Achieving reproducible data workflows: Lightweight tools for safe and efficient data management

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Maintaining reproducible data workflows while keeping data in sync, backed up, and easily accessible from within and outside the lab is a key challenge in research. To minimize time and effort scientists have to spend on these tasks, we provide a suite of tools designed for comprehensive and versioned management of scientific data including convenient storage of data, analysis and metadata annotation for easy reproducability, data sharing and re-usability.

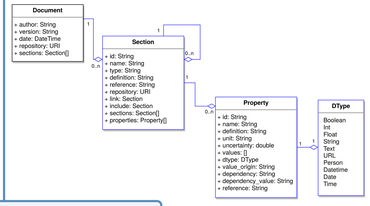
Collect and manage all information about your experiment

Main features
- Open metadata format [1]
- Flexible hierarchical key-value storage
- Save to common structured formats: XML, JSON, YAML
- Template system for reusable metadata structures
- Terminology repository [2] for reusable definitions

- GUI editor [3]
- Available for macOS and Linux
- Cross-document drag-and-drop for metadata subtrees

- Export to RDF retaining your own terms and structure
- Query metadata using semantic web technologies
- Search cross document via SPARQL queries
- Make metadata publicly available on meta.g-node.org

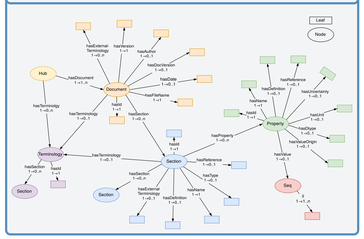
The odML Metadata format



public SPARQL resource
meta.g-node.org

Queries

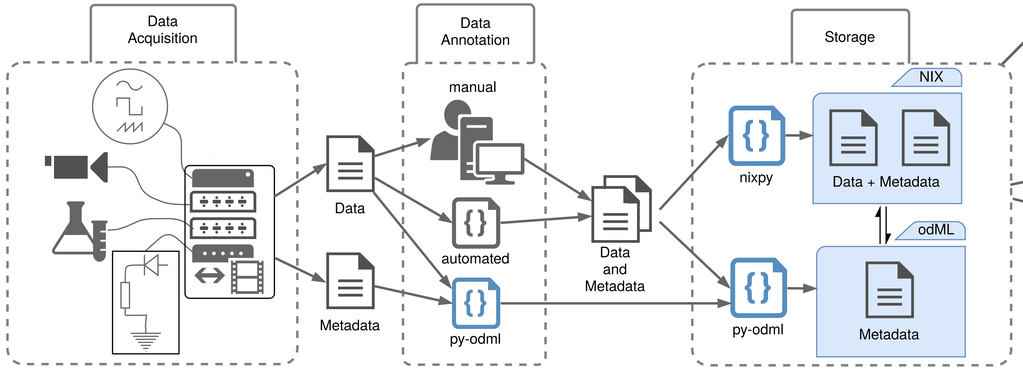
odML RDF schema



Secure data storage, easy collaboration and publication

Main features
- Access data from any location
- Free storage for scientific data [11]
- Built in versioning (built on git [12])

- Platform independent
- Secure access
- Public and private repositories
- Citable data by DOIs



py-odml

meta.g-node.org:
access diverse metadata datasets
all datasets are publicly available
searchable by SPARQL via API and web

odML files in gin:
- indexed and searchable
- treeview rendering for convenient exploration

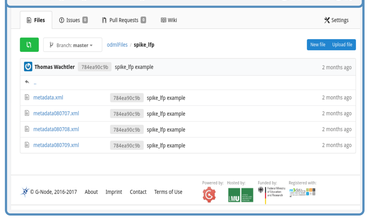
GIN Repository Workflow

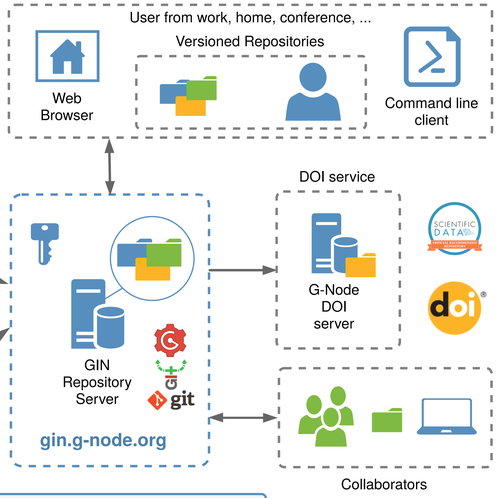
- Browse, download, and upload data via web
- Download and upload large files via command line [13]
- Automate workflows using command line client
- All changes are versioned automatically

GIN Client

```
$ gin login
Login: achilleas
Password: **********
Hello achilleas. You are now logged in.

$ gin get G-Node/odmlFiles
Fetching repository 'G-Node/odmlFiles'... OK
Initialising local storage... OK

$ gin ls
Synced:
        metadata.xml
        metadata080707.xml
        metadata080708.xml
        metadata080709.xml

$ |
```

GIN Web





Upcoming features
- Format validation
  - BIDS, odML, NIX, custom formats
- CI for scientific data, run automated tests for scripts and data integrity.
- automated export of odML to RDF

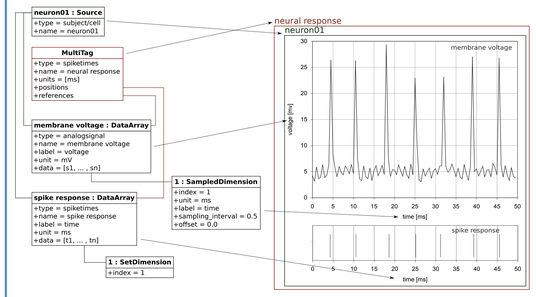
Collaboration
- User management
- User Access Levels
- On and offsite collaboration

Manage data and metadata together in an open, versatile format

Main features
- Open data format
- Store data, analysis results, and metadata conveniently in the same file
- Descriptive associations between data, analysis results, and metadata

- Free open source libraries for multiple programming languages: C++ [4], Python [5], Matlab [6], Java [7]
- NIX IO for Neo [8]
- Enables interoperability with Neo compatible tools, e.g., the Elephant toolkit [9]
- NIXView [10] Cross-platform GUI

The NIX data model



Resources

Contact: dev@g-node.org

[1] Grewe et al (2011), doi:10.3389/fninf.2011.00016
[2] http://www.g-node.org/projects/odml/terminologies
[3] https://github.com/G-Node/odml-ui
[4] https://github.com/G-Node/nix
[5] https://github.com/G-Node/nixpy
[6] https://github.com/G-Node/nix-mx
[7] https://github.com/G-Node/nix-java
[8] http://neuralensemble.org/neo
[9] http://neuralensemble.org/elephant
[10] http://bendalab.github.io/NixView
[11] https://gin.g-node.org
[12] https://git-scm.com

Supported by BMBF grants 01GQ1302, 01GQ1509

Federal Ministry of Education and Research