CoI with a specific proposal presented to them through the PRACE platform (based on a preview of partners and summary), giving them a chance to opt out of evaluating this proposal.

After the assignment, all external experts were given access to the proposals that they were to review; each proposal being assigned to two expert evaluators. The individual assessment report (IAR) was to be completed using a pre-defined structure on the PRACE platform consisting of three main sections:

- Excellence: covering the soundness of the concept, the scientific excellence, the quality of the consortium and above all whether the proposed algorithmic development would lead to novel forward-looking and potentially disruptive approaches to the solution of complex mathematical, numerical or data-processing problems on current and future European exascale supercomputers.
- Impact: covering whether the proposed study shows significant performance improvements or great potential to solve currently non-tractable computational challenges, and whether fundamentally new, non-incremental improvements are targeted. Furthermore, the Technology Readiness Level (TRL) advancement and the

[5] In the context of experts from large organisations comprising many subsidiaries or independent institutes/departments, “local” is used to mean the specific sub-organisation involved in Inno4scale open call proposals

potential to be integrated into named applications with an estimated reduced time-to-solution are covered.

- Implementation: covering the quality of the workplan, the justification of the requested resources, the consortium structure and the access to HPC resources.

Proposals were scored for the above criteria on a scale between 0 and 5; scores could take values of half a point:

- 0: the proposal fails to address the criterion under examination or cannot be judged due to missing or incomplete information
- 1 (Poor): the criterion is addressed in an inadequate manner, or there are serious inherent weaknesses
- 2 (Fair): while the proposal broadly addresses the criterion, there are significant weaknesses
- 3 (Good): the proposal addresses the criterion well, although improvements would be necessary
- 4 (Very good): the proposal addresses the criterion very well, although certain improvements are still possible
- 5 (Excellent) the proposal successfully addresses all relevant aspects of the criterion in question. Any shortcomings are minor.

The total score of the proposal is the sum of all three scores. A score of less than 3.0 for any criteria or a sum of less than 10.0 leads to the proposal being disqualified.

Consensus Process and final ranked list of proposals

After the individual assessments a moderator from Inno4scale WP2 worked with the two individual evaluators to produce a consensus report (CR), which has the same structure as the individual reports. The moderator's role was to create a first draft, support the expert evaluators to reach an agreed position within a consensus meeting and to finalise the CR. A subsequent consistency check ensured a globally consistent evaluation result across all proposals. The consensus reports were turned into evaluation summary reports (ESRs), deleting the identities of the evaluators and the moderators, and any non-evaluation comments. The individual ESRs were shared via the PRACE platform with the corresponding proposing consortium. Additionally, the information contained in the ESRs was also part of

the notification email sent via the platform when notifying the proposers on the results of the evaluation.

All non-disqualified proposals were ranked according to their aggregate score in the CRs; ties being broken by the individual scores of the evaluation criteria in the order Impact, Excellence, Implementation, followed by requested funding (lower requested funding being ranked higher, noting that this proved not to be necessary in practice).

The highest ranked proposals were selected, until the total available funding budget was exhausted. More information, e.g., the number of selected proposals, is available in section 2.5.

The identities of the evaluators and the moderators are not disclosed to anybody outside the call evaluation team. The proposals are likewise treated as confidential and are shared, in the case of successful proposals, with other WPs as needed for their work (WP1 for negotiating the funding agreements, WP3 for progress monitoring of the Innovation Studies, WP4 for dissemination).

2.3. Open Call Promotion

To promote the open call to the research community a number of measures were taken. The deliverable D4.2 “Concept for Call support” that was submitted in month 2 of the project (August 2023) [1] defined KPIs for the communication and dissemination tasks relating to promotion of the Inno4scale open call. Table 1 lists the KPIs and target values from D4.2 and the achieved values. Further information about dissemination activities is available in the respective WP4 deliverables [2].

T2.2 created all information about the open call presented on the project website and in the call documentation. It also prepared and provided five webinars to potential proposers. Some of the webinars were open to everybody interested and some were particularly targeted at National Competence Centres (NCCs) and Centres of Excellence (CoE):

- NCC/CoE Webinar #1 on August 21st, 2023: 25 participants, 26 registrations.
- Public Webinar #1 on August 22nd, 2023: 26 participants, 30 registrations.

- NCC/CoE Webinar #2 on August 28th, 2023: 17 participants, 23 registrations.
- Public Webinar #2 on August 29th, 2023: 26 participants, 26 registrations.
- Public Webinar #3 on September 6th, 2023: numbers not available.

A recording of one of the webinars was made available on YouTube[6], so that all interested researchers had a fallback option if the dates did not work for them.

The activities performed in Task 2.2 in collaboration with WP4 achieved the targets in the majority of areas. This obviously contributed to the achievement of the strategic targets for the open call: a sufficiently large number of high-quality proposals was received from which the top 22 proposals were selected for funding.

Table 1: Open call Promotion, Achieved and target values

Activities	KPIs	Target Values	Achieved Values
LinkedIn Channel	Total #Followers #Posts	50 weekly	126 more than weekly
X/Twitter Channel	Total #Followers #Tweets	60 weekly	50 more than weekly
Communication Campaigns	#Campaigns	1	3
Network Leverage	#Entities (e.g., universities, institutes) contacted	40	41
Website	#Visitors	1,400	6,676
Webinars	#Public #Invited (CoEs, NCCs): 2	2 2	3 2
Events	#Participation in Events	1	0
Press	#Press releases: #Press clippings:	1 6	1 25

2.4. Open Call Execution

The call was published on the Inno4scale website[7] on July 28th, 2023; Figure 2 shows the respective page as it looked at the time of the call. On the website, the open call documents (included in the appendix of this deliverable) were made available to all prospective proposers:

- Open call announcement and proposer's guide

[6] https://www.youtube.com/watch?v=xBg4kqaEQsg
[7] https://www.inno4scale.eu/calls/

- Open call template ("Exemplar") for part B of a proposal
- Open call Proposals evaluation check-list
- List of Frequently Asked Questions

Each proposal consists of two parts:

- Part A: information about participating organisations and requested funding. This information had to be entered in the PRACE peer review portal in an online form.
- Part B: (.docx template available) the main part of the proposal describing the new idea and the work plan consisting of seven sections:
    - Summary
    - State of the art
    - Concept and design of the innovative algorithm
    - Expected impact and exploitation by existing applications
    - Baseline performance and means of verification of the improvements
    - Description of the work plan
    - Quality of the consortium as a whole and of the individual proposers
    - Justification of costs and resources.

Part B was limited to a maximum of 11 pages, including the title page. Exceeding these limits would result in a proposal being disqualified. Proposals had to be submitted in the Adobe PDF format.

Proposers uploaded their proposals (part B) to the PRACE peer review portal[8], which could be accessed using a link on the website, and the system assigned a unique proposal number to each upload. Any questions about eligibility rules and call expectations, about how to submit a proposal, about the PRACE portal, and about the possibility of making changes to already submitted proposals could be addressed via email to inno4scale_call@bsc.es. Additionally, the contact form on the Inno4scale website was used by several researchers interested in the open call. All questions were distributed to key members of WP2 and answered by the scapos, BSC or HLRS teams. Altogether about 40 questions (generic requests for clarifications on eligibility or call expectations) reached the open call team of

[8] https://pracecalls.eu/

WP2 and were answered – most of them on the same day – by WP2. Some questions dealt with the possibility of purchasing computing equipment. Many researchers asked about details of the proposal templates. It should be noted that the project did not provide advice to any potential proposers concerning the technical details of the ideas or algorithms that they were planning to address.

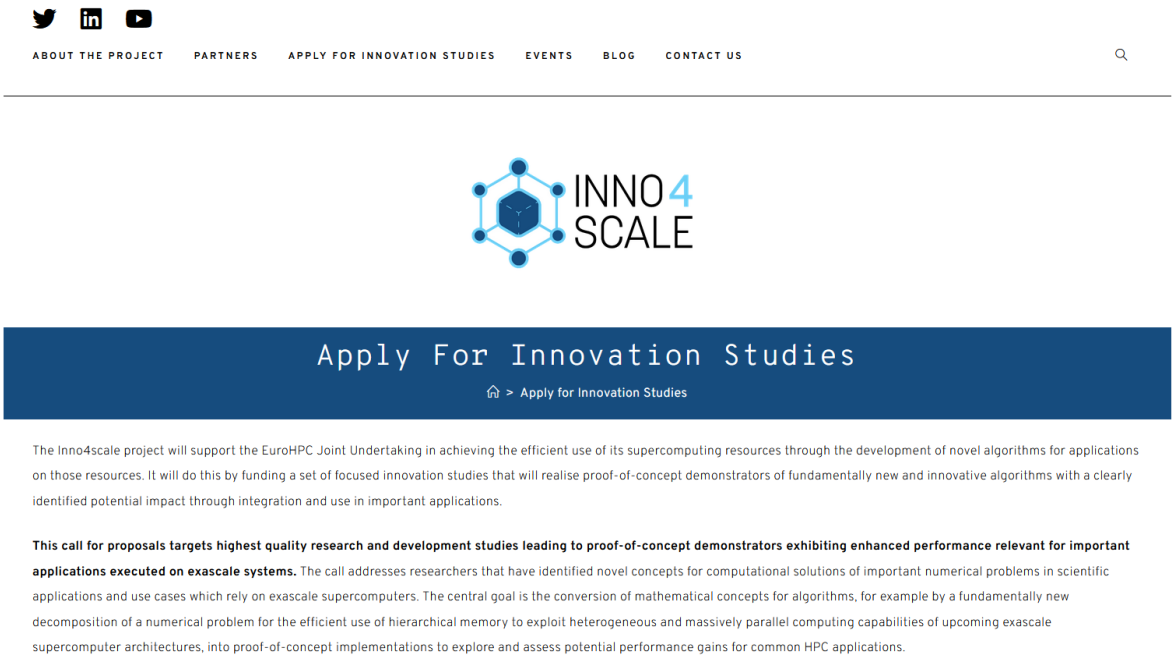


Figure 2: Inno4scale website with Open call information

All submissions had to be made before September 28th, 2023 at 17:00 Brussels time. A total of 51 proposals were received, of which one was a duplicate, i.e. an older version, of another. Before the start of the evaluation phase an administrative check was performed for all proposals: the total funding amount and effort, the proposal length (page count), and the location of organisations requesting funding were checked. During this check one proposal was eliminated because it contained 16 pages that exceeded the page number limit of 11 pages. The remaining 49 proposals were then evaluated.

2.5. Evaluation and Selection Procedure

All work dealing with the call evaluation – most importantly the assignment of experts to proposals, moderating consensus meetings and finalizing consensus reports – was performed by the call evaluation team consisting of five employees from scapos.

Individual evaluators were selected by WP2 using prior experience with similar evaluator selections in the Fortissimo projects. Selection was driven by the specific HPC methods and application fields of the proposals. Individual evaluators were reimbursed by BSC according to the number of their review assignments using the standard EC daily rate.

Care was taken to assign evaluators with competency in the HPC domain and application field of each proposal and to avoid any conflicts of interest. Evaluators were required to sign an appointment form with the financial terms and with a strict confidentiality clause requiring them to destroy the proposals and assessment forms after completing their consensus meetings.

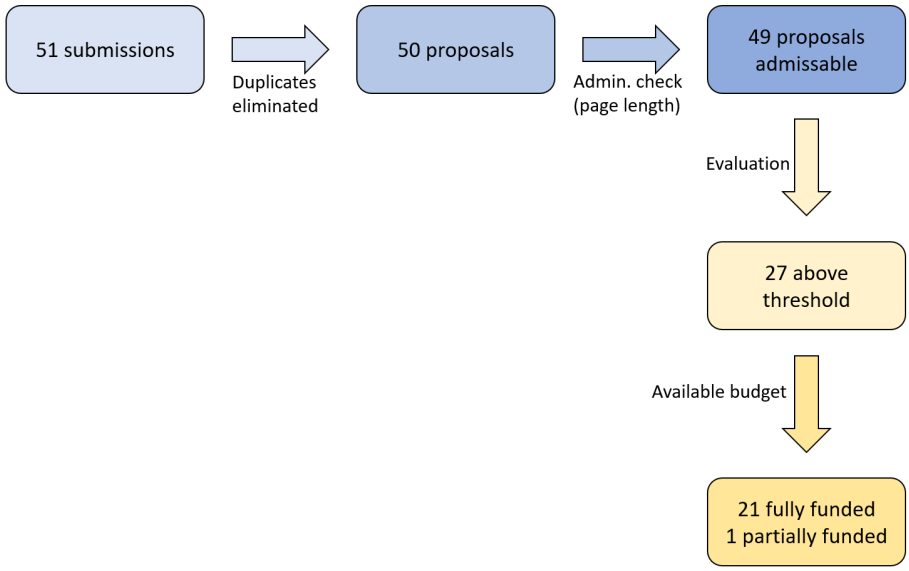


Figure 3: Evaluation process

The initial reviews for the 49 eligible experiment proposals were carried out by 27 external European evaluators. The maximum number of proposals per evaluator was six, and each evaluator worked on at least two proposals.

On October 10th, 2023 the external reviewers were informed of how many proposals they were reviewing. The individual proposals were then distributed to them via the PRACE peer review portal in the following days, after the setup and activation of their accounts. The completed individual assessment reports were requested to be submitted in the PRACE peer review portal by October 31st. Each evaluator was given an "information pack" with all the call documents, and a detailed evaluator briefing presentation. Three 60-minute briefing meetings were organised on October 11th, 12th and 13th in order to make it possible for each evaluator to attend a briefing.

The subsequent round of consensus meetings took place between November 6th and November 23rd, 2023. All 49 consensus reports were finished and confirmed by the external evaluators by November 23rd, 2023 using a template with the same structure as the IARs.

In order to ensure a globally consistent evaluation result, a holistic consistency check across all evaluations was performed. Each CR was checked by a moderator not involved in the corresponding consensus meeting, and a few inconsistencies were spotted. To rectify these, some (relatively minor) changes of comments or scores were agreed subsequently with the evaluators to clarify some open questions and inconsistencies in scoring. This consistency check was completed before the time of the General Assembly (GA):

Evaluation Summary Reports (deleting all non-evaluation comments from the CRs) as well as the CRs were uploaded to the PRACE peer review portal.

Of the 49 proposals, 22 turned out to be below the threshold for at least one of the criteria or the sum of all three criteria, and thus ineligible for funding. The remaining 27 proposals were ranked by their total score (of up to 15 points), and ties were broken by the points awarded to the criteria, in the sequence of Impact ⇒ Excellence ⇒ Implementation.

A list containing information about the scores for all innovation study proposals that were ranked above threshold was prepared for the Inno4scale General Assembly on November 28th, 2023 where the decision about the funded Innovation Studies was taken.

Starting with the highest ranked application (which achieved a total of 14 points), 22 proposals were selected, resulting in a budget of € 4.100.676 to be distributed to third

parties and virtually exhausting the available budget. The lowest ranked, yet still selected proposal scored a total of 11.5 points.

Using the available budget only 21 proposals could have been funded with the full amount that they requested in their proposals. However, this led to a considerable amount of budget still remaining, almost but not fully enough to fund another proposal. Therefore, for the proposal ranked 22nd, the following approach was decided on by the Inno4scale GA: the coordinator of the proposal was contacted and they were given the opportunity to reduce the requested funding and self-finance the rest of the budget, keeping the scope of the proposed work unchanged. The coordinator agreed on behalf of the proposing consortium and the funding agreement – including an annex about the reduced funding and unchanged scope of the proposed work – was signed.

All proposers were informed on November 30th, 2023 via the PRACE peer review portal about the funding decision: 22 proposals that would be funded[9], 5 proposals that were on a waiting list and 22 proposals that would not be funded.

The list of the selected 22 and the 5 waiting list proposals was transmitted to WP1 also on November 30th, 2023 for them to start the conclusion of the corresponding funding agreements. Furthermore, the selected proposals and the waiting list proposals itself were also shared with WP1: this made it possible to include the original proposal in the Funding Agreements.

Details about the results of the open call and the selected Innovation Studies can be found in Section 3.

[9] With one exception: the proposal ranked 22nd was informed later, in January 2024.

3. Open Call Results

As the main result of the open call, 21 Inno4scale Innovation Studies started their execution in M8 of the project (February 2024), as foreseen by the DoA. The 22nd Innovation Study – receiving only partial funding – started in March 2024. This section presents relevant statistics about the submitted Innovation Studies proposals and the selected Innovation Studies, lists the titles, coordinators and discusses a set of lessons learnt while executing the call and carrying out the proposal evaluation and experiment selection.

3.1. Open Call Proposal and Innovation Studies Statistics

Information about all submitted proposals

The 49 submitted proposals came from a wide range of European countries: a total of 19 countries was represented by participation in the proposals. The breakdown of submitted proposals across countries is presented in Figure 4. Germany leads with 17 organisations participating in proposals, followed by Spain (7), Sweden (6) and Greece, Italy, France and the Netherlands with 5 organisations.

All in all, 71 different organisations participated in the proposals, most of them being universities or large research organisations. However, some companies from the HPC sector, e.g., HPC technology and service providers, also participated.

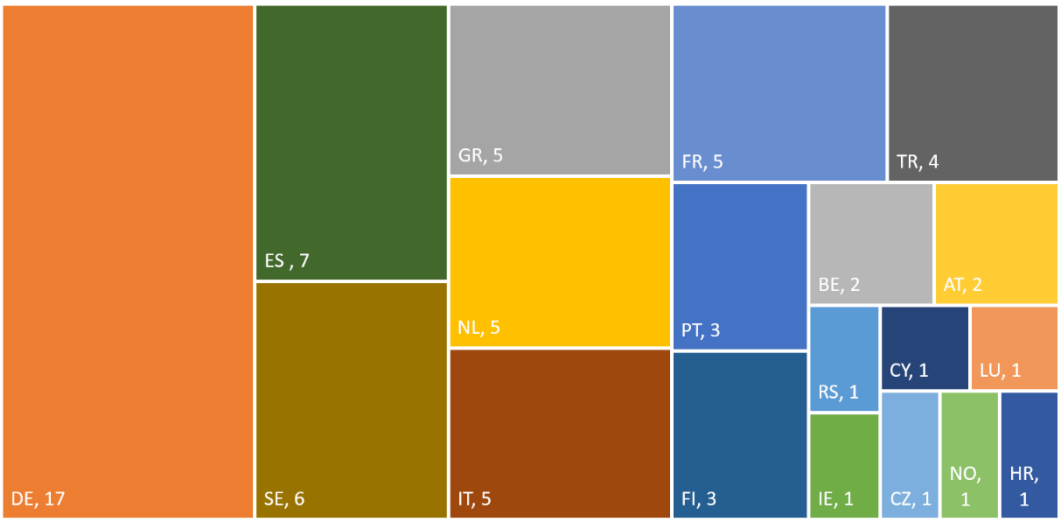


Figure 4: Number of participating organisations per country for all submitted proposals

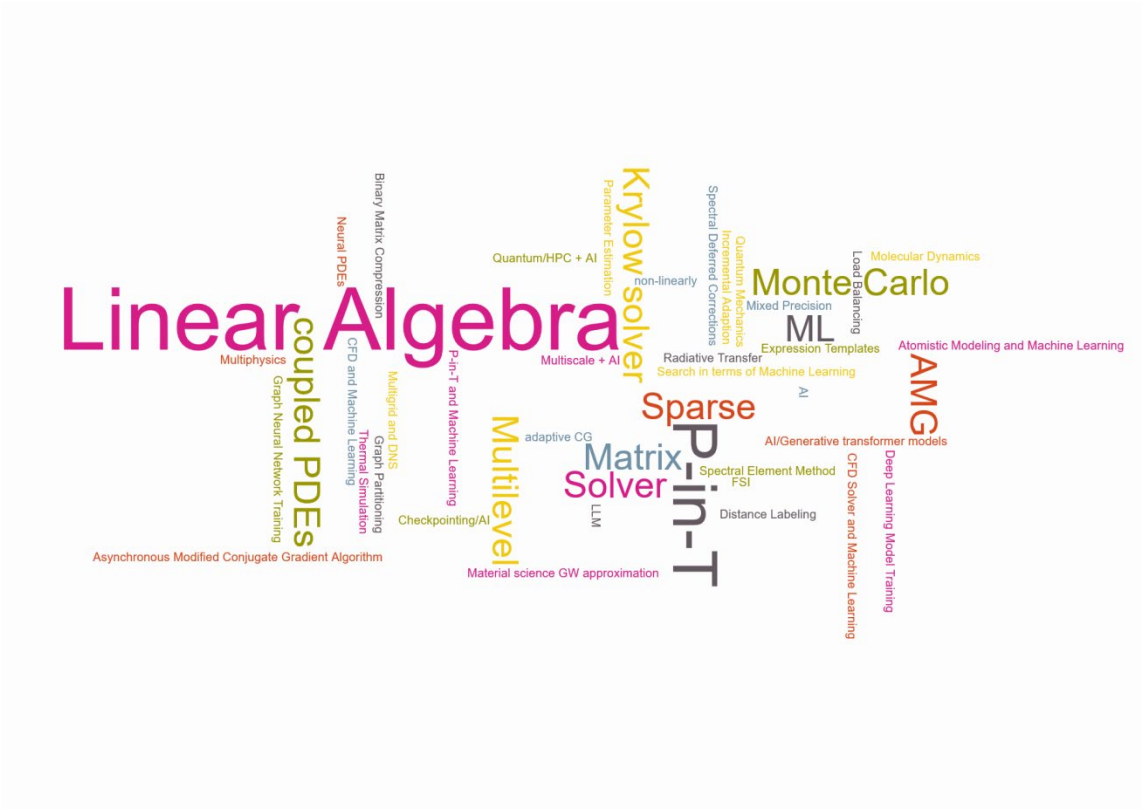


Figure 5: Technical approaches (all proposals)

Figure 5 and Figure 6 show the technical approaches and application domains of the 49 proposals submitted. Within the technical approaches there was a strong focus on Linear Algebra: AMG methods, acceleration of linear solvers (e.g., CG methods or more general Krylov solvers). Another approach that was investigated by several proposals is “Parallel-in-time” methods.

Most of the proposals addressed applications in the classic CFD domain (e.g., wind farm simulation, combustion or thermodynamics). Another strong focus of the application domains was material science and molecular dynamics. Two proposals dealt with scientific cooperation and social media and one involved an application in financial mathematics.

Figure 7 shows the number of proposals employing AI technologies. The majority of proposals (30) does not use AI or ML methods for the proposed work, while 6 proposals are planning to use neural networks and 13 machine learning. 4 proposals out of these aim at using machine learning to accelerate problems from Linear Algebra.

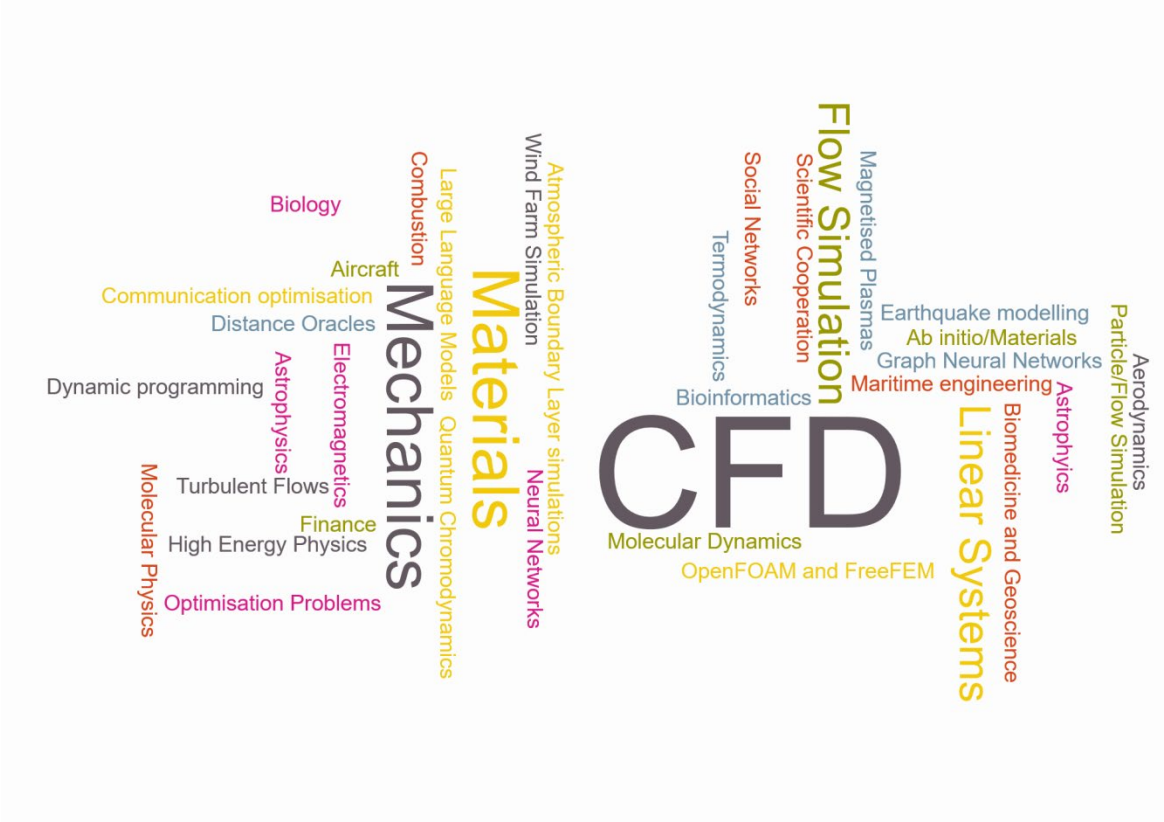


Figure 6: Application areas (all proposals)

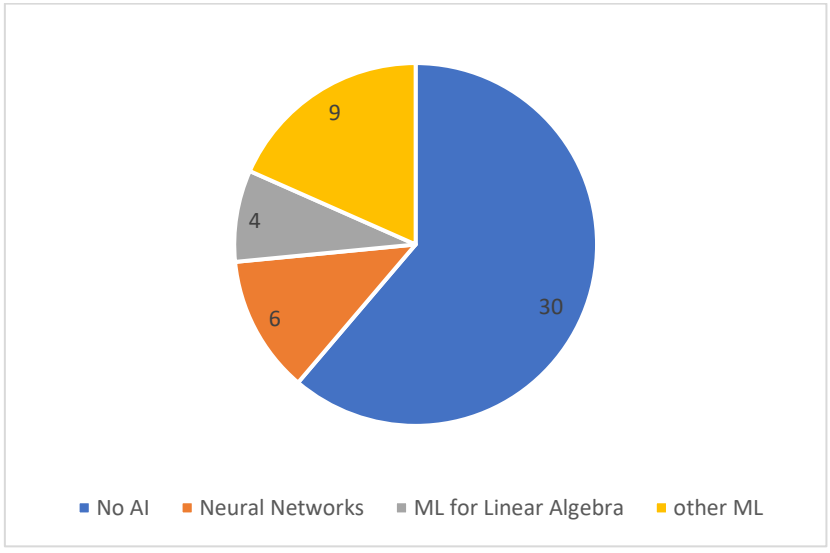


Figure 7: AI technologies used (all proposals)

Information about the Selected Innovation Studies

Figure 8 shows the number of participating organisations per country for the 22 selected Innovation Studies. Innovation Study participants come from 14 different countries: Germany leads with 11 organisations, followed by Finland, France and Portugal with 3 organisations each.

Figure 9 shows the requested funding per country for the 22 selected proposals. As to be expected, the distribution closely resembles that of the number of organisations shown in Figure 8: German organisations requested about 1.7 M € in the successful proposals, followed by Finland (500,000 €) and Belgium (310,000 €).

Finally, Figure 10 shows the usage of AI and ML technologies for the selected proposals. More than half of the proposals (13) do not employ any AI technologies, 3 propose to use neural networks, 6 of them plan to use ML for their implementations. This is – more or less – the same percentage as in Figure 7 for all submitted proposals.

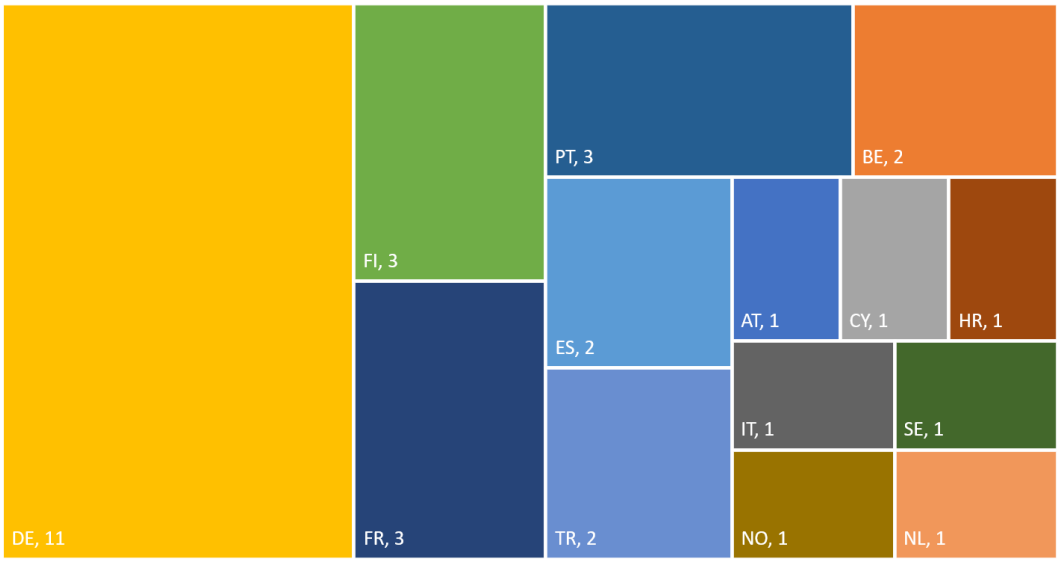


Figure 8: Number of participating organisations per country for all selected proposals

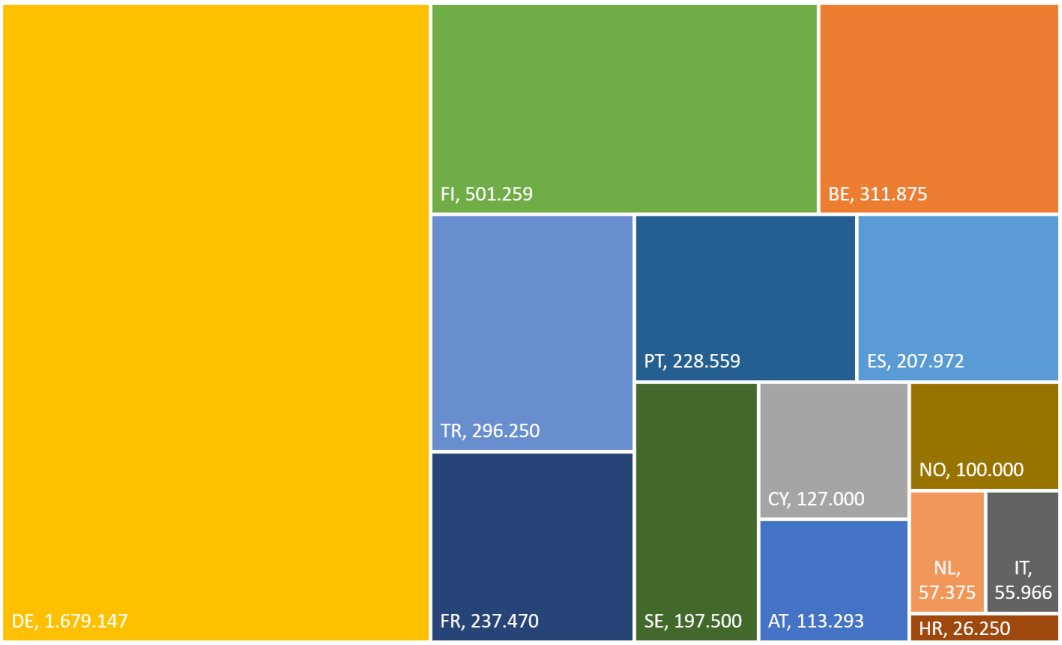


Figure 9: Funding requested (in €) per country for the 22 selected Innovation Studies

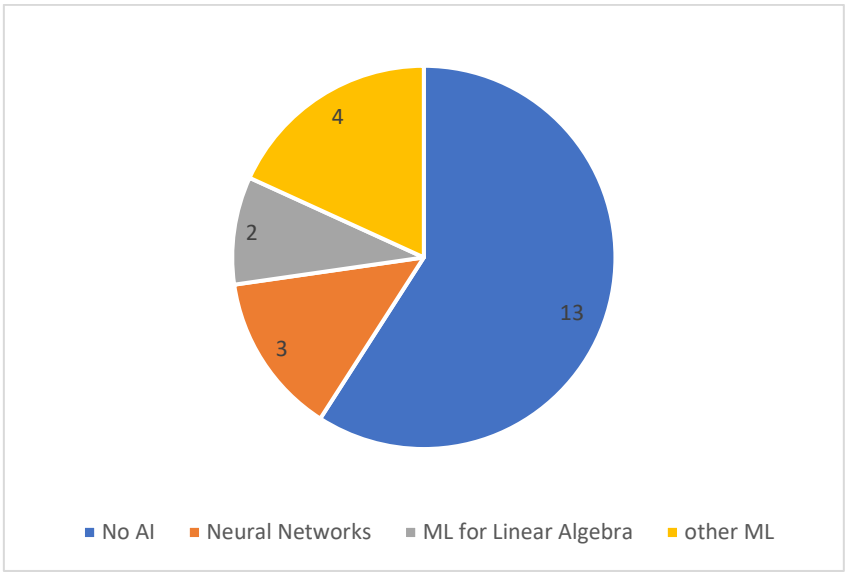


Figure 10: AI technologies used (selected proposals)

3.2. Funded Innovation Studies

Table 2: List of Innovation Studies: Title and participating organisationsTable 2 lists the 22 selected Innovation Studies, naming the coordinating organisations and the other participants involved as well as the title.

Table 2: List of Innovation Studies: Title and participating organisations

Acronym	Title	Coordinating Organisation	Further Participating Organisations
AceAMG	Asynchronous Extreme Scale MP AMG Solvers	Karlsruhe Institute of Technology, Germany	Forschungszentrum Jülich, Germany
adaptiveCG	Adaptive CG Algorithm on Large-Scale GPU Systems	Koç University, Turkey	Simula Research Laboratory, Norway
ASTERIX	Adaptive Strategies Towards Expedient Recovery In eXascale	University of Helsinki, Finland	CSC - IT Centre for Science, Finland
asynchronous CG	Asynchronous Conjugate Gradient Method	Wikki Gesellschaft für numerische Kontinuumsmechanik mbH, Germany	Institut national de recherche en sciences et technologies du numérique, France
CBM4scale	Compressed Binary Matrix Algorithms for Scaling	Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa, Portugal	Universität Wien, Austria
CVolBal	Communication Volume Balancing in Sparse Collectives	Bilkent University, Turkey	
ESPLAG	Enabling SParse training of LLMs on GPUs	Universidade da Coruña, Spain	Fundacion Publica Gallega Centro Technologico de Supercomputation de Galicia, Spain
Ex3S	Extreme Speed Scalar Solver	TU Damstadt, Germany	Forschungszentrum Jülich, Germany
Exa4GW	Exascale-ready GW algorithms for materials interfaces	Technische Universität Dresden, Germany	Universität Regensburg, Germany
exaSIMPLE	A Hybrid ML-CFD SIMPLE Algorithm for the Exascale Era	Blue Ocean Sustainable Solutions, Portugal	INESC TEC – Instituto de Engenharia de Sistemas e Computadores, Technologia e Ciencia, Portugal Maritime Research Institute Netherlands, Netherlands
FLOWGEN	Fast Learning for On-the-fly	Centre Européen de	Friedrich-Alexander-

	3D floW Generation up to the Exascale raNge	Recherche et de Formation Avancée en Calcul Scientifique, France	Universität Erlangen-Nürnberg, Germany
ISOLV-BSE	Iterative SOLVers for pseudo-hermitian eigenproblems with application to large-scale Bethe-Salpeter Equations	Universitat Politècnica de València, Spain	Consiglio Nazionale delle Richerche, Italy
LimitX	Learning Materials at eXascale	Forschungszentrum Jülich, Germany	Rudjer Boskovic Institute, Croatia Commissariat a l' Energie Atomique et aux Energies Alternatives, France
MG4ML	Multigrid Methods for Multilevel Approaches	The Cyprus Institute, Cyprus	Bergische Universität Wuppertal, Germany
MLMC-PinT4Data	Parallel-in-time micro-macro Monte Carlo methods for uncertainty quantification and data assimilation	KU Leuven, Belgium	TU Darmstadt, Germany
NEOSC	Novel mEthOds to resolve the data analysis bottleneck in GPU-accelerated Stencil Computations	Aalto University, Finland	CSC - IT Centre for Science, Finland
NeuralPint	Neural operators as coarse models for parallel-in-time integration	Technische Universität Hamburg, Germany	Forschungszentrum Jülich, Germany
ScalaMIDA	Scalable Multi-Index Delayed Acceptance for Non-Linear Earthquake Modelling	Karlsruhe Institute of Technology, Germany	TU München, Germany Ludwig-Maximilians-Universität München, Germany
SCALE-TRACK	A scalable two-way coupled Euler-Lagrange particle tracking algorithm	Leibniz-Institut für Troposphärenforschung e.V.c, Germany	Wikki Gesellschaft für numerische Kontinuumsmechanik mbH, Germany
STRAUSS	Scalable Task-Parallel Multigrid Solvers	KTH Royal Institute of Technology, Sweden	
TiPOWind	Time-parallelism and matrix free optimization for optimal control of wind farms	KU Leuven, Belgium	
XCALE	Adding physics-inspired interactions for fast and accurate machine-learning interatomic potentials across scales	Aalto University, Finland	CSC - IT Centre for Science, Finland

3.3. Lessons learnt

All in all, the Inno4scale open call was successful and its main aim was reached: 49 proposals were independently evaluated and 22 Innovation Studies with a total budget of € 4.100.676 were selected. All 22 Innovation Studies started on time – at the beginning of February 2024[10].

Although the time frame was rather challenging with the planned start of the Innovation Studies at month 8 of the project runtime, the previous experience with similar open call and review processes made it possible for the consortium to stick to a tight time schedule and finish the evaluation process by the end of November 2023 (two months after the call was closed). The Inno4scale coordinator then still had two months for setting up the individual funding agreements with the Innovation Studies.

At the beginning of the open call it was hard to estimate how many proposals would be submitted: although parts of the consortium have a lot of experience with similar open call and evaluation methodologies, the applications to be investigated in the Innovation Studies come from a very different, and more limited background and area, mostly involving universities or other research organisations. 50 proposals were submitted, of which 49 passed the administrative check and 27 were evaluated above threshold: considering the innovative, new applications Inno4scale wants to investigate and the strict boundary conditions of the open call text this is a very satisfactory and adequate number of proposals and shows that the open call promotion activities were successful.

The evaluation and consensus process worked very well and efficiently: all individual assessment reports were handed in on time, all meetings could be scheduled without further delay or problems and for all 49 proposals a consensus report was produced after only one consensus meeting.

The evaluations were performed by 27 external experts: the appointment and remuneration of which worked reasonably well and the costs for the individual evaluations were well within the estimation of the DoA.

[10] The innovation study that was on rank 22 of the evaluation and had to reduce the requested funding and self-finance started one month later, in March 2024.

The call text and the webinars about the call tried to encourage submissions from so-called "non-expert areas". However, no proposals from underrepresented domains were received. One of the submitted proposals suggested developing a marketplace for match-making between scientists and NGOs. But even in this rather atypical case, the proposing consortium consisted of scientists with a strong HPC background. A possible follow-up project would have to think very carefully about measures that could help with reaching non-expert areas, for example an even closer collaboration with NCCs.

Finally, Figure 11 shows the geographic spread (i.e. the number of the participating organisations and of the coordinating organisations per country) that was achieved in the Inno4scale open call for Innovation Studies.

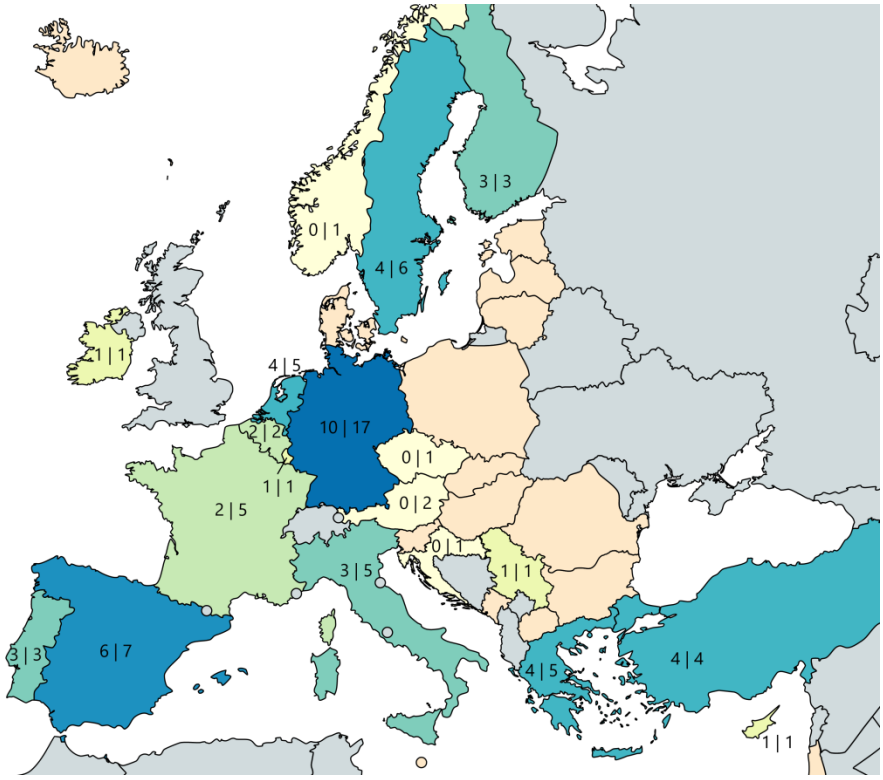


Figure 11: numbers show the participating organisations for each country: # of coordinating org | # of participating org (all proposals)

There is a strong focus on the countries Germany, France, Spain and Italy. However, there are also some other countries with many participating organisations: Sweden, the Netherlands, Turkey and Greece.

4. Summary

The main objective of Work Package 2 (which ended in month 9) was to execute the open call (call documentation and announcement, evaluation procedure and consensus meetings) to generate the best possible set of Innovation Studies. These Innovation Studies are the main body of the project itself and will produce important results and strengthen efficient usage of the upcoming European exascale supercomputers through the development of novel algorithms for important applications.

At the heart of the open call evaluation is the consensus-based review methodology. To provide a fast and efficient review process, the Inno4scale consortium – and particularly WP2 leader scapos – relied on experiences from, and best practices established in, the previous Fortissimo projects. With some changes in the details of the evaluation criteria and the related scoring and eligibility criteria to make sure that the methodology matches to the call topics, the evaluation process for all 49 submitted eligible proposals worked very well and smoothly and finished in time.

The open call received 49 eligible proposals (one additional proposal that exceeded the page limit) from 19 different European countries. 27 of these 49 proposals were evaluated above the previously defined threshold and therefore were eligible for funding. Using the full €4 M budget for funding for third parties, the first 22 proposals were selected to become the Inno4scale Innovation Studies. The selected Innovation Studies achieved a minimum score of 11.5.

References

[1] D4.1 Initial Communication and dissemination strategy, Inno4scale WP4 Deliverable, July 2023.

[2] D4.2 Report on Open Call, Inno4scale WP4 Deliverable, August 2023.

Appendix

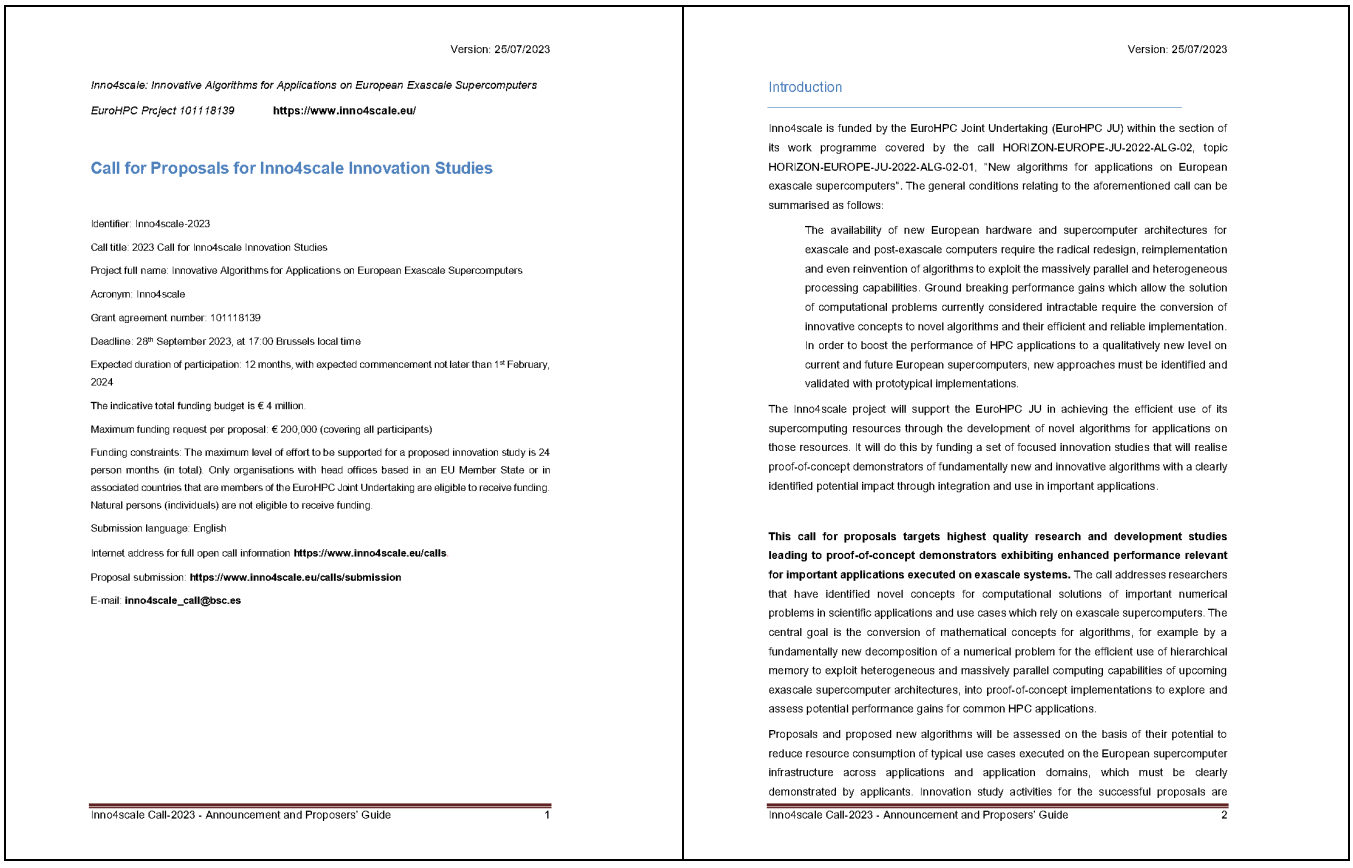
Open Call Documents Relevant for Proposers

Inno4scale's open call did open on July 28th, 2023 and closed on September 28th, 2023. The call was published on the project's website with a number of documents for prospective proposers:

- Open call announcement and proposers' guide
- Template ("Exemplar") for Part B of a proposal
- Proposer-Evaluator check-list ("check-list")
- List of Frequently Asked Questions

Open Call Announcement and Proposers' Guide

Table 3: Open call announcement and proposer's guide



Version: 25/07/2023

Inno4scale: Innovative Algorithms for Applications on European Exascale Supercomputers

EuroHPC Project 101118139 **https://www.inno4scale.eu/**

Call for Proposals for Inno4scale Innovation Studies

Identifier: Inno4scale-2023

Call title: 2023 Call for Inno4scale Innovation Studies

Project full name: Innovative Algorithms for Applications on European Exascale Supercomputers

Acronym: Inno4scale

Grant agreement number: 101118139

Deadline: 28th September 2023, at 17:00 Brussels local time

Expected duration of participation: 12 months, with expected commencement not later than 1st February, 2024

The indicative total funding budget is € 4 million.

Maximum funding request per proposal: € 200,000 (covering all participants)

Funding constraints: The maximum level of effort to be supported for a proposed innovation study is 24 person months (in total). Only organisations with head offices based in an EU Member State or in associated countries that are members of the EuroHPC Joint Undertaking are eligible to receive funding. Natural persons (individuals) are not eligible to receive funding.

Submission language: English

Internet address for full open call information **https://www.inno4scale.eu/calls**.

Proposal submission: **https://www.inno4scale.eu/calls/submission**

E-mail: **inno4scale_call@bsc.es**

Inno4scale Call-2023 - Announcement and Proposers' Guide 1

Version: 25/07/2023

Introduction

Inno4scale is funded by the EuroHPC Joint Undertaking (EuroHPC JU) within the section of its work programme covered by the call HORIZON-EUROPE-JU-2022-ALG-02, topic HORIZON-EUROPE-JU-2022-ALG-02-01, "New algorithms for applications on European exascale supercomputers". The general conditions relating to the aforementioned call can be summarised as follows:

> The availability of new European hardware and supercomputer architectures for exascale and post-exascale computers require the radical redesign, reimplementation and even reinvention of algorithms to exploit the massively parallel and heterogeneous processing capabilities. Ground breaking performance gains which allow the solution of computational problems currently considered intractable require the conversion of innovative concepts to novel algorithms and their efficient and reliable implementation. In order to boost the performance of HPC applications to a qualitatively new level on current and future European supercomputers, new approaches must be identified and validated with prototypical implementations.

The Inno4scale project will support the EuroHPC JU in achieving the efficient use of its supercomputing resources through the development of novel algorithms for applications on those resources. It will do this by funding a set of focused innovation studies that will realise proof-of-concept demonstrators of fundamentally new and innovative algorithms with a clearly identified potential impact through integration and use in important applications.

This call for proposals targets highest quality research and development studies leading to proof-of-concept demonstrators exhibiting enhanced performance relevant for important applications executed on exascale systems. The call addresses researchers that have identified novel concepts for computational solutions of important numerical problems in scientific applications and use cases which rely on exascale supercomputers. The central goal is the conversion of mathematical concepts for algorithms, for example by a fundamentally new decomposition of a numerical problem for the efficient use of hierarchical memory to exploit heterogeneous and massively parallel computing capabilities of upcoming exascale supercomputer architectures, into proof-of-concept implementations to explore and assess potential performance gains for common HPC applications.

Proposals and proposed new algorithms will be assessed on the basis of their potential to reduce resource consumption of typical use cases executed on the European supercomputer infrastructure across applications and application domains, which must be clearly demonstrated by applicants. Innovation study activities for the successful proposals are

Inno4scale Call-2023 - Announcement and Proposers' Guide 2

expected to commence at TRL 0-1 and achieve TRL 3-4 by the end of the 12-month study period[1]. Activities encompassing porting, reimplementation, incremental improvement, or parallelization of an existing algorithmic implementation will not be considered within the scope of this call. Proposals addressing algorithms using emerging technologies such as quantum computers will only be considered to be within the scope of the call if linked to HPC, for example, by exploiting hybrid quantum-classical exascale architectures.

Expectations for the innovation studies and for proposals

The proposed innovation studies are expected to:

1. **Demonstrate scientific excellence on the identified and proposed novel, forward-looking and potentially disruptive approaches to the solution of complex mathematical, numerical or data processing problems on current and future European exascale supercomputers.**
2. **Present proofs-of-concepts and solutions, which:**
   - **Clearly demonstrate great potential to solve currently non-tractable computational challenges in the context of use of the European flagship HPC systems;**
   - **Clearly demonstrate significantly superior performance compared to existing solutions and exploiting the specific capabilities of Exascale supercomputers by recovering compute or improving substantially time-to-solution and energy-to-solution for important use cases, possibly across scientific domains;**
   - **Demonstrate the potential to be integrated into important applications, addressing relevant use cases with a broad user base.**
3. **Involve a balanced and appropriate consortium which:**
   - **Includes all necessary parties required for the effective and efficient execution of the proposed study;**
   - **Involves at most 3 organisations, each of which is assigned at least 6 person months of effort**
4. **Define the HPC computing resources they need and budget for them. Successful proposals will be encouraged and assisted to obtain access to exascale technology for their development purposes, notably through the Benchmark and Development Access calls for the EuroHPC JU systems, in order to test and**

[1] TRL definitions are included at the end of this document

implement their algorithm concepts and/or novel solutions. (Inno4scale will <u>not</u> be in a position to provide computing resources).

5. **Deliver, as part of their final reporting, a report suitable for broad communication to non-technical experts (incl. stakeholders and the general public).**

Taking into consideration the first 2 points above, proposals should:

- Explain the concept and design of a fundamentally new and innovative algorithm.
- Present a sound theoretical concept, substantiated by, for example, peer-reviewed publications, with a credible and convincing plan to achieve a first proof-of-concept implementation.
- Describe clearly the state of the art (baseline) of the concept and implementation which should be in line with the scope of the call regarding the TRL (as stated in the introduction above).
- Provide a list of applications frequently used on HPC systems with typical use cases which could substantially benefit from the proposed solution including an estimate of the reduction of time-to-solution for the use cases.

Proposals that do not meet the expectations listed under the 3rd item (concerning a balanced and appropriate consortium) should clearly justify the construction of the proposed consortium in terms of effectiveness of the workplan and quality of the expected results. Furthermore, proposals should demonstrate the feasibility of the innovation study work plan, in terms of quality and efficiency, and present a clear and sound financial management of the study.

Submission Details

Submission deadline:
All submissions must be made by 17:00 Brussels local time on September 28th 2023.

Electronic submission: Proposal submission is exclusively in electronic form using the proposal submission tool accessible via the Inno4scale web-site: **https://www.inno4scale.eu/calls/submission**

The central component of proposal submission is the completion of administrative information within the online submission system (which will include information about all proposal participants) and the uploading of a PDF-document (whose individual size must not exceed 5.0 MB) compliant with the instructions on proposal structure given below.

Proposal format and structure:

Proposals must be submitted in English.

The main section of the proposal – "Part B" the PDF-document to be uploaded to the submission system - must not exceed 10 pages in length (including any appendices, but excluding the cover page). The text should be no smaller than 11 point Arial font. **Proposals submitted with a Part B whose length (excluding the cover page) exceeds the 10-page limit will be rejected without further evaluation.**

ALL PROPOSERS MUST TAKE CAREFUL NOTE OF THE ABOVE RULES.

The structure of Part B of the proposal (and indicative length per section) should be as follows:

1. Summary (1 page)
2. State of the art (1 page)
3. Concept and design of the innovative algorithm (1 page)
4. Expected impact and exploitation by existing applications (2 pages)
5. Baseline performance and means of verification of the improvements (1 page)
6. Description of the work plan (2 pages)
7. Quality of the consortium as a whole and of the individual proposers (1 page)
8. Justification of costs and resources (1 page)

A management structure will be imposed on the successful proposals. That is, the proposal will not need to contain a description of how the management of the experiment in the framework of the overall Inno4scale project will be achieved, but should include tasks for the technical management of the experiment activities.

A proposal exemplar for Part B can be found at
https://www.inno4scale.eu/calls/submission.

<u>It is a requirement that this exemplar be followed and in particular that the proposal budget be provided using the embedded Excel spread-sheet.</u>

Indicative budget

Inno4scale will make use of the Financial Support for Third Parties method[2] to enable the inclusion of new study partners. The indicative total funding budget for the call is € 4 million

[2] Integration of new Third Parties will conform with the Horizon Europe/EuroHPC JU grant agreements

The funding of Third Parties will follow the same principles as used for beneficiaries of Inno4scale, which receive European Commission funding within the R&D&I programme of the EuroHPC Joint Undertaking. In particular, Third Parties will receive 100% funding of incurred eligible costs[3].

The funding for an individual innovation study may not exceed € 200,000 (covering all participants). The maximum level of effort to be supported for a proposed innovation study is 24 person months (in total). Proposers should consider their actual needs and the evaluation will take into account the appropriateness of the requested resources.

Only organisations with head offices based in an EU Member State or in associated countries that are members of the EuroHPC Joint Undertaking are eligible to receive funding.

Natural persons (individuals) are not eligible to receive funding.

Proposals to Inno4scale Call-2023 that do not adhere to the abovementioned funding restrictions **will be rejected without further evaluation**.

Inno4scale reserves the right to make the appropriate and necessary effort and budget cuts in the case that erroneous budget data is included in accepted proposals.

Evaluation Criteria

The criteria for evaluation will comprise:

1. **Impact**: based on the expected performance improvement and target applications.
2. **Excellence**: soundness of concept, innovation and quality of the proposers.
3. **Implementation**: quality of the workplan and justified deployment of resources.

Each criterion will carry a score ranging from 0 to 5, and with a minimum threshold of 3 for each of them and the overall threshold for the sum of all criteria is 10. All criteria are equally weighted. However, in case of a tie in the overall score ranking, proposals are ranked based on the individual criteria scoring applying the following priority: Impact, Excellence, Implementation.

Adherence to the proposal format and structure described previously – and notably to the prescribed page limit – will allow the independent external evaluators to evaluate the proposal against all of the above-mentioned evaluation criteria. As explained earlier in this document,

[3] The details of funding rules that will be applied can be found in the annotated model grant agreement for the Horizon Europe programme:
https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/aga_en.pdf

failure to adhere to the funding restrictions and to the proposal format instructions will lead to immediate rejection of the proposal. Each proposal will be evaluated by two independent expert evaluators. The proposers will be provided with the results of the evaluation in the form of an evaluation summary report comprising the consolidated findings of the independent expert evaluators and a decision from the project on the result of the selection procedure. That decision is final and the project will not enter into discussions concerning the evaluation results, and no appeals process will be provided.

Financial information for innovation study consortia selected for funding:

Consortia concluding an agreement for funding of an innovation study with the Inno4scale project coordinator, the Barcelona Supercomputer Centre (BSC), will receive, on commencement of the innovation study, an initial payment (pre-financing) totalling 50% of the budgeted, indicative funding for the study. Thereafter, quarterly monitoring of technical progress and use of financial resources will be the basis of interim payments up to a maximum of 85% of the total budgeted, indicative funding for the study. The remaining 15% will be paid following acceptance of the final reports as part of the final project review by the EuroHPC JU and BSC's approval of the final cost reports from the study consortium.

Technology readiness levels (TRL)

The following definitions apply:

- TRL 1 basic principles observed
- TRL 2 technology concept formulated
- TRL 3 experimental proof of concept
- TRL 4 technology validated in lab
- TRL 5 technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 system prototype demonstration in operational environment
- TRL 8 system complete and qualified
- TRL 9 actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Template for Part B of a Proposal

Table 4: Template for Part B of a proposal

Proposal to Inno4scale Call-2023 Part B

Call Information:

Identifier: Inno4scale-2023
Call title: 2023 Call for Inno4scale Innovation Studies
Project full name: Innovative Algorithms for Applications on European Exascale Supercomputers
Acronym: Inno4scale
EuroHPC Project 101118139
Deadline: 28th September 2023, at 17:00 Brussels local time

Innovation Study Title [1]

Name of the coordinating person:
Title First Name, Last Name, Partner Organisation

E-mail:

This cover page may not be extended with any additional text/information.

This cover page will be ignored when the page count of the proposal is checked.

[1] Please provide an acronym for the proposal alongside the title

Summary
(Guideline: 1 page)

State of the art
(Guideline: 1 page)

Describe clearly the state of the art (baseline) of the concept and implementation which should be in line with the scope of the call regarding the TRL: Innovation study activities are expected to commence at TRL 0-1 and achieve TRL 3-4[2] *by the end of the 12-month study period.*

Concept and design of the innovative algorithm
(Guideline: 1 page)

Explain the concept and design of a fundamentally new and innovative algorithm. Present a sound theoretical concept, substantiated by, for example, peer-reviewed publications.

The Inno4scale expectation for the innovation studies:

Demonstrate scientific excellence on the identified and proposed novel, forward-looking and potentially disruptive approaches to the solution of complex mathematical, numerical or data processing problems on current and future European exascale supercomputers.

Expected impact and exploitation by existing applications
(Guideline: 2 pages)

Inno4scale innovation studies should realise proof-of-concept demonstrators of fundamentally new and innovative algorithms with a clearly identified potential impact through integration and use in important applications.

The Inno4scale expectation for the innovation studies:

Demonstrate the potential to be integrated into important applications, addressing relevant use cases with a broad user base.

Provide a list of applications frequently used on HPC systems with typical use cases which could substantially benefit from the proposed solution including an estimate of the reduction of time-to-solution for the use cases.

[2] See the Inno4scale Call-2023 Announcement and Proposers Guide for a TRL definition

2

5

Baseline performance and means of verification of the improvements

(Guideline: 1 page)

The Inno4scale expectation for the innovation studies:

Clearly demonstrate significantly superior performance compared to existing solutions and exploiting the specific capabilities of exascale supercomputers by recovering compute or improving substantially time-to-solution and energy-to-solution for important use cases, possibly across scientific domains.

Description of the work plan

(Guideline: 2 pages)

Present a credible and convincing plan to achieve a first proof-of-concept implementation and demonstrate the feasibility of the work plan, in terms of quality and efficiency. Present a clear and sound financial management of the study.

Experiment Title					
Participant short name					
Role					
Description: •					
Workplan **Task 1 Task name** Task description. ***Deliverable:*** *Deliverable short description (Experiment Month MM (i.e. within months 1 to 12 of the innovation study))* ... **Task N Task name** Task description. ***Deliverable:*** *Deliverable short description (Experiment Month MM (i.e. within months 1 to 12 of the innovation study))*					
Impact and Outputs					

3

(Output = concrete results from the study, such as, but not limited to, software releases, user workflows, experience reports, performance results
Impact = explanation of the use of the innovation study results, enhanced capabilities of target applications, etc.)

The output of the experiment will be:
•

The results of the experiment will be ...

Participants and effort						
Participant						**TOTAL**
Task 1 effort (PM)						
...	...	...	...	...	...	...
Task N effort (PM)						

PM = Person Months

If the proposal involves use of data covered by the EU General Data Protection Regulation or national regulations implementing these, this should be raised, and adequate protection measures for these should be specified.

Risks affecting the success of the technical activities should be briefly characterized, and mitigation measures discussed, where applicable.

Quality of the consortium as a whole and of the individual proposers

(Guideline: 1 page)

The descriptions of the individual proposers should explain the proposer's capability, as an entity and, in terms of the key staff to be assigned to the innovation study, to carry out the assigned tasks. The description of the consortium (for the innovation study) as a whole should provide evidence that the consortium includes the necessary and sufficient set of complementary capabilities (i.e. no unnecessary overlap of capabilities nor omission of required capabilities). Each participant should have a significant and well-justified role.

The Inno4scale expectation for the innovation studies:

Involve a balanced and appropriate consortium which: Includes all necessary parties required for the effective and efficient execution of the proposed study; Involves at most 3 organisations, each of which is assigned at least 6 person months of effort.

4

Justification of costs and resources

(Guideline: 1 page)

Cost breakdown per Participant according to funding rules for Third Parties. The total requested funding may not exceed € 200,000. The total effort for the study may not exceed 24 person months.

(The table below is an embedded spread-sheet, please use it, by double-clicking the table, to input your data. The data in the spread-sheet is purely for illustration purposes)

Participant Number	Participant short name	Requested Funding rate	Estimated eligible costs						Requested Funding (€)
			Effort (PM)	Personnel Costs (€)	Subcontracting (€)	Other Direct costs (€)	Indirect costs (€)	Total costs	
1	Eg-Research	100%	12	80.000	-	7.000	21.750	108.750	108.750
2	Eg-App Expert	100%	9	60.000		7.000	16.750	83.750	83.750
3									
									-
Total			21	140.000	-	14.000	38.500	192.500	192.500

The Inno4scale expectation for the innovation studies:

Involve a balanced and appropriate consortium which: Includes all necessary parties required for the effective and efficient execution of the proposed study; Involves at most 3 organisations, each of which is assigned at least 6 person months of effort.

Proposals that do not meet those expectations should clearly justify the construction of the proposed consortium in terms of effectiveness of the workplan and quality of the expected results.

Costs for subcontracting and other direct costs, including computing costs need to be clearly explained. Indirect costs are to be calculated as 25% of direct costs (i.e. personnel costs + other direct costs).

Successful proposals will be encouraged and assisted to obtain access to exascale technology for their development purposes, notably through the Benchmark and Development Access calls for the EuroHPC JU systems, in order to test and implement their algorithm concepts and/or novel solutions. Other or additional computing costs should be scoped, in terms of the required core hours, and assigned under "Other Direct costs" The need for the requested computing resources should be substantiated.

5

Proposer-Evaluator Check List

Table 5: Proposer-Evaluator check list

Version: 25/07/2023

Inno4scale Call-2023: Proposer-Evaluator Check-List

Evaluation Criterion: Impact

Check-List:

Would the proposed innovation study lead to a proof-of-concept demonstrator exhibiting enhanced performance relevant for important applications executed on current and future exascale systems? If successful, would the innovation study results:

- Clearly demonstrate great potential to solve currently non-tractable computational challenges in the context of use of the European flagship HPC systems.
- Clearly demonstrate significantly superior performance compared to existing solutions and exploiting the specific capabilities of exascale supercomputers by recovering compute or improving substantially time-to-solution and energy-to-solution for important use cases, possibly across scientific domains.
- Demonstrate the potential to be integrated into important applications, addressing relevant use cases with a broad user base.

Does the proposed work appropriately address the target for the call, the expectations of the call and the priorities of the call? In particular:

- Does the proposal seek to realise fundamentally new and innovative algorithms?
- Are the proposed activities based on existing algorithmic implementations? If the proposed activities encompass porting, reimplementation, incremental improvement, or parallelization of existing algorithmic implementations the proposal is outside the scope of the call and cannot be evaluated above threshold on impact.
- Does the proposal commence at TRL 0-1 and seek to achieve TRL 3-4 by the end of the innovation study?
- Does the proposal provide a list of applications frequently used on HPC systems with typical use cases which could substantially benefit from the proposed solution including an estimate of the reduction of time-to-solution for the use cases?
- If the proposal addresses algorithms using emerging technologies such as quantum computers is this clearly and strongly linked to HPC, for example, by exploiting hybrid quantum-classical exascale architectures?

1

Version: 25/07/2023

Evaluation Criterion: Excellence

Check-List:

Concept & Innovation:

Does the proposal demonstrate scientific excellence, providing a sound theoretical concept substantiated by a clear understanding of the state of the art? Is the theoretical concept consistent with the workplan leading to a proof-of-concept demonstrator at the end of the innovation study?

If successful, would the proposed algorithmic development lead to novel, forward-looking and potentially disruptive approaches to the solution of complex mathematical, numerical or data processing problems on current and future European exascale supercomputer?

Quality of the Consortium

Does the consortium contain the necessary partners with all the skills needed to carry out the proposed work? Are the roles of all partners clearly described and does each partner have a significant and well-justified role? Are key personnel clearly identified and described?

Evaluation Criterion: Implementation

Check-List:

Is the work plan sufficiently clear and coherent so that it gives confidence that the proposed work will be carried out effectively and will be directed towards achieving the objectives of the call?

Is the proposed innovation study, as described in the proposal, feasible in the technical and management sense? Are risks properly described and addressed?

Does the workplan include the delivery of final reports that include material/components suitable for broad communication to a non-technical audience?

Is a successful completion of the proposed innovation study to be expected given the resources (financial and effort of personnel) planned for the proposed workplan? Have resources been allocated to members of the consortium in such a way that each of them has the required resources needed to carry out their part in the work effectively? Is the effort of each partner required for specific tasks clearly described?

Are the proposed resources (effort, budget, any sub-contract) clearly justified in the proposal?

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The call expects that an innovation study consortium includes a maximum of 3 organisations and that each organisation is assigned at least 6 person months effort. If that is not true for the proposed consortium, does the proposal provide an appropriate justification of the construction of the consortium in terms of its ability to meet the workplan and call objectives?

The innovation studies will need access to appropriate computing resources for testing and evaluating algorithmic developments and for evaluating the performance impact of their proof-of-concept demonstrators. Does the proposal explain the resources they need and how they will be acquired (which might be through the Benchmark and Development Access calls for the EuroHPC JU systems)?

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FAQ

Table 6: Frequently asked questions

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Inno4scale Call-2023: FAQ

Q: When should I submit my proposal?

We strongly advise against last minute submissions and recommend that proposers make use of the option to upload and update draft proposals throughout the period in which the call is open. Every uploaded version will replace the previously uploaded one, only the last version submitted will be taken for the evaluation.

Proposal submission after the deadline will not be possible.

Q: Are there restrictions on the organisations that may participate?

Successful proposals will be included in the Inno4scale Project as clearly defined activities within the project and new participants will be included as Third Parties contracted by the Inno4scale Coordinator, the Barcelona Supercomputing Center.

Only organisations with head offices based in an EU Member State or in associated countries that are members of the EuroHPC Joint Undertaking are eligible to receive funding.

All organisations that are eligible to participate within the H2020 framework programme would be expected to be accepted for participation as Third Parties in Inno4scale. Natural persons (individuals) are not eligible to receive funding.

Q: Are there any rules regarding the structure of the proposal Consortium?

The Inno4scale open call targets proposals from consortia that can perform an innovation study leading to a proof-of-concept demonstrator exhibiting enhanced performance relevant for important applications executed on exascale systems. The consortium should contain the necessary partners with all the skills needed to carry out the proposed work.

It is expected that the consortium proposed for an innovation study comprises at most 3 organizations and that each organization is assigned at least 6 person months of effort. Proposals that do not meet those expectations should clearly justify the construction of the proposed consortium in terms of effectiveness of the workplan and quality of the expected results.

Q: What is the funding model and what financial restrictions apply?

The maximum EC funding expected to be allocated to an individual innovation study is € 200,000. However, that is a maximum figure and the proposal evaluators will be asked to pay attention to the planned resources (effort & budget) being commensurate with the stated

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objectives of the study. It is also important to note that the maximum level of effort to be supported for a proposed innovation study is 24 person months.

The funding of Third Parties must follow the same principles as used for beneficiaries of Inno4scale, which receives European Commission funding within the R&D&I programme of the EuroHPC Joint Undertaking. In particular, Third Parties will receive 100% funding of incurred eligible costs.

The details of funding rules that will be applied can be found in the annotated model grant agreement for the Horizon Europe programme:

https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/aga_en.pdf

However, key aspects to be noted are that the eligible costs include:

a) Direct personnel costs for personnel contributing to the innovation study activities.
b) Other direct costs for items such as: travel and subsistence; invoiced computing services; depreciation costs of equipment needed for execution of the experiment; costs of internally invoiced computing services (directly used for the application experiment).
c) Indirect costs calculated as a flat rate of 25% of eligible direct costs (with certain exceptions, but including the items under a) & b) above).

Q: How will access to HPC computing resources be supported?

Successful proposals will be encouraged and assisted to obtain access to exascale technology for their development purposes, notably through the Benchmark and Development Access calls for the EuroHPC JU systems, in order to test and implement their algorithm concepts and/or novel solutions. Other or additional computing costs should be included within the budget of the proposed innovation study, that is they should be scoped, in terms of the required core hours, and assigned under "Other direct costs" The need for the requested computing resources should be substantiated.

Q: Does the innovation study have to focus on particular types of applications?

No specific application fields are targeted. Innovation studies should demonstrate scientific excellence on the identified and proposed novel, forward-looking and potentially disruptive approaches to the solution of complex mathematical, numerical or data processing problems on current and future European exascale supercomputers. The resulting proof-of-concept demonstrators are expected to demonstrate great potential to solve currently non-tractable computational challenges in the context of use of the European flagship HPC systems and the

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potential to be integrated into important applications, addressing relevant use cases with a broad user base.

However, note that proposals addressing algorithms using emerging technologies such as quantum computers will be considered to be within the scope of the call only if linked to HPC, for example, by exploiting hybrid quantum-classical exascale architectures.

Q. What is the requirement for attending meetings?

Each innovation study should organise a kick-off meeting which all participants are expected to attend. Further study-internal meetings, whose attendance and frequency depend on the work plan, are anticipated. Furthermore, a representative of the experiment should normally participate in at least one Inno4scale communication and dissemination event and should also attend one Inno4scale review meeting. However, based on current practices following the Corona pandemic it is expected that most meetings will be held as online meetings.

Q: What is the time-line for evaluation & study commencement?

The target is for the innovations studies to commence not later than 1st February 2024. We expect to be able to communicate the results of the evaluation of proposals by the middle of December 2023.