FENIX

RESEARCH INFRASTRUCTURE

Fenix e-infrastructure service provisioning - lessons learned

WHITEPAPER

www.fenix-ri.eu

Content

Acronyms

ACD	Active Data Repositories
ARD	Archival Data Repositories
BSC	Barcelona Supercomputing Center
CEA	Commissariat à l'énergie atomique et aux énergies alternatives
CINECA	Consorzio Interuniversitario
CSCS	Centro Svizzero di Calcolo Scientifico
HBP	Human Brain Project
HPC	High Performance Computing
IAC	Interactive Computing Services
ICEI	Interactive Computing E-Infrastructure for the Human Brain Project
JSC	Jülich Supercomputing Centre
PI	Principal Investigator
PRACE	Partnership for Advanced Computing in Europe
R&D	Research & Development
SCC	Scalable Computing Services
VM	Virtual Machine Services

1. Introduction

This document aims to summarise the typical research categories making use of the Fenix resources and services, and the knowledge the consortium has gained about if and how the offered services are meeting the users' needs. This White Paper targets similar initiatives and e-infrastructure service providers, which are offering services to multiple user communities.

The following sections include, after a brief introduction of the services that are available within the Fenix Infrastructure, statistics on the users and results from the consultations that have been run to understand their satisfaction and issues with the offered services. The document will conclude with the lesson learned and outlook for the future.

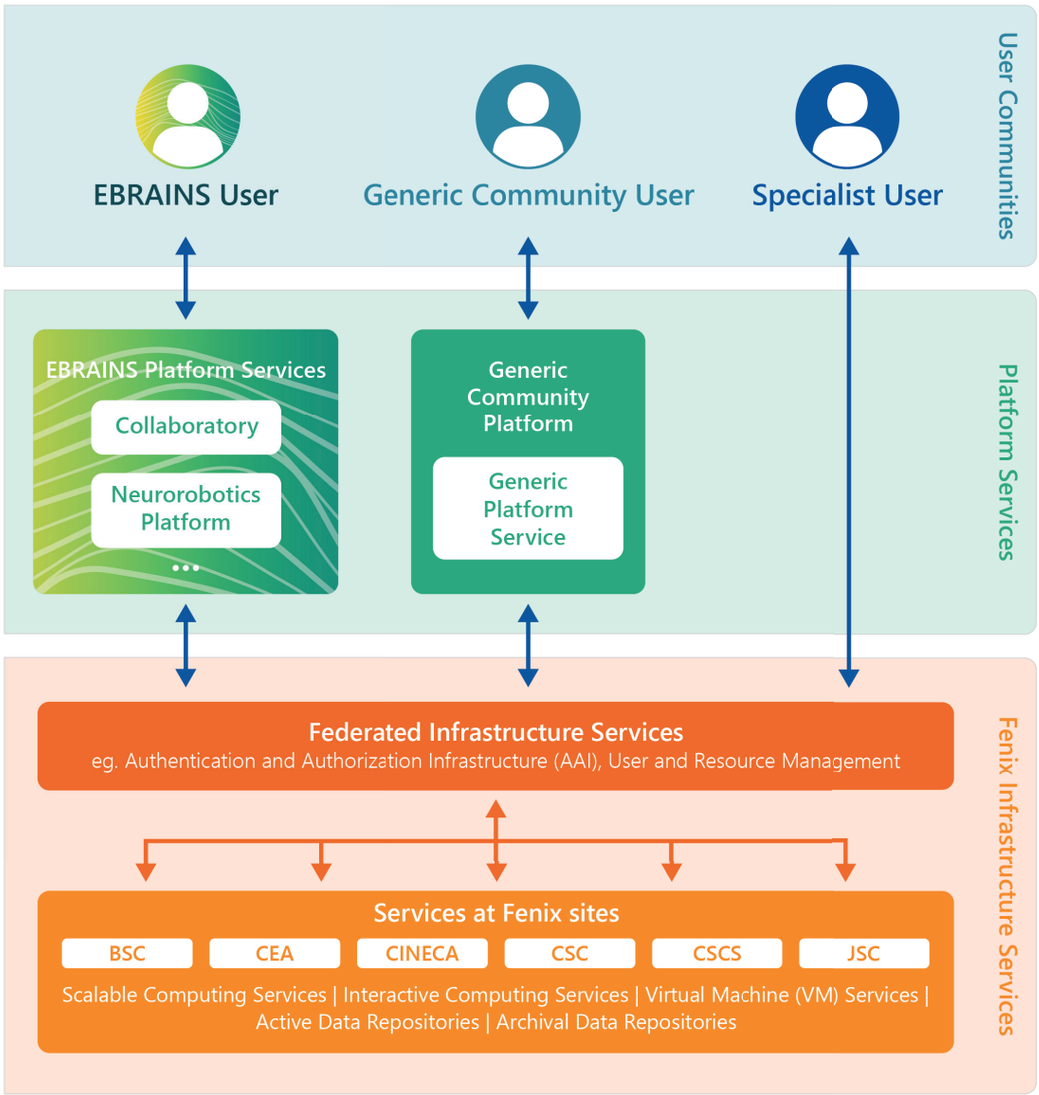
2. Fenix offering to users

Six European supercomputing centres, namely BSC (Spain), CEA (France), CINECA (Italy), CSC (Finland), CSCS (Switzerland) and JSC (Germany), agreed to align their services to facilitate the creation of the Fenix Infrastructure. The distinguishing characteristic of this e-infrastructure is that data repositories and scalable supercomputing systems are in close proximity and well integrated. An initial version of the Fenix Infrastructure has been realised through the ICEI project (Interactive Computing E-Infrastructure for the Human Brain Project, 01/2018 - 09/2023).

The Fenix HPC, cloud and storage infrastructure services available for research communities and users can be summarised as follows:

- Interactive Computing Services (IAC): Quick access to single compute servers to analyse and visualise data interactively, or to connect to running simulations, which are using the scalable compute services.
- Scalable Computing Services (SCC): Massively parallel HPC systems that are suitable for highly parallel simulations or for high-throughput data analysis tasks.
- Virtual Machine Services (VM): Service for deploying virtual machines in a stable and controlled environment that is, for example, suitable for deploying platform services like the HBP user portal ("Collaboratory"), image services or neuromorphic computing and neurorobotics front-end services.
- Active Data Repositories (ACD): Site-local data repositories close to computational and/or visualisation resources that are used for storing temporary replicas of data sets.
- Archival Data Repositories (ARD): Federated data storage, optimised for capacity, reliability and availability that is used for long-term storage of large data sets which cannot be easily regenerated.

These services can be accessed by users via a federation layer, which provides authentication and authorisation as well as User and Resource Management as depicted in the figure below.



Beyond the usage of services and resources, users can engage with the Fenix service providers in different ways: Particularly important is the establishment of the Fenix User Forum (FUF); this is an online platform for the interaction between users and Fenix experts as well as among users themselves, for Fenix documentation dedicated to users, and for user events and meetings.

Fenix Infrastructure users can also actively participate in a series of webinars that are being organised regularly to introduce relevant audiences to the available services and resources, offer guidance on practical issues such as applying for and using the resources, and to showcase use cases that exploit the Fenix services. The recordings of the Fenix webinars, success stories from different use cases, and technical documentation on the Fenix Infrastructure services are published on the Fenix website.

3. Who are the Fenix users?

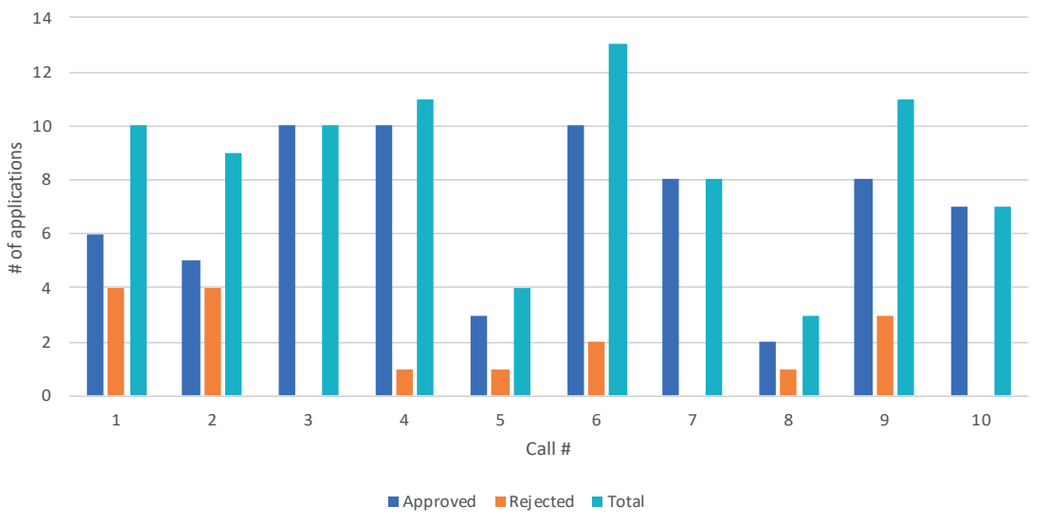
Service-oriented provisioning of computing and storage resources within Fenix aims to support in particular science communities that develop, deploy and operate domain specific platform services. These services run on top of the Fenix Infrastructure services. The Human Brain Project is the prime and lead user community. Other science and engineering communities are provided access in collaboration with PRACE. In all cases, resource access is granted free of charge and the review process of requests for resources follows the peer review principles that have been established by PRACE, including a technical and a scientific review.

Benefits of the Fenix e-infrastructure services provisioned to its users include the following:

- The provisioned Fenix services and resources are free of charge;
- Also PhD students and scientists from countries without larger national HPC systems can apply;
- Project proposals are comparably short and easy to prepare;
- The acceptance rate of submitted project proposals is significantly higher than through other calls (also due to the low usage);
- Flexibility with regards to the timeline for submitting project proposals (continuously open call for EBRAINS/HBP members and neuroscientists) and the allocated resources can be changed during the project lifetime, if necessary;
- Small/short-term allocations, e.g. for workshops and trainings, are possible;
- Fenix offers a distinct set of resources not available through other calls.

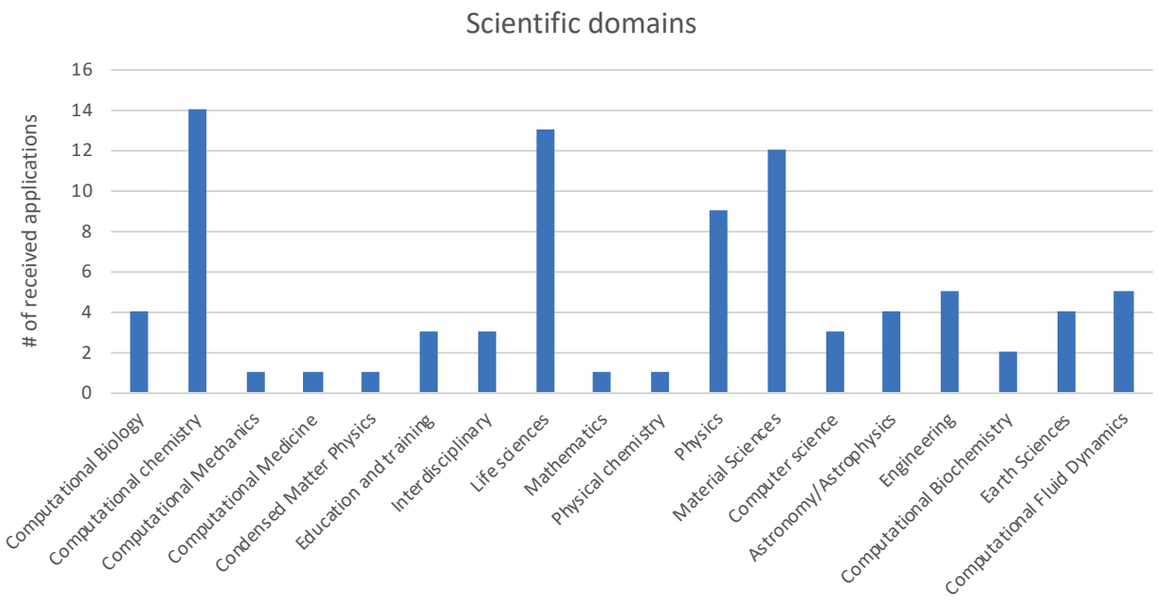
3.1 PRACE users

10 calls have been run since 2020 with a total of 86 applications received. The projects were submitted by 61 unique principal investigators (PIs) of whom 20% are women. Of these proposals 68 were both technically and scientifically positively evaluated, and resources were granted at the supercomputing centres.
The trend shows an average of 8 proposals received per call with an average acceptance rate of 80%.



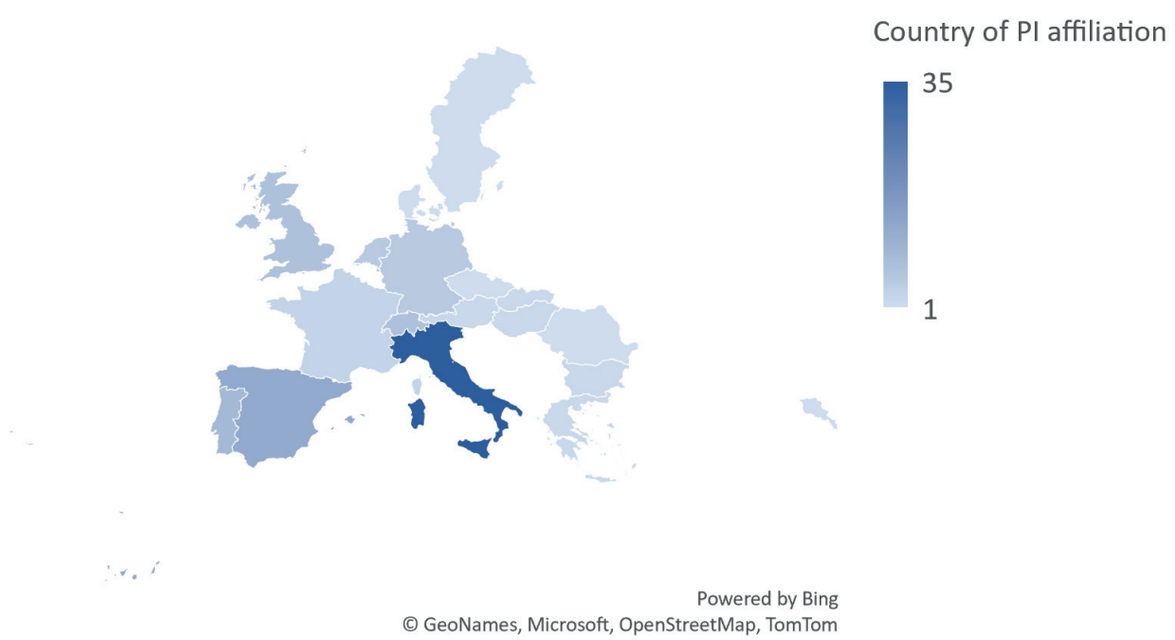
Number of received, approved and rejected applications for each PRACE call

18 scientific domains are covered by the received applications, half of which are from 4 main research areas: chemistry, physics, life sciences, and material sciences.



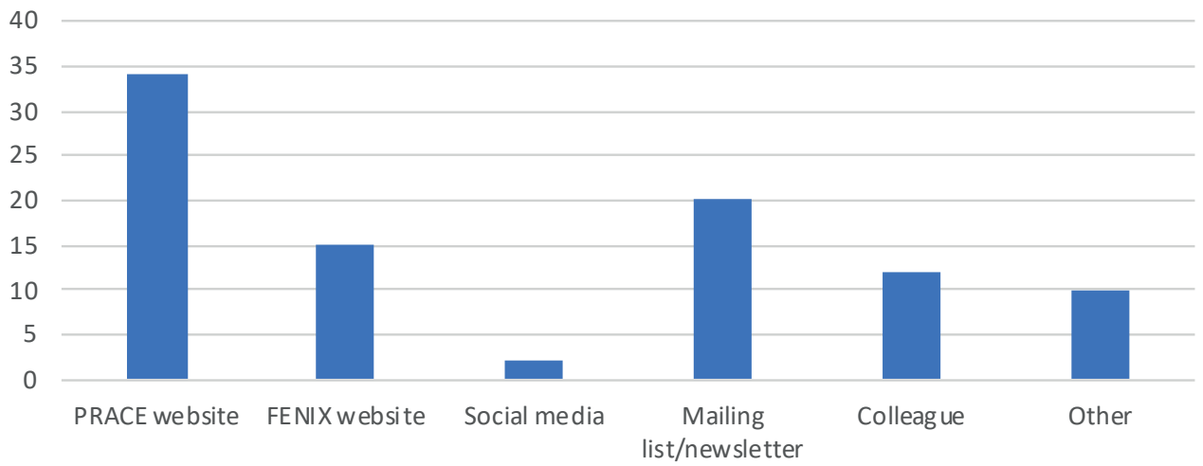
Number of applications received in the different scientific domains

Applications are received from many countries in Europe (17 in total), with also a good representation of Eastern European countries.



Number of received applications per country of affiliation of the PI

The majority of the applicants have learned about the calls and the Fenix Infrastructure and available resources from the PRACE website or via newsletter and mailing lists.

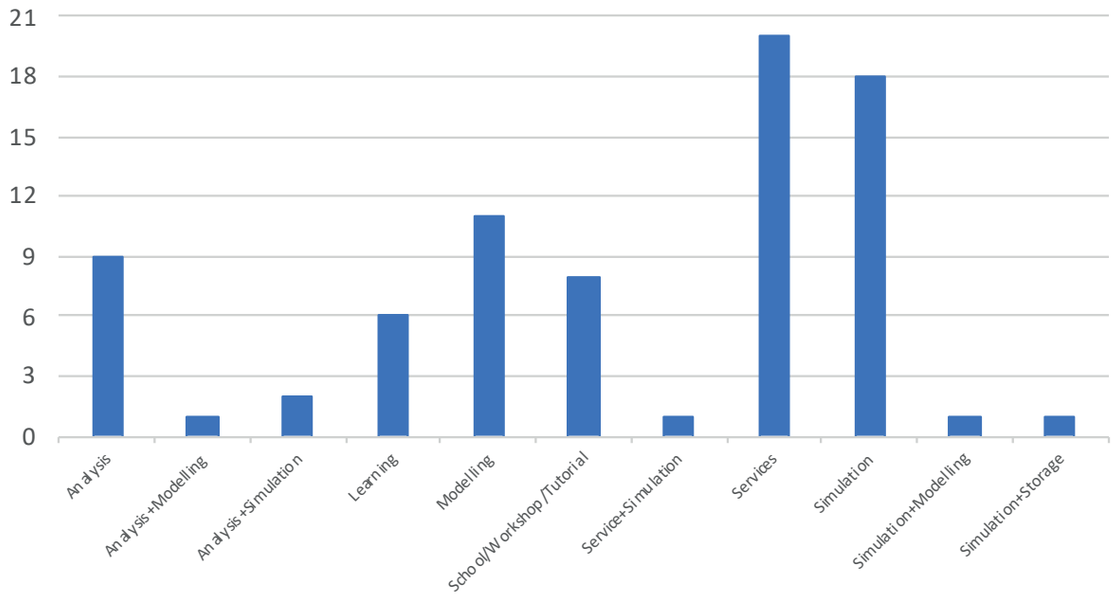


Number of times each channel has been indicated as a source of information on the PRACE calls
**Please note that multiple replies are possible for this question in the application form*

3.2 HBP users

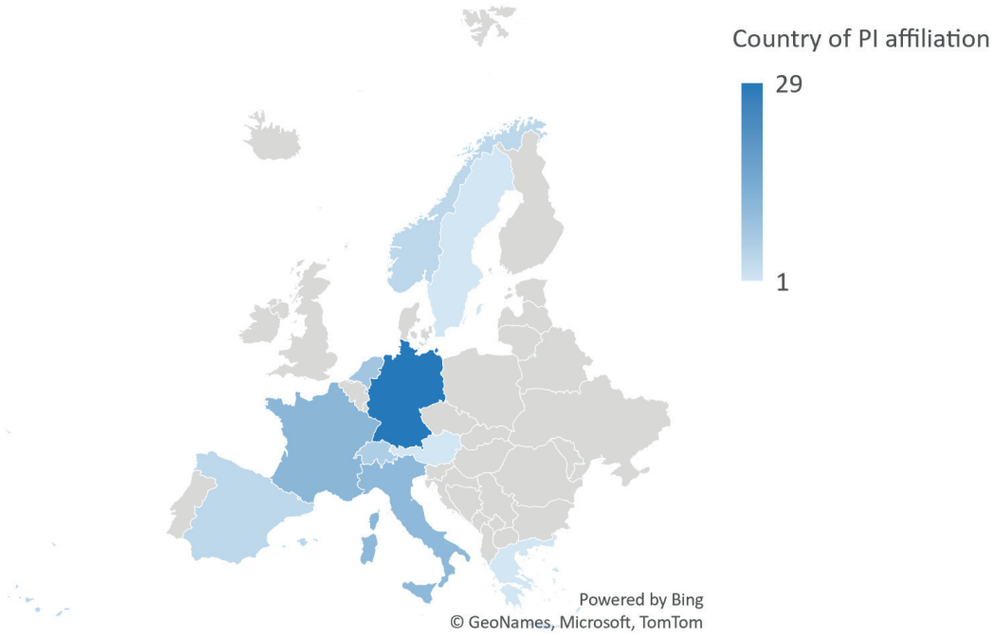
78 proposals have been received by the end of September 2022, which were all positively evaluated and accepted for resource allocation. The projects were submitted by 49 unique PIs of which 17% are women.

For HBP users instead of looking at the scientific domain we analysed the sub-topic covered by the projects, and it can be noted that the majority of projects are offering services or running simulations.



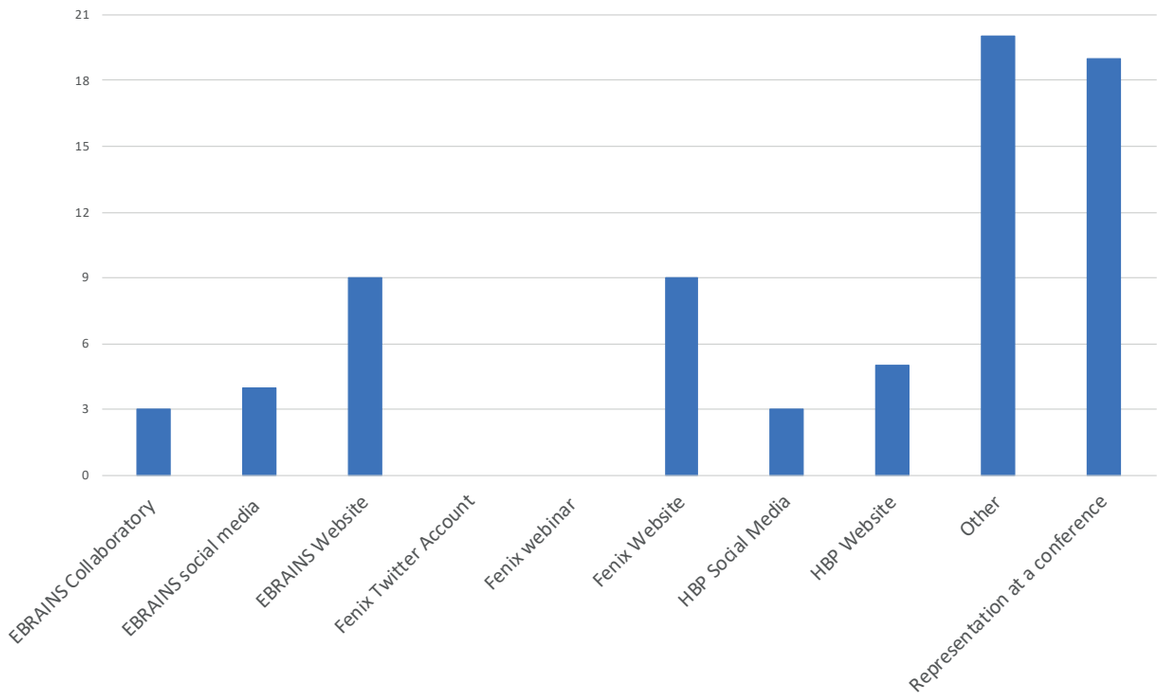
Number of applications received in the different research areas

For what concerns the geographical location of the institutions of the principal investigators, there is a good coverage of European countries. It is evident that there is a high number of applications coming from Germany; the reasons behind this will be further investigated if this trend will continue in the future.



Number of received application per country of affiliation of the PI

The majority of the applicants have learned about the possibility to apply for resources of the Fenix Infrastructure through the HBP resource allocation mechanism from the EBRAINS and Fenix websites or via presentation/representation at a conference/workshop/tutorial and other HBP members (the last one included in "Other").



Number of times each channel has been indicated as a source of information by HBP applicants

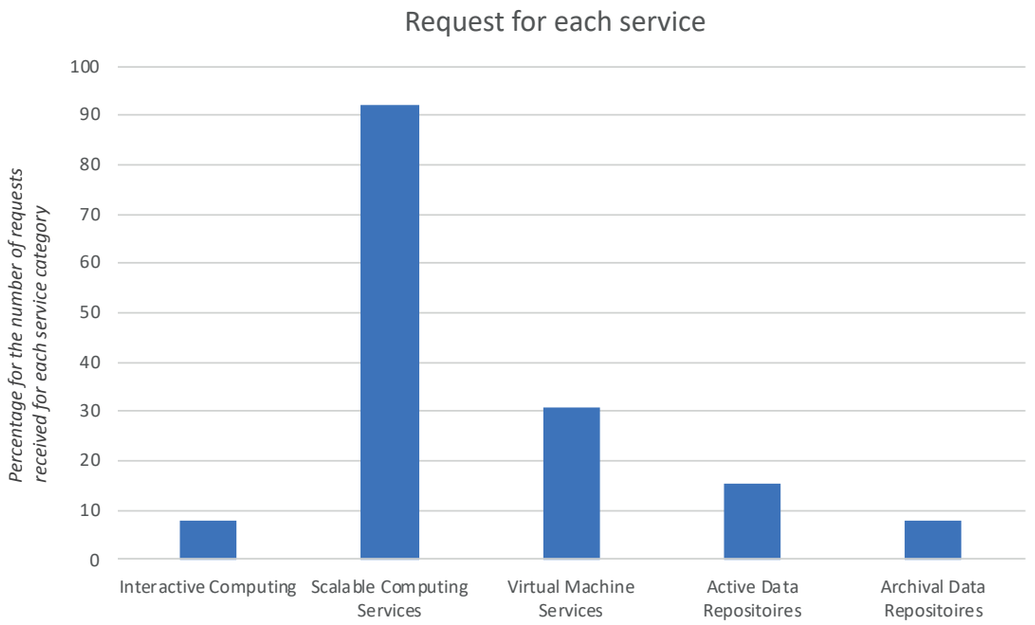
3.3 Users' feedback surveys

Different surveys have been conducted to understand the satisfaction of users of the Fenix Infrastructure with the offered services, and to identify issues that could be improved.

3.3.1 Users' survey autumn 2021

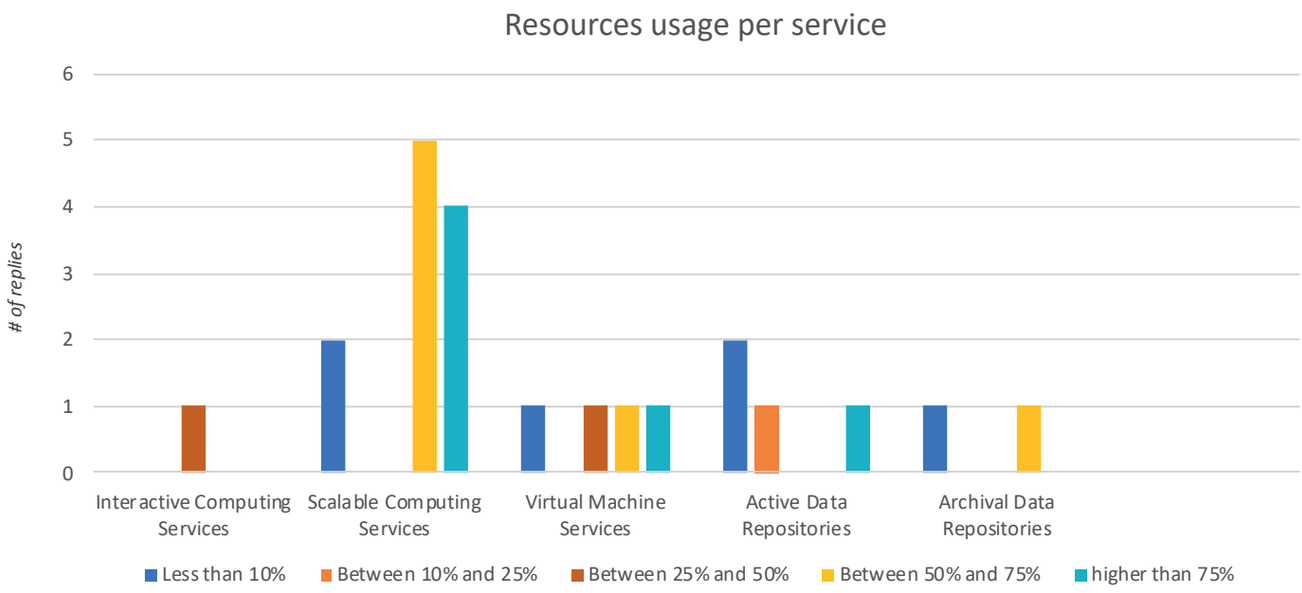
A first users' survey was designed to collect feedback from the PIs of both PRACE and HBP projects so that the team would be able to address potential issues with respect to resource request, access procedures and usage of the services. The survey was sent out in September 2021.
A total of 13 replies have been received which were almost equally distributed between PRACE and HBP users (7 and 6 PIs respectively).

84% of the respondents found it easy or very easy to apply for resources of the Fenix Infrastructure (with an average of 4 points on a scale up to 5) with Scalable Computing Services being the most requested one.



Number of requests for each service category

If we look at the self-assessment on the usage of the resources, **scalable computing resources are being used by 84% of the PIs, while all other services see some slow uptake of the resource utilization.**



Self-assessment on the usage of the requested service

When asked about the reasons for this low usage, a few users commented that the project was recently started or that they foresee no issues in making use of all resources by the end of it; other reasons were related to specific project constraints (i.e. availability of experimental data or code updates to be completed).

Overall, **more than 90% of PIs reported that they are satisfied or very satisfied with the provisioned services.** Reasons for dissatisfaction were reported to be: scheduled downtime not well announced to users, more reliability needed, and lack of support for workflows involving human data.

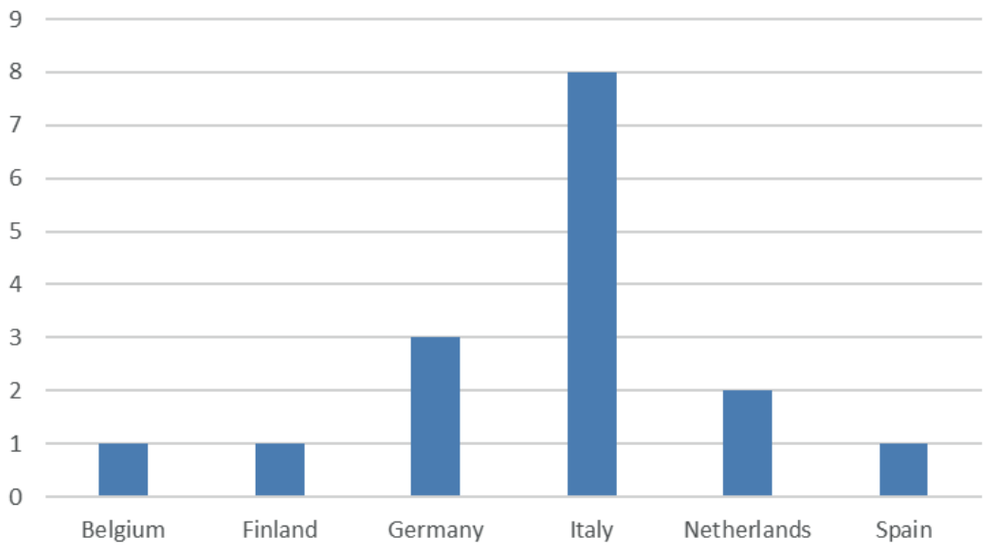
In general, from the analysis of all the replies, we can summarise that PRACE users are usually more satisfied with the provided services and support than the ones who received resources via the HBP application process and they are more aware of the different support activities. HBP users under-use the resources more often and to a larger extent than the PRACE users.

3.3.2 Users' survey summer 2022

Following the results of the previous survey and the collected statistics on resource allocation and utilization by the HBP user community, the consortium decided to reach-out to leading European brain scientists that use simulations for their research to collect their feedback and better understand the lower uptake from HBP researchers as compared to PRACE users (section 3.3.1). For this purpose, two additional surveys have been sent out in June 2022. The first one addressed the HBP users who already successfully submitted requests for resources of the Fenix Infrastructure to collect information on the reasons for the lower than planned usage. The second survey was sent out to European brain scientists in the computational domain in order to collect insights on the awareness about the availability of the Fenix Infrastructure resources and their interest in applying for resources.

3.3.2.1 Neuroscientists not using Fenix resources

The survey was sent to 53 contacts from 23 different neuroscience communities, and shared with the HBP consortium to collect the feedback from members who are not using resources of the Fenix Infrastructure (yet). 17 replies were received.
In terms of geographical distribution, we received responses from 6 different countries.



Replies to the question "Which country hosts your institution?"

Looking at the research areas, 5 responses are from researchers working in computational neuroscience, while the others cover quite a wide range of topics within the Neuroscience domain (like Systems neuroscience, Neurophysiology, Cellular Neuroscience).

The majority of the respondents (about 60%) have more than 10 years of experience in this domain and less than 6 years of experience in using HPC and cloud computing. Only two users are not currently using any HPC or cloud computing resources in their research.
About 65% of the users knew about the Fenix Infrastructure.

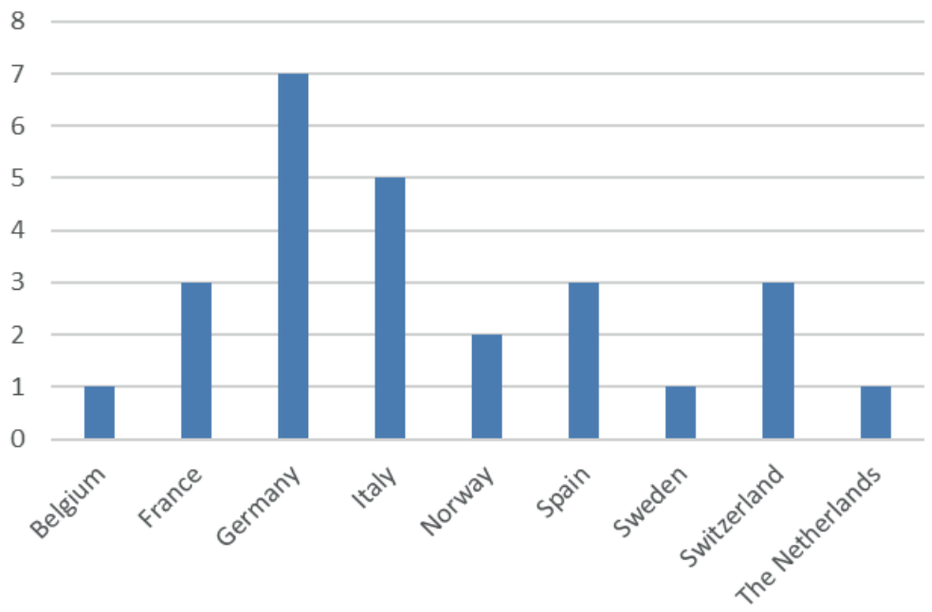
Replies to the question "Do you know the Fenix Infrastructure?"

Among those 11 who were aware of the Fenix Infrastructure, most of them have learned about it from colleagues or from other sources. 55% of them have applied to make use of Fenix resources. Those who have not applied mentioned as a main reason that they would use local resources mainly set-up to manage the high volume of data.

The 3 over the 5 users, who have not yet applied for Fenix resources, would consider applying in the future.

3.3.2.2 Current Fenix users - HBP members and neuroscientists

This second survey was designed to reach out to HBP members and neuroscientists already accessing the Fenix resources, in order to understand their level of satisfaction with the provided services. The survey was sent to 167 users, and we received 27 replies (with a response rate of 16%).
The received replies cover users from 9 different countries.



Replies to the question "Which country hosts your institution?"

If we look at the respondents' experience in neuroscience, the majority (about 75%) have less than 10 years of experience in this domain, including 42% with less than 6 years of experience. This nicely shows that the call is open to early career researchers and this opportunity is also well taken by this target group. The respondents were spread a bit more evenly in terms of experience in HPC and cloud computing with just a bit more than 50% with less than 5 years of experience.

The outcomes of the survey related to the satisfaction can be summarised as follows:

- Documentation and support: 72% of the respondents are satisfied with the documentation and services description. Unhappy users said that it was hard to understand how to access the resources. In terms of user's support, 88% of the respondents are satisfied or very satisfied. Only one of the three dissatisfied users mentioned a reason for this and it was related to slow response time.
- Scalable Computing Services 79% of the respondents are either satisfied or very satisfied.
- Interactive Computing Services: 50% of the respondents are either satisfied or very satisfied with the majority of users being neither satisfied nor dissatisfied.
- Virtual Machine Services: 39% of the respondents are either satisfied or very satisfied with the majority of users being neither satisfied nor dissatisfied.
- Active data repositories: 57% of the respondents are either satisfied or very satisfied.
- Archival data repositories: Half of the respondents are satisfied or very satisfied with the service; in this case no users are unsatisfied.

In all cases where dissatisfaction on the usage of the service was reported, no reasons were provided for the cases of dissatisfaction.

From the above replies, it can be concluded that the Scalable Computing Service, besides being the most requested service, is also the one meeting best the user needs. This could be related to the higher experience researchers have with this type of service.
It is also important to note that about 50% of the respondents would recommend colleagues to apply for the Fenix resources.

3.3.3 Follow-up of events

An additional way of engaging with current and potential Fenix users is to follow-up with the attendees of the Fenix webinar series.

A post-webinar survey was created with the feedback of the communication and technical experts of the consortium. The questionnaire was kept short and to the point to allow for more replies.

Different ways were used to encourage the webinar attendees to complete this short survey:

- Promote the survey at the beginning and end of the webinars
- Send the survey link in the webinar chat
- Automatic survey link opens in the participant's browser once the session is over
- Survey link included in the post-webinar follow-up email that is sent to all attendees and registered participants

Based on the feedback provided in the post-webinar survey, **most of the attendees assessed the Fenix webinars of great value and were satisfied with the length, content and material/tools/techniques of the webinar.** About half of the attendees stated that they have projects that would benefit from the Fenix services and feel ready to use the Fenix Infrastructure. The majority of attendees stated that they would like to be contacted for future Fenix activities and provided their contact details for this purpose.

In case the Fenix webinar attendees provided qualitative feedback to the open-ended questions, the responses are addressed individually and follow-up actions are taken to address the received feedback. In particular, we addressed proposed topics for future webinars and questions by organizing webinars including the particular topics with examples, and also organised presentations on specific case studies/success stories.

Furthermore, in attempting to follow-up with the webinar attendees, a follow-up email is sent to all attendees that includes links to the Fenix Resources and Access pages, the open Fenix Calls that are ongoing at the time along with the respective deadline to apply, the information on upcoming events, the FUF registration page, and the post-webinar survey link. Participants are also encouraged to keep up to date with the Fenix activities by following the social media channels and to catch up with the webinars by checking the recordings and presentations slides on the Webinars page.

Finally, a personalised email is sent by the ICEI project management office to those people that responded to the surveys and said that they would like to be contacted for support. Apart from useful practical information and links, similar to the ones sent in the standard follow-up email, this email also stated the willingness and availability of the Fenix experts to offer individual support via email or call regarding the application process.

4. Lessons learned & outlook

Based on the collected information on the current Fenix user base and analysis of the received feedback on the offered Fenix services and events, the following graph highlights the key lessons learned and related actions to further improve the Fenix offering and user satisfaction.

In the future, the ICEI project will continue to serve science communities by providing sustainable e-infrastructure services with access to the leading-edge supercomputers in Europe.

Key actions will include:

- Continue to provide success stories and use cases examples via webinars and the website to show the added value in the usage of the Fenix Infrastructure services;
- Continue the monitoring of the usage of the allocated resources and interact with users showing low usage so to identify as early as possible any technical or organisational bottleneck;
- Organise another survey with Fenix Infrastructure users to monitor the users' satisfaction and collect feedback for possible future improvements in the service offering.

Lessons learned	Actions taken
Add a **question in application form on how applicants** learned **from provisioned services**	Increase **promotion of service** offering via respective channel
Continuous monitoring of uptake of provided **services**	Regular **internal meetings** of service providers to assess the situation and agree on related improvements/new strategies
Provide **clear instructions** on how to **access provisioned services** and refer to all relevant details, continuously review, update and promote information on access	Provide **information on access in video format**, implement **online application tool,** if possible
Useful to have a **platform** where the various information **on provisioned services** is provided in one place (documentation, event announcements, maintenance announcements, support...), but an online forum is not the right tool to foster interactions and discussion with users	Provide opportunities for users to share experiences and discuss with service providers at **dedicated user meetings** and **at events** users are usually attending
More utilized services are also more positively rated in feedback surveys	Offer **dedicated training** for **less used services** and **individual support** when users start to use respective services
Real life use cases facilitate the promotion of provisioned services and uptake by users	**Promote provisioned services** via success stories, webinars and presentations by users
Provide **dedicated training, support and documentation** for provisioned services	Closely **monitor service utilization by users,** especially when users start to use a service, and identify blocking technical issues as early as possible, offer individual support
User surveys are a helpful tool in order to receive feedback on the offered services	Organize **user surveys** on the provisioned services **on a regular basis**

Useful links

More about Fenix: https://fenix-ri.eu/about-fenix
Fenix services description: https://fenix-ri.eu/infrastructure/services
How to apply to Fenix resources: https://fenix-ri.eu/access
Electronic application tool for EBRAINS/HBP-affiliated scientists and neuroscientists not affiliated with HBP: https://jards-ebrains.fz-juelich.de/jards/WEB/application/login.php?appkind=jards-ebrains-app
PRACE collaborative calls website: https://prace-ri.eu/hpc-access/collaborative-calls/

More information regarding available resources, allocation process and user guides reagarding the electronic application tool for EBRAINS/HBP-affiliated scientists and neuroscientists not affiliated with HBP: https://wiki.ebrains.eu/bin/view/Collabs/fenix-icei/
Fenix success stories: https://fenix-ri.eu/infrastructures/success-stories

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ICEI has received funding from the European Union's Horizon 2020 research and innovation programme within the Human Brain Project Framework Partnership Agreement under the grant agreement No. 800858.