

Towards Materials and Manufacturing Commons - the enablers Digital Marketplaces, FAIR Principles and Ontologies  
Berlin – April 4th – 6th 2023

# FAIR principles

## A short introduction

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# What are the FAIR principles ?

nature > scientific data > comment > article

MENU ▾ SCIENTIFIC DATA

Comment | OPEN | Published: 15 March 2016

## The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson, Michel Dumontier, IJsbrand Jan Aalbersberg, Gabrielle Appleton, Myles Axton, Arie Baak, Niklas Blomberg, Jan-Willem Boiten, Luiz Bonino da Silva Santos, Philip E. Bourne, Jildau Bouwman, Anthony J. Brookes, Tim Clark, Mercè Crosas, Ingrid Dillo, Olivier Dumon, Scott Edmunds, Chris T. Evelo, Richard Finkers, Alejandra Gonzalez-Beltran, Alasdair J.G. Gray, Paul Groth, Carole Goble, Jeffrey S. Grethe, Jaap Heringa, Peter A.C 't Hoen, Rob Hooft, Tobias Kuhn, Ruben Kok, Joost Kok, Scott J. Lusher, Maryann E. Martone, Albert Mons, Abel L. Packer, Bengt Persson, Philippe Rocca-Serra, Marco Roos, Rene van Schaik, Susanna-Assunta Sansone, Erik Schultes, Thierry Sengstag, Ted Slater, George Strawn, Morris A. Swertz, Mark Thompson, Johan van der Lei, Erik van Mulligen, Jan Velterop, Andra Waagmeester, Peter Wittenburg, Katherine Wolstencroft, Jun Zhao & Barend Mons - Show fewer authors

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FAIR Principles have been internationally endorsed (G8, G20, European Commission, NIH, ...)

FAIR principles: <https://www.go-fair.org/fair-principles/>

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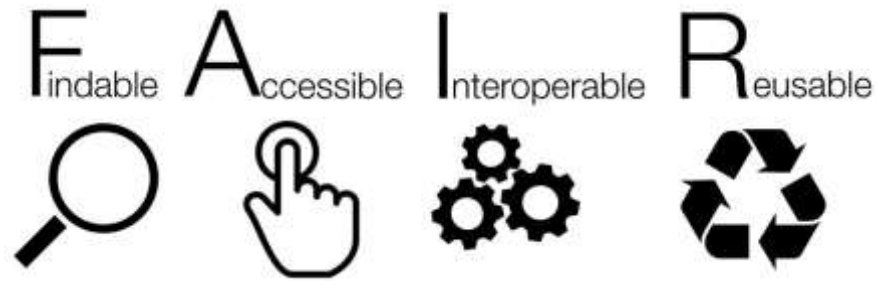
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Transform data into machine actionable unit of information

**F**indable   
**A**ccessible   
**M**achine actionable 

FAIR Principles have been internationally endorsed (G8, G20, European Commission, NIH, ...)

FAIR principles: <https://www.go-fair.org/fair-principles/>



### Findability

- F1- (Meta) data are assigned globally unique and persistent identifiers
- F2 - Data are described with rich metadata
- F3 - Metadata clearly and explicitly include the identifier of the data they describe
- F4 - (Meta)data are registered or indexed in a searchable resource

### Accessibility

- A1 - (Meta)data are retrievable by their identifier using a standardised communication protocol
  - A1.1 - The protocol is open, free and universally implementable
  - A1.2 - The protocol allows for an authentication and authorisation procedure where necessary
- A2 - Metadata should be accessible even when the data is no longer available

### Interoperability

- I1 - (Meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation
- I2 - (Meta)data use vocabularies that follow the FAIR principles
- I3 - (Meta)data include qualified references to other (meta)data

### Reusability

- R1 - (Meta)data are richly described with a plurality of accurate and relevant attributes
  - R1.1 - (Meta)data are released with a clear and accessible data usage license
  - R1.2 - (Meta)data are associated with detailed provenance
  - R1.3 - (Meta)data meet domain-relevant community standards

# Metadata: the key to machine-actionability

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# Implementing FAIR principles: a technical challenge ?

## Key technical elements

- Globally Unique Persistent and Resolvable Identifiers
- Metadata
  - Provenance
  - Common format
  - FAIR Vocabularies/Ontologies
  - Leverage domain specific metadata standards
  - Persistent
- Free, Open and Universal Access protocol
- Licences (human and machine readable)

## Key technical elements

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## Associated Social challenges

- Who guarantees the persistency of the identifiers? How long should it be persistent?
- How do you define rich metadata? Which metadata schema/elements should be used?
- What should be the optimal provenance granularity?
- Which Vocabularies/Ontologies should be used ? What are the governance models for the ontologies?
- How do I guarantee the persistency of the metadata beyond the life of the data?
- How do we encode legal aspects into machine readable format ?



# What does it mean for an ontology to be FAIR?



- 17 generic recommendations and 12 Best Practices
- Recommendation aligned with RFC 2119 (MUST, SHOULD, MAY)

- 9 MUST
- 7 SHOULD
- 1 MAY
- 1 Undetermined

February 25, 2022

Project deliverable Open Access

## D2.8 FAIR Semantics Recommendations Third Iteration

 Yann Le Franc;  Luiz Bonino;  Hanna Koivula;  Jessica Parland-von Essen;  Robert Pergl

This document is the third and final iteration of recommendations for making semantic artefacts FAIR. These recommendations result from continuous discussions with semantic experts from multiple communities. Our previous work included 17 preliminary recommendations related to one or more of the FAIR principles, and 10 best practice recommendations on semantic artefacts. These recommendations were last published as Deliverable 2.5 and have now gone through minor revisions. The work has been published on GitHub and we used GitHub's issue tracking feature to allow the community to comment on the recommendations and best practices. The work presented in this version relates to the Best practices, the proposition for an initial service architecture to support FAIR Semantics, a first version of a community-driven minimum metadata schema for describing the Semantic Artefacts and discussing the future work around the recommendation and FAIR semantics.

207

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175

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Keyword(s):

FAIRSF AIR FAIR Data Semantic artefacts

<https://github.com/FAIRSF AIR/FAIRSemantics>

# How did we built them?



FAIRsFAIR workshop  
co-located with RDA P14

## BUILDING THE DATA LANDSCAPE OF THE FUTURE: FAIR SEMANTICS AND FAIR



**Workshop**  
Minimum metadata  
schema for semantic  
artefacts



**Recommendations  
for FAIR Semantics**

Online **WORKSHOP**

15 October 2020  
13:00-17:00



**Common Minimum  
Metadata for  
Semantic Artefact**

4 June 2021  
09:30 - 13:00 CEST



- — FAIR Semantics recommendations are linked to similar work
  - — Best practices for implementing fair vocabularies and ontologies on the web - Daniel Garijo and Maria Poveda (2020)
  - — Ten simple rules for making a vocabulary FAIR – Cox et al. (2021)
  - — OBO Foundry principles
  - — IOF principles

# GOFAIR: an organisation working with the communities

## How to GO FAIR

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### How to GO FAIR

Since its beginning in early 2018, the GO FAIR community has been working towards implementations of the **FAIR Guiding Principles**. This collective effort has resulted in a three-point framework that formulates the essential steps towards the end goal, a global Internet of FAIR Data and Services where data are **F**indable, **A**ccessible, **I**nteroperable and **R**eusable (**FAIR**) for machines.



# GOFAIR: collecting the diversity of approaches to FAIR



FAIR principle	Question	FAIR enabling resource types	Your answers
F1	What globally unique, persistent, resolvable identifiers do you use for metadata records?	Identifier type	e.g. PURL, DOI
F1	What globally unique, persistent, resolvable identifiers do you use for datasets?	Identifier type	
F2	Which metadata schemas do you use for findability?	Metadata schema	
F3	What is the technology that links the persistent identifiers of your data to the metadata description?	Metadata-Data linking mechanism	
F4	In which search engines are your metadata records indexed?	Search engines	
F4	In which search engines are your datasets indexed?	Search engines	
A1.1	Which standardized communication protocol do you use for metadata records?	Communication protocol	
A1.1	Which standardized communication protocol do you use for datasets?	Communication protocol	
A1.2	Which authentication & authorisation technique do you use for metadata records?	Authentication & authorisation technique	
A1.2	Which authentication & authorisation technique do you use for datasets?	Authentication & authorisation technique	
A2	Which metadata longevity plan do you use?	Metadata longevity	
I1	Which knowledge representation languages (allowing machine interoperation) do you use for metadata records?	Knowledge representation language	
I1	Which knowledge representation languages (allowing machine interoperation) do you use for datasets?	Knowledge representation language	
I2	Which structured vocabularies do you use to annotate your metadata records?	Structured vocabularies	
I2	Which structured vocabularies do you use to encode your datasets?	Structured vocabularies	
I3	Which models, schema(s) do you use for your metadata records?	Metadata schema	
I3	Which models, schema(s) do you use for your datasets?	Data schema	
R1.1	Which usage license do you use for your metadata records?	Data usage license	
R1.1	Which usage license do you use for your datasets?	Data usage license	
R1.2	Which metadata schemas do you use for describing the provenance of your metadata records?	Provenance model	
R1.2	Which metadata schemas do you use for describing the provenance of your datasets?	Provenance model	

Magagna, B, et al. 2020. Reusable FAIR Implementation Profiles as Accelerators of FAIR Convergence. DOI: 10.1007/978-3-030-65847-2\_13

# FAIR principles at the heart of EOSC

- From SRIA v1.1: *“EOSC will essentially involve the federation of existing research data infrastructures and the realisation of a Web of FAIR Data and Related Services for Science, making research data interoperable and machine-actionable following the FAIR guiding principles”*



# FAIR project landscape for EOSC



# FAIR for Industry session - Tomorrow

- — Introduction to FAIR principles
- — Examples of Implementation by Industry
- — FAIR in OntoCommons
- — FAIR resources for industry: What is happening in EOSC?
- — FAIR ressources from GoFAIR



Thank you for your attention

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