

eLabFTW

Free Electronic Lab Notebook



Alexander Minges

“Thementag Elektronische Laborbücher”

26. March 2019 – University of Rostock

Institute of Biochemical Plant Physiology

Heinrich Heine University Düsseldorf


Introduction

What is eLabFTW?

eLabFTW is a generic electronic lab notebook (ELN)


What is eLabFTW?

eLabFTW is a generic electronic lab notebook (ELN)

- Free and open-source software (GNU AGPL 3.0 )


What is eLabFTW?

eLabFTW is a generic electronic lab notebook (ELN)

- Free and open-source software (GNU AGPL 3.0 )
- Community-driven development – by scientists, for scientists


What is eLabFTW?

eLabFTW is a generic electronic lab notebook (ELN)

- Free and open-source software (GNU AGPL 3.0 )
- Community-driven development – by scientists, for scientists
- Browser-based user interface compatible with all commonly used browsers and (mobile) devices

What is eLabFTW?

eLabFTW is a generic electronic lab notebook (ELN)

- Free and open-source software (GNU AGPL 3.0 )
- Community-driven development – by scientists, for scientists
- Browser-based user interface compatible with all commonly used browsers and (mobile) devices
- Multilingual

What is eLabFTW?

eLabFTW is free and open-source software (FLOSS)

What is eLabFTW?

eLabFTW is free and open-source software (FLOSS)

Free as in “**beer**” eLabFTW is (and will always be)
available **free of charge**

Free as in “**freedom of speech**” Its **source code** is available
and can be **adjusted, changed and freely
distributed**

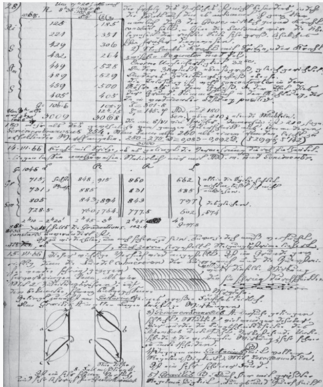
Why electronic lab notebooks?

Hand-written lab notebooks are anachronistic...

Dirnagl & Przedzina 2016 (doi: [10.12688/f1000research.7628.1](https://doi.org/10.12688/f1000research.7628.1))

Why electronic lab notebooks?

Hand-written lab notebooks are anachronistic...



Dirnagl & Przedzins 2016 (doi: 10.12688/f1000research.7628.1)



- 2012 Initiated by Nicolas Carpi at the *Institut Curie*
- Feb. 2013 First public version (0.7.0)
- 2018 Announced as an officially supported software project by the *Institut Curie*
- Aug. 2018 Current major version 2.0 released
- Mar. 2019 Feature preview 2.1.0-alpha

eLabFTW is platform independent



- Installation on a **server** (Webserver + PHP + MySQL/MariaDB)
- Access via **web browser** on many different clients (desktop, notebook, tablet, smartphone)
- **No client software** needed
- No dependency on specific **operating systems**



Used worldwide



Features

eLabFTW features a modern and clean UI

The screenshot displays the eLabFTW web interface in a browser. The address bar shows the URL `https://127.0.0.1/experiments.php`. The navigation menu includes 'eLabFTW', 'EXPERIMENTE', 'DATENBANK', 'TEAM', 'SUCHE', and 'DOCUMENTATION'. A user greeting 'Hallo, Alexander' is visible in the top right corner. The main heading is 'Experimente', followed by a 'Neu erstellen' button and a set of filters: 'Filterstatus', 'Filter', 'Anordnen nach', 'Sortieren', 'Reihenfolge', and 'Zurücksetzen'. Below this, it indicates '3 angezeigte Ergebnisse' and 'Alle auswählen'. The list contains three items: 'Lorem Ipsum III' (RUNNING, 2018.09.12), 'Lorem Ipsum II' (FAIL, 2018.09.12), and 'Lorem Ipsum' (SUCCESS, 2018.09.12). Each item has a status icon, a date, a description, and a plus icon. An 'ALLES ANZEIGEN' button is at the bottom.



Experimente

- Freely definable **status** (e.g. “finished”, “in progress” ...)
- **time stamping** of experiments
- Definition of **templates and stepped procedures**



Database entries

- Templates and sub types
- Use cases: laboratory inventory, protocols, ...
- Calendar with **bookable items** (e.g. technical facilities)



Database entries

- Templates and sub types
- Use cases: laboratory inventory, protocols, ...
- Calendar with **bookable items** (e.g. technical facilities)



Categorization

- Freely choosable **tags**

Creating experiments and database items

Rich text editor

Browser: <https://127.0.0.1/experiments.php?mode=edit&id=3>

Schlagwörter: lorem ipsum Schlagwort hinzufügen

Datum: 20180912 Sichtbarkeit: Only the team Status: Running

Experiment

Bearbeiten Ansicht Einfügen Format Tabelle

Rich text editor toolbar: Bold, Italic, Underline, Text color, Background color, Bulleted list, Numbered list, Indent, Outdent, Undo, Redo, Save

Lorem ipsum dolor sit amet consectetur adipiscing elit

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem. Nulla consequat massa quis enim. Donec pede justo, fringilla vel, aliquet nec, vulputate eget, arcu. In enim justo, rhoncus ut, imperdiet a, venenatis vitae, justo. Nullam dictum felis eu pede mollis pretium. Integer tincidunt. Cras dapibus. Vivamus elementum semper nisi. Aenean vulputate eleifend tellus. Aenean leo ligula, porttitor eu, consequat vitae, eleifend ac, enim. Aliquam lorem ante, dapibus in, viverra quis, feugiat a, tellus. Phasellus viverra nulla ut metus varius laoreet. Quisque rutrum. Aenean imperdiet. Etiam ultricies nisi vel augue. Curabitur ullamcorper ultricies nisi.

Lorem ipsum dolor sit amet consectetur adipiscing elit

Aenean commodo ligula eget dolor aenean massa

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem.

Aenean commodo ligula eget dolor aenean massa

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem.

- Lorem ipsum dolor sit amet consectetur.
- Aenean commodo ligula eget dolor.
- Aenean massa cum sociis natoque penatibus.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean commodo ligula eget dolor. Aenean massa. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Donec quam felis, ultricies nec, pellentesque eu, pretium quis, sem.

Creating experiments and database items

Attaching of files with previews

The screenshot shows a web browser window with the address bar displaying "https://127.0.0.1/experiments.php?mode=edit&id=3". The page content includes a "Datei anhängen" section with the instruction "Dateien zum Hochladen hier fallen lassen". Below this, the "Angehängte Dateien" section displays three attached files:

- baboon.tif** (768.14 KB): A thumbnail image of a baboon's face. Below the thumbnail are the file name, size, and options: "Click to add a comment" and "Neue Version dieser Datei hochladen".
- 5jvl.d.pdb** (1.03 MB): A 3D ribbon diagram of a protein structure. Below the diagram are the file name, size, and options: "Click to add a comment" and "Neue Version dieser Datei hochladen".
- Structure2D.CID.2396.pdf** (7.21 KB): A 2D chemical structure diagram. Below the diagram are the file name, size, and options: "Click to add a comment" and "Neue Version dieser Datei hochladen".

Inventory management using templates

The screenshot shows a web browser window with the address bar displaying "https://127.0.0.1/database.php". The page title is "Datenbank - eLabFTW". The navigation menu includes "eLabFTW", "EXPERIMENTE", "DATENBANK", "TEAM", "SUCHE", and "DOCUMENTATION". The user is logged in as "Hallo, Alexander".

The main content area is titled "Datenbank" and features a "Neu erstellen" button. Below this, there are sorting and filtering options: "Sortiere nach Typ", "Filter", "Anordnen nach", "Sortieren", "Reihenfolge", and "Zurücksetzen".

Three items are listed in a table:

Item Name	Protocol	Date	Icon	Action
Transformation von E.coli XL1-Blue	PROTOKOLL	2018.09.13	🔗 Transformation XL1-Blue	⊕
pET-16b	PLASMID	2018.09.13	🔗 pET	⊕
Magnesiumphosphat	CHEMKAUE	2018.09.13		⊕

At the bottom of the list, there is a button labeled "ALLES ANZEIGEN".

The footer contains system information: "SYSADMIN-KONTROLLZENTRUM | ADMIN-KONTROLLZENTRUM" and "Bereitgestellt von eLabFTW Seite generiert in 0.05442 Sekunden".

Booking equipment and facilities

The screenshot shows a web browser window with the URL <https://127.0.0.1/team.php?tab=1&item=1>. The page title is "Team" and the user is logged in as "Hallo, Alexander". The navigation menu includes "eLabFTW", "EXPERIMENTE", "DATENBANK", "TEAM", "SUCHE", and "DOCUMENTATION".

The main content area is titled "Team" and has sub-tabs for "TERMINPLANER", "INFORMATION", and "VORLAGEN". Below this, there is a link "Wechsel das Objekt" and the selected object "Zentrifuge - Avanti JXN-26".

The calendar view shows the dates "10. - 16. Sep. 2018" and a "Woche" button. The calendar grid has columns for days of the week (MO. 10.9, DI. 11.9, MI. 12.9, DO. 13.9, FR. 14.9, SA. 15.9, SO. 16.9) and rows for hours (06, 07, 08, 09, 10, 11, 12). Two booking slots are visible:

- A slot from 07:00 to 08:30 on Wednesday (MI. 12.9) labeled "DZ (Alexander Minges)".
- A slot from 09:00 to 12:00 on Monday (MO. 10.9) labeled "Zellen (Alexander Minges)".

Hour	MO. 10.9	DI. 11.9	MI. 12.9	DO. 13.9	FR. 14.9	SA. 15.9	SO. 16.9
06							
07			07:00 - 08:30 DZ (Alexander Minges)				
08							
09	09:00 - 12:00 Zellen (Alexander Minges)						
10							
11							
12							

Additional features

- Alternative input syntax: **structured text** (Markdown)

Additional features

- Alternative input syntax: **structured text** (Markdown)
- **Preview** of common file formats (u.a. PDF, TIFF, PDB, SDF,...)

Additional features

- Alternative input syntax: **structured text** (Markdown)
- **Preview** of common file formats (u.a. PDF, TIFF, PDB, SDF,...)
- **Versioning** of entries and attached files

Additional features

- Alternative input syntax: **structured text** (Markdown)
- **Preview** of common file formats (u.a. PDF, TIFF, PDB, SDF,...)
- **Versioning** of entries and attached files
- **Linking** of/between experiments and database items

Additional features

- Alternative input syntax: **structured text** (Markdown)
- **Preview** of common file formats (u.a. PDF, TIFF, PDB, SDF,...)
- **Versioning** of entries and attached files
- **Linking** of/between experiments and database items
- **Sharing** experiments with other users

Additional features

- Alternative input syntax: **structured text** (Markdown)
- **Preview** of common file formats (u.a. PDF, TIFF, PDB, SDF,...)
- **Versioning** of entries and attached files
- **Linking** of/between experiments and database items
- **Sharing** experiments with other users
- Rendering of **math formula**

Upcoming features

New in 2.1.0 (incomplete):

- Possibility to include a **privacy statement** (“GDPR-compliance”)
- **Mailinglists**
- **Reports** in admin interface (e.g. disk space usage)
- Miscellaneous things “under the hood”

Time stamping

Status of experiments

- Proof of defined status at time point “X”
- Time stamping authority (TSA) according to RFC 3161 (e.g. DFN)
- Verification of data integrity by cryptographic hash (SHA256)



Figure: Wikimedia Commons; CC BY-SA 4.0 


Time stamping

Status of experiments

- Proof of defined status at time point “X”
- Time stamping authority (TSA) according to RFC 3161 (e.g. DFN)
- Verification of data integrity by cryptographic hash (SHA256)



📍 Experiment wurde mit einem Zeitstempeln versehen von Alexander Minges auf 2018-09-12 bei 22:50:11 Europe/Paris 📄 ⬇️ ⓘ

Figure: Wikimedia Commons; CC BY-SA 4.0   

Data export/import

- Export of single experiments and data items as **ZIP** archive
- Export as **PDF** including preview of attached files (if possible)
- Mass export as **CSV** (text-only) or **ZIP** archive (incl. attached files)
- Import of tables (**CSV**) to create experiments or database items



Integration into existing infrastructure

- Default after installation: local user accounts
- Integration into existing identity management (SAML 2.0)
- Combination of local and centrally managed accounts possible



Access via public REST API

- Interaction with lab equipment and processes
- Automated creation/termination of experiments
- Upload of files to eLabFTW
- Data export in JSON format

Creating an experiment using *bash* scripts

```
#!/bin/bash
export API_KEY=XXXXX
curl -X POST -H "Authorization: $API_KEY" \
  "https://elabftw.example.org/api/v1/experiments"

# Upload and attach file to experiment 3
curl -X POST -F "file=@your-file.jpg" -H \
  "Authorization: $API_KEY" \
  "https://elabftw.example.org/api/v1/experiments/3"
```



Python library for easy interaction with eLabFTW:

elabapy 0.4.0

```
pip install elabapy
```



Creating an experiment using *python*

```
#!/sbin/env python
import elabapy

manager = elabapy.Manager(endpoint="https://elab.example.org/api/v1/",
                           token="XXXX")

exp = manager.create_experiment()

files = {'file': open('report.xls', 'rb')}
print(manager.upload_to_experiment(exp["id"], files))
```

Creating an experiment using *python*

```
#!/sbin/env python
import elabapy

manager = elabapy.Manager(endpoint="https://elab.example.org/api/v1/",
                           token="XXXX")

exp = manager.create_experiment()

files = {'file': open('report.xls', 'rb')}
print(manager.upload_to_experiment(exp["id"], files))
```

Additional examples: <https://doc.elabftw.net/api.html>

How to try?



<https://demo.elabftw.net>



<https://doc.elabftw.net/install.html>

Finally

Further questions?



Website <https://www.elabftw.net>

Documentation <https://doc.elabftw.net>

Source code <https://github.com/elabftw/elabftw>



alexander.minges@hhu.de (de/en)

nicolas.carpi@curie.fr (fr/en)

Acknowledgments

Prof. Dr. Georg Groth
Institute of Biochemical Plant Physiology
Heinrich Heine University Düsseldorf



Nicolas Carpi
Institut Curie, Paris
France



Thank you for your kind
attention!