

Templates for reproducible science

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Overview of Reproducibility in Science

Significance of reproducibility and reusability in scientific research

- Reproducibility



Reproducible but not accurate

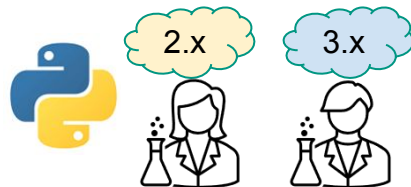
- Reusability



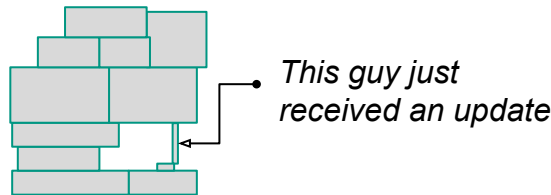
Accessible and usable for future experiments

Common factors affecting reproducibility

- Inconsistent Environments



- Dependency Management



- Manual Setup



*Clone repository
Compile project
Pray it works*

Importance of Software Templates

Software Engineering Best practices [e.g. [1](#),[2](#),[3](#)]

1. Enhance Code Readability
2. Keep Code Efficiency
3. Test Your Code
4. Be Descriptive
5. Use Version Control
6. Refactor Your Code
7. Apply the KISS principle (Keep It Simple, Silly)
8. Apply the DRY (Don't Repeat Yourself) principle
9. ...

This is where ***software templates*** come very handy, e.g. to:

- *Ensure Consistency*; set software project structure
- *Enforce Best Practices*: pre-set certain code functionalities
- *Improve Efficiency*: provide good code examples, including tests

Tools for Reproducibility and Standardization



Tracks changes to files and allows developers to manage the history of their code.

Pro: easy to use

Contra: templates from hubs are not very customisable

Create **standardized environments** by encapsulating the code, dependencies, libraries, and operating system in a container

Pro: solves inconsistent environments and dependency management

Contra: no template framework



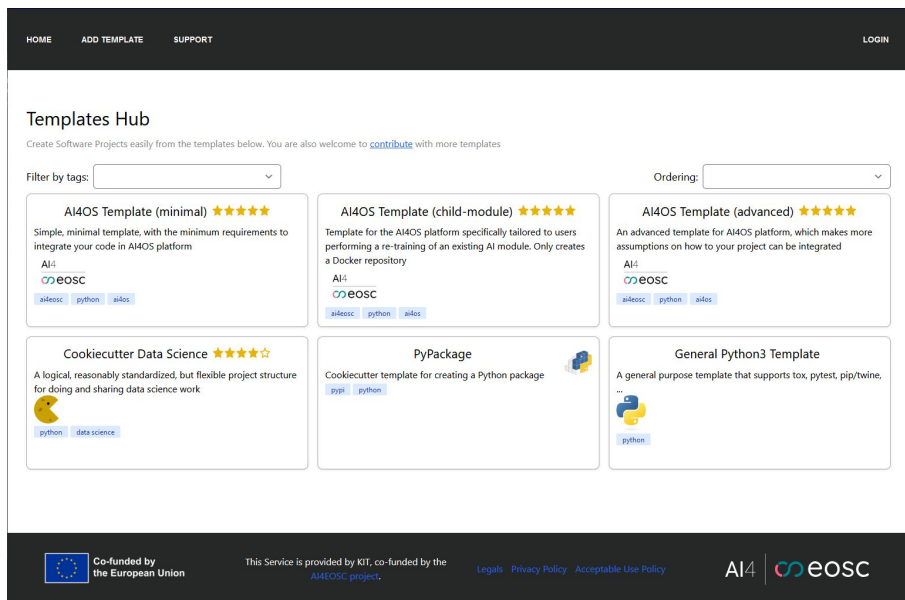
A command-line utility (python package) that creates projects from *cookiecutters* (project templates)

Pro: very customisable templates (Jinja-based)

Contra: one has to install the cookiecutter tool locally

.. and in any case, it can be useful to have a central place to select your best template ..

Templates Hub



HOME ADD TEMPLATE SUPPORT LOGIN

Templates Hub

Create Software Projects easily from the templates below. You are also welcome to [contribute](#) with more templates

Filter by tags: Ordering:

AI4OS Template (minimal) ★★★★★

Simple, minimal template, with the minimum requirements to integrate your code in AI4OS platform

AI4
eosc

ai4oscc python ai4os

AI4OS Template (child-module) ★★★★★

Template for the AI4OS platform specifically tailored to users performing a re-training of an existing AI module. Only creates a Docker repository

AI4
eosc

ai4oscc python ai4os

AI4OS Template (advanced) ★★★★★

An advanced template for AI4OS platform, which makes more assumptions on how to your project can be integrated

AI4
eosc

ai4oscc python ai4os

Cookiecutter Data Science ★★★★★

A logical, reasonably standardized, but flexible project structure for doing and sharing data science work

python data science

PyPackage

Cookiecutter template for creating a Python package

python

General Python3 Template

A general purpose template that supports tox, pytest, pip/twine.

python

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AI4 | eosc

Templates Hub web service, running at <https://templates.services.fedcloud.eu>, is a *collection of software templates (cookiecutters)* where users can very easily:

- **list** available templates and rates
- **choose** a template of their interest
- **generate** software project based on the selected template:
 - Fill out the corresponding web form
 - Receive zip file with the customized startup software project

Templates Hub: Live Demo

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LOGIN

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A logical, reasonably standardized, but flexible project structure for doing and sharing data science work



[python](#) [data science](#)


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Cookiecutter template for creating a Python package


[pypi](#) [python](#)

General Python3 Template

A general purpose template that supports tox, pytest, pip/twine, ...




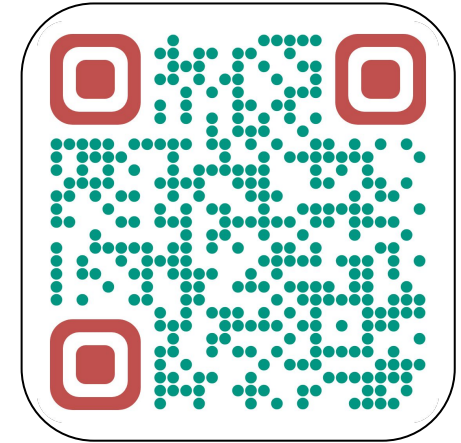
[python](#)


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templates.services.fedcloud.eu

Templates Hub: Web GUI (frontend) (demo)

HOME
ADD TEMPLATE
SUPPORT
LOGOUT

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AI4OS Template (advanced) ★★★★★ [</>Source](#)

ai4osc python ai4os



An advanced template for AI4OS platform, which makes more assumptions on how to your project can be integrated

Filling this web-form will generate a .zip file with the folders generated by the cookiecutter.

Remote URL to host your new repositories (git), e.g. `https://github.com/ai4os-hub` (i.e. at github)

Short name of your project (max 4 words). This is also the name of the module to be imported, e.g. `import project_name as aimodel`.

Create a folder template to start a model from the beginning.


Integrate a model from a git repository as git submodule, e.g. `git@github.com:your_organization/model_name.git`. Ignored if you select to create a folder template from the beginning.

Author name(s) (and/or your organization/company/team). If many, separate by comma

E-Mail(s) of main author(s). If many, separate by comma

A short description of the project.

Application version (expects X.Y.Z (Major.Minor.Patch), in accordance with <https://semver.org/>).




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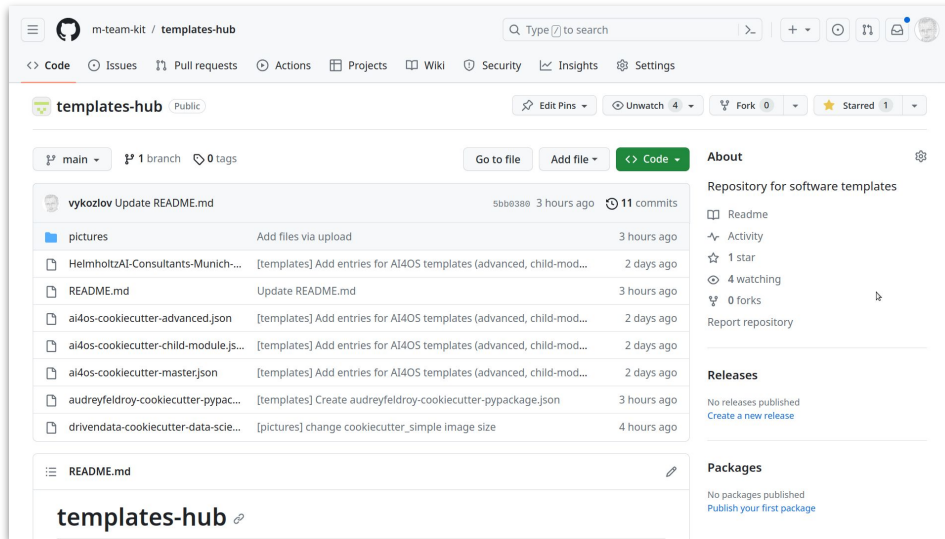
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Adding a New Template to Templates Hub



1. Fork this repository
2. (optional) Add a logo for your template, i.e. an image file in the `pictures/` directory or use one of the available
3. Create a new JSON file keeping convention `githubuser-cookiecutter_repository.json`
4. Fill the content following the example below
5. Commit your changes
6. Create [Pull Request](#) to add your new file in our repository

```
{
  "title": "Template name",
  "summary": "Short summary",
  "tags": [], // e.g. prog language, target, etc
  "picture": "", // i.e. an image in pictures/
  "gitLink": "https://github.com/user/repository",
  "gitCheckout": "branch",
  "feedback": "", // e.g. github issues link, email
}
```

NB: Github repo is also Helpdesk through Issues

Summary

Templates Hub service is a *collection of software templates*, which can be used to *generate* new software projects through the *web interface*

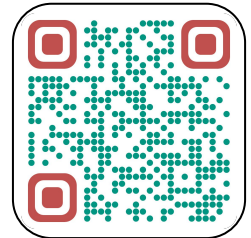
Key points for templates:

- Software development Best Practices reduce variability on reproducibility due to software artifacts.
- Templates Hub to search for the best template that fits your requirements.
- Usage of AI4EOSC framework will help you improve performance and reproducibility in your AI experiments and services.

Service: <https://templates.services.fedcloud.eu>

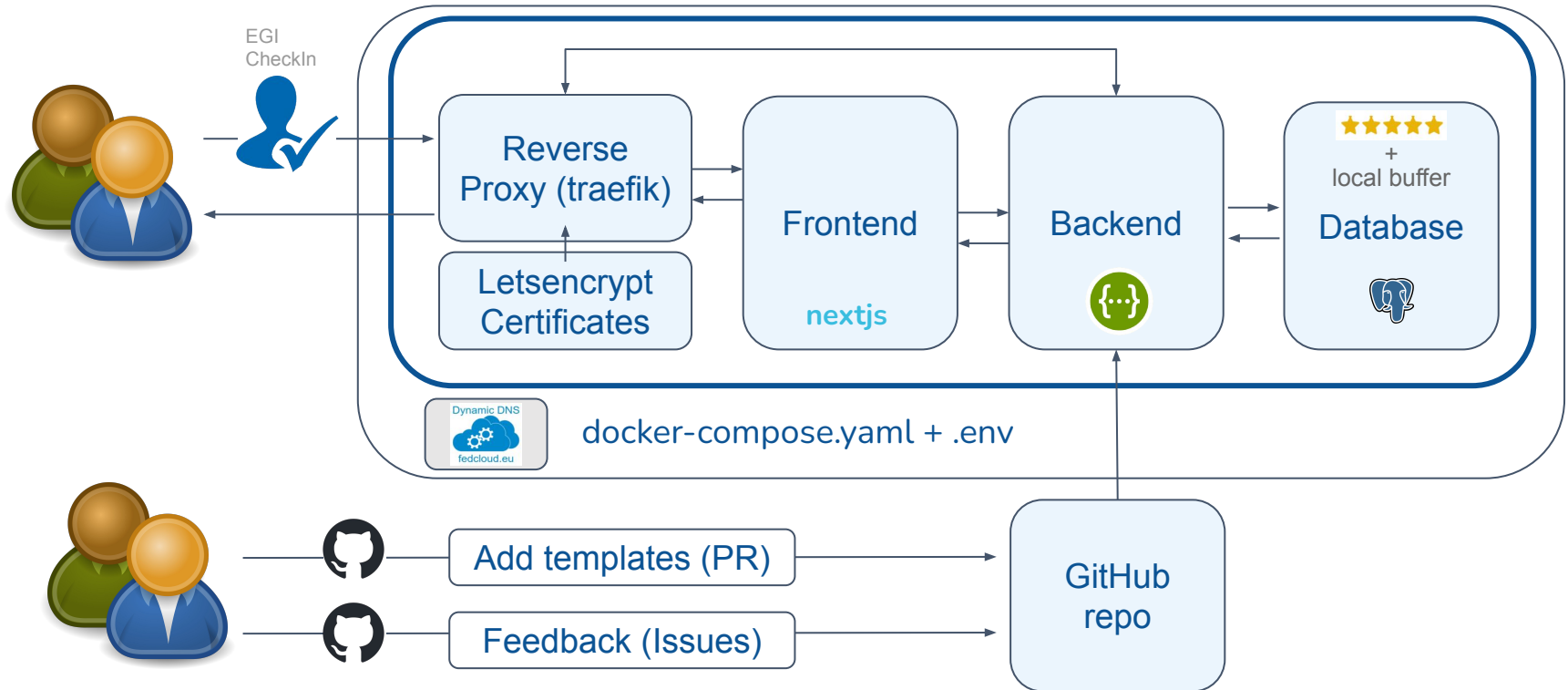
GitHub repo to add templates: <https://github.com/m-team-kit/templates-hub>

GitHub issues: <https://github.com/m-team-kit/templates-hub/issues>

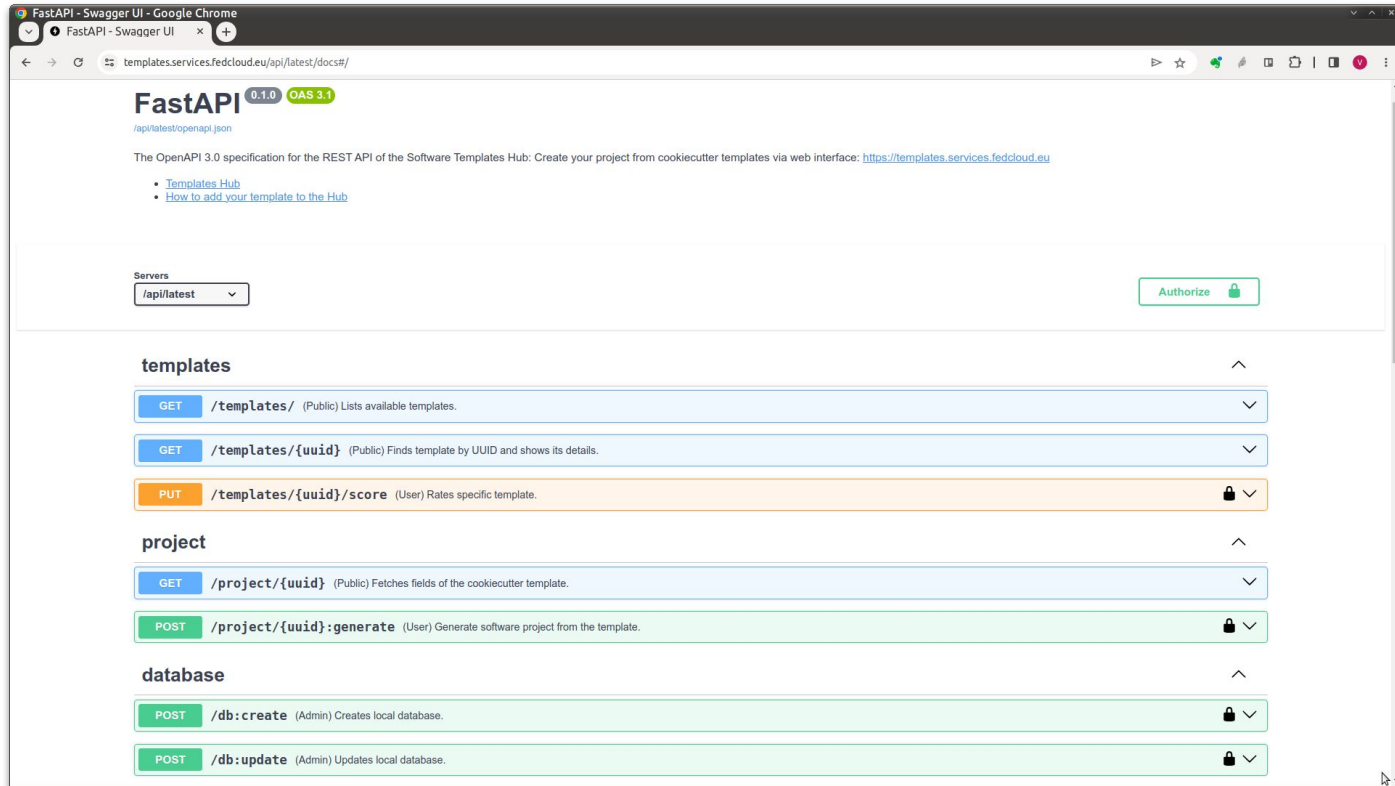


Backup Slides for Questions

Templates Hub: (current) Architecture



Templates Hub: REST API (backend) (demo)



The screenshot shows the Swagger UI for the FastAPI REST API. The browser title is "FastAPI - Swagger UI - Google Chrome" and the URL is "templates.services.fedcloud.eu/api/latest/docs#/".

FastAPI 0.1.0 OAS 3.1
/api/latest/openapi.json

The OpenAPI 3.0 specification for the REST API of the Software Templates Hub: Create your project from cookiecutter templates via web interface: <https://templates.services.fedcloud.eu>

- [Templates Hub](#)
- [How to add your template to the Hub](#)

Servers: /api/latest [Authorize]

templates

- GET /templates/ (Public) Lists available templates.
- GET /templates/{uuid} (Public) Finds template by UUID and shows its details.
- PUT /templates/{uuid}/score (User) Rates specific template. [Lock]

project

- GET /project/{uuid} (Public) Fetches fields of the cookiecutter template.
- POST /project/{uuid}:generate (User) Generate software project from the template. [Lock]

database

- POST /db:create (Admin) Creates local database. [Lock]
- POST /db:update (Admin) Updates local database. [Lock]