Sicherheit in Technik und Chemie

The BAM Data Store: Piloting an openBIS-Based Research Data Infrastructure for Materials Science and Engineering

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BAM at a Glance

Materialprüfungsamt
Lichterfelde in 1904

In Berlin & Brandenburg

Activity
Research

Activity
Testing

Activity
Reference materials

1660 Employees

FOCUS AREA
ENERGY

FOCUS AREA
INFRASTRUCTURE

FOCUS AREA
ENVIRONMENT

FOCUS AREA
MATERIALS

FOCUS AREA
ANALYTICAL SCIENCES

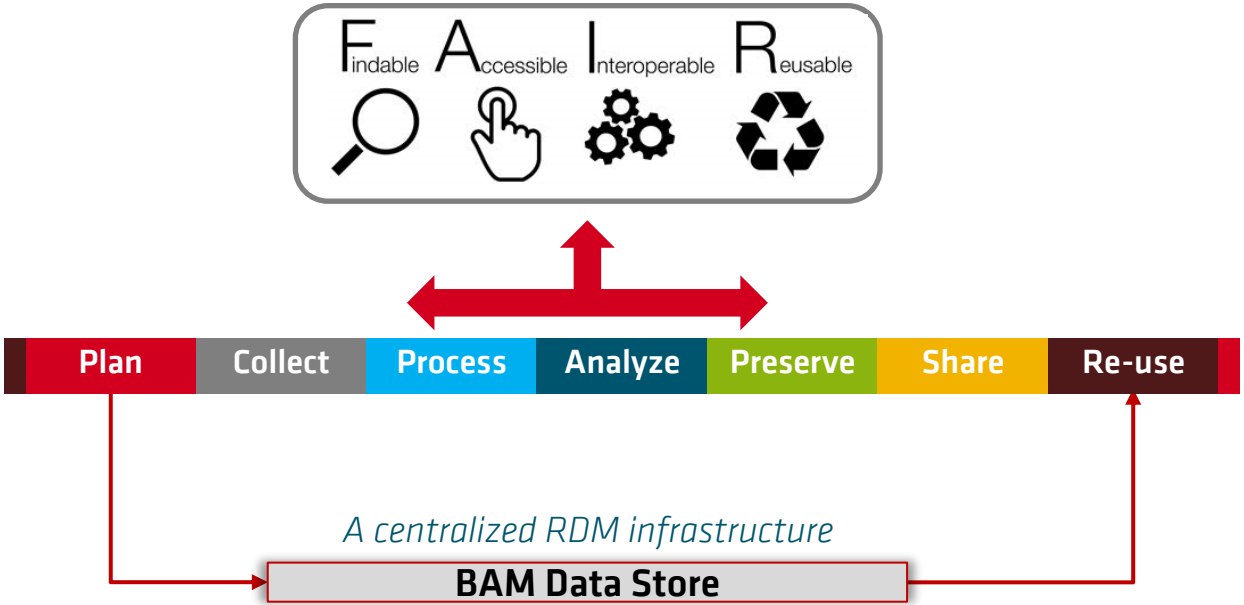
NFDI MatWerk

NFDi4ing

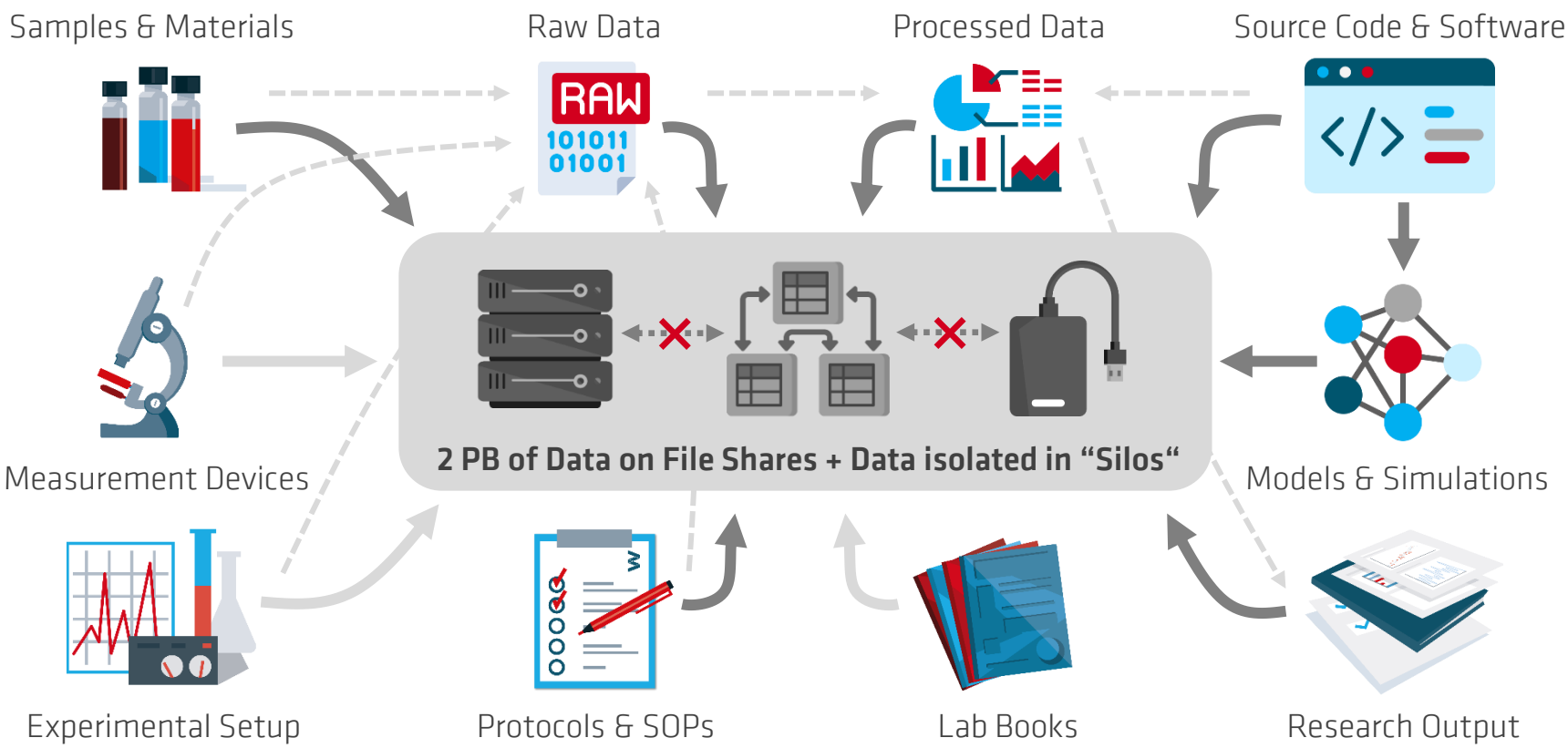
nfdi4chem

DAPHNE

Enabling FAIR Data at BAM



Current RDM Practices at BAM



BAM Data Store Framework and underlying openBIS Framework

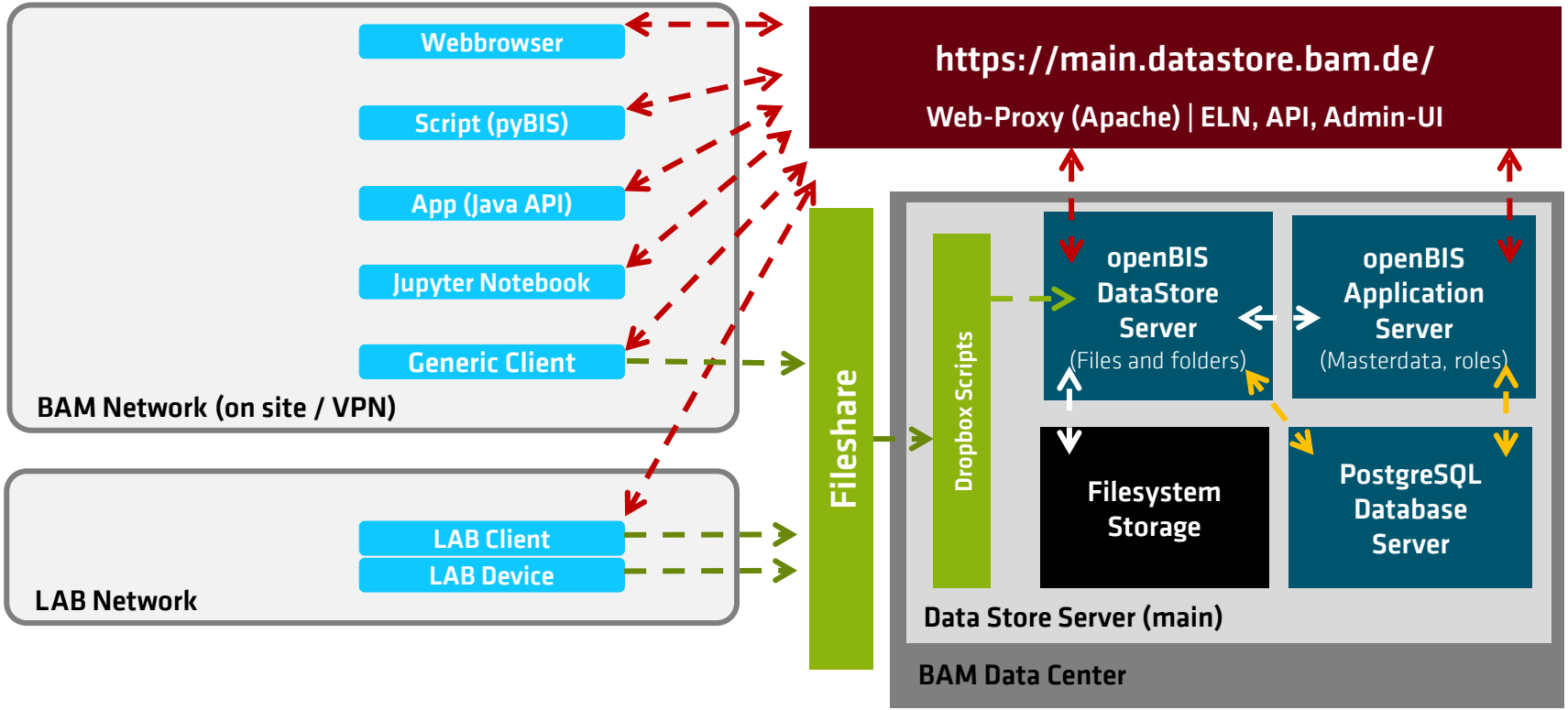
openBIS: open Biology Information System
Underlying framework & open source software developed by ETH Zurich since 2007

- ✓ Electronic lab notebook (ELN)
- ✓ Inventory management
- ✓ Data management

BAM Data Store:
Framework for central RDM system at BAM, developing since 2021

- Infrastructure
- Work packages for tool adoption and continuous operation

BAM Data Store - General Structure



Piloting the BAM Data Store: Five Groups in 2021

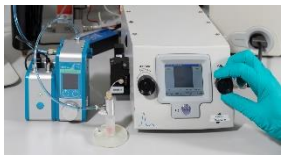
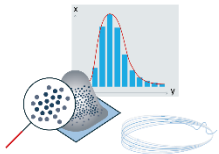
Data Store Stewards are trained Domain researchers

BAM

1. **Thermal Analysis Microplastics**
2. **Structural Health Monitoring**
3. **Nanoplatform**
4. **Computer Tomography@BAM**
5. **Additive Manufacturing**

Activity	Methodologies
Determination of microplastic content in environmental samples.	Thermal analysis
Assessment of aging infrastructure structures with digital technologies.	Monitoring data, Sensors, photos, videos, simulation models, etc.
Synthesis and characterization of nanomaterials, reference nanomaterials.	Diverse methods >90 Instruments
Material characterization with 3D imaging (CT).	Computer Tomography (CT)
Defect detection during the construction process.	Thermography, Tomography, etc.

BAM Data Store Implementation –nanoPlattform Project

Research data centrally stored from > 30 researchers and technical staff from diverse BAM locations	Data registered in inventory and ELN for >150 chemicals, >90 Instruments, >800 experimental steps	Meta(data) collected from >400 synthesized Nanomaterials
 	   	

BAM Data Store Implementation – nanoPlattform Project

BAM

Hierarchical Data organization

- Inventory
  - Equipment
  - Materials
    - Nanomaterials
      - Iron oxide
        - **ION089**
- Lab Notebook
  - NPF Lab book
    - Iron oxide
      - ION089
        - Synthesis ION089
        - **DLS Zetasizer ION089**
        - TEM ION089

User defined Metadata schemas

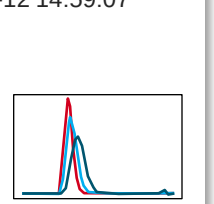
Nanomaterial: ION089

Composition:	Iron oxide
Concentration:	31.27 mg/mL
Storage:	Room 42
Registrator:	jdoe
Registration Date:	2021-07-13 10:24:23

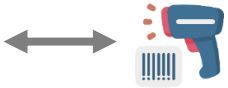
Linked Objects

Experimental Step DLS: DLS Zetasizer ION089

Start date:	2021-08-12 14:59:07
Temperature (°C):	25.0
Dispersant:	Toluene
Z-Average:	14.8967
Peak 1 (Intensity) [nm]:	16.6467



openBIS Interfaces and extensions



Creation of / Search for Barcodes

Offer of nano reference materials in the BAM webshop

Automated (Meta)data upload via Dropbox

Integrated data analysis with Jupyter Notebooks

Publication of reference data and -protocols

Source: Datenmanagement im Nanomaterial-Labor - 2023 - Wiley Analytical Science

BAM Data Store Implementation – Lessons Learned

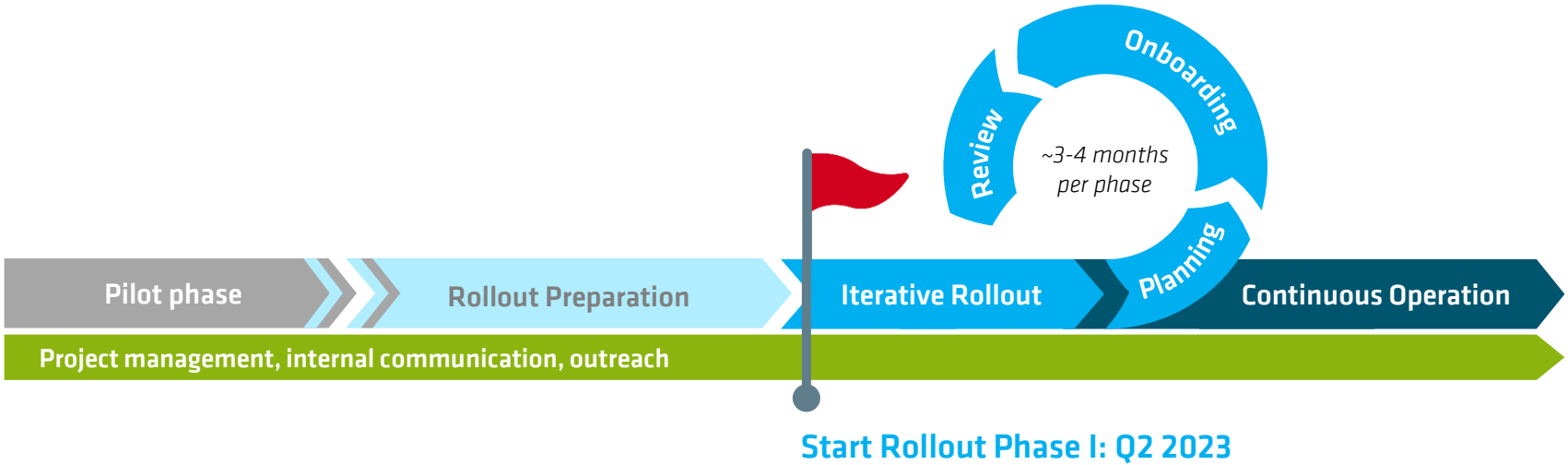
The BAM Data Store meets most of the RDM needs of heterogenous MSE groups:

- openBIS can be used with all levels of data literacy.
- Enables standardised data documentation and traceability.
- Initial customisation is time-consuming due to lack of metadata standards in MSE domains.
- Automating workflows for data import and integrated data analysis saves time.

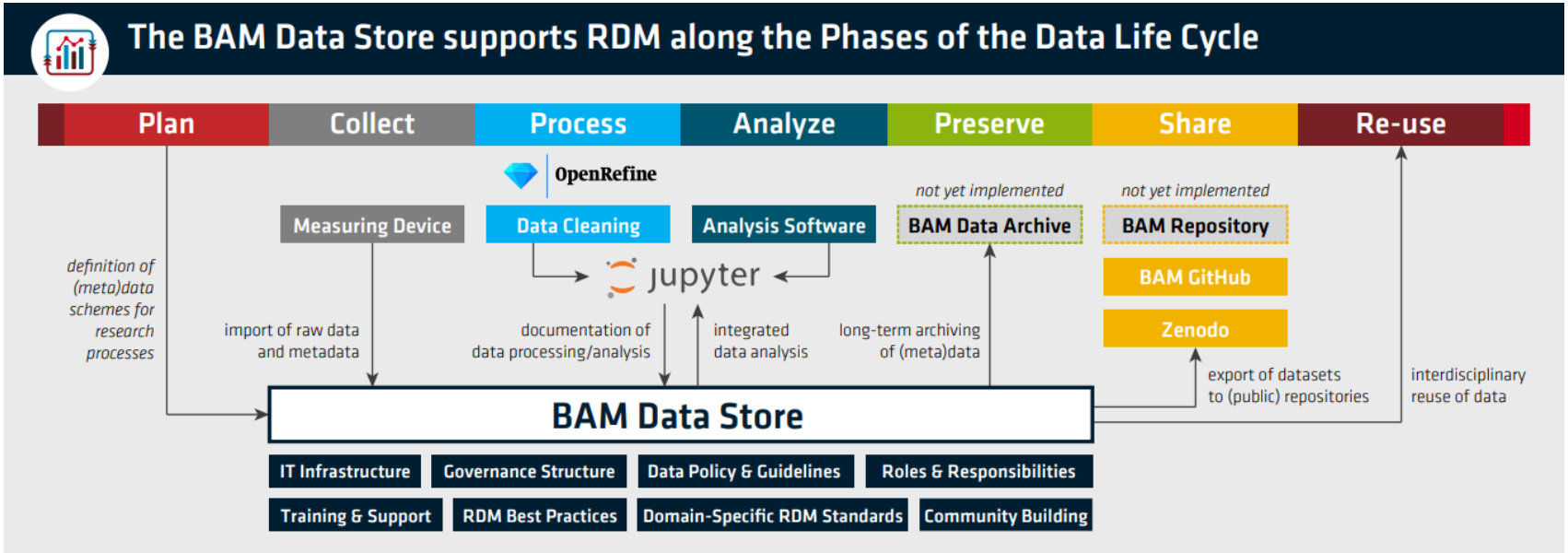
Continous operation of an institutional RDM system requires resources and governance structures:

- ✓ Close collaboration between eScience and IT departments as well as the domain researchers.
- ✓ Additional IT resources and personel for training and support.
- ✓ Upper management support.
- ✓ Willingness to embrace cultural change to adopt RDM tools.

BAM Data Store – Rollout Phase to Achieve Continous Operation (2023)



The BAM Data Store Framework for Tool Adoption and Continuous Operation



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