Experiences and Perspectives from NFDI

NFDI, NFDI4Chem, Base4NFDI, TS4NFDI

Oliver Koepler
National EOSC CZ Conference, Prague, 26.11.2024
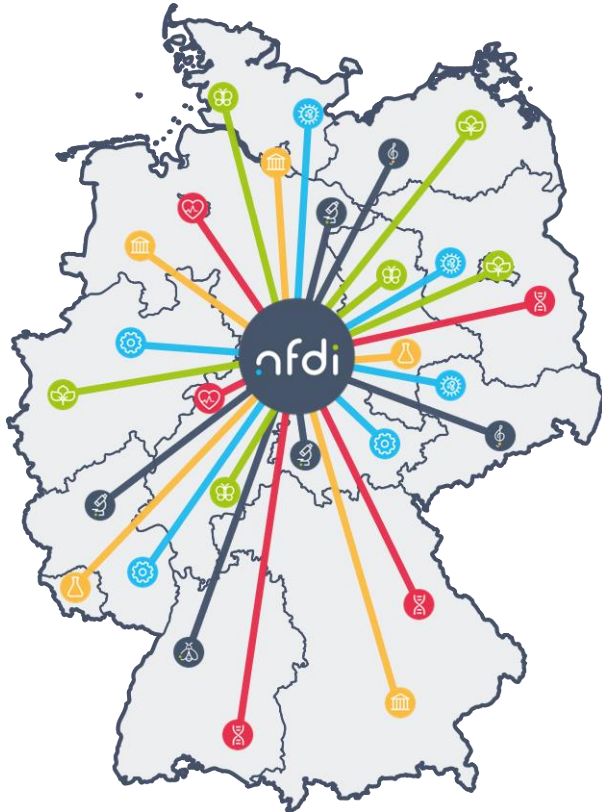
Germany's RDM Infrastructure Landscape
Performance through diversity…

- **Multiple Stakeholders** (Research Institutions, Universities, Research Data Centres, Libraries, HPC Centres…)

- **2014: RfII** founded to advise on consolidation and sustainability

- **2016:** RfII recommended setting-up the **NFDI**, guided by scientific needs

- **2018:** NFDI program launched - 1 Billion Euro for 10 years

- **2020:** *NFDI Association* and *NFDI Directorate* established

- **2023:** *26 Disciplinary NFDI Consortia* and *Base4NFDI* in full swing

NFDI
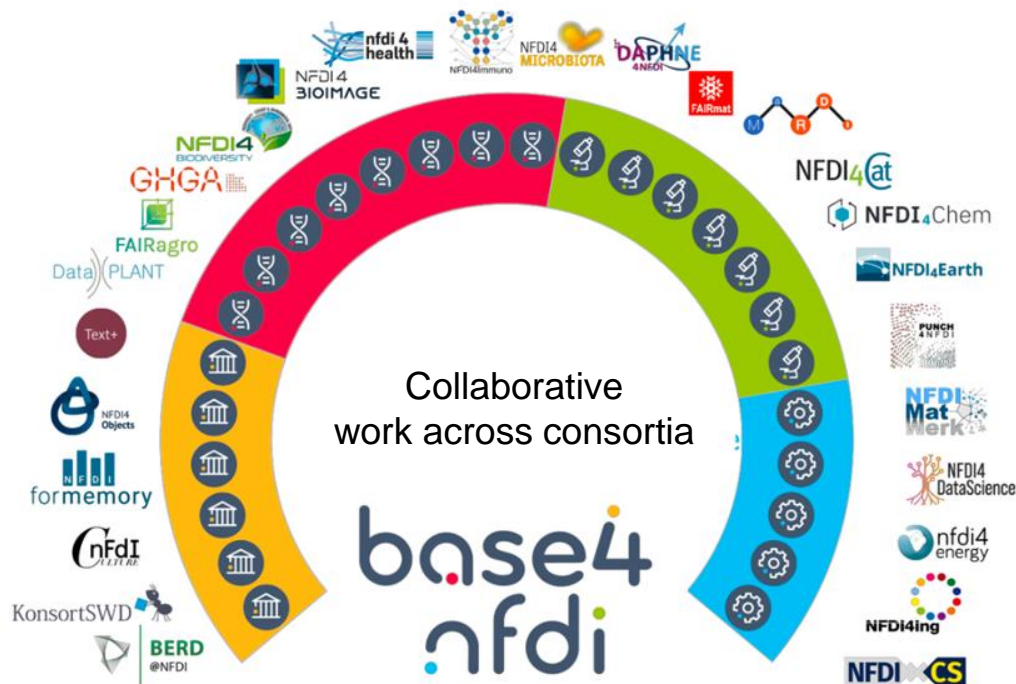## connects infrastructures and services

- Science-driven and demand-orientated (bottom-up)

- NFDI connects research communities

- Utilise, expand and consolidate existing solutions

- Identification and definition of standards, methods, etc.

- Facilitating collaboration between research areas

- **Increase the efficiency of the German research landscape**

Who we are
Consortia actively shaping the NFDI

nfdi — Nationale Forschungsdaten Infrastruktur

8 Consortia from **Life Sciences**

7 Consortia from **Natural Sciences**

6 Consortia from **Humanities and Social Sciences**

5 Consortia from **Engineering Sciences**

Collaborative work across consortia

base4 nfdi

Decentralized Network
Consortia and participating Organisations

26 + 1 NFDI Consortia
> 290 Member Institutions in NFDI Association
> 1500 people involved

NFDI Services
A selection of ~ 250 services developed in NFDI

- Helpdesks that offer discipline-specific RDM advice http://www.nfdi.de/helpdesks/

- Platform in which own biodiversity data can be visualised and analysed.

- Electronic Lab Notebook: https://chemotion.net

- Service for the sustainable publication and preservation of cultural science research data: https://radar.products.fiz-karlsruhe.de/de/radarabout/radar4culture

- Tool for harmonising German measurement instruments from various survey programms https://www.gesis.org/angebot/daten-aufbereiten-und-analysieren/question-link

- RDM Knowledge Bases, e.g https://knowledgebase.nfdi4chem.de/knowledge_base/de/

- Platform for 'Simulation as a Service'

- Tool for data protection compliance

- Tool for the creation of data management plans (DMP)

NFDI Collaborations
International, National, Regional, Local

European Open Science Cloud (EOSC)

        The NFDI Association is a mandated member of the EOSC Association for Germany

Research Data Alliance (RDA)

        NFDI Association is an institutional member, many consortia active in RDA WGs and IGs

Gaia-X

        NFDI Association is involved in the BMBF project FAIR Data Spaces, which aims to combine Gaia-X and NFDI to create a joint cloud-based data space for industry and science

NFDI is cooperating with

        11 RDM-Initiatives of German Federal States

        86 RDM Service Centers at German universities

        Further National RDM Initiatives (e.g. Data Competency Centers)

The Chemistry Consortium NFDI4Chem

In the National Research Data Infrastructure (NFDI)

We Cover Data Handling from Creation to Re-use

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© ThisisEngineering/ unsplash

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Create Data
Smart Lab

Publish & Access Data
Repositories

Find & Use Data
Metadata, Semantics & Standards

Get Support
Cultural Change

Trusted Federation of Repositories

🗄️ 🗄️ 🗄️ **Core Repositories**

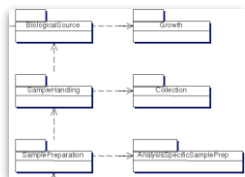Process & Analytics | Spectroscopy | Subdomain specific | Multidisciplinary

Metadata & Ontologies

Minimum Information for Chemical Investigations define *what* to report about chemistry data

Data Model

Schemas enhanced by Ontologies define *how* to report and ...

schema.org

DataCite
FIND, ACCESS, AND REUSE DATA

Bioschemas

... enable metadata harvest & search

TERMINOLOGY SERVICE.

NFDI₄Chem

TS4 nfdi

SEARCH SERVICE.

NFDI₄Chem

140k   Datasets

We get the word into the community

>1400	Survey responses

>100	Conferences

Onsite Training (RDM / ELN)

>1000	Participants

2022

2023

2024

FJS 2022 HANNOVER

CHEMISTRY IS COMING HOME

FJS ULM 2024

FAIR4Chem Award 2025
NFDI4Chem is looking for the FAIRest dataset in chemistry!
t1p.de/qd9uy

YouTube

Knowledge Base / YouTube

68	Articles (EN/DE)

66	Videos

NFDI.Chem   Knowledge Base   NFDI4Chem ↗   Terminology Service ↗   Search Service ↗   FAQ

NFDI4Chem Knowledge Base

A place for all knowledge regarding Research Data Management (RDM) in Chemistry
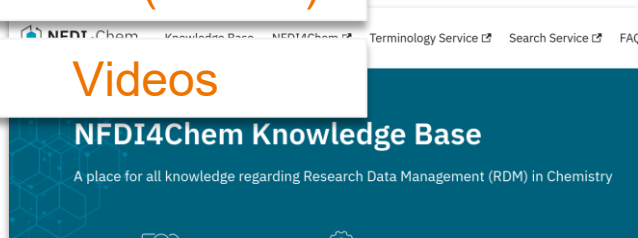
Fostering the cultural change

Use of ELNs raised from 19% to 30%

> 30 Journals recommend NFDI4Chem repositories

1. Introduction to NFDI

2. NFDI4Chem – the NFDI consortium for Chemistry

3. NFDI Sections - Collaborative work across consortia

4. Base4NFDI and Basic Services

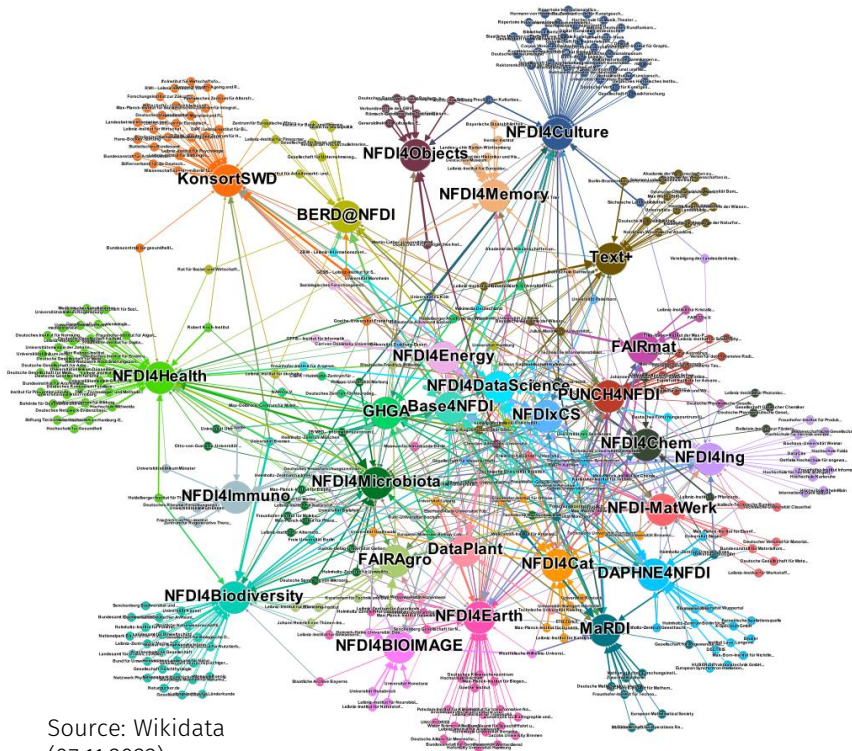5. TS4NFDI – Terminology Basic Service

6. NFDI and EOSC

Common challenges, common solutions
Cross-Cutting Topics in the NFDI

Source: Wikidata
(07.11.2022)

Identification and discussion of Cross-Cutting Topics has started as early as 2018.

F. O. Glöckner, „Berlin Declaration on NFDI Cross-Cutting Topics". Zenodo, Sep. 22, 2019. doi: 10.5281/zenodo.3457213.

M. Bierwirth, „Leipzig-Berlin-Erklärung zu NFDI-Querschnittsthemen der Infrastrukturentwicklung". Zenodo, Juni 15, 2020. doi: 10.5281/zenodo.3895209.

NFDI Sections
Formalization of Cross-Cutting Topics

Section-metadata **(Meta)data, Terminologies, Provenance**

Common challenges, common solutions

Section-infra **Common Infrastructures**

Section-edutrain **Training & Education**

Section-ELSA **Ethical, Legal and Social Aspects**

Section-industry **Industry Engagement**

NFDI Sections
Working Groups & Topics

- Data Integration (DI)
- Data Management Planning (DMP)
- Data Science and Artificial Intelligence (DSAI)
- Electronic Lab Notebooks (ELN)
- Identity and Access Management (IAM)
- Long-term Archival (LTA)
- Multi-Cloud (MC)
- Persistent Identifiers (PID)
- Research Software Engineering (RSE)

- DALIA platform for teaching materials as a knowledge base
- Teaching data competence and FAIR concepts at all educational and competence levels
- Discipline-specific train-the-trainer concepts
- Error culture in science

- Cookbooks, Guidance and Best Practice
- Terminology Services
- Ontology Harmonization and Mapping
- Search and Harvesting
- Knowledge Graphs (KG)
- Research Software Metadata
- Task Force Metadata

- Facilitate communication between industry and NFDI consortia to identify shared problems
- Standardized processes to streamline collaboration between industry and NFDI consortia

- Data protection
- Anonymisation
- Data trust models
- Commenting on EU and national legislative proposals

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Base4NFDI "Vision": Provide cross-disciplinary services to drive FAIR practices to underpin the transition to Open Science

- **NFDI:** Providing science-driven data services to research communities

- **Base is a Joint initiative** of **all 26** disciplinary consortia in NFDI

- **Bottom up**: To establish interdisciplinary basic core services across consortia

- Develop a NFDI-wide **basic service portfolio** and related governance

Base4NFDI: Mission & Potentials

## User driven, quality assured: complementing and aligning the NFDI

Base4NFDI is a framework for ...

- Defining **potential** basic services from cross-cutting groups ("NFDI Sections")

- User-driven **requirements** analysis

- **Seed** funding for service projects: these exist of leading infrastructure providers

- Uptake is supported by Base **engagement staff**

Services: Three development phases

Successive concretization of projects + NFDI **consensus** + Consortia Votes

1.Initialisation

2.Integration
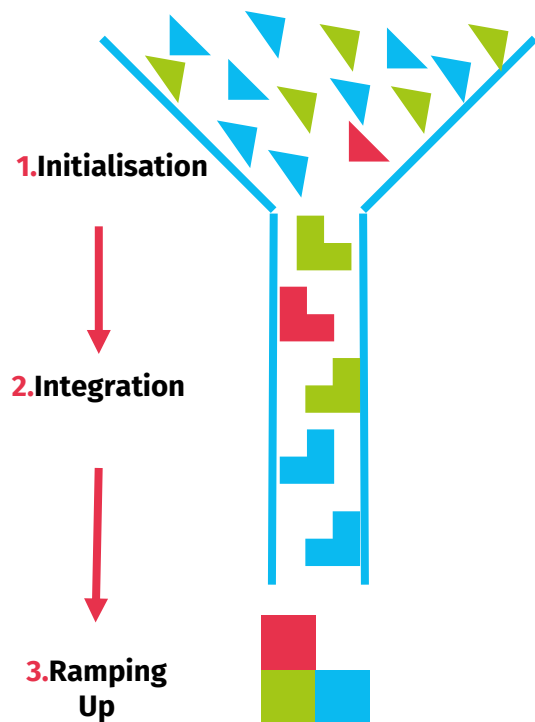
3.Ramping Up

- **Initialisation**: services kick off with requirement & landscape analysis, software evaluation, training
- **Integration**: builds on initialization prototype, EOSC alignment, interoperability, KPIs, APIs
- **Ramping up**: Upscaling - offer a long-term operating model reach the ramping up phase

25%

50%

75%

Assessed by Technical Expert Committee (TEC)

base4 nfdi
Basic Services for NFDI

Base4NFDI – Status after 18 months

7 Calls, 8 Basic Service Projects, 7 Service Stewards = 22 partner institutions

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

TS4 nfdi
Terminology Services
for the German National Research
Data Infrastructure

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

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

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

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

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

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

... further
Basic Services
to follow!

https://base4nfdi.de/

Brief Overview
What does the service want to offer?

- TS4NFDI aims to standardise and harmonise terminology management within the NFDI
- facilitating consensus-building and interoperability of services across disciplines to achieve a common knowledge representation and engineering framework

TS4 nfdi

**Terminology Services
for the German National Research
Data Infrastructure**

What does the service want to offer?
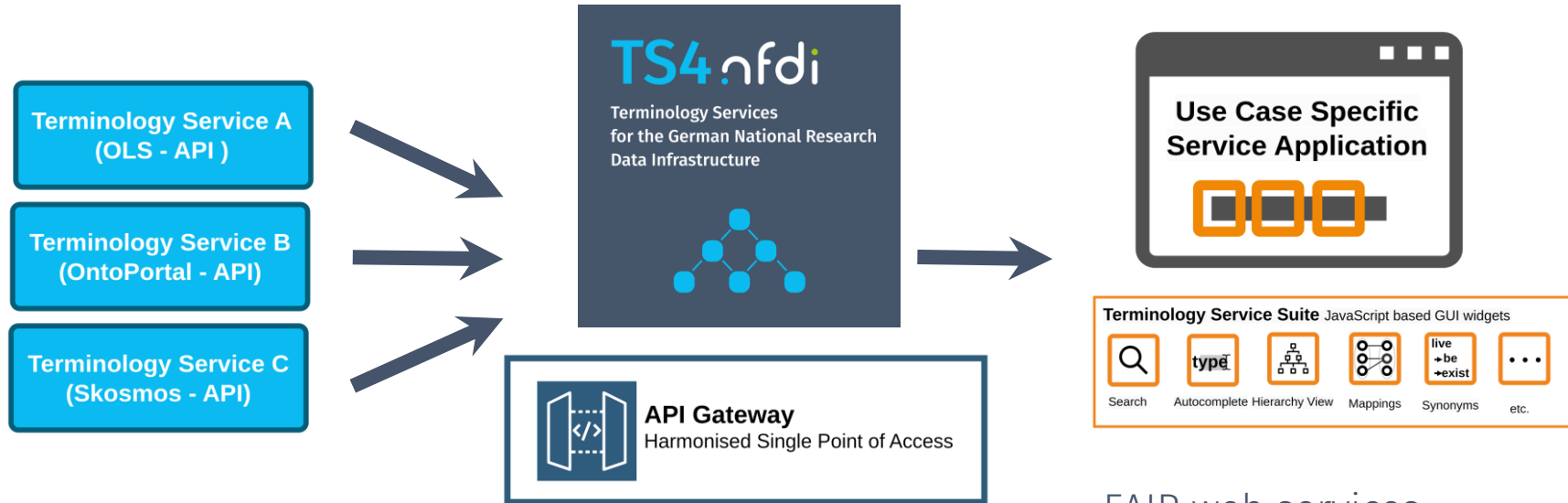
one single API for different Terminology Services
direct integration of terminologies to web services through **widgets**

FAIR web services
with semantic data

- annotation service
- search engine
- data repository

NFDI, Base4NFDI & EOSC: Open Questions on Interoperability

NFDI Basic Service Portfolio and NFDI Consortia Services

- Require **aligning concepts**, see e.g *NFDI4Biodiversity Service Portfolio Report*

- Require **Common Interoperability Criteria**

NFDI Services and EOSC Nodes/Federation

- **NFDI Basic Services** to **follow the EOSC Interoperability Framework**

- **Interoperating Basic & EOSC Services**

- **NFDI Consortia Services** as **EOSC Thematic Nodes !?!**

Base4NFDI: Interoperability with EOSC

- **Focus on technical alignment with EOSC**

- **Examines the EOSC Interoperability Framework –** IAM4NFDI as a case study and blueprint for other services

- **Gives actions for the Base4NFDI service teams –** Embedding Interoperability early on in the basic service process

POLICY PAPER

Base4NFDI Services and EOSC: Guidance for Interoperability

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Thank You !
Questions ?

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