

The Base4NFDI framework and its basic service projects

André Giesler, Jana Tatscheck
June 10, 2025 | NFDI4Biodiversity



Questions? Send an email to:

base4nfdi-office@lists.nfdi.de

Check our website:

www.base4nfdi.de

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- Jupyter4NFDI
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- DMP4NFDI

Base4NFDI Explainer Video

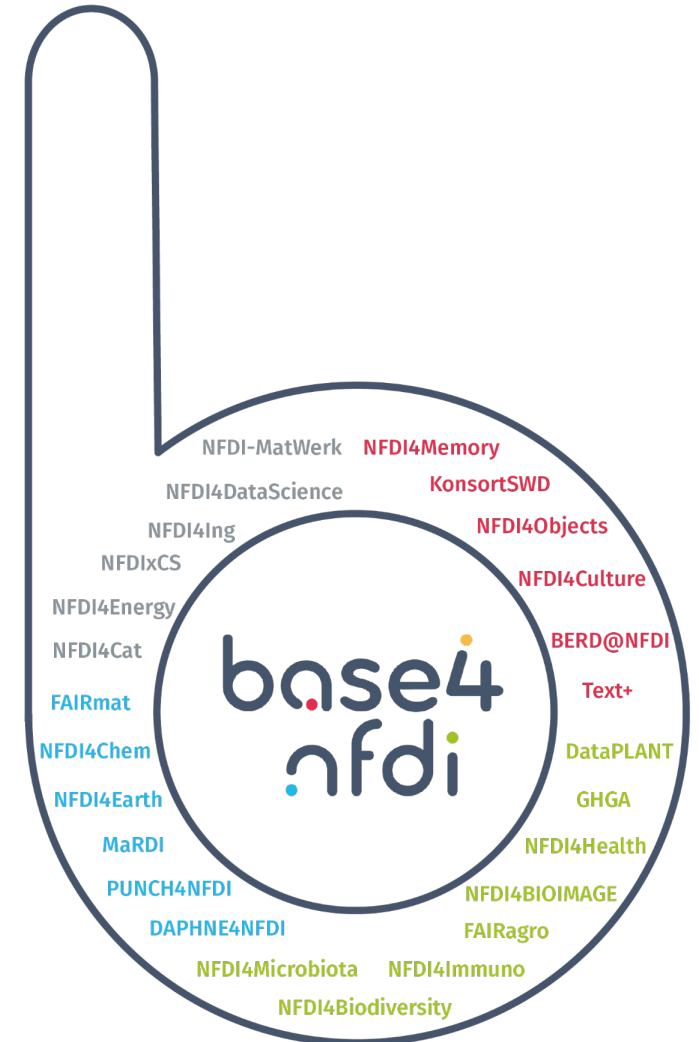
 https://www.youtube.com/watch?v=wZbHh78F_e4



Base4NFDI

Who are we? What do we want?

- Base4NFDI is the joint initiative of **all 26 NFDI** consortia.
- Our goal is to establish **reliable basic services** for **FAIR** research data management.
- Basic services should...
 - create added value for all users,
 - **be usable** for as many consortia as possible,
 - exploit **synergies** between **existing solutions**,
 - **be compatible** with international standards and services (e.g. EOSC)
- Basic Services are **technical-organizational solutions** and consist of a development team



Base4NFDI

How do we promote the basic services?



- Base4NFDI provides the **framework** for **basic services**
- We support the **service teams** during development with
 - the **creation of proposals** for potential services.
 - managing the application process.
 - a transparent allocation of flexible funding.
 - establishing a **stepwise service development process**.
 in different **phases** with different focuses.
 - user-driven requirements analyses (surveys, UX).
 - consulting, training, outreach, legal aspects, ...
 - integration in an NFDI wide basic service portfolio.

However, Base4NFDI *is not* the provider of the basic services.

New roles to support basic service development

How is Base4NFDI staff organized?

Four Task Areas (TA1–TA4)

- to guide and support the services through different phases

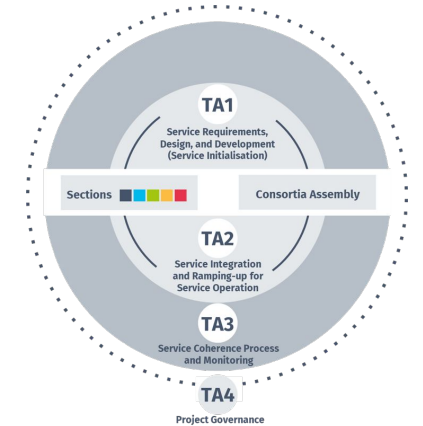
Section Liaison Officers

- directly **support the work of the NFDI Sections** in matters related to preparing basic services development strategies, decisions and monitoring



Service Stewards

- **support the service development** process through all phases
- ensure **exchange of information** between all process stakeholders



Service Stewards

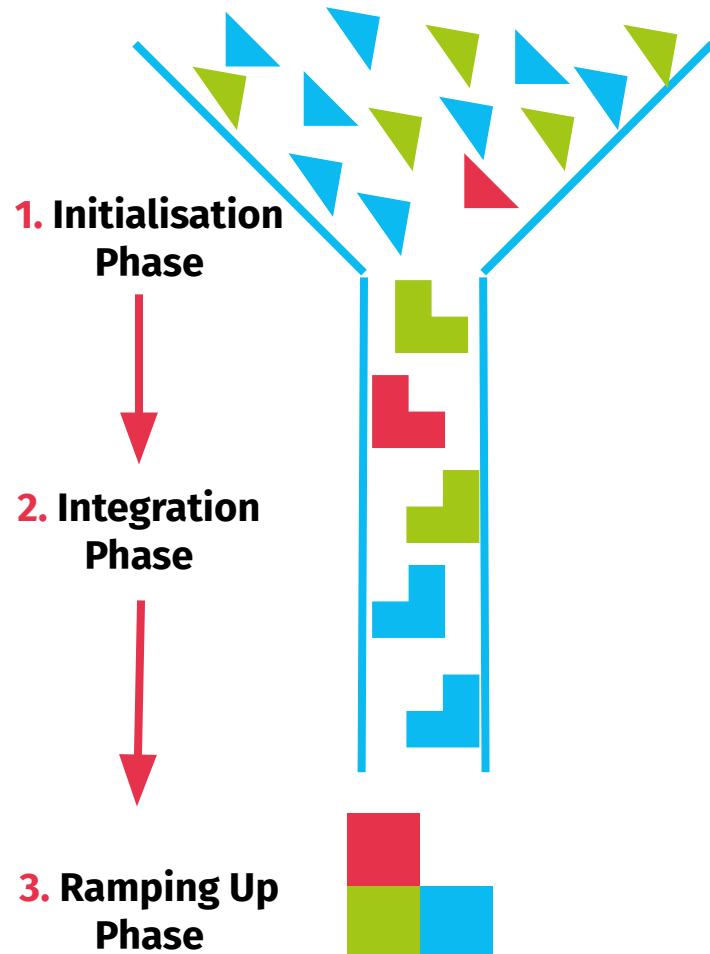
Base4NFDI's interface to the Basic Service Teams and Consortia



Service Refinement during the phases

What is expected from the basic service teams?

Ideally, all implementation phases (application process for each) are run through

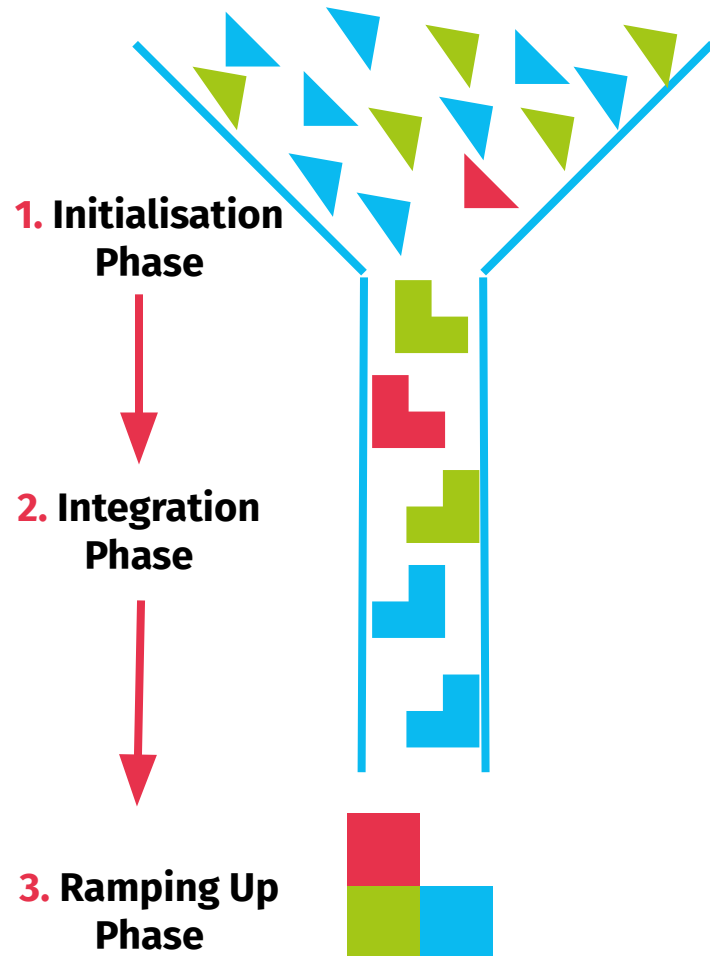


- **Initialisation (1 year):** requirement & landscape analysis, software evaluation, prototypes (software, guidance, websites), outreach
- **Integration (2 years):** implement user requirements (technical exchange), documentation, establish help desk, EOSC and standards alignment, KPIs, training
- **Ramping up (2 years):** Upscaling, offer a long-term operating model, broad usage in NFDI

Service Refinement during the phases

What is expected from the basic service teams?

Ideally, all implementation phases (application process for each) are run through



- **Initialisation (1 year):** requirements analysis, software evaluation (software, guidance), landscape analysis, user requirements (software, guidance)
- **Integration (1 year):** implementation user requirements (software, guidance), monitoring the phases, and requesting deliverables at the end. (critical exchange), documentation, establish help desk, EOSC and standards alignment, KPIs, training
- **Ramping up (2 years):** Upscaling, offer a long-term operating model, broad usage in NFDI

Current basic service projects

... with start of funding



Integration

IAM4.nfdi
Identity and Access Management
for the German National Research
Data Infrastructure



May 2023

TS4.nfdi
Terminology Services
for the German National Research
Data Infrastructure



Nov 2023

PID4.nfdi
Persistent Identifier Services
for the German National Research
Data Infrastructure



Jan 2024



Winter Service Roadshow Videos
<https://base4nfdi.de/news-events/events/services-roadshow-by-base4nfdi-12-2024>




Initialisation

DMP4.nfdi
Data Management Plans
for the German National Research
Data Infrastructure



KGI4.nfdi
Knowledge Graph Infrastructure
for the German National Research
Data Infrastructure



----- June 2024 -----

Jupyter®4.nfdi
A central JupyterHub
for the German National Research
Data Infrastructure



nfdi.software
A research software marketplace
for the German National Research
Data Infrastructure



Nov 2024

RDMT4.nfdi
Research Data Management Training
for the German National Research
Data Infrastructure



Feb 2025

Jupyter4NFDI

Basic Service

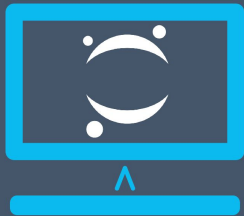
Jupyter4NFDI

Facts

Initialisation

Jupyter®4.nfdi

A central JupyterHub
for the German National Research
Data Infrastructure



base4nfdi.de/projects/jupyter4nfdi

<https://nfdi-jupyter.de/>



jupyter4nfdi@lists.nfdi.de

What is the service based on?

- **Jupyter Notebooks** are a core tool for data science in terms of coding, visualization, reproducibility
- A **JupyterHub** is a multi-user server enabling the use of Notebooks simultaneously making it easier to share resources

What is the goal?

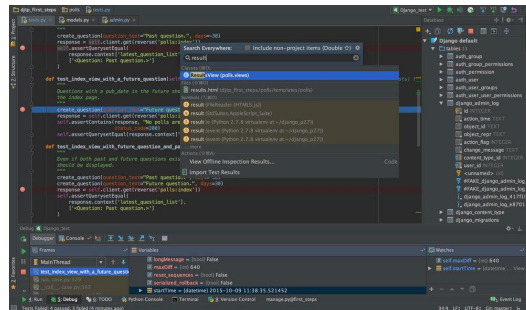
- Establishing a **central JupyterHub for all NFDI users** allowing access to various resources as cloud environments and HPC
- Provide a foundational set of resources by **connecting external sites** to the central instance
- **Simplify access** and improve usability
- Should fit to 90% of all typical use cases

Base4NFDI
Roadshow Dec 2024



What are (Jupyter) Notebooks?

Coding, Visualisation, Reproducibility



Source code



Visualization
(potentially interactive)



Download
GitHub
Binder
Code

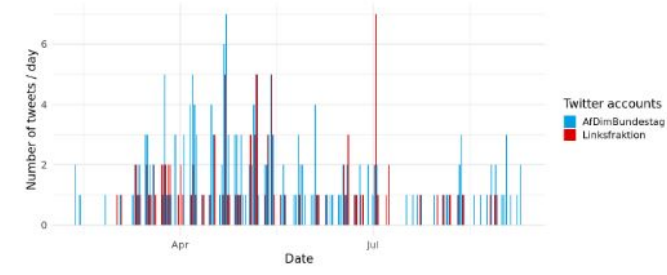
COVID-19 in Germany's Political Discourse

We measure the number of posts on Twitter created by the parties in the German Bundestag containing the string "corona". We restrict us to the account of the left-wing party *Die Linke* (@Linksfraktion) and the right-wing party *Alternative für Deutschland* (@AfDimBundestag).

```
[1]: source("myLib.R")
```

Next, we read the `data` (see `data-collection.ipynb`) and plot the frequency of tweets. For plotting we use the R package `ggplot`.

```
[2]: data <- read_csv("data.csv", col_types = cols()) %>% mutate(date=
data %>% ggplot(aes(x = date, fill = username)) +
  geom_histogram(position = "dodge", binwidth = 1) +
  labs(y = "Number of tweets / day", x = "Date", fill="Twitter ac
  scale_fill_manual(values = c_values)
```



Twitter accounts
■ AfDimBundestag
■ Linksfraktion



Natural language



Share it



Share Configuration
Share Example
✕

Share your configuration via URL

<https://hub.nfdi-jupyter.de/share/ZW7R0OpH2F4>

Close
Copy

JupyterHubs

Dozens of installations in Germany

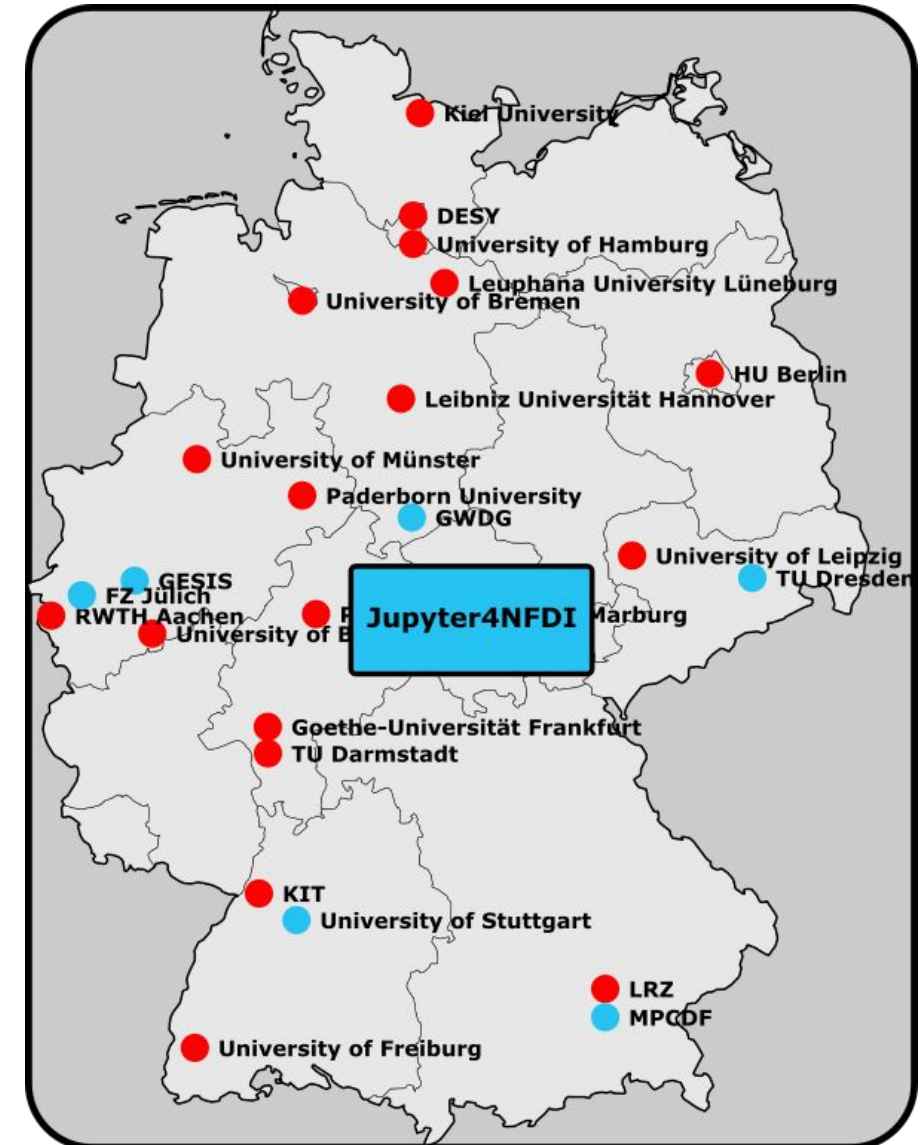
Challenges

- Out of 24, 20 are not accessible to external users
- What is available? What are the differences?

Proposed Jupyter4NFDI solution

- Partners are **combining** their computing resources
- Results in one centralized NFDI JupyterHub
- **Tailored features** on top of vanilla JupyterHub
- Complements existing (specialised) Hubs

Available at <https://hub.nfdi-jupyter.de>



Resources of Jupyter4NFDI

What is available?

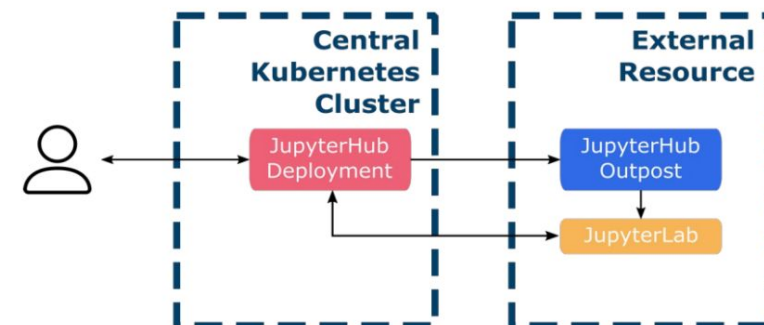
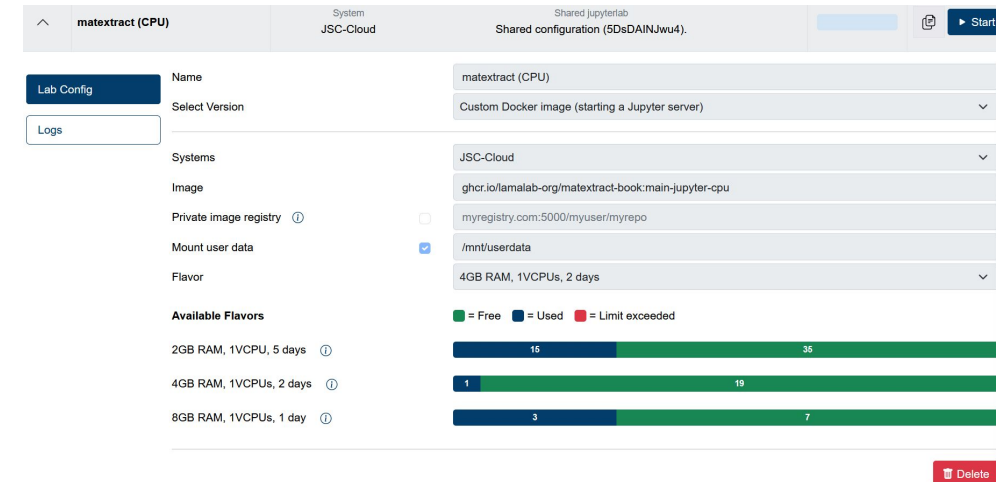
Easy service login

- ✔ Login with your Home IdP or social IdPs (via Helmholtz ID)
- 🔄 In progress: connection to IAM4NFDI infra proxy



Systems

- ✔ Available: JSC Cloud (Forschungszentrum Jülich)
 - 2GB RAM, 1 CPU for 5 days
 - 4GB RAM, 1 CPU for 2 days
 - 8GB RAM, 2 CPUs for 1 days
 - may change in future
 - Each users enjoys 25 GB of persistent storage
- 🔄 Connection of for more (external) systems planned
 - MPCDF (testing phase in staging environment)
 - de.NBI
 - GWDG
 - TU Dresden
- ✔ Technical background: In-house development of **JupyterHub Outpost** architecture to connect external resource providers



Benefits and Features of Jupyter4NFDI

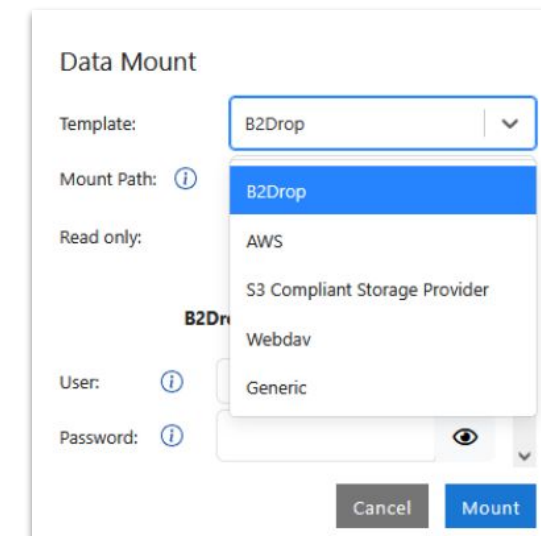
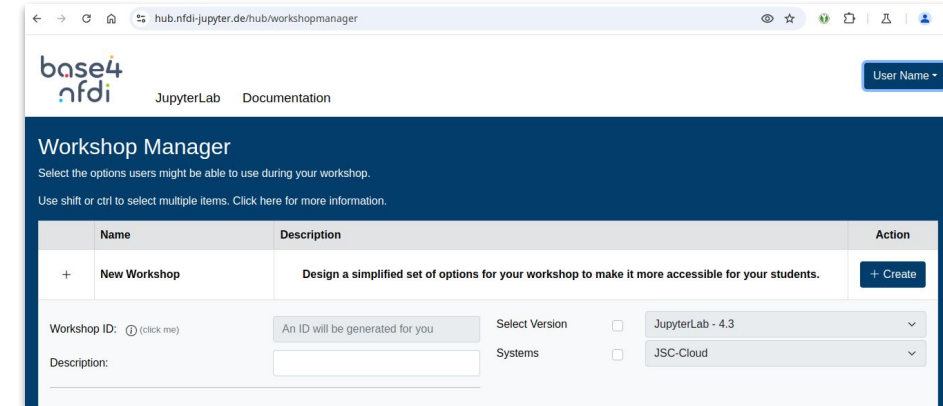
Current work status

- ✔ **Use it for workshops in NFDI**
 - Tailored resources for training courses / workshops
 - Create custom workshop IDs and configure resources

- ✔ **Share your projects with others**
 - Repo2Docker (Binder) integration into JupyterHub
 - Facilitates building Docker images directly from GitHub, GitLab, Zenodo or other sources
 - Shareable links to launch FAIR digital objects
 - JupyterLab DataMount provide seamless access to external storage (AWS, S3, B2DROP, WebDAV, Generic)

- ✔ **Highly customizable**
 - Run your own Docker images (e.g. with your specific libs)
 - Create tailored computing environments

- 🔄 **In progress...**
 - Centralized storage and data sharing is planned for the future

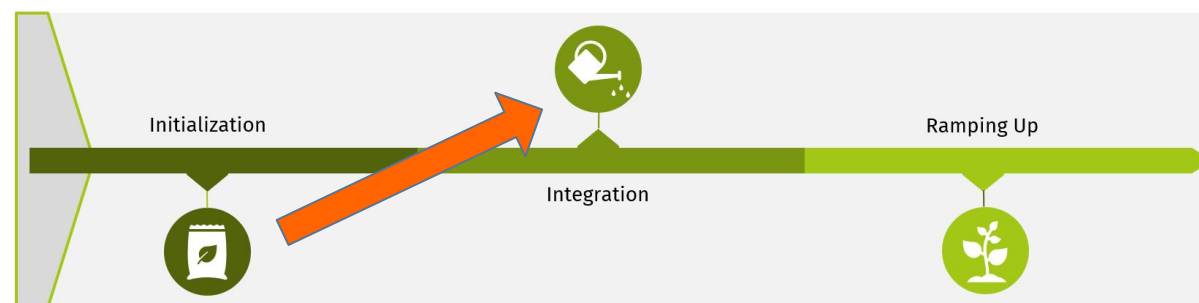


Jupyter4NFDI

Outlook on Integration Phase

Potential start:
October 2025

- **Onboarding of Content:** Content from Base services of other consortia, as well as from individual content producers and researchers.
- **Verifiable Reproducibility:** Based on FAIR Jupyter, the service team will share a knowledge graph for computational notebook reproducibility.
- **Training:** The service team will provide reusable training materials for both regular users and researchers, aiming to make their computational workflows Jupyter4NFDI-ready.



How to Integrate JupyterNFDI in my Community?

Workshops, Open Hours, Incubators

- Workshops
 - Ask Jupyter4NFDI or Service Stewards for a service introduction, webinar, workshop at your consortium
- Contact the team for direct support in their [weekly open hours](#) Mondays 9 a.m.
- Get tailored support by Incubator projects starting at integration phase from October 2025
- ...or just use it!



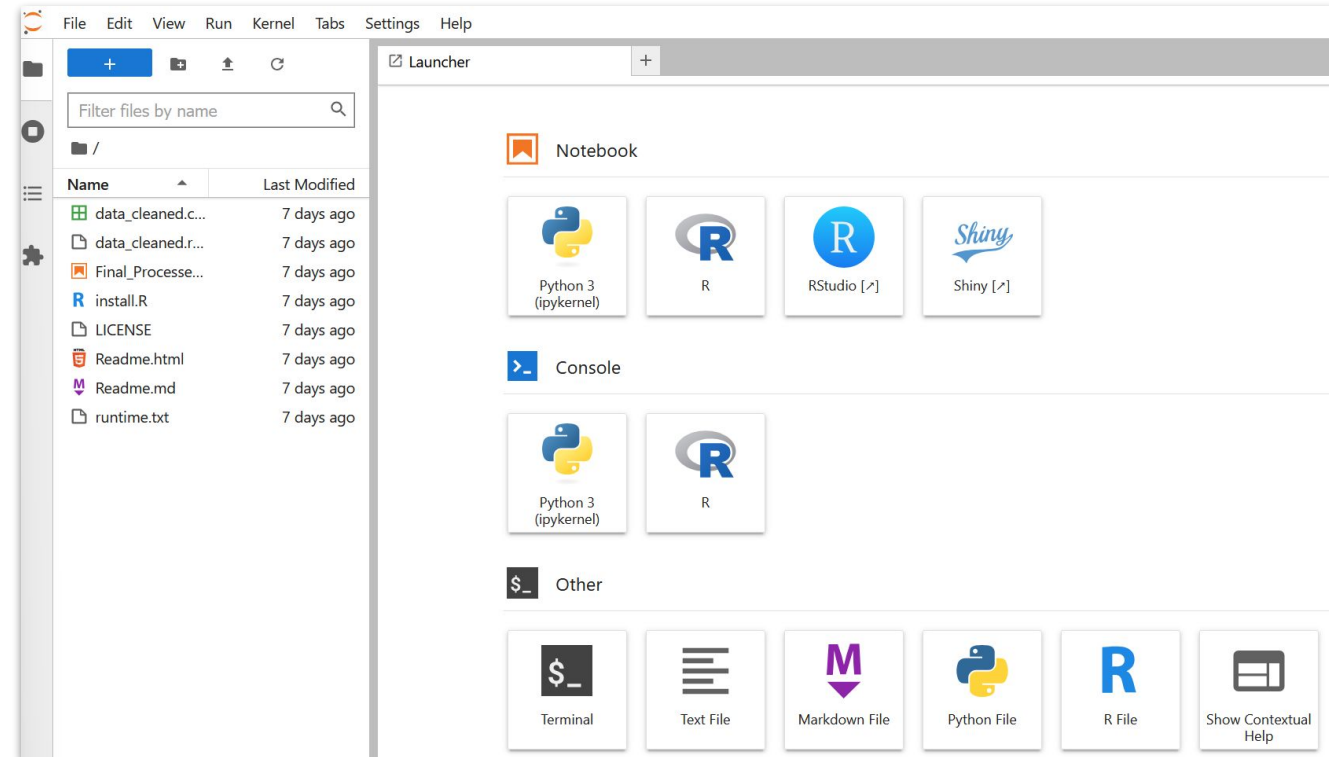
jupyter4nfdi@lists.nfdi.de



<https://nfdi-jupyter.de/> (Documentation)



<https://hub.nfdi-jupyter.de> (Landing page)



PID4NFDI

Basic Service

PID4NFDI

Goals and Benefits

Integration

PID4nfdi

Persistent Identifier Services
for the German National Research
Data Infrastructure



base4nfdi.de/projects/pid4nfdi.html

pid.services.base4nfdi.de



pid4nfdi@lists.nfdi.de

Why?

PIDs are persistent, globally unique identifiers to link, cite, refer to research resources in connection metadata

Goal

harmonize the PID service landscape within NFDI at all levels (technical, organisational, methodological, and in communication)

What is in it for you?

- PID4NFDI **is not another PID provider** for generating PIDs, but it integrates existing PID infrastructures
- PID providers are already in the project (GWGD, DataCite)
- Users can access a central place to find transparent information on existing PIDs incl. decision guides, howtos, governance & costs models

Base4NFDI
Roadshow Dec 2024



PID Coordination Hub

A Vision for PID4NFDI



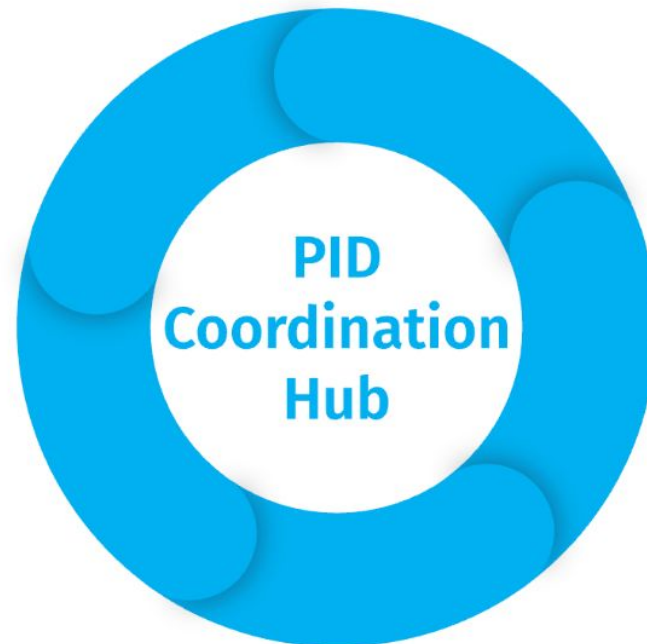
pid.services.base4nfdi.de

Support and Information

- Linking existing PID resources
- Display best practices
- Helpdesk and open hours
- Training

Target group-specific community engagement

- Repository managers
- Researchers
- Organizations
- Decision makers



Metadata and Interoperability

- Support for metadata quality assessment
- Guidelines for metadata harmonization
- Focus on resources from use cases

Services

- Prefix registration service for PID use-cases
- B2Inst
- Data Type Registry (EOSC)
- PID Metaresolver (EOSC)
- Compliance Assessment Toolkit (EOSC)

Governance

- Tool for PID provider selection
- NFDI-wide PID guidelines and compliance testing

Use Cases

Focus Groups

Outreach

Service components

Current work status



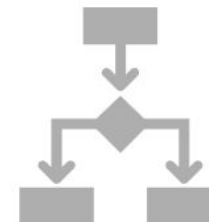
PID Coordination Hub

✓ continuously updated
([link](#))



PID Cookbook

✓ continuously extended
([collection](#))



PID provider selection tool

🕒 in progress
([PID provider overview](#))



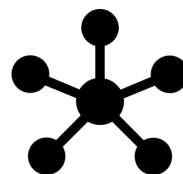
ePIC prefix registration

✓ operational
([request form](#))



Focus groups for PID integration in ELNs, DMPs

🕒 in progress
([contact](#))



Use Cases for instruments, physical objects, high granular/warm data, projects & grants

✓ continuously extended
(i.a. [KonsortSWD](#), [Text+](#))



Support for PID integration

✓ operational
([contact form](#), [FAQs](#))



Training materials on PIDs (fundamental/advanced/expert)

✓ continuously updated
([collection](#))

PID4NFDI

Get in touch!

Get informed on PIDs, PID providers, metadata quality and more on the [PID Coordination Hub](#) and in the [FAQs](#)

Join their focus groups for PID integration in ELNs/DMPs ([info](#))

Make a **consultation appointment** with the team ([contact form](#) | pid4nfdi@lists.nfdi.de) on your specific PID topic, e.g.

- PID strategy for your consortium/institution
- PID selection and implementation
- Metadata quality assessment
- PID-specific plugins (esp. in ELNs, DMPs)
- Standards, best practices and training

Invite the team to your workshops on PIDs, metadata, interoperability and related topics

- recent event: NFDI BioMed consortia Metadata & Interoperability meeting

Meet the team

- NFDI PID WG offers regular bi-monthly open hour, next on July 28, 1pm ([link](#))
- Text+ Plenary on June 16-17, 2025 (Göttingen)
- 2nd NFDI Metadata workshop on June 25-27, 2025 (Hannover)
- CoRDI + UC4B on August 26-29, 2025 (Aachen)

DMP4NFDI

Basic Service

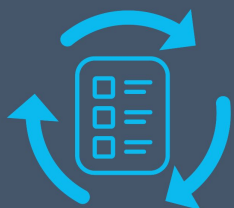
DMP4NFDI

Goals and Benefits

Initialisation

DMP4nfdi

Data Management Plans
for the German National Research
Data Infrastructure



base4nfdi.de/projects/dmp4nfdi

dmp.services.base4nfdi.de



dmp4nfdi@lists.nfdi.de

Why?

DMPs are essential to prepare and maintain proper RDM/FAIRness and should precede and accompany every research project

Goal

establish and foster the NFDI-wide use and application of maDMPs and maSMPs (and analogues)

What is in it for you?

- centrally hosted, open source tool (RDMO) for DMPs + SMPs* with customisable client for each consortium
- support in discipline-specific, interoperable DMP template creation and standardisation
- support in RDMO plugin development
- Open Educational Resources and support on outreach, DMP/SMP awareness and training

Base4NFDI
Roadshow Dec 2024



*SMPs: Software Management Plans

How can DMP4NFDI help you?

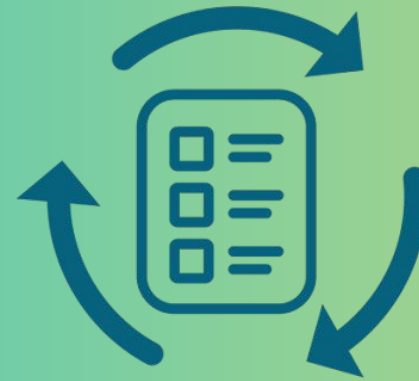
Service components



Hosting

&

Integration with other services



Template standardisation

&

Support for development



Training

&

Support for outreach

Service components

Current work status



Customisable RDMO client
for each consortium

 operational
([RDMO](#) & [demo instance](#))



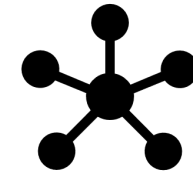
Separate test and
production environments

 operational




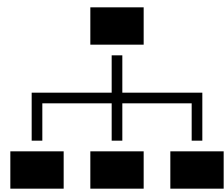
One database for shared
use of templates

 operational



Integration with other
services via plugins

 operational
([Zenodo](#), [MaRDMO](#), [Sensor Search](#))




Centralised vocabulary to
ensure interoperability

 in progress
([RDMO attributes](#) & [RDA maDMP standard](#))



DMP4NFDI template
framework

 in progress
(mappings, crosswalks)



Support for DMP/SMP
template development +
community outreach

 operational
([contact form](#))



Training for
consortium staff
(train-the-trainer approach)

 in progress
(TtT workshop on June 30)

DMP4NFDI

Service information

- DMP4NFDI **website**: <https://dmp.services.base4nfdi.de/>
- **Service Cooperation Model** outlining the collaboration between DMP4NFDI and NFDI consortia: [10.5281/zenodo.15004954](https://zenodo.org/doi/10.5281/zenodo.15004954)
- **Focus group** with PID4NFDI: <https://pid.services.base4nfdi.de/community/focus-groups/>
- DMPs based on **RDA maDMP Standard**:
<https://github.com/RDA-DMP-Common/RDA-DMP-Common-Standard>

Current RDMO clients



DMP4NFDI

Get in touch!

If your consortium is planning to provide a DMP service

– **contact the team** via dmp4nfdi@lists.nfdi.de or their [contact form!](#)

The team is looking for **incubator projects** (3-6 months, [call](#) starts November 15, 2025) for the integration phase, to support you with

- RDMO [hosting](#)
- DMP template development
- Training and community outreach
- Integration with other consortium services via plugins

Meet the team

- monthly **Jour Fixe** (every first Tuesday), next on July 1, 11-12 am ([Agenda](#)) – open to everyone interested!
- CoRDI + UC4B on August 26-29, 2025 (Aachen)



Thank You!
Questions?



Service Stewards

base4nfdi-servicestewards@lists.nfdi.de

base4
nfdi Basic Services
for NFDI

Questions? Send an email to:

base4nfdi-office@lists.nfdi.de

Check our website:

www.base4nfdi.de

Additional slides for questions

- The application process
- funding



Service Stewards





base4nfdi-servicestewards@lists.nfdi.de

www.base4nfdi.de

How do we define a basic service?







... is a technical-organisational solution that *typically* includes...

-  storage and computing resources
-  software, processes and workflows
-  support via service desks
-  a project team

... with different levels of technicity!



A basic service ideally...

-  creates added value for all users
-  bundles existing services
-  considers sustainable, scalable systems
-  provides trackable KPIs

How to Become a Basic Service

NFDI Section

present your service
→ section votes



Base4NFDI

submit your
proposal

How to Become a Basic Service

NFDI Section

present your service
→ section votes



Base4NFDI

submit your
proposal

22 Jan 2025

23 April 2025

30 July 2025

How to Become a Basic Service

NFDI Section

present your service
→ section votes

Base4NFDI

submit your
proposal

Base4NFDI

TEC evaluation

22 Jan 2025

23 April 2025

30 July 2025

- Hans-Joachim Bungartz
- Patrick Fuhrmann
- Christian Grimm (Co-chair)
- Uwe Konrad
- Erwin Laure
- Anne Lipp
- Wolfgang Nagel
- Matthias Razum
- Simone Rehm (Co-chair)
- Henriette Senst
- Achim Streit
- Hannes Thiemann
- Ramin Yahyapour (Co-chair)

How to Become a Basic Service

Consortia Assembly

votes on the proposal

Apr 2025

July 2025

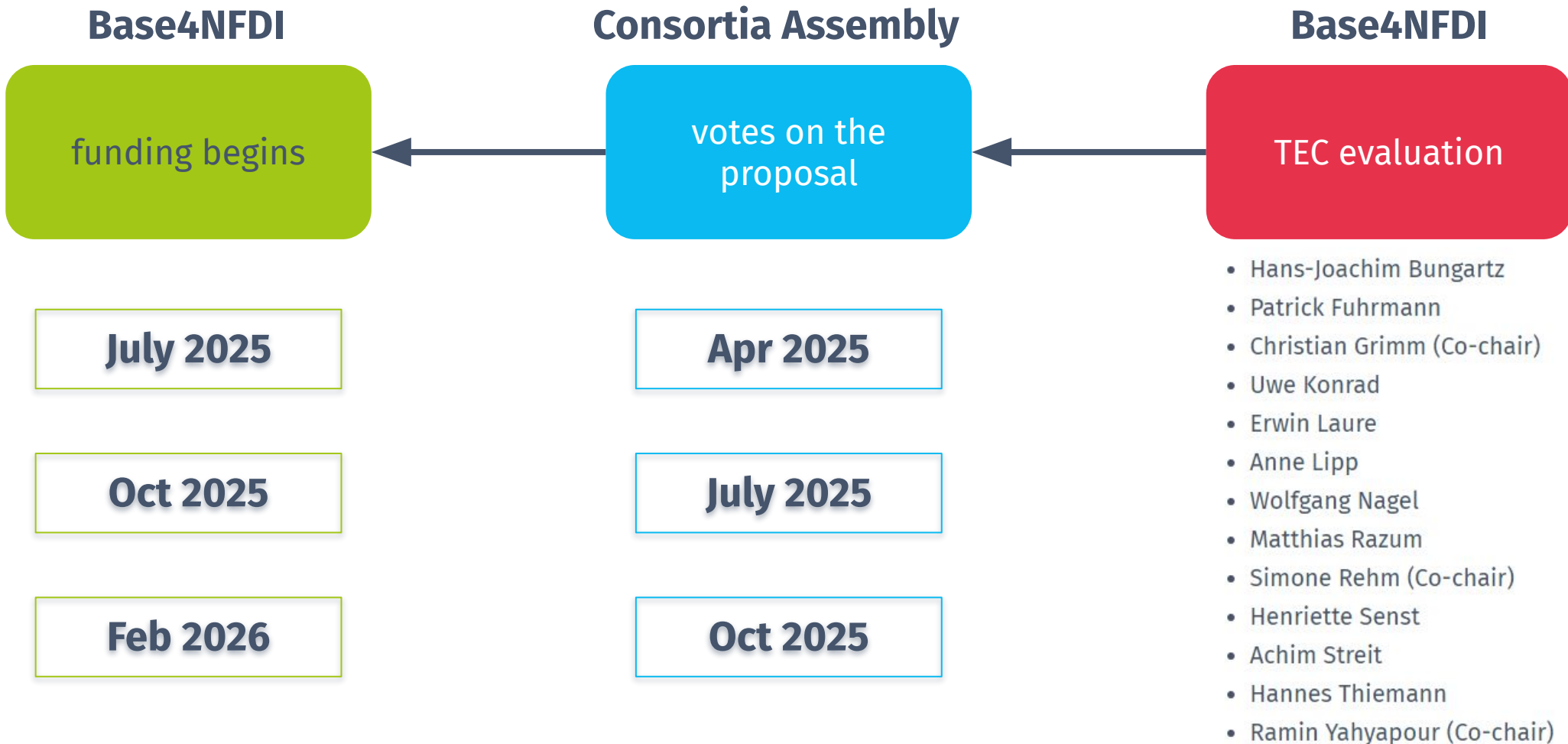
Oct 2025

Base4NFDI

TEC evaluation

- Hans-Joachim Bungartz
- Patrick Fuhrmann
- Christian Grimm (Co-chair)
- Uwe Konrad
- Erwin Laure
- Anne Lipp
- Wolfgang Nagel
- Matthias Razum
- Simone Rehm (Co-chair)
- Henriette Senst
- Achim Streit
- Hannes Thiemann
- Ramin Yahyapour (Co-chair)

How to Become a Basic Service



Criteria for basic services

Initialisation 1 yr



25%



TRL 3-4



Concept



SWOT

Integration 2 yrs



50%



TRL 5-6



Calculation



Interop.



EOSC
alignment

Ramping Up 2 yrs



75%



TRL 7-8



Sustainable



-> TRL 9

What is funded each year?



Initialisation 1 yr	2 Postdoc (E13/3 or E14/2) 1 Researcher (E13/2)
Integration 2 yrs	3 Postdoc (E13/3 or E14/2) 3 Researcher (E13/2)
Ramp-Up 2 yrs	4 Postdoc (E13/3 or E14/2)