1. General Information

|  |  |  |
| --- | --- | --- |
| Project title | *Project title* | |
| Project keywords (max. 5) | *Keywords* | |
| Research field[[1]](#footnote-2) | *Research field* | |
| Research field OECD Field of Science**2** | *OECD Field of Science* | |
| Financing channel (1st / 2nd / 3rd)**3** | 1 | *Fill in call/funding name(s)…* |
| 2 | *Fill in call/funding name(s)…* |
| 3 | *Fill in call/funding name(s)…* |

|  |  |
| --- | --- |
| Continued (follow-up) application**4** | Yes  No |
| * Institute that granted the previous project | NWO  SURF other: *Fill in name* |
| * NWO or SURF file number of previous project | *File number (dossier number)* |
| * Submission date of report on previous project | Submission date of report |
| Group application | Yes  No |
| Desired start date**5** | Select start date |
| Expected end date**5** | Select end date |
| Is this application confidential?**6** | Yes, indicate reasons why: Explanation  No |

*Choose from:* [*https://www.nwo.nl/en/nwo-research-fields*](https://www.nwo.nl/en/nwo-research-fields)

**2** *Only required if computing time is requested on the pre-exascale supercomputer LUMI.*

*Choose from:* [*https://joinup.ec.europa.eu/collection/eu-semantic-interoperability-catalogue/solution/field-science-and-technology-classification*](https://joinup.ec.europa.eu/collection/eu-semantic-interoperability-catalogue/solution/field-science-and-technology-classification)

**3** *Explain how the research in this project will be financed. In the case of subprojects, indicate for each subproject. If your project (or subprojects) is financed through 2nd or 3rd channels (geldstroom) or relates to another NWO application, mention the funding instrument/call, the overall project and its file number or dossier number (if available).*

***4*** *In case of a continued (follow-up) application: a report of the previous project must be submitted.*

*If the previous project was granted by NWO then this report must be submitted in the ISAAC application and reporting system. When the previous application was granted via SURF, the report needs to be submitted as an attachment to this application. The report template can be found on the funding page for Computing Time on the NWO website. (For administrative reasons, any remaining resources in the previous project will not be added to the continuation project.)*

***5*** *If no end date is provided, grant periods are standard two years. For the pre-exascale supercomputer LUMI the maximum project duration and standard grant periods are one year.* ***Important for Grid applications:*** *In case of continued (follow-up) applications for Grid resources, make sure that the requested start date leaves no gap between the start date of the new application and the end date of the previous application. This will ensure continuous availability of resources between applications. the start/end dates will be quoted in the approval letter and may differ from the default runtime of 2 years.*

*Three months before the end of the grant, you will receive a notification from SURF by email. At the end, the account is closed and submission of a final report to NWO Domain Science is mandatory.*

**6** *Granted computing time projects will be published on the NWO website (name applicant, affiliation, project title and granted resources), unless the project includes confidential matter.*

1. Main applicant (principal investigator)**7**

|  |  |
| --- | --- |
| Last name |  |
| First name |  |
| Initials |  |
| Title(s) |  |
| Gender**8** |  |
| Job title |  |
| Type of position | Permanent  Temporary**9** |
| Organisation**10** |  |
| Faculty/department |  |
| Group/Subgroup (‘leerstoelgroep’) |  |
| Address / P.O box, postal code, city |  |
| Telephone |  |
| Email |  |
| Point of contact for NWO**11** | Yes  No |
| Point of contact for SURF | Yes  No |

***7*** *The main applicant (principal investigator) should submit this application in his/her own ISAAC account.*

***8****Relevant with respect to diversity and inclusion:* [*https://www.nwo.nl/en/common/policies/diversity-and-inclusion/index*](https://www.nwo.nl/en/common/policies/diversity-and-inclusion/index)

***9*** *Applications from researchers with a temporary position need a signature as guarantee from a supervising scientific staff member with a permanent contract. Supervising staff members can (co-)sign multiple applications. See also Call for proposals, paragraph 3.1.*

***10*** *In case of a university affiliation and a UMC related research project, also include the name of the UMC.*

***11*** *The granting letter will be sent to the main applicant. For all other matters, NWO will contact the indicated point of contact.*

1. Co-applicants (if applicable)

*Other team members (could be national/international).*

|  |  |
| --- | --- |
| Last name |  |
| First name |  |
| Initials |  |
| Title(s) |  |
| Job title |  |
| Organisation |  |
| Faculty/department |  |
| Group/subgroup (‘leerstoelgroep’) |  |
| Address / P.O. box, postal code, city |  |
| Telephone |  |
| Email |  |
| Point of contact for NWO**12** | Yes  No |
| Point of contact for SURF | Yes  No |

*In case of more co-applicants, copy the table and fill out for each co-applicant.*

***12*** *The granting letter will be sent to the main applicant. If you wish that NWO will (also) contact one or more of the co-applicants for any other matters, mark it here.*

1. Scientific case
2. A scientific summary is required for applications for Snellius (exceeding 5 million SBUs) or applications for the pre-exascale supercomputer LUMI.

|  |
| --- |
| *Scientific summary (use a maximum of 250 words)* |

1. Describe the complete project in the context of your research group, including the relation between subprojects (if any) in your application. Specify the scientific question(s) you want to answer, describe the computational work (planned runs) and necessary recourses for each sub-project (in connection with the table below). If your application is related to another NWO application or project, mention the funding instrument/call, the overall project and its registration number (if available).

|  |
| --- |
| *Describe here (in case of a group application use a maximum of 200 words per sub-project, otherwise use a maximum of 1000 words for your description)* |

1. Indicate the importance of the requested computing facilities, storage and expertise (also include any enabling work e.g. data transport, software setup before or after the project) that needs to be carried out for your scientific research and its impact. Motivate how your team will use these resources to accomplish the scientific goals. The Impact Outlook approach is for research that focuses primarily on scientific impact. However, NWO does encourage researchers to think about opportunities for societal impact as well. See also the [NWO Impact Outlook Approach](https://www.nwo.nl/en/impact-outlook-approach).

|  |
| --- |
| *Describe the use and impact of computing facilities on research project here* |

1. Indicate which local computing facilities are available to the research group. Indicate why the system you prefer is indeed the right system for your application. Describe why other systems (e.g. your local facilities or other national facilities) cannot be used.

|  |
| --- |
| *Describe local facilities and available technical resources here* |

1. Indicate the names or expected positions of the people who will be performing the actual computational work and indicate the duration of their involvement in the project. Provide information about technical experience of all people involved in the computational work of the project with high performance computers and/or other computer facilities (which, where, for how long, familiarity with the compute, storage systems and software of the requested resources).

|  |
| --- |
| *Describe the manpower involved in the computational work here* |

1. Technical case
2. Requested facilities

Note that before submitting the application form, you need to consult SURF to discuss and elaborate on your project requirements. Tick the box to confirm.

|  |
| --- |
| Applicant is/has been in contact with a SURF advisor to discuss the proposed technical setup.  Name of SURF advisor: *SURF advisor*  In case of the pre-exascale supercomputer LUMI, applicant has previously been granted pilot access or has been granted access to the system through a call for proposals for access by the European High Performance Computing Joint Undertaking (EuroHPC JU). |

Describe the type and amount of the requested resources (computing time, storage and expertise). Depending on the requested service system, fill out the applicable section A/B/C/D/E of the technical appendix at the end of this form.

**Please DELETE the tables with the computer facilities (A,B,C,D,E) that are NOT relevant for the current proposal.**

(Snellius supercomputer / Pre-exascale supercomputer LUMI / Data Processing (Grid, Spider) / HPC Cloud via SURF Research Cloud / Cloud Research Consultancy)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A. Snellius supercomputer\*  > 1,000,000 (CPU or GPU) SBU, including 200 GB home directory storage per login (max 1,000,000 files) | | | | |  |
| COMPUTING TIME  *Select box & fill out:*  Requested amount in SBU, CPU core hours or GPU hours, for yr 1 & yr 2 | **Thin CPU SBU**  *Max/yr 125,000,000*  *(125M SBU)*  Year 1:  *Enter amount*  Year 2:  *Enter amount* | **Fat CPU**  *Max/yr 18,000,000*  *(18M SBU)*  Year 1:  *Enter amount*  Year 2:  *Enter amount* | **High-memory CPU**  *Max/yr 1,700,000*  *(1.7M SBU)*  Year 1:  *Enter amount*  Year 2:  *Enter amount* | **GPU**  *Max/yr 32,000,000 (32M SBU)*  Year 1:  *Enter amount*  Year 2:  *Enter amount* | |
| STORAGE  Requested type and amount in Terabytes (TB) | I do not need project space  I need *Amount* TB project space\*\* | | | |  |
| Offline TAPE storage  (Data Archive)  *In case you wish to retain the tape storage of your previous project, provide the total amount here (amount of previous project + requested amount in this application)* | I do not need offline tape storage  I need *Amount* TB offline tape storage (Data Archive) | | | |  |
| TECHNICAL INFO  Mandatory form | I filled out Technical appendix A. Snellius | | | |  |

|  |  |  |
| --- | --- | --- |
| B. Pre-exascale supercomputer LUMI\*  > 500,000 CPU core hours, > 14,000 GPU hours\*\*\* | | |
| COMPUTING TIME  *Select box & fill out:*  Requested amount in CPU core hours or GPU hours | **CPU core hours**  *Enter amount* | **GPU hours**  *Enter amount* |
| STORAGE  Requested type and amount in Terabyte(TB)-hours | I need *Amount* TB-hours storage | |
| Offline TAPE storage at SURF  *(in case you wish to retain the tape storage of your previous project, provide the total amount here (amount of previous project + requested amount in this application)* | I do not need offline tape storage  I need *Amount* TB offline tape storage | |
| TECHNICAL INFO  Mandatory form | I filled out Technical appendix B. Pre-exascale supercomputer LUMI | |

|  |  |  |
| --- | --- | --- |
| C. Data Processing (Grid, Spider)\*  > 1,000,000 CPU core hours, > 10,000 GPU hours\*\*\*\* | | |
| COMPUTING TIME  *Select box & fill out:*  Requested amount in CPU core hours or GPU hours, for yr 1 & yr 2 | **CPU core hours**  Year 1: *Enter amount*  Year 2: *Enter amount* | **GPU hours**  Year 1: *Enter amount*  Year 2: *Enter amount* |
| STORAGE  Requested type and amount in Terabytes (TB) | I need *Amount* TB online disk storage in year 1  I need *Amount* TB online disk storage in year 2 | |
| Offline TAPE storage  *(in case you wish to retain the tape storage of your previous project, provide the total amount here (amount of previous project + requested amount in this application)* | I do not need offline tape storage  I need *Amount* TB offline tape storage | |
| TECHNICAL INFO  Mandatory form | I filled out Technical appendix C. Data Processing | |

|  |  |  |
| --- | --- | --- |
| D. HPC Cloud (via SURF Research Cloud)\*  > 50,000 CPU core hours, > 5,000 GPU hours | | |
| COMPUTING TIME  *Select box & fill out:*  Requested amount in CPU core hours or GPU hours, for yr 1 & yr 2 | **CPU core hours**  Year 1: *Enter amount*  Year 2: *Enter amount* | **GPU hours**  Year 1: *Enter amount*  Year 2: *Enter amount* |
| STORAGE  Requested type and amount in Terabytes (TB) | I need *Amount* TB online disk storage | |
| Offline TAPE storage  (Data Archive)  *(in case you wish to retain the tape storage of your previous project, provide the total amount here (amount of previous project + requested amount in this application)* | I do not need offline tape storage  I need *Amount* TB offline tape storage | |
| TECHNICAL INFO  Mandatory form | I filled out Technical appendix C. HPC Cloud (via SURF Research Cloud) | |

|  |  |  |
| --- | --- | --- |
| E. Cloud Research Consultancy\*  > 100,000 CPU core hours | | |
| COMPUTING TIME  *Select box & fill out:*  Requested amount in CPU core hours for yr 1 & yr 2 | **CPU core hours**  Year 1: *Enter amount*  Year 2: *Enter amount* |  |
| STORAGE  Requested type and amount in Terabytes (TB) | I need *Amount* TB online disk storage | |
| Offline TAPE storage  (Data Archive)  *(in case you wish to retain the tape storage of your previous project, provide the total amount here (amount of previous project + requested amount in this application)* | I do not need offline tape storage  I need *Amount* TB offline tape storage | |
| TECHNICAL INFO  Mandatory form | I filled out Technical appendix D. Cloud Research Consultancy | |

|  |  |
| --- | --- |
| Data Sharing  See also section 6. Project Plan | |
| RESEARCH DRIVE  (enabling sharing of your data with other users) | Select the box if you want to make use of Research Drive  *For all applications,* ***up to 5 TB*** *on Research Drive can be provided via SURF, enabling sharing of your data with other (intern)national institutions. The Research Drive account will either be delivered by your institution or directly via SURF. More information:* [*https://www.nwo.nl/en/research-data-management*](https://www.nwo.nl/en/research-data-management) |

NOTES

*\* In case of a request of less than the amount of computing time in the table, you can apply directly via SURF. More information: https://www.surf.nl/en/services, choose Computing Services.*

*\*\* Project space (Snellius) enables you to allow multiple users to get access to your data. Project space has no backup, and will be cleaned up following the expiration policy described* [[*here*](https://userinfo.surfsara.nl/systems/cartesius/filesystems)](https://servicedesk.surf.nl/wiki/display/WIKI/Snellius+hardware+and+file+systems)*.To securely preserve your output data, you can request access to Data Archive. If you want to continue using the SURF Data Archive to preserve your data at the end of your grant period, contact SURF about an arrangement with your institute.*

*\*\*\** Note that f*or the pre-exascale supercomputer LUMI the maximum project duration is one year.*

*\*\*\*\* CPU and GPU capacities for Grid will be transferred into priority configurations by means of a so-called fairshare mechanism. These priority configurations will allow projects to claim a continuous amount of designated cores for an approved project. Over the project runtime, the continuously available cores will automatically accumulate into the allocated CPU and/or GPU capacities. In times of under-usage by other projects, more cores can be acquired than foreseen, but this will not go at the cost of the priority configuration. For more information about the applied fairshare mechanism, see:* [*https://servicedesk.surf.nl/wiki/display/WIKI/Usage+and+Service+Model*](https://servicedesk.surf.nl/wiki/display/WIKI/Usage+and+Service+Model)*.*

1. Requested expertise

Describe, in sufficient detail, what kind of technical support you will need from SURF to accomplish your scientific goals. Detailed descriptions of the various types of expertise are provided at <https://www.surf.nl/en/consultancy-on-ict-solutions-for-researchers>. Expertise includes:

* Expert advice and support for optimum use of the HPC systems, such as: software optimization and/or parallelization, setting up VMs, implementation of algorithms on batch job systems, running jobs, and adapting jobs to run on multiple nodes.
* Expertise needed to build a platform on Data Processing infrastructures. Expertise can be needed for application design and deployment on the infrastructure, both at the application side as well as at the infrastructure level. Support is included in the services, depending on specific needs of the project. Data Processing requires minimal 60 hours per year.
* Expertise needed for data-analysis, the use and realization of 2D/3D visualizations for data-analysis and exploration.
* Machine Learning Support: Expertise needed to efficiently train, distribute at scale and deploy machine learning workflows on HPC, commodity and specialized infrastructure. This includes consultancy for new algorithm selection, customization and adoption, and support for off-the-shelf machine learning libraries.
* Expertise needed for setup and support of cloud based applications under Cloud Research Consultancy. For long-term Devops support, the minimum is 120 hours per year.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SYSTEM**  I need technical support for (select box): | **TYPE OF ACTIVITIES**  Describe here what kind of activities are needed from SURF: | **TECHNICAL SUPPORT**  Requested amount of hours technical support per year | | |
|  | | Year 1,  #hours | Year 2,  #hours |  |
| **Snellius Supercomputer** |  |  |  |  |
| **Pre-exascale supercomputer LUMI** |  | N/A |  |
| **Data Processing (Grid/Spider)** |  |  |  |
| **HPC Cloud (via SURF Research Cloud)** |  |  |  |
| **Cloud Research Consultancy** |  |  |  |

1. Data management plan

Provide a data management plan for the generated data, for both during and after the grant period of the computational job. See also: <https://www.nwo.nl/en/research-data-management>.

*Attach or submit a filled out data management plan and please summarize below:*

* *the size, location and number of files for the input data and how it is transferred to the computing facility.*
* *the size and number of intermediate files created during the processing of the input data.*
* *the size and number of files for the output data.*
* *only for applications for the pre-exascale supercomputer LUMI: for how long input, intermediate and output data will be stored on the system during the runtime of the project.*
* *where the input, intermediate, and output data will be stored after the end date of this application.****13/14***

|  |
| --- |
| *Summarize your data management plan here****12*** |

***12******The storage provided during the grant period is not intended for long term storage****. The data management plan should contain details on how you are going to transfer permanent data to long term storage. If in section 5. Technical case, you selected the use of SURF Research Drive that will allow you to share and store your data, you can mention this in your data management plan. If you are planning to use the SURF Data Archive (offline tape storage), to preserve your data at the end of your grant period, you can also mention this here. You can also make the data referable by linking it to persistent identifiers via SURF:* [*https://www.surf.nl/en/portfolio-data-services-what-service-do-you-need-to-manage-and-store-your-data*](https://www.surf.nl/en/portfolio-data-services-what-service-do-you-need-to-manage-and-store-your-data)*.*

***13******Data preservation after the end of the project is outside the scope of this grant.*** *Contact SURF about an arrangement with your institute.*

1. Remarks, references and relevant publications

|  |
| --- |
| *Describe here* |

1. Privacy

In case (special categories of) personal data are processed on the services and/or infrastructure of SURF, Parties will agree on a Data Processing Agreement (DPA) that applies to the processing of (special categories of) personal data within the framework of this agreement.

Without a signed DPA, the Applicant will not process personal data on the services and/or infrastructure of SURF. In the event of a breach of this agreement, the Applicant accepts full liability and fully indemnifies SURF for the consequences, including claims of parties involved and fines from supervisory authorities, instituted or imposed on the basis of the GDPR and/or other applicable legislation.

No (special categories of) personal data can be processed on the pre-exascale supercomputer LUMI.

Indicate which option applies:

A DPA must be drawn up for this agreement.

Contact details:

|  |  |
| --- | --- |
| Privacy officer / DPO of your institution:  E-mail address of privacy officer: | Name:  E-mail: |
| Privacy officer SURF:  E-mail address: | Department Quality, Procurement & Legal  [klantsupport@surf.nl](mailto:privacy@surf.nl) |

Applicant expressly declares not to process personal data on the services and / or infrastructure of SURF, nor on the pre-exascale supercomputer LUMI. In the event of a breach of this declaration, Applicant accepts full liability and fully indemnifies SURF for the consequences, including claims of parties involved and fines from supervisory authorities, instituted or imposed on the basis of the GDPR and other applicable legislation.

1. Date and Signature

|  |  |
| --- | --- |
| *Date* |  |
| *Signature of main applicant* |  |

*In case of a temporary contract of the main applicant, a supervising scientific staff member with a permanent contract is requested to co-sign the application. By signing the application, the supervising scientific staff member declares that he/she is responsible for the awarded resources.*

|  |  |
| --- | --- |
| *Date* |  |
| *Name of scientific staff member****15*** |  |
| *Signature of supervising scientific staff member* |  |

***15*** *The main applicant is the PI of this computational research project. The signing supervising staff member is not the PI of this research project, but a guarantor. A supervising staff member is allowed to sign for and guarantee multiple applications.*

*Note that the provided information in this application and related documents, such as rebuttal, report template and data management plan will be shared with SURF for optimal service delivery and improvement of the national infrastructure for research.*

*This application form must be submitted in pdf-format via the NWO ISAAC system:* [*www.isaac.nwo.nl*](http://www.isaac.nwo.nl)*.*

**TECHNICAL APPENDIX**

**Choose and completely fill in the appropriate appendix for your application:**

1. Snellius
2. Pre-exascale supercomputer LUMI
3. Data Processing (Grid, Spider)
4. HPC Cloud (via SURF Research Cloud)
5. Cloud Research Consultancy

**Please DELETE the appendices (A,B,C,D ,E) that are NOT relevant for the current proposal**

1. Snellius

*Only answer the questions in this section, if you are applying for access to the Snellius supercomputer (CPU or GPU). If you are unable to fill out these questions, contact SURF for support: An overview of what is available in the various compute and storage facilities can be a great aid to you for deciding what resources to ask for. Technical overviews of which types of nodes are available can be found at the user documentation for* [[*Snellius*](https://servicedesk.surf.nl/wiki/)](https://servicedesk.surf.nl/wiki/)*.*

|  |
| --- |
| Numerical methods and implementation aspects |
| 1. Which numerical methods will be used in your project? If relevant, give details on discretisation and numerical methods.  |  | | --- | | *Describe here* |  1. Describe the implementation details of your numerical approach for the preferred system (MPI, OpenMP, hybrid, CUDA, OpenCL, OpenACC, ….)  |  | | --- | | *Describe here* |  1. Which ‘standard’ package(s) (application software, if any) and which libraries will be used?  |  | | --- | | *Describe here* |  1. Indicate the parallel performance of the code(s) you plan to use.  |  | | --- | | *Describe here* |  1. Indicate how much memory and how much I/O (volume, bandwidth, possibly meta-data intensive behavior\*) will be needed.  |  | | --- | | *Describe here* |   \* *Any behavior that increases meta-data overhead, such as highly frequent opening and closing of many files per task, doing large numbers of small I/O’s – characteristics that significantly limit the utilization of available bandwidth.* |
| Feasibility |
| 1. Explain the amount of requested computing time. You can use the table below to summarize.  |  | | --- | | *Describe here* |   *\* Explain how your planned runs add up to the requested amount of computing time. (The accounting weight “a” for Snellius depends on the type of node used. For****CPU******thin****nodes it is 1, for****CPU******fat****nodes it is 1.5, for a****CPU******high-memory****nodes**(32 GB/core) it is 2, for****CPU high-memory****nodes (64 GB/core) it is 3. For Snellius****GPU****nodes, you must specify the number of GPU's in the table below. The weight factor is based on the number of GPU's and is 128 for Nvidia A100 GPU's and 192 for Nvidia H100 GPU's. For Snellius nodes can be used exclusively or shared. If used in a shared way, the 'atomic allocation' unit is 16 cores for CPU nodes and 1 GPU for GPU nodes. Take into account that always s multiples of the ‘atomic allocation’ are charged to your job, independent of how many cores within an ’atomic allocation’ you actually use.*  *Be aware of the fact that when submitting the report of your project to NWO Domain Science, you have to compare your actual runs and actual used computing time against the breakdown of computational work you have indicated here.*   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Type Run | # Runs | # Steps/Run | Wall time/Step | # CPU cores | # GPU's | accounting  weight | Total SBUs/Type Run | | 1 | r1 | s1 | w1 | p1 | g1 | a1 | r1\*s1\*w1\*p1\*a1 | | 2 | r2 | s2 | w2 | p2 | g2 | a2 | r2\*s2\*w2\*p2\*a2 | | 3 .... | r3 | s3 | w3 | p3 | g3 | a3 | r3\*s3\*w3\*p3\*a3 | | …. | …. | …. | …. | …. |  | …. | …. | | TOTAL |  |  |  |  |  |  | GRAND TOTAL |  1. Describe both the total memory requirements of the full job and the memory requirements per core or MPI process.  |  | | --- | | *Describe here* |  1. Describe the requirements for data storage and for I/O. Distinguish between project space storage and scratch storage space during the job. You are also able to apply for offline tape storage capacity in the Data Archive to complement the Snellius compute project. *Details on the different storage spaces, including expiration policies are provided* [*here*](https://servicedesk.surf.nl/wiki/display/WIKI/Snellius+filesystems)*.*   *Standard is 200 GiB home directory with backup-service of 1 incremental backup per 24 hours; Standard 8 TiB / 2 Million I-node scratch space capacity. Home directory and scratch quota apply per login. Per project there can be one personal login for every project user who signed the SURF usage agreement for their login.*  *Note that an I-node quota applies to the project space. This represents the maximum number of files allowed on the project space, as described* [*here*](https://servicedesk.surf.nl/wiki/display/WIKI/Snellius+filesystems)*. The limit for a 1 TiB project space is 1 Million I-nodes, the limit associated with a 512 TiB project space is 15 Million I-nodes. This reflects that programs handling a large number of small files per task have considerable meta-data overhead and have severely limited, much less than linear, scaling potential without restructuring, optimizing, their I/O behavior.*  *You are able to apply for enforcement of two-factor authentication for the logins associated with your project. If two-factor authentication is required, it must be enforced for all members of the project and able to access its data. Individual users cannot request exemption for their login.*  *If, after a grace period of at least 4 weeks and at most 15 weeks, there is no granted continuation project in place, the account that was associated with the expired project is closed and any remaining end-user data associated with the closed account will be removed.*   |  | | --- | | *Describe here* |  1. Provide scaling graphs of the numerical methods used in the proposal on the selected or a similar system.  |  | | --- | | *Provide here* |  1. Indicate the required post processing work and the necessary computing systems.  |  | | --- | | *Describe here* | |

Associated expertise hours

Provide details about the implementation and timeline for the SURF expertise requested in Section 5b in this application form. This type of request is targeted for more in-depth application support where you can get up to 520 hours of HPC advisor support dedicated to improving performance and optimization of their code, or support in data visualization of results. Examples include:

applications deployment on the system and configuration (estimated: 20-80 hours of support)

applications benchmark and profiling on Snellius (estimated: 80-160 hours of support)

software development and/or parallelization (estimated: 160-520 hours of support)

code porting and validation (estimated: 320-520 hours)

Detailed descriptions of the various types of expertise SURF offers are provided at <https://www.surf.nl/en/consultancy-on-ict-solutions-for-researchers>

Enter a detailed description of implementation process timeline, work to be done by the SURF staff, and an estimate of the number of hours requested for each year.

|  |  |
| --- | --- |
| Requested expertise and work implementation  Year 1 | Estimated SURF support hours |
| *Describe here* | *Support hours year 1* |
| Requested expertise and work implementation  Year 2 | Estimated SURF support hours |
| *Describe here* | *Support hours year 2* |

*Contact the SURF service desk (*[*www.servicedesk.surf.nl*](http://www.servicedesk.surf.nl)*) for more details on the available expertise, and for support in filling in this information.*

1. Pre-exascale supercomputer LUMI

**Please DELETE the appendices (A,B,C,D ,E) that are NOT relevant for the current proposal**

*Only answer the questions in this section, if you are applying for access to the pre-exascale supercomputer LUMI (CPU and/or GPU). If you are unable to fill out the questions in this section, contact SURF for support: An overview of what is available in the various compute and storage facilities can be a great aid to you for deciding what resources to ask for. Technical overviews of which types of nodes are available can be found in the user documentation for the pre-exascale supercomputer LUMI at* [*https://docs.lumi-supercomputer.eu/hardware/ and* [*https://docs.lumi-supercomputer.eu/storage/*](https://docs.lumi-supercomputer.eu/storage/)*.*](https://docs.lumi-supercomputer.eu/hardware/)

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| Numerical methods and implementation aspects |
| 1. Which numerical methods will be used in your project? If relevant, give details on discretisation and numerical methods.   *Describe here*   1. Describe the implementation details of your numerical approach for the preferred system (MPI, OpenMP, hybrid, ROCm, OpenCL, OpenACC, ….)   *Describe here*   1. Which ‘standard’ package(s) (application software, if any) and which libraries will be used?   *Describe here*   1. Indicate the parallel performance of the code(s) you plan to use.   *Describe here*   1. Indicate how much memory and how much I/O (volume, bandwidth, possibly meta-data intensive behavior\*) will be needed.   *Describe here*  \* *Any behavior that increases meta-data overhead, such as highly frequent opening and closing of many files per task, doing large numbers of small I/O’s – characteristics that significantly limit the utilization of available bandwidth.* |
| Feasibility |
| 1. Explain the amount of requested computing time. You can use the table below to summarize.   *Describe here*  *\* The CPU-core hours (for CPU nodes) or GPU hours (for GPU nodes) billed per hour depends on the slurm partition to which a job is submitted, the amount of allocated memory per core and on whether the node is shared or not. Details about the billing policy can be found* [*here*](https://docs.lumi-supercomputer.eu/runjobs/lumi_env/billing/)*.*  *Be aware of the fact that when submitting the report of your project to NWO Domain Science, you have to compare your actual runs and actual used computing time against the breakdown of computational work you have indicated here.*   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Type Run | # Runs | # Steps/Run | Wall time/Step | # CPU cores | # GPU's | Billed resource type (CPU-core hours or GPU hours) | CPU core-hours/GPU hours billed per wall-clock hour | Total CPU core-hours/GPU hours per Type Run | | 1 | r1 | s1 | w1 | p1 | g1 |  | a1 | r1\*s1\*w1\*a1 | | 2 | r2 | s2 | w2 | p2 | g2 |  | a2 | r2\*s2\*w2\*a2 | | 3 .... | r3 | s3 | w3 | p3 | g3 |  | a3 | r3\*s3\*w3\*a3 | | …. | …. | …. | …. | …. |  |  | …. | …. | | TOTAL |  |  |  |  |  |  |  | GRAND TOTAL |  1. Describe both the total memory requirements of the full job and the memory requirements per core or MPI process.   *Describe here*   1. Describe the requirements for data storage and for I/O. Distinguish between project persistent, project scratch, project flash and object storage space. *Details on the different storage spaces, including expiration policies are provided* [*here*](https://docs.lumi-supercomputer.eu/storage/)*.*   *Note that an I-node quota applies to the project and home storage spaces. This represents the maximum number of files allowed on the storage space, as described* [*here*](https://docs.lumi-supercomputer.eu/storage/)*.*  *Project members can still access the project data during a 90-days grace period after the end date of the project. After the grace period any data left on the pre-exascale supercomputer LUMI* ***will be deleted****.*  *Describe here*   1. Provide scaling graphs of the numerical methods used in the proposal on the selected or a similar system.   *Provide here*   1. Indicate the required post processing work and the necessary computing systems.   *Describe here* |

Associated expertise hours

Provide details about the implementation and timeline for the SURF expertise requested in Section 5b in this application form. This type of request is targeted for more in-depth application support where you can get up to 520 hours of HPC advisor support dedicated to improving performance and optimization of their code, or support in data visualization of results. Examples include:

* applications deployment on the system and configuration (estimated: 20-80 hours of support)
* applications benchmark and profiling on the pre-exascale supercomputer LUMI (estimated: 80-160 hours of support)
* software development and/or parallelization (estimated: 160-520 hours of support)
* code porting and validation (estimated: 320-520 hours)

Detailed descriptions of the various types of expertise SURF offers are provided at <https://www.surf.nl/en/consultancy-on-ict-solutions-for-researchers>

Enter a detailed description of implementation process timeline, work to be done by the SURF staff, and an estimate of the number of hours requested for each year.

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| Requested expertise and work implementation | Estimated SURF support hours |
| *Describe here* | *Support hours* |

*Contact the SURF service desk (*[*www.servicedesk.surf.nl*](http://www.servicedesk.surf.nl/)*) for more details on the available expertise, and for support in filling in this information.*

1. Data Processing

**Please DELETE the appendices (A,B,C,D ,E) that are NOT relevant for the current proposal**

*Only answer the questions in this section ,if you are applying for Data Processing. If you are unable to fill out these questions, contact SURF for support:* [*https://servicedesk.surfsara.nl/*](https://servicedesk.surfsara.nl/)

Enter here the required CPU and GPU capacity, in wall clock (core) hours per year, for the processing platforms (HTDP) you propose to use in this project. You can select multiple compute platforms if required. Detailed descriptions of these platforms are provided at: <https://servicedesk.surf.nl/wiki/>. Note that CPU and GPU capacities for Grid will be transferred into priority configurations by means of a so-called fairshare mechanism. These priority configurations will allow projects to claim a continuous amount of cores over the allocated project period.

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| **Processing platform** | **Year 1**  **[CPU core hours]** | **Year 2**  **[CPU core hours]** | **Year 1**  **[GPU hours]** | **Year 2**  **[GPU hours]** | **Location** |
| Grid |  |  |  |  | SURF |
| Grid |  |  | N/A\* | N/A\* | NIKHEF |
| Spider |  |  |  |  | SURF |

*\*GPU’s are only available for location SURF*

Associated storage components

Enter here the storage volumes, in units of TB, per storage component for each of the selected processing platforms. For each year give the total storage needed for that year (for year 2 this will include minimally all stored data that is carried over from year 1). If technically feasible it is allowed to select multiple storage components per processing platform. If the same storage component is used for different processing platforms then provide each on a separate line. The different options for combining processing platforms and storage are described at <https://servicedesk.surf.nl/wiki/>

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| --- | --- | --- | --- | --- |
| **Storage component** | **Year 1**  **[TB]** | **Year 2**  **[TB]** | **Location** | **Processing Platform** |
| Grid storage – disk |  |  | SURF |  |
| Grid storage – disk |  |  | NIKHEF |  |
| Grid storage – tape |  |  | SURF |  |
| Spider shared storage |  |  | SURF |  |
| (Swift) Object storage |  |  | SURF |  |
| Data Archive |  |  | SURF |  |
| Research Drive | Yes  No | | | |

Associated expertise hours

Enter here the amount of SURF expertise, in units of hours, related to the implementation details provided in Section 5b ‘Requested expertise’ in this application form. Use one line per type of expertise. Note that apart from specific expertise related to your project, any kind of regular support (e.g., onboarding, troubleshooting) is not included with the service by default and should be requested here as well. For regular projects this typically starts at 60 hours per year. Hence, the **minimum you need to request is 60 hours per year** and any specific expertise requested for your project needs to be added to this number. Detailed descriptions of the various types of expertise SURF offers are provided at <https://www.surf.nl/en/consultancy-on-ict-solutions-for-researchers>

|  |  |  |  |
| --- | --- | --- | --- |
| **Expertise** | **Year 1**  **[hours]** | **Year 2**  **[hours]** | ***[Comment]*** |
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Additional remarks

Enter here any additional remarks concerning the technical setup of your project. This may include, but is not limited to, time critical processing, data transport to/from site, private nodes, use and or hosting of special services (e.g. PiCas), collaborative aspects, exotic software requirements and community support.

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| *Additional remarks* |

1. HPC Cloud (via SURF Research Cloud)

**Please DELETE the appendices (A,B,C,D ,E) that are NOT relevant for the current proposal**

*Only answer the questions in this section if you are applying for HPC Cloud (via SURF Research Cloud). If you are unable to fill out these questions, contact SURF for support:* [*https://servicedesk.surf.nl/*](https://servicedesk.surf.nl/)

Enter here the required CPU and GPU capacity, in wall clock (core) hours per year. Detailed description of the service is provided at: [*https://www.surf.nl/en/surf-research-cloud-collaboration-portal-for-research*](https://www.surf.nl/en/surf-research-cloud-collaboration-portal-for-research).

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| **Cloud platform** | **Year 1**  **[CPU core hours]** | **Year 2**  **[CPU core hours]** | **Year 1**  **[GPU hours]** | **Year 2**  **[GPU hours]** |
| HPC Cloud (via SURF Research) |  |  |  |  |

Associated storage components

Enter here the volumes, in units of TB, per storage component. If technically feasible it is allowed to select multiple storage components. If the same storage component is used for different compute platform then mention the other processing platforms in the last column.

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| --- | --- | --- |
| **Storage component** | **Extra Year 1**  **[TB]** | **Extra Year 2**  **[TB]** |
| Grid storage – disk |  |  |
| Grid storage – tape |  |  |
| Block storage  *(2 TB included)* |  |  |
| (Swift) Object storage |  |  |
| Data Archive |  |  |
|  | | |
| Research Drive | Yes  No | |

Associated expertise hours

Enter here the amount of SURF expertise, in units of man hours, related to the implementation details provided in Section 5b ‘Requested expertise’ in this application form. Use one line per type of expertise. Detailed descriptions of the various types of expertise SURF offers are provided at <https://www.surf.nl/en/consultancy-on-ict-solutions-for-researchers>

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| --- | --- | --- | --- |
| **Expertise** | **Year 1**  **[hours]** | **Year 2**  **[hours]** | ***[Comment]*** |
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Additional remarks

Enter here any additional remarks concerning the technical setup of your project. This may include, but is not limited to, time critical processing, data transport to/from site, private nodes, use and or hosting of special services, collaborative aspects, exotic software requirements and community support. In all cases we strongly encourage you to contact SURF to first assess the feasibility before submitting this application.

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| *Additional remarks* |

1. Cloud Research Consultancy

**Please DELETE the appendices (A,B,C,D ,E) that are NOT relevant for the current proposal**

*Only answer the questions in this section, if you are applying for Cloud Research Consultancy. If you are unable to fill out these questions, please contact SURF for support:* [*https://servicedesk.surf.nl/*](https://servicedesk.surfsara.nl/)

Enter here the estimated CPU and GPU capacity, in wall clock core hours per year, as well as the amount of attached block storage, in TB, for the platforms you propose to use in this project. You can select multiple platforms if required. Detailed descriptions of some of these platforms are provided at: <https://servicedesk.surf.nl/wiki/pages/viewpage.action?pageId=9797642>.

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| --- | --- | --- | --- | --- | --- | --- |
| **Cloud platform** | **Year 1**  **[CPU core hours]** | **Year 2**  **[CPU core hours]** | **Year 1**  **[GPU hours]** | **Year 2**  **[GPU hours]** | **Year 1**  **[TB]** | **Year 2**  **[TB]** |
| MS4 |  |  |  |  |  |  |
| Kubernetes |  |  |  |  |  |  |

Associated storage components

Enter here the volumes, in units of TB, per storage component for each of the selected compute platforms. If technically feasible it is allowed to select multiple storage components per compute platform. If the same storage component is used for different compute platform then please provide each on a separate line. Detailed descriptions are provided at: <https://servicedesk.surf.nl/wiki/pages/viewpage.action?pageId=9797642>.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Storage component** | **Year 1**  **[TB]** | **Year 2**  **[TB]** | **Location** | **CCS Platform** |
| Grid storage - disk |  |  | SURF |  |
| Grid storage - disk |  |  | NIKHEF |  |
| Grid storage - tape |  |  | SURF |  |
| (Swift) Object storage |  |  | SURF |  |
| Data Archive |  |  | SURF |  |
|  | | | | |
| Research Drive | Yes  No | | | |

*Note that in case your application requires a configuration that also involves one or more other compute or processing services as a back-end system, the corresponding technical sections for these services should be filled out separately.*

Associated expertise hours

Enter here the estimated amount of SURF expertise, in units of hours, related to the implementation details provided in Section 5b ‘Requested expertise’ in this application form. It is important that you have already discussed your detailed requirements with SURF advisors, since the Cloud Research Consultancy involve a particularly diverse range of expertise, of which a specific subset needs to be allocated for your project. Please use one line per type of expertise. Note that expertise is the most important component of this service. The implementation plan should describe all co-development that involves SURF personnel together with a motivation for the required hours of expertise. Apart from specific expertise related to your project, any kind of regular support also needs to be included. For Cloud Research Consultancy projects the **required expertise typically starts at 120 hours per year**.

Detailed descriptions of the various types of expertise SURF offers are provided at: <https://www.surf.nl/en/consultancy-on-ict-solutions-for-researchers>.

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| **Expertise** | **Year 1**  **[hours]** | **Year 2**  **[hours]** | ***[Comment]*** |
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Additional remarks

Enter here any additional remarks concerning the technical setup and expertise requested for your project. This may include, but is not limited to architectural design, automation, helpdesk support, software porting, security, interoperability with other services, and community support. In all cases we strongly encourage you to contact SURF to first assess the feasibility before submitting this application.

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| *Additional remarks* |

1. [↑](#footnote-ref-2)