Concept for Setting up a Working Group in the NFDI Section "Common Infrastructures"

Name of the working group
Research Software Engineering

Acronym
infra-rse

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Abstract

The Working Group *Research Software Engineering* (WG infra-RSE) of the NFDI Section *Common Infrastructures* brings the NFDI consortia together in all software-related aspects of the joint development of the National Research Data Infrastructure (NFDI). Firstly, the WG addresses software infrastructure components that, taken together, represent an integral part of the NFDI with its networked structure. Secondly, the WG also addresses research software, i.e. software products and digital tools that are developed by researchers and used for research purposes, especially for working with research data. Last but not least, the WG also addresses the needs of research software engineers (RSEs), e.g., by providing RSE- and NFDI-specific communication and networking channels.

For this purpose, the WG operates a central forum for the necessary communication, exchange and development of recommendations as well as alternatives for their implementation. The WG facilitates early processes for consensus-building in order to implement jointly cross-consortium measures on the topic of software and in a coordinated manner within the NFDI.
Furthermore, the WG establishes the software ecosystem within the NFDI that is necessary for professional software engineering, similar to the structures of large, distributed, free and open source software communities that have been functioning for decades.
In addition, the WG supports the consortia in topics such as the provisioning of research software and the communication of best practices in research software engineering.

Finally, the WG serves as an interface for the NFDI to comparable European and international initiatives in order to promote the connectivity of the NFDI with other infrastructures in Europe and worldwide. The needs and requirements of the scientific communities are brought into the WG through the participation of the NFDI members.

Motivation and Objectives

Software is a fundamental tool in increasingly digitized research processes involving research data. The development and use of software for research purposes has multiplied over the last two decades. The research software available today ranges from small, helpful scripts to robust software products and complex software systems. In a wide variety of forms, research software supports the work of local working groups, small scientific communities and large global research networks. Research software opens up generic offerings that are widely used and are often used as the basis for software products that build on them. However, it also provides specific offers tailored to specific use cases, which are used by specialist communities for special purposes in research. With its range of variation and abundance, the provision of research software and the possibility of being found has become a challenge. However, working with research data and its usefulness go hand in hand with the use of research software. In addition to the research data, the software required for its use must thus be equally available - and opens up new possibilities through its use with other research data of the same type.

In addition to its use in research activities, software also represents an essential component in digital infrastructures. Digital infrastructures consist not only of IT hardware and communication networks, but also of distributed, complex software systems with various software components that work in

coordination with each other. The functionality, connectivity, compatibility and security of the infrastructure as a whole and of the individual software components depend on jointly agreed interfaces, standards and conventions. The development of a networked infrastructure as envisaged in the Research Data Commons (RDC) concept[1] requires jointly developed solutions and agreements for their implementation. Ideally, these common solutions are implemented jointly in agile processes with involvement of NFDI consortia, as well as other national and international partners. This promotes not only the necessary harmonization but also re-use and reusability as well as the efficient use of resources.

For all focal points - research software, RSEs, and software infrastructure of the NFDI - the following objectives, which still need to be specified and are to be implemented step by step, are planned:

1) a *software ecosystem* - similar to the structures of established free and open source software communities - which enables the joint and coordinated implementation, further development and maintenance of the software components required for the development and operation of the networked digital data infrastructure of the NFDI;

2) a *forum* for the necessary communication, which promotes the exchange of information on current developments and best practices within the consortia, in Europe and worldwide, as well as early coordination for the development of common approaches and recommendations;

3) a *software expert panel* (either the WG or as a new panel) and processes embedded in the NFDI governance, which ensure the development of early coordinated recommendations and the preparation of joint decisions in committees of the NFDI on software-related topics, as well as the receipt and processing of requests on the topics of research software and software infrastructure from committees of the NFDI;

4) the prototypical achievement of the above objectives by means of one or more *use cases*, validation of the results and successive introduction of the acquired measures together with the experience gained in further use cases across consortia;

5) a *marketplace* for accessing the extensive portfolio of research software implicitly brought together in the NFDI, with the necessary metadata to enable work with the research data made available in the NFDI;

6) recommendations for *training* opportunities to communicate good practice in software development to the wider community of developers and researchers within the NFDI (in consultation with the Education and Training Section) building upon available training material and initiatives.

For achieving the objectives, the WG will not carry out major software development, will not provide services nor bundle services. The WG will only promote networking on software-related aspects within the NFDI and will act in an advisory and supportive capacity.

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[1] https://docs.google.com/presentation/d/1mbdS3m5xDuIN3LEspGu0SHSyYdveRkG59mROQcSVtdc/edit#slide=id.gf4efc09af7_0_5

Work Plan

Tasks of the WG within the NFDI

With its installation, the WG will involve representatives of the consortia, bring together the consortia on the topics of research software and software engineering, collectively survey the status quo of the consortia and establish coordination processes for the development of initial publications with the following results:
- Establish a forum with initial events to exchange and survey the status quo in the consortia and to present best practices and solutions with impulses coming from outside the NFDI (Objective 2).
- Produce a report on the status quo in the NFDI with regard to research software and software engineering in the consortia (Objective 2).
- Development of a draft for a common mission statement "Software Engineering in the NFDI" (Objective 1)
- Develop a draft strategy for establishing a software ecosystem within the NFDI (Objective 1)
- Identification of use cases for a cross-consortium, step-by-step, prototypical development of the software ecosystem (Objectives 1 and 4)
- Develop a recommendation for ensuring quality criteria such as reliability, compatibility and security, as well as for any necessary assistance such as the provision of checklists and a test suite for testing the software (Objective 1)
- Compilation of open questions and the resulting follow-up tasks after completion of the above-mentioned work for a possible continuation and mandating of the WG after expiry of the initial term.

Task of the NFDI bodies in cooperation with the WG

In discussions with NFDI committees, the WG will explore the need for regulations on coordination processes and governance between committees and the WG, as well as the need for and tasks of a Software Expert Panel, and, if necessary, develop alternatives for the implementation of governance structures with the following result:
- Develop a recommendation on governance structures, and describe an agreed proposal for implementation (Objective 3).

Tasks of the consortia with support from the WG

In preparation for the concretisation of the planning of projects and measures, the following tasks are processed with corresponding results:
- Development of a concept for the Marketplace, taking into account requirements from the consortia and taking into account the results of a landscape analysis on available solutions, solution approaches and, if applicable, best practices (Objective 5)
- Creating recommendations for training opportunities to spread good practices in terms of software development using available content and training initiatives (Objective 6)
- Develop a recommendation ensuring quality of research software in relation to software badges in terms of runnability, repeatability/traceability, comparability, reusability/reuse and reproducibility (Objective 5)

Prioritization of the above-mentioned work, division of the work into smaller teams of the WG and the possible involvement of NFDI committee representatives in individual activities will be discussed and clarified immediately after the WG is set up and begins its work.

The work of the working group is initially supported by the participation of the funded consortia. The necessary implementation of joint concrete measures may take place in the context of the NFDI-wide basic services and/or further funding options if additional resources are required beyond the funding of the consortia.

Collaboration Plan

In order to ensure connectivity and compatibility with European and international efforts and to dovetail the activities there with those of the NFDI, the WG acts as an interface and focal point for the NFDI on the topic of software. The members of the WG already bring the necessary active networking to these initiatives. This ensures both the necessary transfer of knowledge on current activities and results from outside to the NFDI as well as impulses which can be introduced from the NFDI into other initiatives. In addition, guests are invited to WG-related topics on a permanent basis and as required in order to integrate additional expertise.

Participation of WG members in complementary initiatives outside the NFDI:
- EOSC Task Force Infrastructure for Quality Research Software → Bernd Flemisch, Leyla Jael Castro
- RDA FAIR for Research Software (FAIR4RS) WG → Leyla Jael Castro, Tibor Kalman
- EURISE Network → Tibor Kalman
- Allianz Initiative → Konrad Förstner
- deRSE e.V. → Frank Löffler
- International Council of RSE associations → Frank Löffler
- Free Software Foundation Europe e.V. → Christian Busse
- AG DH-RSE → Daniel Jettka

Participation of guests for the integration of necessary expertise:
- tbc

WG members are also involved in other sections and working groups of the NFDI to ensure the exchange of information and to enable synergies, e.g. with the section *Education and Training*.

Initial Membership List

The needs and requirements of the scientific communities are brought into the WG through the participation of the consortia. The following consortia and organizations support the inclusion of the above-mentioned work by the WG and will participate in the work of the WG during the initial term with the named representatives:

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The participation of other consortia and organizations is expressly desired and required. Joining the WG is possible at any time.