

FAIR workflow services

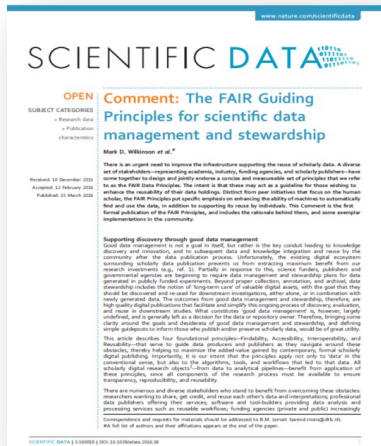
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BioExcel Centre of Excellence
Software Sustainability Institute UK
FAIRDOM Consortium

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FAIR Guiding Principles for Research Data Findable, Accessible, Interoperable, Reusable



Office of
Data Science Strategy



F, I, R Metadata generated and exposed for data products?

F1

Workflow consumes, propagates, generates
FAIR **identifiers** for data?

license data outputs?

R1.1

R1 community **data formats**?

R1.1

usage restrictions on the
reference data needed?

parameters validated?

R1.2

A1

How does the
workflow **access**
FAIR data?

**fully track and report data
provenance** through the workflow?

R1.2



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FAIR Guiding Principles for Research Software Findable, Accessible, Interoperable, Reusable



FAIR for Research Software (FAIR4RS) Working Group

Katz, et al PATTERNS 2, 2021

Patterns



Opinion

Taking a fresh look at FAIR for research software

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<https://doi.org/10.1016/j.patter.2021.100222>

Software is increasingly essential in most research, and during research. To make this research software (FAIR), we need to define exactly what FAIR means: is a living and complex object for which it is impossible

Data Science 3 (2020) 37–59
DOI 10.3233/DS-190026
IOS Press

[Lamprecht et al., 2020](#)

Towards FAIR principles
for research software

FAIR Computational Workflows Goble et al, 2020

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Kuzak^{5,d}, Carlos Martinez⁶,
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Martinez⁶, Peter McQuilton¹,
Iopoulou⁶, Josep L.L. Gelpi⁶,
Pella-Gutierrez^{6,*,**}

F1

register workflows with assigned PID +
metadata in a searchable resource.

A1

metadata & workflow retrievable by PID using a
standardized communication protocol; metadata
retrieval even if the workflow is no longer available.

I1

workflows should read, write or exchange data
using domain-relevant community standards

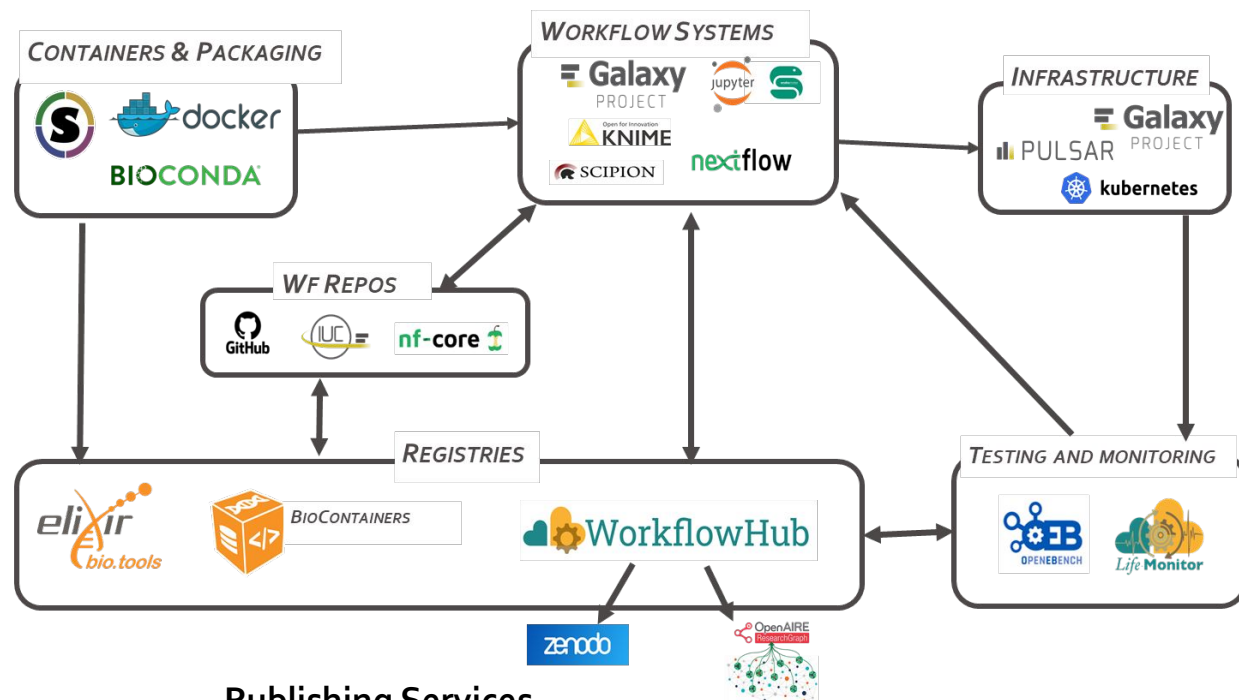
R1

The workflow is **usable** (it can be executed) &
reusable (it can be understood, modified,
built upon, or incorporated into other
workflows).

R1.2

(Meta)data, workflows and tools are associated with **detailed
provenance – data lineage, workflow lineage & workflow logs**

FAIR Workflow Services, FAIR Enabling Services



A WfMS agnostic
FAIR data and workflow
commons

Honour legacy & diversity

Support native repositories
& platforms

Buy-in & on-boarding of
WfMS for lifting and
sharing metadata and
adopting APIs

**Publishing Services
(EOSC) Repositories**

Knowledge Graphs



Connecting Research
and Researchers



Findable & Accessable

register workflows with assigned PID + metadata in a searchable resource.



Dockstore
Create, Share, Use

<https://dockstore.org/>



WorkflowHub

<https://workflowhub.eu>

Publishing Services



zenodo

ORCID
Connecting Research
and Researchers

Journals



Digital Objects of Scholarship

published, cited, exchanged, reviewed, validated & reused

- Versioning, DOI/PID assignment
- Collections, workflow libraries

WfMS Agnostic *degrees of onboarding, support & access*

- Native repositories
- Metadata standards framework, handle associated objects and links between objects.
- Execution API (GA4GH)



Galaxy
PROJECT



SCIPION

nextflow



scripts

Tools



Containers



Deploys

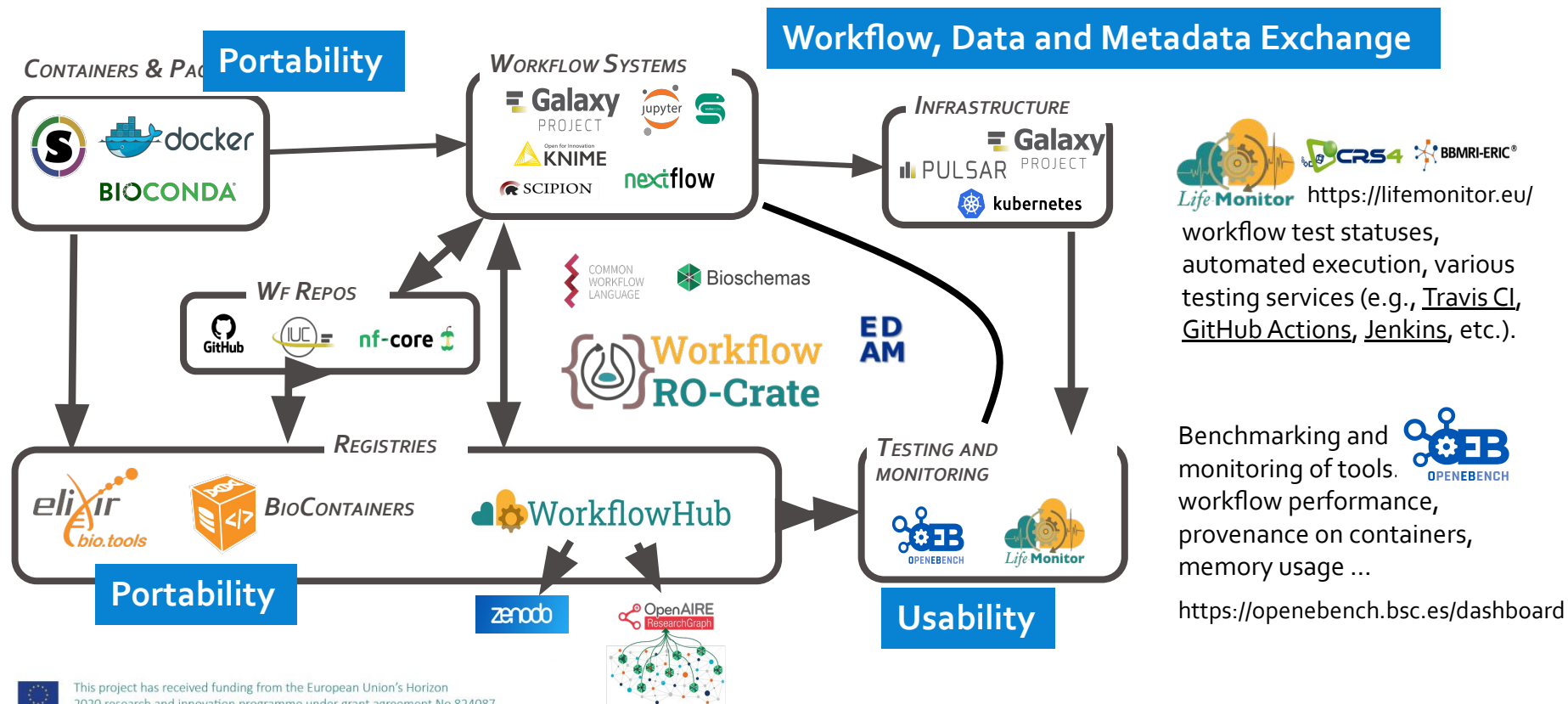


Repos

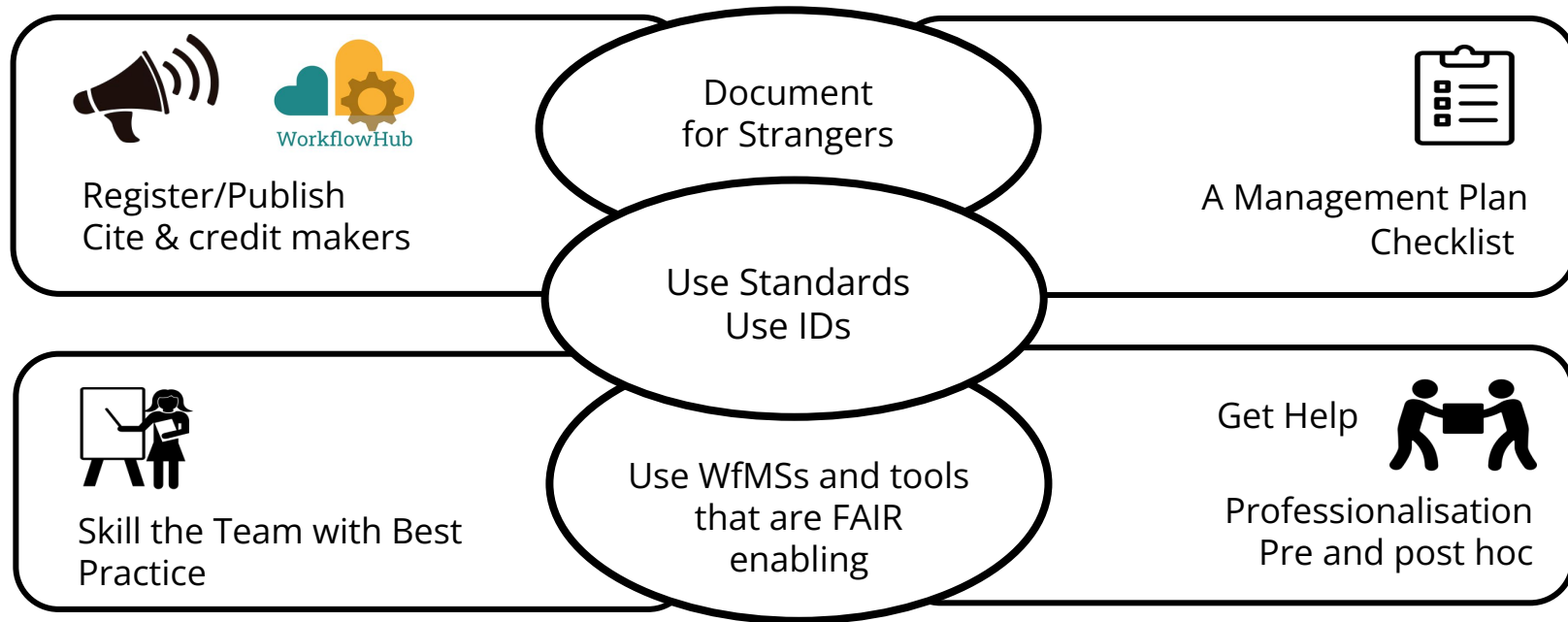


Reproducible and (Re)Usable

execute once accessed, reused and remixed as components



What can a you do to be FAIR?



Acknowledgements

The **WorkflowHub Club**, Bioschemas Community, RO-Crate Community, CWL Community, Galaxy Europe, EOSC-Life and ELIXIR Tools Platform.

<https://about.workflowhub.eu/community/>

WorkflowHub <https://workflowhub.eu/> and <https://workflowhub.org>

EOSC-Life <https://www.eosc-life.eu/>

ELIXIR <http://elixir-europe.org>

RO-Crate <https://www.researchobject.org/ro-crate/>

Galaxy Europe <https://galaxyproject.eu/>

Bioschemas <https://bioschemas.org>

Common Workflow Language <https://www.commonwl.org/>

WorkflowsRI <https://workflowsri.org/>

Dockstore <https://dockstore.org/>

LifeMonitor <https://lifemonitor.eu/>

