

# HELIPORT: An overarching Data Management System at HZDR

**HELIPORT** HELmholtz Scientific  
Project WOrkflow PlaTform 

Stefan E. Müller, Thomas Gruber, Guido Juckeland, Jeffrey Kelling, Oliver Knodel, Mani Lokamani, Martin Voigt, David Pape

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DRESDEN  
concept



**HZDR**  
HELMHOLTZ ZENTRUM  
DRESDEN ROSSENDORF

# The Helmholtz-Zentrum Dresden-Rossendorf (HZDR)

## ■ About 1470 employees

- ~ 670 scientists

## ■ Research sites:

- main site in Dresden-Rossendorf
- additional sites in Grenoble, Freiberg, Görlitz, Leipzig and Schenefeld

## ■ Research fields:

- Energy, Health and Matter

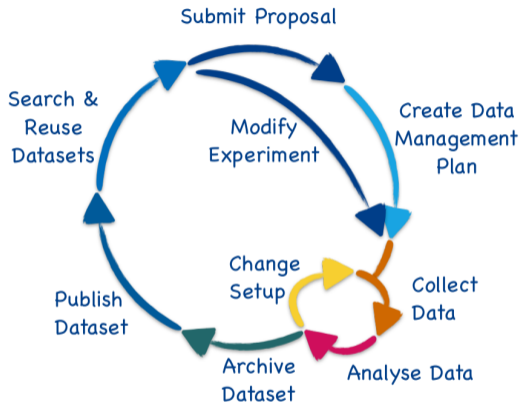
## ■ Research facilities

- ELBE - Center for High-Power Radiation Sources
- Dresden High Magnetic Field Laboratory (HLD)
- Ion Beam Center (IBC)



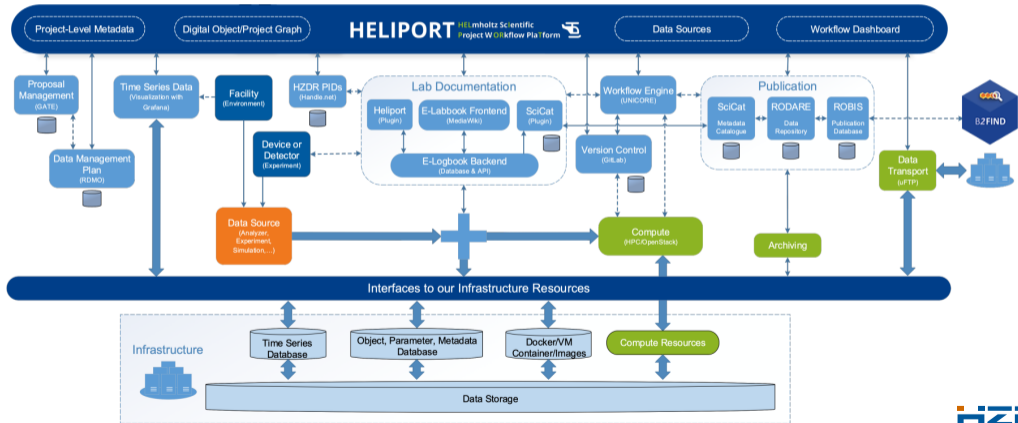
# End-to-End Digital Data Lifecycle

- Many tools to support the individual steps of the different research experiments:
  - Electronic lab notebooks
  - Interactive analysis
  - **FAIR publication** of data sets (HZDR's **RODARE** repository)
  - Scientific **workflow** management
  - **Handle** (PID) generation and management
- Uniform and smooth access to and **between** all services and systems is necessary
- Documentation of all the linked resources is essential to create a **comprehensible** and **FAIR** data lifecycle
  - In accordance with the **HZDR Data Policy**



# HELIPORT as an overarching guidance system

There is a need to support the entire experiment with reliable **interconnected tools** to enable **FAIR** science. Underlying IT infrastructures are complex, documentation may be missing (lack of time), and often scientists may not know which services are available at facilities and how to use them. An **overarching system** guiding the scientists through the lifecycle of their research project is necessary.



# The HELIPORT project

*“The **HELIPORT** project aims at developing a platform which accomodates the **complete life cycle** of a scientific project and links all corresponding programs, systems and workflows to create a more **FAIR and comprehensible** project description.”*

## Features:

- Entry point for experiments and scientific projects
- User and group authorisation/management
- Overview of systems and devices involved in a scientific project
- Provision of metadata from proposal management system
- Registration of and access to site-internal file systems
- Automated transfer of metadata between involved systems/services
- Background data publication of datasets (e.g. **Zenodo, Rodare**)
- Integration of reproducible computational workflows
- HPC cluster access (**slurm, UNICORE**)
- Digital object and handle management with graph visualisation
- Timeline representing changes
- **HELIPORT** Web API
- Authentication via **Helmholtz ID**

Project members:



Funded by:



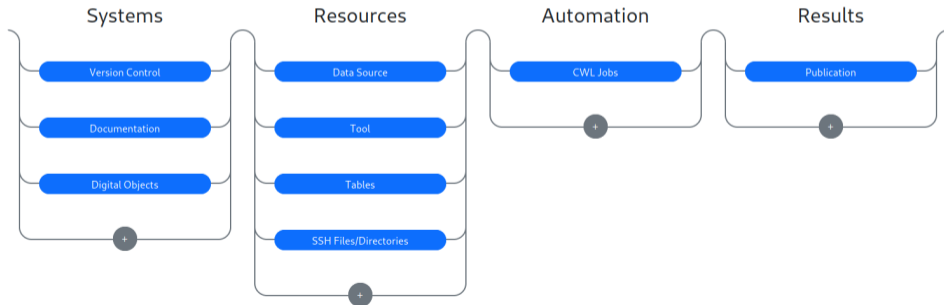
# The HELIPOINT project

“The **HELIPOINT** project aims at developing a platform which accomodates the **complete life cycle** of a scientific project and links all corresponding programs, systems and workflows to create a more **FAIR and comprehensible** project description.”

Project members:



Funded by:



# HELIPORT infrastructure

- **HELIPORT** web app is based on **Django**
  - **HELIPORT** communicates with various systems through **Web APIs**
  - Project-level metadata is stored in an SQL database and can be exported in various metadata schemes
- Computational workflows are managed in **HELIPORT** and executed on HPC clusters using **slurm** or **UNICORE**

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### Remote Server Logins

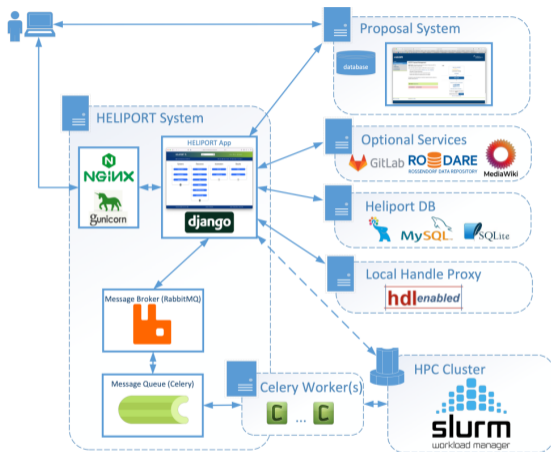
Logins added here can be used to access resources like files on remote servers or workstations.

| ID | Type                 | Name     |            |             |
|----|----------------------|----------|------------|-------------|
| 25 | authentication token | gitlab   | Edit       | Remove      |
| 82 | ssh connection       | uts      | Disconnect | Edit Remove |
| 15 | ssh connection       | muelle94 | Disconnect | Edit Remove |

Add a Login

Login Type: Choose a Login Type

- ssh connection
- username and password
- authentication token



# HELIPORT interface to Proposal Management System

## ■ Automated transfer of project metadata from beamtime proposal management system into HELIPORT

- Title, Authors, Description
- Beamtime schedule
- Research facility used

**HZDR**

**HZDR Proposal Management**

**Proposal management**

- Login
- Registration
- Lost password
- Lost username

**Log out**

You have logged out from proposal management system.  
For user with institutional Login: Please close your browser if you want to logout of Shibboleth completely.

HZDR GATE is the general access tool to the research infrastructures (RI) at HZDR, offering access to external user.

Users are kindly required to register in HZDR GATE in order to be able to

- submit a proposal for beamtime at CHMTEC-INFRA, DRACO, ELBE, ISC or RADGATE.
- participate in accepted experiments
- provide user feedback and to submit experimental reports
- publish data resulting from experiments at an RI at HZDR.

A template for project descriptions for beamtime requests at ELBE or DRACO is available following this link.

**New Users: Registration**

**Lost password** **Lost username**

**Login**

Login via umbrellaID

**umbrella**

umbrellaID

or

**GATE Login**

or

Institutional Login via Shibboleth

**HZDR**  
HELMHOLTZ-ZENTRUM  
DRESDEN FORSCHUNGSZENTRUM

Helmholtz-Zentrum Dresden-...

Or select your organization from the list below

Please select your org:  **Continue**

gELBE beamtime 21102205-ST

GATE Connection

Tags

Project Timeline

Object Graph

Project

**Gate Project**

|                                    |   |
|------------------------------------|---|
| <b>GATE-ID</b>                     | 2205  |
| <b>Title</b>                       | Tests of the detector system for the Stopping Target Monitor of the MUZE experiment in a high flux pulsed gamma beam (Resubmission of 20101909-ST due to COVID pandemic)  |
| <b>Proposer</b>                    | Mueller, Dr. Stefan (FWCC) - 7394 (Owner of Project "gELBE beamtime 21102205-ST")   |
| <b>Abstract</b>                    | The gELBE pulsed gamma beam, with narrow pulses set to about 600 kHz repetition rate - the choice of the ELBE CW mode with micropulses at 406 kHz or 812.5 kHz is ideal in our case- is the unique facility in the world suited to study the performance of the Stopping Target Monitor detector of the MuZe Experiment. The STM monitor has the crucial role to normalize the charged lepton flavor muon conversion rate in the MuZe experiment. The ability to operate at high rate in presence of background is crucial. We have at ELBE the unique possibility to validate the final methodology that will be employed by the STM detector. |
| <b>Proposal</b>                    | 21102205-ST   |
| <b>Restricted</b>                  | no  |
| <b>Responsible Experimentalist</b> | Mueller, Dr. Stefan (FWCC) - 7394   |
| <b>Local Contact</b>               | Schwengner, Dr. Ronald (FWKK) - 938   |



# Project list

- The owner of a project is typically the corresponding beamline scientist, the project proposer acts as a manager and can add additional project members
- Tags and sub-projects including inheritance are possible in the project list

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### Project List

| Project Name                        | Last Modified | Owner                             |                      |
|-------------------------------------|---------------|-----------------------------------|----------------------|
| EPOS 23203274                       | Nov 30, 2023  | Ferrari, Dr. Anna (FWKH) - 5161   | <a href="#">Open</a> |
| Semantic x-Lab                      | Jul 11, 2023  | Voigt, Martin (FWCC-D) - 141575   | <a href="#">Open</a> |
| ▶ gELBE Projects <span>gELBE</span> | Oct 20, 2023  | Mueller, Dr. Stefan (FWCC) - 7394 | <a href="#">Open</a> |
| Cyclotron Update 2023               | Jan 24, 2024  | Mueller, Dr. Stefan (FWCC) - 7394 | <a href="#">Open</a> |
| SATIF15                             | May 15, 2023  | Mueller, Dr. Stefan (FWCC) - 7394 | <a href="#">Open</a> |
| SOTA on Uncertainties               | Jan 31, 2024  | Pape, David (FWCC) - 139658       | <a href="#">Open</a> |
| HELIPORT                            | May 23, 2023  | Voigt, Martin (FWCC-D) - 141575   | <a href="#">Open</a> |
| Digital Twin Showcase               | Dec 01, 2023  | Voigt, Martin (FWCC-D) - 141575   | <a href="#">Open</a> |
| presentation <span>AAA</span>       | Nov 28, 2023  | Voigt, Martin (FWCC-D) - 141575   | <a href="#">Open</a> |
| My Simulation Project               | May 31, 2022  | Voigt, Martin (FWCC-D) - 141575   | <a href="#">Open</a> |

[Create Project](#)

« < 1 2 > »

# Systems: Documentation and Code Repositories

The “Systems” section is typically used to refer to all internal and external systems or services which are used:

- Electronic Lab Notebooks (Mediawiki, Hedgedoc, Google-Docs,...)
- GitLab, Github, Workflowhub, ...
- Authentication via pre-defined Login-method (ssh, token, username and password)



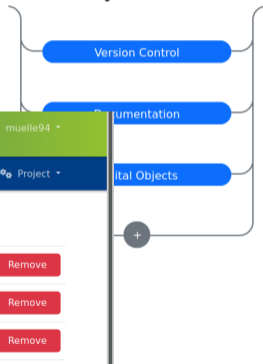
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## Systems



| ID | Description                    | System   |      |      |        |
|----|--------------------------------|----------|------|------|--------|
| 26 | Run logbook                    | HedgeDoc | Open | Edit | Remove |
| 23 | Preparation and Requirements   | HedgeDoc | Open | Edit | Remove |
| 55 | New Cloud folder (Password: .) | Other    | Open | Edit | Remove |

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## Systems

Version Control

Documentation

Digital Objects

HELIPORT  About Docs muelle94

gELBE beamtime 21202619-ST > Version Control Tags Project Timeline Object Graph Project

### Version Control

| ID | Name  | View   | Edit | Remove |        |
|----|---|--------|------|--------|--------|
| 32 | ▲ Alex Keshavarzi's github repo (use branch McrDev) | View → | Edit | Remove |        |
| 33 | ♥ TRCprocess  | View → | Open | Edit   | Remove |

### Add a Source Code Repository

HZDR GitLab Other New

< 1 2 ... >

search ☆


FWCC / statistics-collector  
Collects data from different sources and prepares it for further usage in statistical analysis. Mainly aimed to help with creating the relevant statistics for the yearly report but also extendable for different use-cases. Current status:

Import Open

# Data resources

- Folders and files in site-internal filesystems can be registered in **HELIPORT** as **data source**
- Each **project member** has read-only access to the files and folders using the stored login credentials of the **HELIPORT** project
- The provenance of the data sets generated from an experiment is entirely comprehensible

The screenshot shows the HELIPORT web interface. At the top, there is a navigation bar with the HELIPORT logo, a search bar, and user information (About, Docs, muelle94). Below the navigation bar, the breadcrumb trail indicates the current location: gELBE beamtime 21202619-ST > SSH Files/Directories. The main content area is titled "SSH Files and Directories" and contains a table with the following data:

| ID | Name   | Login    | Path                         |  |
|----|--|----------|------------------------------|--|
| 36 |  /bigdata<br>/GATE21202619ST/Data | muelle94 | /bigdata/GATE21202619ST/Data | <a href="#">Open</a> <a href="#">Edit</a> <a href="#">Delete</a> |

Below the table, there is a section titled "Add a Data Source" with a warning message: "⚠ All members of this project will have read-only access to data sources added here! They will only be able to **read** the data at the specified path and its subdirectories. Please note that HELIPORT is a still a work in progress. **Do not** share sensitive data!"

The form for adding a data source includes the following fields:

- Name**: Text input field
- Path**: Text input field
- Login**: Dropdown menu with "Choose a Login" selected
- Description**: Text area

# Data resources

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gELBE beamtime 21202619-ST > SSH Files/Directories

Tags Project Timeline Object Graph Project

### SSH Files and Directories

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Name

HELIPORT

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gELBE beamtime 21202619-ST > SSH Files/Directories

/bigdata/GATE21202619ST/Data

Tags Project Timeline Object Graph Project

Select: All **Files** Directories

name, size or date

Select Pattern

### /bigdata/GATE21202619ST/Data

- DSPEC\_LaBr [Add Tag](#)
- HPGe\_data [Add Tag](#)
- Oscilloscope\_data [Add Tag](#)

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**HZDR**

Mitglied der Helmholtz-Gemeinschaft  
S. E. Müller et al. | HZDR | http://www.hzdr.de

# Integration in Overall Publication Workflow

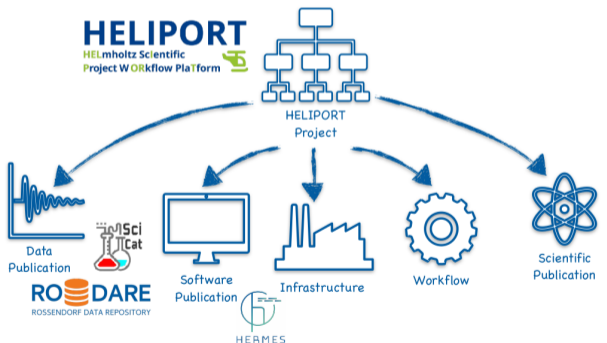
Automated data publication with:

- Metadata from Proposal system
- Files and folders registered and selected in **HELIPORT**

The image illustrates the integration of HELIPORT into a publication workflow. It shows three main components: 1) Project configuration in HELIPORT, including metadata like ID, URL, and title. 2) A workflow diagram showing the flow from Systems (Version Control, File Management, Documentation) through Resources (Data Source, S3 File/Credentials, UNCCORE Storages) to Automato (UNCCORE Jobs). 3) The final publication on RO DARE, which includes author information, a download count of 2,980, and a version history. The bottom-left screenshot shows the 'Members and Contributors' page in HELIPORT, listing project members like Gruber, Dr. Thomas (FWCC) and others. The bottom-middle screenshot shows the 'Second Day' view in HELIPORT, displaying a list of files and folders with their names, sizes, and dates, and options to add tags.

# Conclusions

- The **HELIPORT** system allows to describe and collect metadata from services and systems involved in a scientific experiment from the initial proposal to the final publication and eventual data reuse
- This is very important to provide **FAIR** and **comprehensible** research projects
- Metadata is shared between services and systems by dedicated **interfaces** (APIs)





# Resources



Website: [heliport.hzdr.de](https://heliport.hzdr.de)

The screenshot shows the HELIOPORT website homepage. At the top, there is a navigation bar with 'About', 'News', 'Resources', 'Demo', and 'Docs'. Below the navigation bar, the main heading reads 'HELIPORT HELmholtz Scientific Project WORKflow PlaTform'. A sub-heading states: 'The guidance system HELIOPORT aims to make the entire life cycle of a project at the HZDR findable, accessible, interoperable and reusable according to the FAIR principles, mentioned below. In particular, our data management solution deals with the areas from the generation of the data to the publication of primary research data, the workflows carried out and the actual research results. For this purpose, a concept was developed which shows the various essential components and their connections. Descriptions of the individual components can be found in our HZDR Data Management Strategy.'

Intuitive and structured user interface

This screenshot shows a 'Project Graph' interface for a project named 'Project Graph gLRE baseline 21022205-ST'. It features a central bar chart with four segments labeled 'Project', 'Systems', 'Resources', and 'Automation', each with a corresponding value. Below the chart, there are sections for 'Results' and 'Response samples'.

This screenshot shows the 'Response samples' section of the API documentation. It displays a JSON response for a 'GET /api/projects/' request. The response includes fields like 'total', 'page', 'items', and 'links'. The 'items' field contains a list of project objects with details like 'id', 'name', 'description', and 'status'.

API doc: [heliport.hzdr.de/app/redoc/](https://heliport.hzdr.de/app/redoc/)

Repository: [codebase.helmholtz.cloud/heliport](https://codebase.helmholtz.cloud/heliport/heliport)

The screenshot shows the HELIOPORT repository page on GitHub. It displays the repository name 'HELIPORT', project ID '1287', and statistics: 1,941 Commits, 5 Branches, 2 Tags, and 3.4 GiB Project Storage. The page also shows the latest commit, version information (5.0.1), and various badges for license (GNU GPL v3), CI/CD configuration, and adding a Kubernetes cluster.

This screenshot shows a workshop presentation slide for HELIOPORT. The title is 'HELIPORT: A Portable Platform for FAIR {Workflow | Metadata | Scientific Project Lifecycle} Management and Everything'. The authors listed are Oliver Knodel, Martin Voigt, Robert Ufer, David Pape, Mani Lokamani, Stefan E. Müller, Thomas Gruber, and Guido Juckeland. The slide includes an abstract, an introduction, and a DOI: 10.1145/3456287.3465477.

