

FAIR workflow services

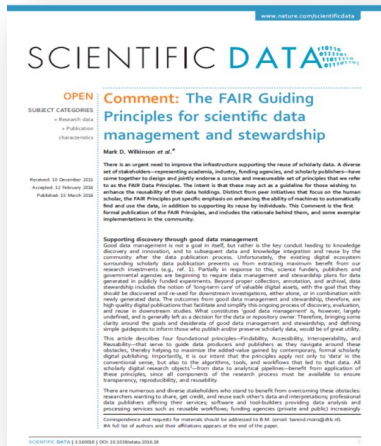
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BioExcel Centre of Excellence
Software Sustainability Institute UK
FAIRDOM Consortium

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



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

F1 Workflow consumes, propagates, generates FAIR identifiers for data?

R1 license data outputs? community data formats?

R1.1 usage restrictions on the reference data needed?

R1.2 parameters validated?

A1 How does the workflow access FAIR data?

R1.2 fully track and report data provenance through the workflow?



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



FAIR for Research Software (FAIR4RS) Working Group

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).

Katz, et al PATTERNS 2, 2021

Patterns



Opinion

Taking a fresh look at FAIR for research software

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IOS Press

[Lamprecht et al., 2020](#)

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

Towards FAIR principles for research software

FAIR Computational Workflows Goble et al 2020

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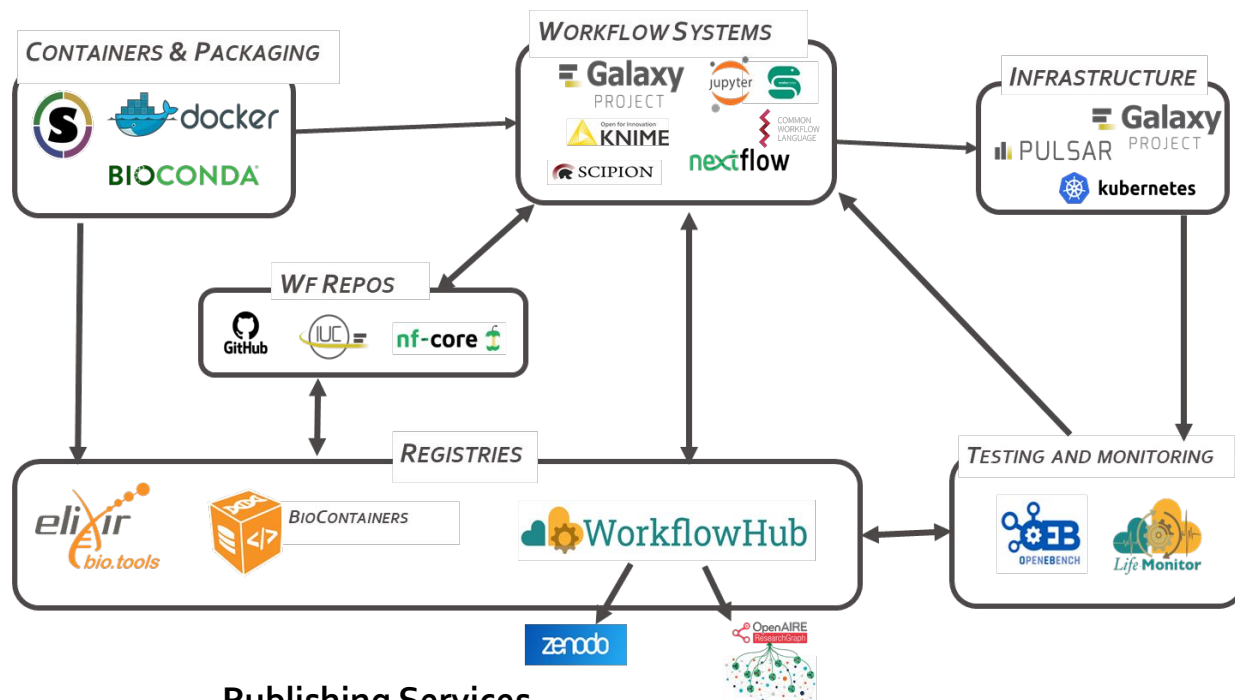
⁴Common Workflow Language project, Software Freedom Conservancy, Inc. 137 Montague St STE 380, NY 11201-3348, USA

⁵Leibniz Institute of Plant Biochemistry (IPB Halle), Department of Biochemistry of Plant Interactions, Weinberg 3, 06120 Halle (Saale), Germany

Kuzak^{5,d}, Carlos Martinez⁶,
Minguez Del Angel⁶,
Martinez⁶, Peter McQuilton¹,
Opoulos⁶, Josep Ll. Gelpi⁶,
Pella-Gutierrez^{6,***}

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



Findable & Accessible

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



Dockstore
Create, Share, Use

<https://dockstore.org/>



<https://workflowhub.eu>



Publishing Services



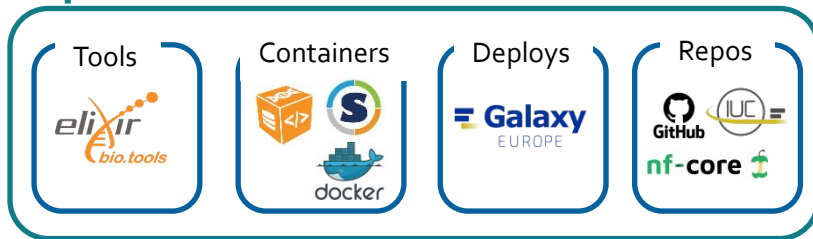
Digital Objects of Scholarship

published, cited, exchanged, reviewed, validated & reused

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

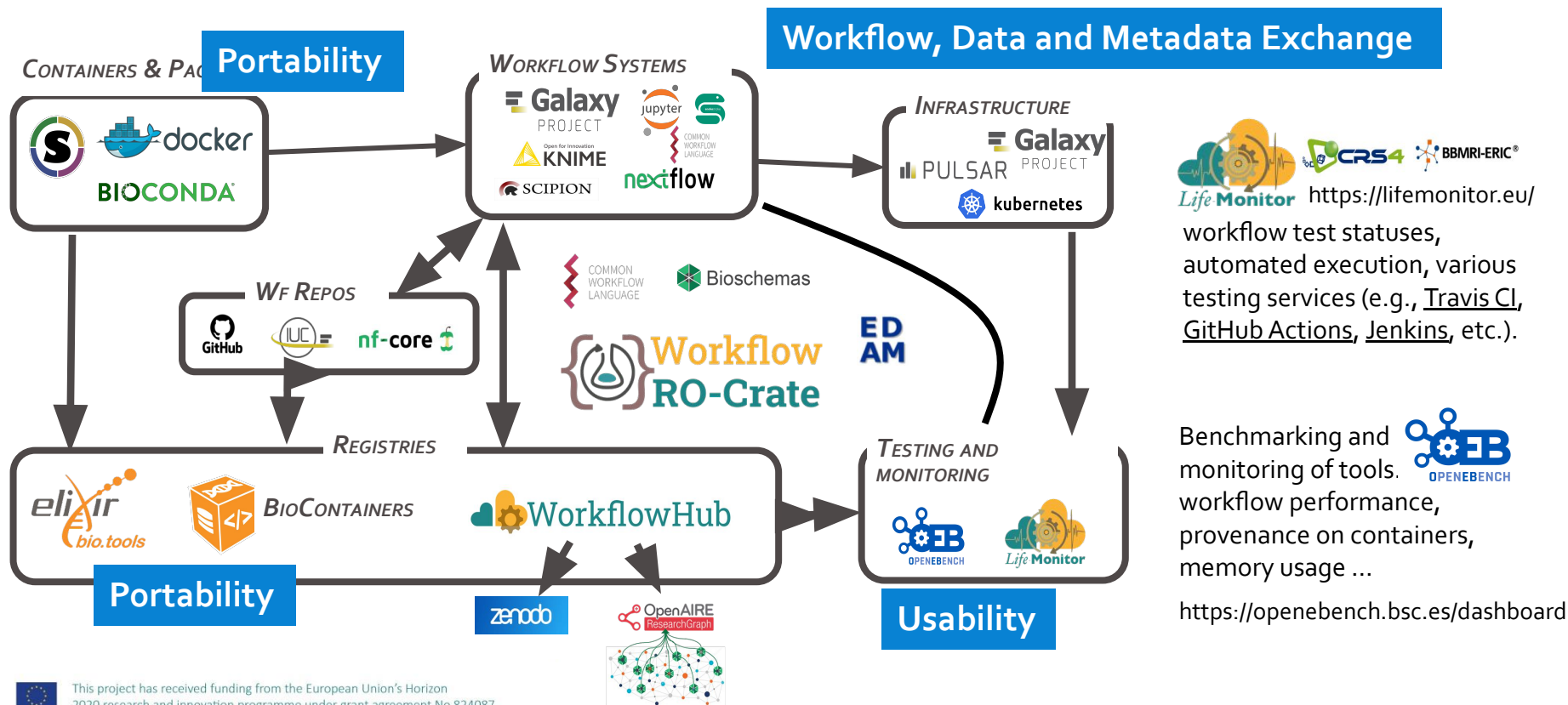
WfMS Agnostic *degrees of onboarding, support & access*

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



Reproducible and (Re)Usable

execute once accessed, reused and remixed as components



What can you do to be FAIR?



Register/Publish
Cite & credit makers

Document
for Strangers



A Management Plan
Checklist

Use Standards
Use IDs



Skill the Team with Best
Practice

Use WfMSs and tools
that are FAIR
enabling

Get Help



Professionalisation
Pre and post hoc



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/>

nf-core 

 Australian
BioCommons









IBISBA^{1.0}
Industrial Biotechnology Innovation
and Synthetic Biology Accelerator


Center of Excellence for Computational Biomedical Research


Synthesis of Systematic Resources
a DISSCo project





Software
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