

Call for Proposals

Open Call for Small-Scale Initiatives in Software Performance Optimization

Speeding up your research software

(OpenSSI 2021b)





Purpose of this call

This call for proposals supports researchers who want to significantly improve the run-time performance of their research software, but who need additional expertise to achieve this. Simply put: *we can help you make your research software run faster.*

This call welcomes all researchers who want to answer a research question relevant to their discipline, but who are prevented from making progress by the speed of their research software in its current form.

Typical problems that you may be faced with include, but are not limited to, the following:

- “We need to perform text analysis on our entire corpus of scanned legal documents, but this will take months.”
- “Our medical visualization tool does not allow interactive browsing through all our generated results, but we really need that to be able to answer our research questions.”
- “We need to run our environmental simulation across a larger surface area, ideally globally, to better validate our model.”
- “Our image processing software pipeline has one bottleneck stalling all our research progress; this really needs to be improved.”
- “Analysing and plotting the results of our simulations is going to take days, which prevents us from exploring the data to find significant results.”

This call for proposals is intended to help solve such software optimization problems.

Projects will start with a high-level look at your research software to identify likely performance issues. Together with eScience experts you will then work towards solving them using any of the following technical solutions:

- Software performance analysis and profiling,
- Algorithmic or numerical improvements,
- Software code optimization,
- Use of specialized software libraries,
- Parallelizing for compute clusters and clouds, or scaling up to supercomputers, and
- Advanced high-performance computing techniques (vectorization, multithreading, GPUs).

The research software should already be in use by an existing research community. Applicants must represent a team of researchers with prior experience in developing research software.

The call is organized around two workshops and includes four months of support by our Research Software Engineers at the Netherlands eScience Center. As a Small-Scale Initiative, this call follows a lightweight procedure without the possibility of appeal.



About the Netherlands eScience Center

The Netherlands eScience Center is the national centre for innovative software solutions in academic research. It was established in 2011 as an independent foundation and receives its funding from NWO and SURF. The eScience Center aims to bridge the gap between digital technologies on the one hand and scientific and scholarly inquiry on the other. Its vision is to establish a robust research community, in which all investigators in all domains are able to exploit advanced digital technologies and research software to answer research questions, keeping the Netherlands at the forefront of cutting-edge international research.

The eScience Center employs about fifty Research Software Engineers or RSEs. As experts in digital technologies and methodologies, they may be seen as the equivalents of postdocs, assistant and associate professors and top-level technicians at universities. In addition to their specific focus on the development of advanced research software, RSEs at the eScience Center will help applicants interpret the results of their research and make the tools and methods that emerge from the project (re-)useable for the wider research community. They will co-author research and methodological publications together with members of the research team. Based at the Netherlands eScience Center in Amsterdam, RSEs perform their project activities both remotely and at project locations.

In operational and administrative terms, projects are overseen by eScience Center's Programme Managers, who share responsibility with the applicant for monitoring progress and facilitating the delivery of project results.

Available projects

This call makes available in-kind support by allocating the time of Research Software Engineers (RSEs) employed by the eScience Center to the project. The eScience Center's in-kind contribution is calculated in 'person years' or PYR.

The total budget available for this call is approx. 3.3 PYR. A maximum of 0.33 PYR (approx. four person months) will be allocated to each awarded project, which means a total of up to 10 projects can be awarded. The maximum duration of each project is 12 months. The projects will start on or after 1 January 2022 and must be completed before 31 December 2022.



Who can apply?

Lead Applicant

Each proposal is to be formally submitted by a single named researcher (henceforth the 'lead applicant' or LA) on behalf of a group of researchers (the 'research team'). The LA must

- be in possession of a PhD and
- be employed by a Dutch research performing organization (Appendix A),
- have demonstrable knowledge and experience in applying digital methodologies to research,
- be one of the (contributing) developers of the research software used in the envisaged project,
- be free to spend a significant amount of time on the proposed project (to be specified on the application template).

The LA may submit only one proposal in that capacity in this call, and may not be the Principal Investigator or Lead Applicant in one of the currently running projects of the eScience Center.

Research Team

Small-Scale Initiatives are a collaborative effort of a coherent research team led by the LA. Teams may include PhD students as well as academic staff, and may represent different disciplines, faculties, levels of expertise, etcetera. Employees of institutes for higher education (hogeschool: see <https://www.vereniginghogescholen.nl/hogescholen>) may also participate in a research team.

Research teams comprising a mix of researchers from different universities or institutes are encouraged to apply. The research team must

- consist of 3 to 5 members (including the LA),
- consist of
 - o experienced users or developers of the research software, and/or
 - o researchers sharing a strong interest in the proposed scientific showcase,
- be free to spend a significant amount of time on the proposed project (to be specified on the application template).

What can be applied for?

Each project involves a period of support, provided by RSEs employed by the Netherlands eScience Center, and two workshops in which the various research teams must participate collectively. The first workshop, on "*Identifying software performance bottlenecks and possible solutions*", will be held on 18 January 2022. After this kick-off, the research teams are expected to continue their research and software development independently, with part-time and on-demand support by the RSEs assigned to the project. A second workshop, on "*Advanced software optimization techniques*" will be held on 24 May 2022.



Research team members must be closely involved in the project, both in the workshops and during the support period. The method of working is collaborative. Together with the RSEs, research team members will share knowledge, explore possibilities and develop solutions. The RSEs will offer advice and support for the duration of the project to help the research team achieve the desired results.

The research team will be responsible for data processing, software coding, and evaluation of the research software developed in the project. Each project envisages all of the following deliverables:

- a research paper,
- a blog post or white paper,
- a software or code release.

Both RSEs and research team members should be available for the submission / review process of the research paper after completion of the project itself. Both RSEs and research team members should be mentioned as co-authors of each of the three deliverables.

Digital Skills Program

The Netherlands eScience Center regularly organizes workshops in our Digital Skills Programme. Specifically workshops on parallel programming in Python and on CUDA programming are planned for November 2021. Team members of proposals submitted in this call are encouraged to participate in these workshops.

Open science, reproducibility, and sustainability

Collaborating with the eScience Center requires applicants to support the use and development of standards-based open-source and FAIR solutions¹.

- open science means that data, methods and results are freely available under open licences,
- reproducible research means that researchers with access to data and software are able to reproduce the research results in so far as these are based on that data and software,
- software is sustainable when it is easier to reuse software than to replace it.

To support the wider research community while ensuring the reproducibility, transparency, and integrity of all the research activities carried out at the eScience Center, all output (such as software and publications) is made available as open access and data is offered as FAIR data. All source code is made publicly accessible on a software development platform (e.g. GitHub), while all software and documentation use permissive open-source licences.

¹ FAIR Data Principles, see <https://www.go-fair.org/fair-principles>
FAIR Software Recommendations, see <https://fair-software.nl>



Preparing an application

Proposals must use the application template “Application template Small-Scale Initiatives in Software Performance Optimization” available on the eScience Center website at <https://www.esciencecenter.nl/calls-for-proposals/open-call-for-small-scale-initiatives-in-software-performance-optimization/> . Applicants should take note of the following requirements:

Software

For a collaboration with eScience Center RSEs to be successful, the research software must be available for use from the start. Before accepting a proposal, this software will be inspected by us to make sure it is ready for use. The software should be of sufficient quality to allow collaborative development and performance optimization. If you are unsure whether your software is suitable, please contact the eScience Center before applying.

Programming skills

Team members should have sufficient programming experience to work together fruitfully with the RSEs on the research software. Prior experience with performance optimizations is not required. If you are uncertain about your computational skills, please contact the eScience Center before applying.

Scientific showcase

The time it takes a computer to run a simulation or calculation often depends on a lot of factors, ranging from the choice of hardware to the specific configuration used for your calculation. Generally, changes made to the software will lead to speed-ups for some conditions, but may have no effect, or even cause slow-downs, under other conditions. Applicants are asked to design a specific and ambitious domain research experiment to set the software performance optimization challenge the project will try to meet.

Submitting the application

Proposals have to be submitted by email, using the required application template. The deadline for submission is 29 October 2021, 14:00:00 (CEST). Please send the filled-in application template to open-ssi-call@esciencecenter.nl.

Assessment procedure

Submissions will be reviewed by experts from the Netherlands eScience Center. To be eligible for funding, an application must have at least the qualification ‘very good’.



Criteria for selection are:

1. Impact of the current research software on the research domain and/or research community (33%).
2. Expected scientific impact of the stated scientific showcase (33%).
3. Feasibility of the proposal and expected ability of the RSEs to give the proposed research a boost through digital technologies (34%).

The intention is to award projects across the following 3 discipline areas (note that the lists are not exhaustive). The number of proposals awarded per discipline area will depend on the number and quality of the submissions:

1. *Physical Sciences and Engineering*, at the eScience Center separated into
 - a. Natural Sciences and Engineering (mathematics, physics, astrophysics, chemistry, engineering, computer science)
 - b. Environment and Sustainability (earth sciences, climatology, agricultural sciences, agriculture & food, ecology, water management)
2. *Life Sciences* (biology, medical and health sciences incl. neuroscience)
3. *Social Sciences and Humanities* (economics, political sciences, law, sociology, anthropology, education sciences, communication studies, psychology, linguistics, philosophy, literary studies, archaeology, history, human geography)

The lead applicants will be informed on the decision by email by mid-December 2021. Applicants will receive a short motivation on the decision.

Timetable

13 September 2021	Call publication / start of submission period
29 October 2021	Submission deadline
Mid December 2021	Notification of acceptance
18 January 2022	Workshop 1
24 May 2022	Workshop 2
January-December 2022	Consultancy period
31 December 2022	End date for projects

Contact details

If you have specific questions about this call for proposals or the assessment procedure, please contact: open-ssi-call@esciencecenter.nl.



Appendix A – Eligible organizations

Universities

Erasmus Universiteit Rotterdam
Open Universiteit Nederland
Protestantse Theologische Universiteit
Radboud Universiteit Nijmegen
Rijksuniversiteit Groningen
Technische Universiteit Delft
Technische Universiteit Eindhoven
Theologische Universiteit Apeldoorn
Theologische Universiteit Kampen
Universiteit Leiden
Universiteit Maastricht
Universiteit Twente
Universiteit Utrecht
Universiteit van Amsterdam
Universiteit van Tilburg
Universiteit voor Humanistiek
Vrije Universiteit Amsterdam
Wageningen Universiteit en Researchcentrum

University Medical Centers

Amsterdam UMC, locatie AMC
Amsterdam UMC, locatie VUMC
Erasmus MC
Leiden UMC
Maastricht UMC+
Radboud UMC
UMC Groningen
UMC Utrecht



KNAW-institutes

Hubrecht Instituut voor Ontwikkelingsbiologie en Stamcelonderzoek
Huygens ING
Internationaal Instituut voor Sociale Geschiedenis
Koninklijk Instituut voor Taal-, Land- en Volkenkunde
Meertens Instituut
Nederlands Herseninstituut
Nederlands Instituut voor Ecologie
Instituut voor Oorlogs-, Holocaust- en Genocidestudies
Nederlands Interdisciplinair Demografisch Instituut
Westerdijk Fungal Biodiversity Institute

NWO-institutes (NWO-I)

AMOLF, Physics of Functional Complex Matter
Advanced Research Center for Nanolithography
Netherlands Institute for Radio Astronomy
Centrum Wiskunde & Informatica
Dutch Institute for Fundamental Energy Research
Nikhef - Nationaal instituut voor subatomaire fysica
Koninklijk Nederlands Instituut voor Onderzoek der Zee
Nederlands Studiecentrum Criminaliteit en Rechtshandhaving
Netherlands Institute for Space Research