

FAIR status quo 2021: current global challenges and opportunities

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November 3 2021
DeiC Conference 2021
Program Dag 1: Spor 1 - Data Management 11:30-12:30
<https://www.deic.dk/en/deic-conference-2021>
Slides: <https://osf.io/b7a3m/>



FAIR status quo 2021: current global challenges and opportunities

- FAIR history
- FAIR implementation
- FAIR challenges & opportunities

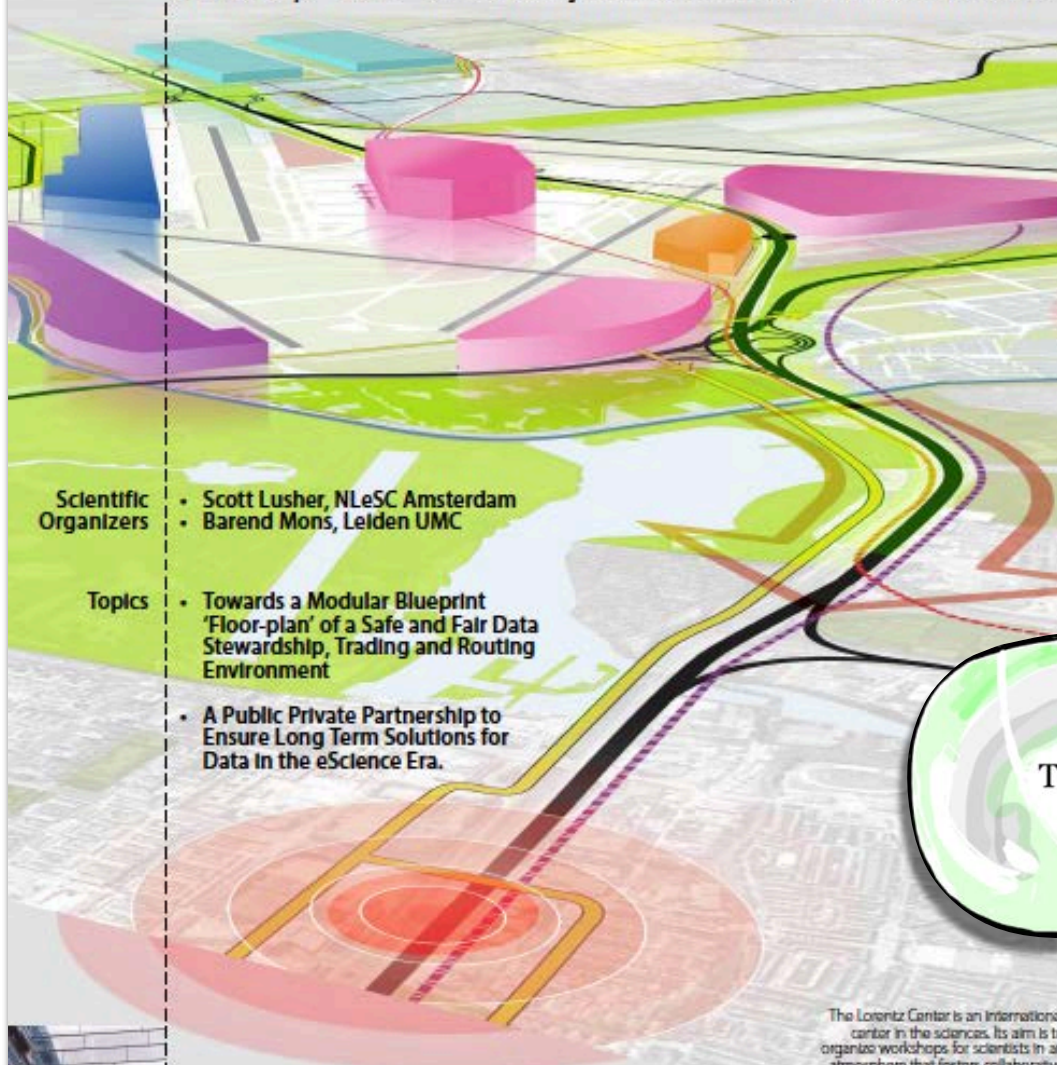
FAIR history

2014

Lorentz
center

Jointly Designing a Data FAIRPORT

Workshop: 13 - 16 January 2014, Leiden, the Netherlands

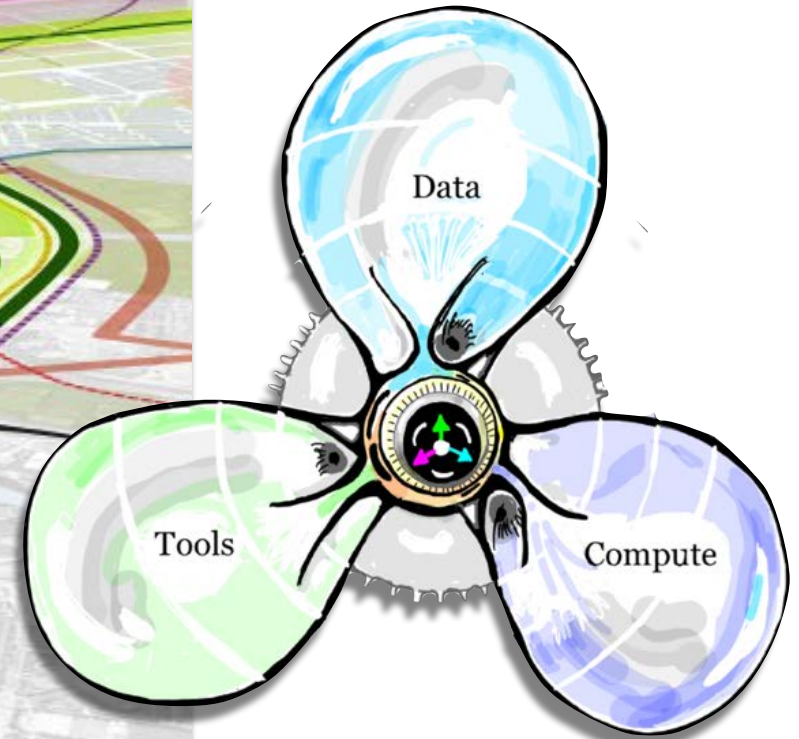


Scientific Organizers

- Scott Lusher, NLeSC Amsterdam
- Barend Mons, Leiden UMC

Topics

- Towards a Modular Blueprint 'Floor-plan' of a Safe and Fair Data Stewardship, Trading and Routing Environment
- A Public Private Partnership to Ensure Long Term Solutions for Data In the eScience Era.



The Lorentz Center is an international center in the sciences. Its aim is to organize workshops for scientists in an atmosphere that fosters collaborative work, discussions and interactions. For registration see www.lorentzcenter.nl

Image: Structure Plan Schiphol Airport by H&P Architectuurplanners. Floor design: Superflex Studios, NL



**Lorentz
center**

www.lorentzcenter.nl

2016 Automating F, A, I and R

Box 2 | The FAIR Guiding Principles

<https://www.nature.com/articles/sdata201618>

To be Findable:

- F1. (meta)data are assigned a globally unique and persistent identifier
- F2. data are described with rich metadata (defined by R1 below)
- F3. metadata clearly and explicitly include the identifier of the data it describes
- F4. (meta)data are registered or indexed in a searchable resource

To be Accessible:

- A1. (meta)data are retrievable by their identifier using a standardized communications protocol
 - A1.1 the protocol is open, free, and universally implementable
 - A1.2 the protocol allows for an authentication and authorization procedure, where necessary
- A2. metadata are accessible, even when the data are no longer available

To be Interoperable:

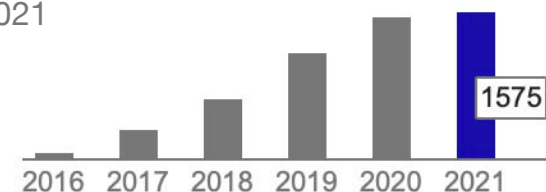
- I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
- I2. (meta)data use vocabularies that follow FAIR principles
- I3. (meta)data include qualified references to other (meta)data

To be Reusable:

- 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

Total citations Cited by 5346

November 2 2021



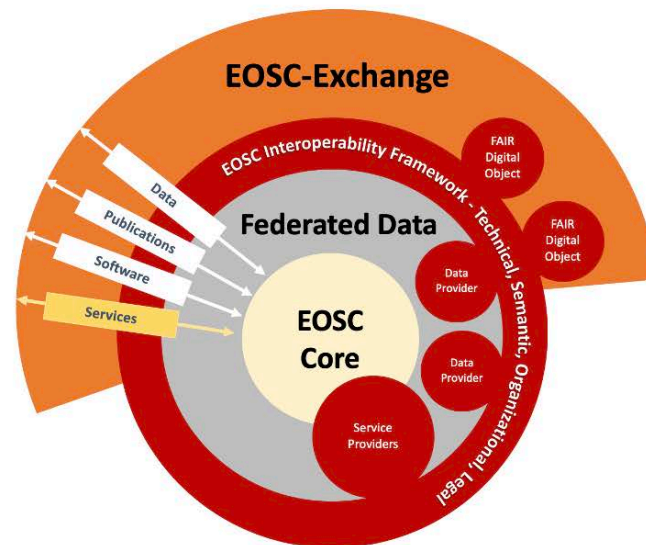
2016 Automating F, A, I and R

FAIR in the EOSC Association

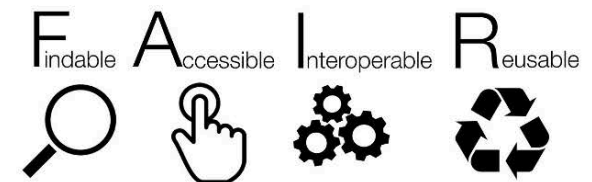
Sarah Jones, GÉANT
sarah.jones@geant.org
Twitter: @sarahroams

FAIRsFAIR resilient FAIR solution
4 October 2021

FAIR is central to principles in EOSC



- Is the glue that connects data & services
- Requirement for FAIR to support reuse
- Use community standards
- Share all types of output (openly)



2018

FAIR Principles

Box 2 | The FAIR Guiding Principles

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FAIR Implementations



2018

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FAIR Implementations

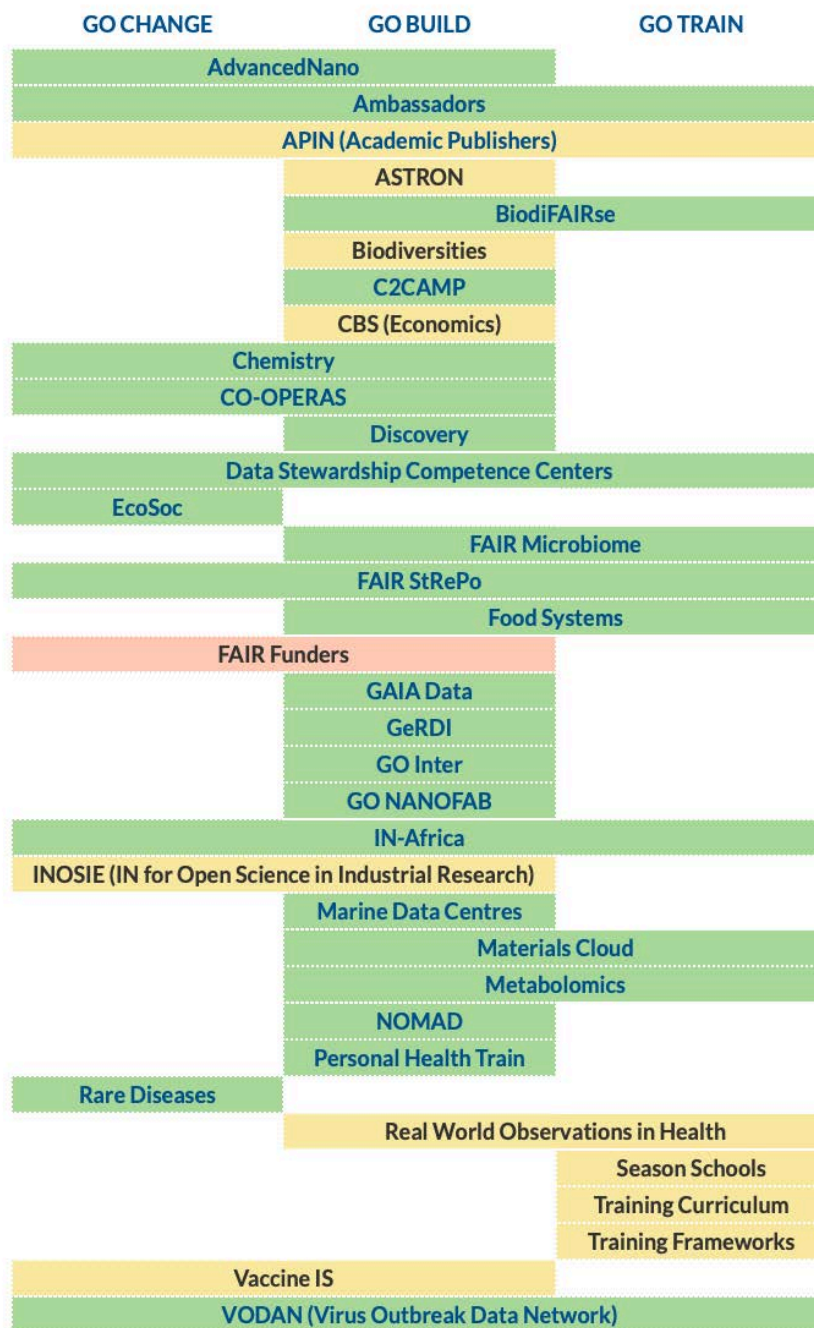


Community (decision making) is central

2021

GO FAIR Implementation Networks

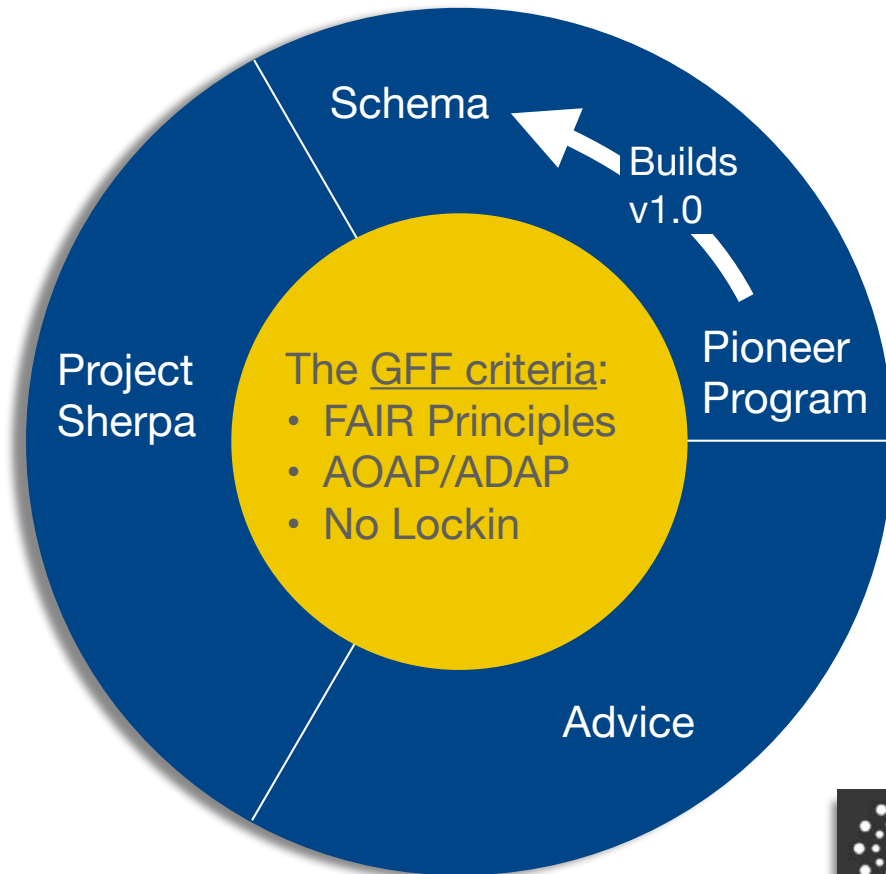
<https://www.go-fair.org/implementation-networks/overview/>



Offices




- Germany
- France
- Brazil
- US
- Austria
- Denmark (starting)
- China (considering)

2021 Pioneer Program



Why FAIR Certification?

- Requested from the community
- Preserve original intent of the FAIR Principles
- Drive convergence
- Promote minimal specs to mitigate vendor lockin

  <https://www.scidatacon.org/virtual-2021/sessions/375/> 

Virtual SciDataCon 2021

Session Title: Certifying FAIR: The GO FAIR Foundation's Pioneer Program to bootstrap community development of FAIR certification for events, people, and technology

Session Organisers: Erik Schultes , Bert Meerman

[Session notes \(Google doc\)](#)

FAIR implementation

“FAIR is 90% metadata”

- Mark Wilkinson, Universidad Politécnica de Madrid
- Mark Musen, Stanford

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Technical infrastructure (FAIR orchestration)

Data/metadata (domain-specific content)

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Home › How to GO FAIR

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.



A framework guiding FAIRification

The Three-point FAIRification Framework provides practical "how to" guidance to stakeholders seeking to go FAIR.

Moreover, by following this framework, stakeholders can rest assured that their efforts toward FAIRification will be optimally coordinated with the efforts of other stakeholders in the GO FAIR community. The three-point framework maximizes reuse of existing resources, maximizes interoperability, and accelerates convergence on standards and technologies supporting FAIR data and services.

- Typically, the FAIRification process begins when a community of practice considers its domain-relevant metadata requirements and other policy considerations, and formulates these considerations as machine-actionable metadata components. These considerations can be guided in **Metadata for Machines (M4M)** Workshops.



2020

Three-Point FAIRification Framework

3-point working group call, even-number week, 13:00-13:30 CET/CEST
<https://docs.google.com/document/d/188HPcK804lwSU1333rimCDZ44r9r67xB0hgGZn16rjw/edit?usp=sharing>

How to GO FAIR

<https://www.go-fair.org/how-to-go-fair/>

Home > How to GO FAIR

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FAIR Implementation Profile

FAIR principle	Question	FAIR enabling resource types	Your answers
F1	What globally unique, persistent, resolvable identifiers do you use for metadata records?	Identifier type	<i>e.g. PURL, DOI</i>
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	
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FIP Mini Questionnaire <http://bit.ly/FIPminiquestionnaire>

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FIP Mini Questionnaire <http://bit.ly/FIPminiquestionnaire>

Community (decision making) is central



F1	What globally unique, persistent, resolvable identifiers do you use for metadata records?	Identifier type	PURLs
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	DCAT; custom CEDAR templates
F3	What is the technology that links the persistent identifiers of your data to the metadata description?	Metadata-Data linking mechanism	FAIR Data Point
F4	In which search engines are your metadata records indexed?	Search engines	SPARQL on FDP network
F4	In which search engines are your datasets indexed?	Search engines	SPARQL on FDP network
A1.1	Which standardized communication protocol do you use for metadata records?	Communication protocol	HTTPS
A1.1	Which standardized communication protocol do you use for datasets?	Communication protocol	HTTPS
A1.2	Which authentication & authorisation technique do you use for metadata records?	Authentication & authorisation technique	Open
A1.2	Which authentication & authorisation technique do you use for datasets?	Authentication & authorisation technique	Working on it (taking a lead from DigiMe).
A2	Which metadata longevity plan do you use?	Metadata longevity	TWOC policy statement (a CEDAR form)
I1	Which knowledge representation languages (allowing machine interoperation) do you use for metadata records?	Knowledge representation language	RDF SKOS
I1	Which knowledge representation languages (allowing machine interoperation) do you use for datasets?	Knowledge representation language	RDF OWL
I2	Which structured vocabularies do you use to annotate your metadata records?	Structured vocabularies	FHIR; OMOP; ICHOM; UMLS ZonMw COVID Program vocabs: <ul style="list-style-type: none"> • https://bioportal.bioontology.org/ontologies/ZONMW-ADMIN-MD • https://bioportal.bioontology.org/ontologies/ZONMW-SUBJECTS • https://bioportal.bioontology.org/ontologies/ZONMW-CONTENT
I2	Which structured vocabularies do you use to encode your datasets?	Structured vocabularies	DCAT; NCI Thesaurus; National Center for Biotechnology Information Organismal Classification
I3	Which models, schema(s) do you use for your metadata records?	Metadata schema	<ul style="list-style-type: none"> • Project Admin Template • Project Content Template • General Purpose Dataset Template
I3	Which models, schema(s) do you use for your datasets?	Data schema	VODAN eCRF: https://bioportal.bioontology.org/ontologies/COVIDCRFRAPID
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	Follow DigiMe schema
R1.2	Which metadata schemas do you use for describing the provenance of your metadata records?	Provenance model	Bioportal and CEDAR
R1.2	Which metadata schemas do you use for describing the provenance of your datasets?	Provenance model	<ul style="list-style-type: none"> • General Purpose Dataset Template • I-ADOPT model

FIP Wizard

FIP Wizard

ICOS v1

Questionnaire | TODOs | Metrics | Preview | Documents | Settings

Share

Users

Knowledge Model Editor

Knowledge Models

Projects

Templates

Create a FIP

Settings

Help

Erik Schultes

Current Phase

Before Submitting the FIP

Chapters

- Background: The FAIR Implementation Profile and FAIR Implementation Community ✓
- II. FAIR Implementation Community ✓
- III. Findability ✓**
- IV. Accessibility ✓
- V. Interoperability ✓
- VI. Reusability ✓
- VII. Register a new resource as a nanopublication ✓

1 F1 What globally unique, persistent, resolvable identifiers do you use for metadata records?

Different identifier service providers offer different kinds of resolution services impacting F2 and I. One example would be a Digital Object Identifier (DOI).

You can answer by indicating **only a single resource at a time**. Please follow this priority:

- Consideration*: Please provide comments about the reasons why your community chose to use this resource
- Wikidata*: Check for existing resources from Wikidata (by typing in that field a keyword and clicking enter, you will find related resources). Alternatively, you may provide here an IRI for a resource from any other third party source. If not found there then follow point 3 below.
- Nanobench*: Check for existing resources from Nanobench (by clicking in that field, available resources will pop up), and if not found there then...
- Register this resource in Nanobench (go to *chapter VII*) and
- then go back to this question (*Nanobench*) to look up for the newly created resource

When you want to provide **an additional resource** please make sure to click on the Add button below this section outside the grey area.

Desirable: Before Submitting the FIP

1.a.1 Consideration


Widely used for data citation, mainly used by us for collections and elaborated data products

Comments on the choice of this FAIR-Enabling Resource. These comments may include requirements or constraints unique to your FAIR Implementation Community (for example, how this choice may impact the findability of your data within or between domains).

If your consideration is based on a common agreement in your community, please add: "Common agreement within the community".

1.a.2 Choose an available resource from WikiData

digital object identifier

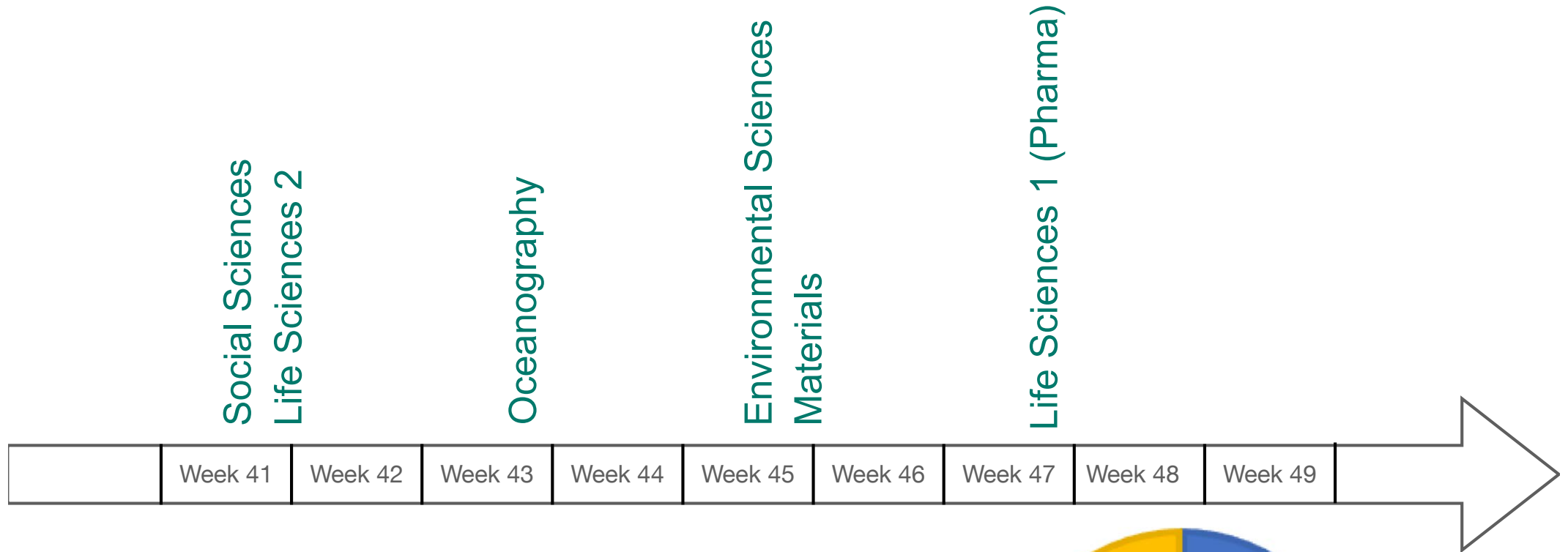
 <http://www.wikidata.org/entity/Q25670>

1.a.3 Choose an available resource from Nanobench

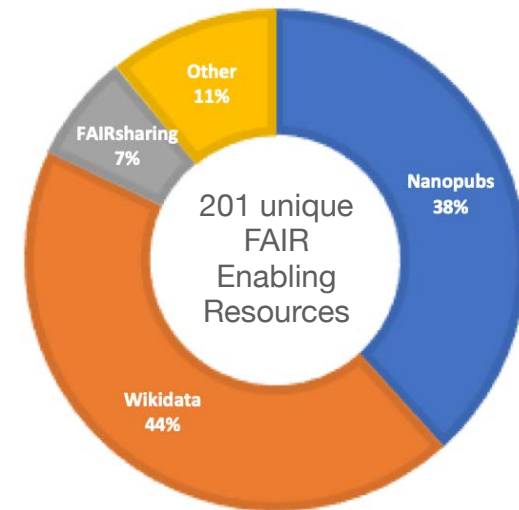
CODATA / GO FAIR

Convergence Symposium Workshops 2021

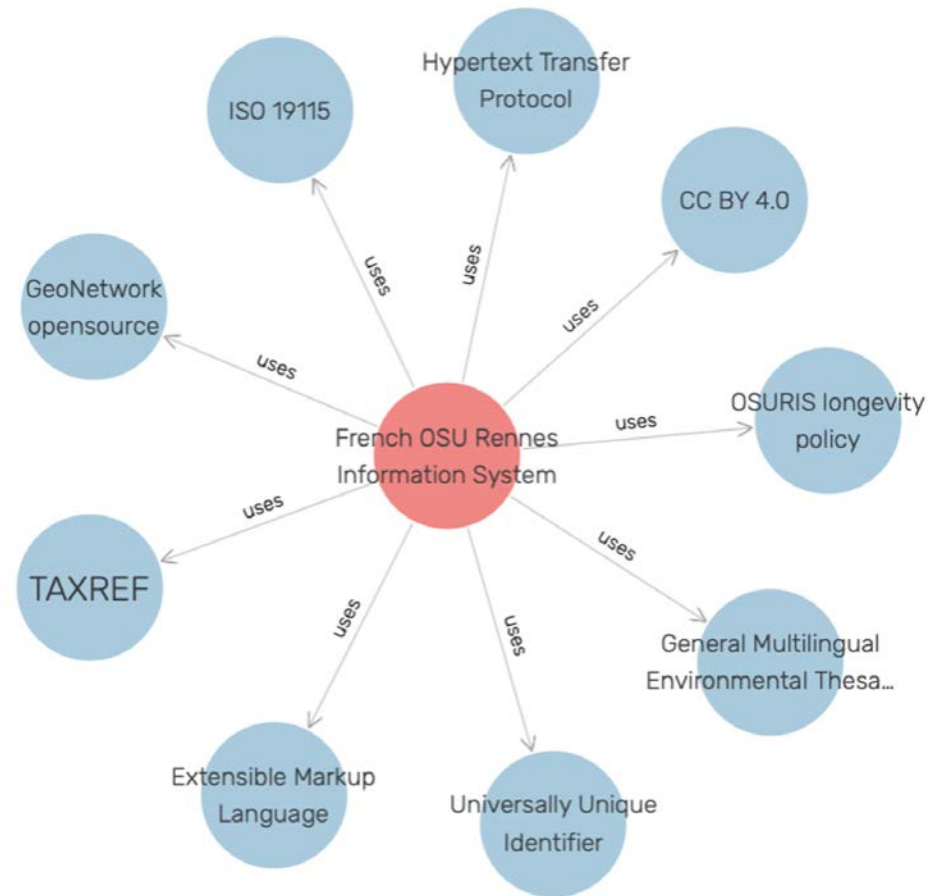
<https://conference.codata.org/FAIRconvergence2020/>



- 6 Workshops
- 25 communities
- 81 participants
- 46 contact hours
- Outputs:
 - Human-readable FIPs <https://osf.io/r2hzc/>
 - FIPs as graphs <https://osf.io/6sbfy/>
 - Convergence Matrix <https://bit.ly/3IKCGFI>

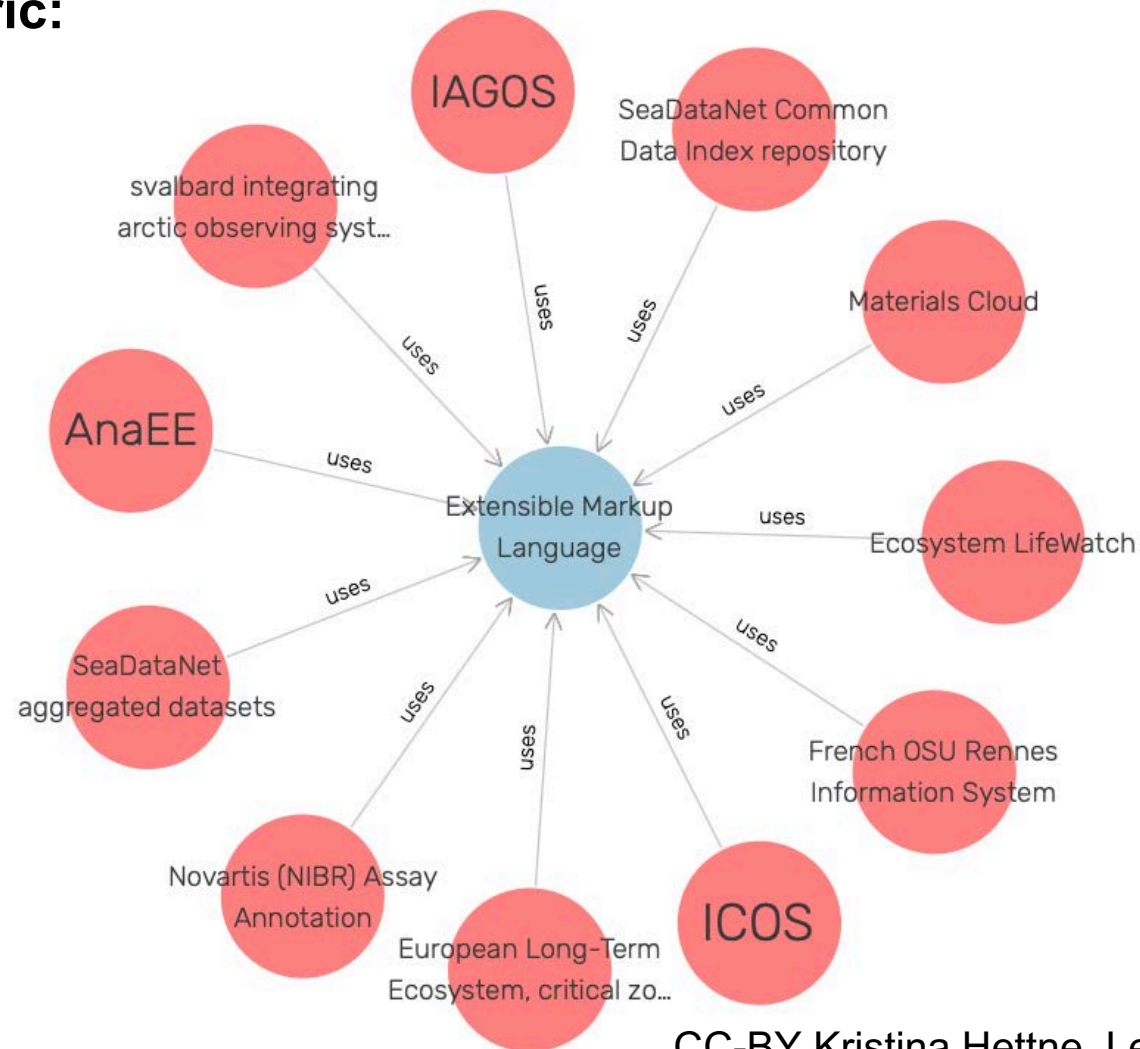


Community-centric: OSURIS FIP



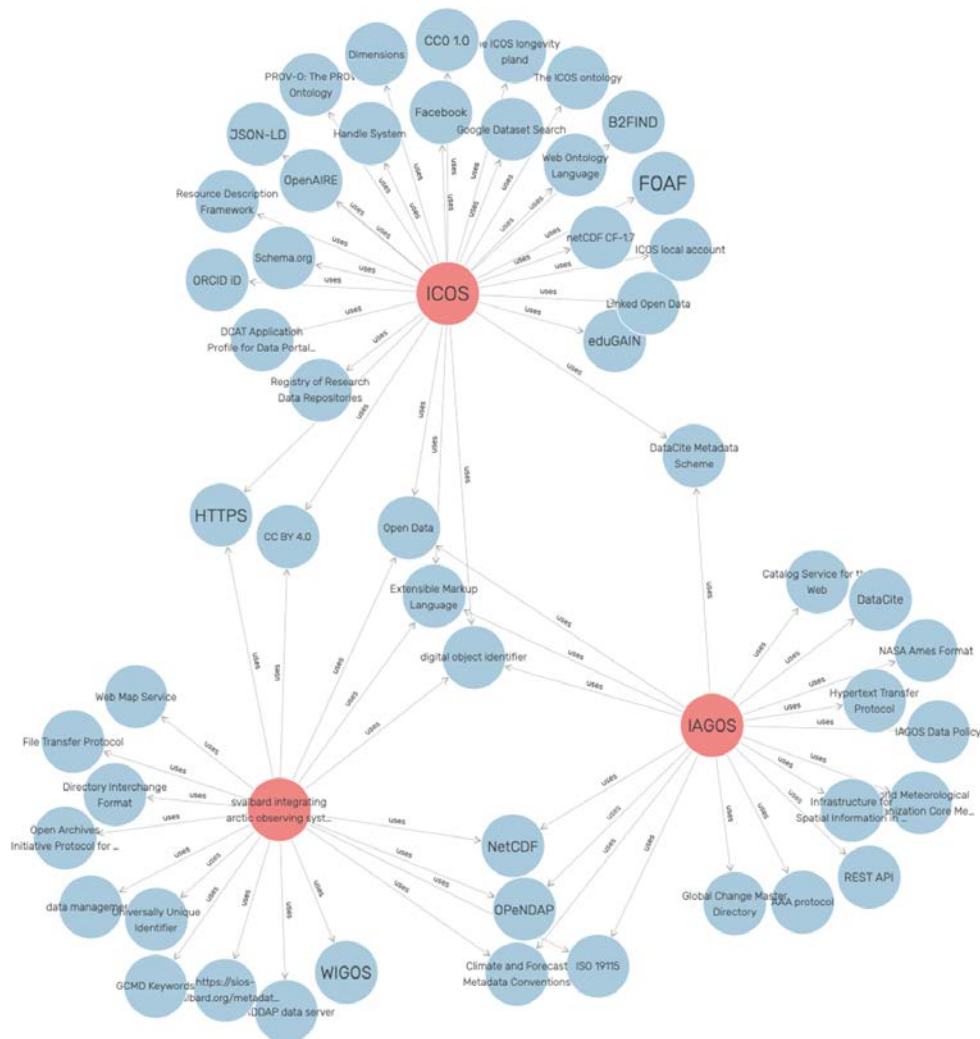
CC-BY Kristina Hettne, Leiden University Libraries
Created with GraphDB

Resource-centric: XML



Red: communities
Blue: resources

CC-BY Kristina Hettne, Leiden University Libraries
Created with GraphDB



Atmosphere sciences

Top 3 shared resources:

1. Digital Object identifier (all)
2. Extensible Markup Language (all)
3. Open Data (all)

Red: communities

Blue: resources

CC-BY Kristina Hettne, Leiden University Libraries
Created with GraphDB

FAIR Convergence Matrix

10/6/2020		environmental sciences	social sciences	health sciences		
FAIR Principle	FAIR Enabling Resource	DiSSCo	GBIF	EduSocDL	VODAN	HPA
F1-MD	Digital Object Identifier	1	1	1	0	2
	<i>Natural Science Identifier</i>	2	0	0	0	0
	Persistent Identifier for eResearch	0	0	0	0	1
	Persistent Uniform Resource Locator	0	0	0	1	0
F1-D	Digital Object Identifier	0	1	1	0	0
	<i>Natural Science Identifier</i>	2	0	0	0	0
	Persistent Uniform Resource Locator	0	0	0	1	0
F2	Darwin Core	1	0	0	0	0
	DataCite	0	0	1	0	0
	DCAT	0	0	0	1	0
	EML GBIF Profile	0	1	0	0	0
	Open Digital Specimens	2	0	0	0	0
F3	Darwin-core Archive	0	1	0	0	0
	FAIR Data point	0	0	0	1	0
	<i>Fair Digital Object</i>	2	0	1	0	0
F4-MD	automatic FDP call home registry	0	0	0	1	0
	DiSSCo European Collection Objects Index	2	0	0	0	0
	Global Biodiversity Information Facility Search Engine	0	1	0	0	0
	Google	0	0	1	0	0
F4-D	automatic FDP call home registry	0	0	0	1	0
	<i>DiSSCo European Collection Objects Index</i>	2	0	0	0	0
	Global Biodiversity Information Facility Search Engine	0	1	0	0	0
	Google Data Search	0	0	1	0	0
A1.1-MD	Digital Object Interface Protocol	1	0	1	0	0
	HTTP REST	1	0	1	0	0
	HTTPS	0	1	0	1	0
A1.1-D	Digital Object Interface Protocol	1	0	1	0	0
	HTTP REST	1	0	1	0	0
	HTTPS	0	1	0	1	0
A1.2-MD	basic access authentication	0	1	0	0	0
	DiSSCo Federated Authentication and Authorization I	2	0	0	0	0
	GBIF.org Authentication technique	0	1	0	0	0
	Open Data	0	0	1	1	0
A1.2-D	basic access authentication	0	1	0	0	0
	<i>DiSSCo Federated Authentication and Authorization I</i>	2	0	0	0	0
	GBIF.org Authentication technique	0	1	0	0	0
	Open Data	1	0	0	0	0
A2	DiSSCo Data Management Plan	1	0	0	0	0
	<i>Global Biodiversity Information Facility longevity poli</i>	0	2	0	0	0
I1-MD	JSON Schema	1	1	1	0	0
I1-MD	JSON Schema	1	1	1	0	0
I1-MD	JSON Schema	1	1	1	0	0
I1-MD	JSON Schema	1	1	1	0	0
I1-MD	JSON Schema	1	1	1	0	0
I2-MD	Access to Biological Collection Data	1	0	0	0	0
	Access to Biological Collection Databases Extended fo	1	0	0	0	0
	DCAT	0	0	0	1	0
	ISO 8601	0	1	0	0	0

<https://bit.ly/3IKCGFI>

FAIR Convergence by Resource Overlap

		biodiversity-ecosystem sciences					marine sciences				atmosphere sciences			material sciences			health sciences							social sciences		generic	SUM/Community
		GBIF	AnaEE	eLTER-RI	DiSSCo	LWERIC Ecosystem	LW marine	ARGO	SeaDataNet-CDI	SeaDataNet-Sextant	ICOS	SIOS	IAGOS	materialscloud	Materiom	optimade	VODAN	HPA	AZCD	AZTM	BRWE	NIBRNXFIP	RCTP	SSSR	EduSocDL	OSURIS	
biodiversity-ecosystem sciences	GBIF		4	4	5	8	5	7	0	3	6	2	2	6	0	2	1	3	2	2	0	2	3	2	3	2	74
	AnaEE	4		5	3	7	2	6	2	5	8	4	8	3	0	2	3	3	1	1	3	2	3	1	2	9	87
	eLTER-RI	4	5		2	7	3	2	2	9	9	5	6	6	0	0	2	1	0	0	0	1	1	4	4	3	76
	DiSSCo	5	3	2		3	1	3	0	1	3	1	0	3	0	4	1	0	0	0	0	0	0	1	5	2	38
	LWERIC Ecosystem	8	7	7	3		7	11	4	5	9	3	3	7	0	4	4	5	2	2	2	5	5	1	7	4	115
marine sciences	LW marine	5	2	3	1	7		2	0	3	2	1	4	5	0	1	1	2	0	0	0	1	0	2	4	1	47
	ARGO	7	6	2	3	11	2		3	1	8	2	2	5	0	2	4	5	2	2	2	3	4	2	5	2	85
	SeaDataNet-CDI	0	2	2	0	4	0	3		3	3	2	1	3	0	0	1	1	0	0	1	2	1	1	1	1	32
	SeaDataNet-Sextant	3	5	9	1	5	3	1	3		5	3	7	3	0	0	1	1	0	0	0	1	1	3	4	3	62
atmosphere sciences	ICOS	6	8	9	3	9	2	8	3	5		5	4	12	0	1	8	7	2	2	2	4	6	3	7	3	119
	SIOS	2	4	5	1	3	1	2	2	3	5		6	5	0	0	3	2	1	1	0	2	2	2	2	2	56
	IAGOS	2	8	6	0	3	4	2	1	7	4	6		3	0	0	0	2	0	0	2	1	1	1	3	5	61
material sciences	materialscloud	6	3	6	3	7	5	5	3	3	12	5	3		0	2	4	3	2	2	0	4	4	3	5	2	92
	Materiom	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	optimade	2	2	0	4	4	1	2	0	0	1	0	0	2	0		0	0	0	0	0	1	0	0	4	2	25
health sciences	VODAN	1	3	2	1	4	1	4	1	1	8	3	0	4	0	0		18	2	2	2	3	6	1	3	0	70
	HPA	3	3	1	0	5	2	5	1	1	7	2	2	3	0	0	18		2	2	2	3	6	1	3	0	72
	AZCD	2	1	0	0	2	0	2	0	0	2	1	0	2	0	0	2	2		14	2	4	2	0	0	0	38
	AZTM	2	1	0	0	2	0	2	0	0	2	1	0	2	0	0	2	2	14		2	4	2	0	0	0	38
	BRWE	0	3	0	0	2	0	2	1	0	2	0	2	0	0	0	2	2	2	2		3	3	0	1	2	29
	NIBRNXFIP	2	2	1	0	5	1	3	2	1	4	2	1	4	0	1	3	3	4	4	3		3	0	2	1	52
	RCTP	3	3	1	0	5	0	4	1	1	6	2	1	4	0	0	6	6	2	2	3	3		0	3	0	56
social sciences	SSSR	2	1	4	1	1	2	2	1	3	3	2	1	3	0	0	1	1	0	0	0	0	0		8	0	36
	EduSocDL	3	2	4	5	7	4	5	1	4	7	2	3	5	0	4	3	3	0	0	1	2	3	8		0	76
generic	OSURIS	2	9	3	2	4	1	2	1	3	3	2	5	2	0	2	0	0	0	0	2	1	0	0		0	44
SUM/Community		74	87	76	38	115	47	85	32	62	119	56	61	92	0	25	70	72	38	38	29	52	56	36	76	44	

FAIR Convergence by Resource Overlap

		biodiversity-ecosystem sciences					marine sciences				atmosphere sciences			material sciences			health sciences						social sciences		generic	SUM/Community	
		GBIF	AnaEE	eLTER-RI	DiSSCo	LWERIC Ecosystem	LW marine	ARGO	SeaDataNet-CDI	SeaDataNet-Sextant	ICOS	SIOS	IAGOS	materialscloud	Materiom	optimade	VODAN	HPA	AZCD	AZTM	BRWE	NIBRNXFIP	RCTP	SSSR	EduSocDL		OSURIS
biodiversity-ecosystem sciences	GBIF		4	4	5	8	5	7	0	3	6	2	2	6	0	2	1	3	2	2	0	2	3	2	3	2	74
	AnaEE	4		5	3	7	2	6	2	5	8	4	8	3	0	2	3	3	1	1	3	2	3	1	2	9	87
	eLTER-RI	4	5		2	7	3	2	2	9	9	5	6	6	0	0	2	1	0	0	0	1	1	4	4	3	76
	DiSSCo	5	3	2		3	1	3	0	1	3	1	0	3	0	4	1	0	0	0	0	0	0	1	5	2	38
	LWERIC Ecosystem	8	7	7	3		7	11	4	5	9	3	3	7	0	4	4	5	2	2	2	5	5	1	7	4	115
marine sciences	LW marine	5	2	3	1	7		2	0	3	2	1	4	5	0	1	1	2	0	0	0	1	0	2	4	1	47
	ARGO	7	6	2	3	11	2		3	1	8	2	2	5	0	2	4	5	2	2	2	3	4	2	5	2	85
	SeaDataNet-CDI	0	2	2	0	4	0	3		3	3	2	1	3	0	0	1	1	0	0	1	2	1	1	1	1	32
	SeaDataNet-Sextant	3	5	9	1	5	3	1	3		5	3	7	3	0	0	1	1	0	0	0	1	1	3	4	3	62
atmosphere sciences	ICOS	6	8	9	3	9	2	8	3	5		5	4	12	0	1	8	7	2	2	2	4	6	3	7	3	119
	SIOS	2	4	5	1	3	1	2	2	3	5		6	5	0	0	3	2	1	1	0	2	2	2	2	2	56
	IAGOS	2	8	6	0	3	4	2	1	7	4	6		3	0	0	0	2	0	0	2	1	1	1	3	5	61
material sciences	materialscloud	6	3	6	3	7	5	5	3	3	12	5	3		0	2	4	3	2	2	0	4	4	3	5	2	92
	Materiom	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	optimade	2	2	0	4	4	1	2	0	0	1	0	0	2	0		0	0	0	0	0	1	0	0	4	2	25
health sciences	VODAN	1	3	2	1	4	1	4	1	1	8	3	0	4	0	0		18	2	2	2	3	6	1	3	0	70
	HPA	3	3	1	0	5	2	5	1	1	7	2	2	3	0	0	18		2	2	2	3	6	1	3	0	72
	AZCD	2	1	0	0	2	0	2	0	0	2	1	0	2	0	0	2	2		14	2	4	2	0	0	0	38
	AZTM	2	1	0	0	2	0	2	0	0	2	1	0	2	0	0	2	2	14		2	4	2	0	0	0	38
	BRWE	0	3	0	0	2	0	2	1	0	2	0	2	0	0	0	2	2	2	2		3	3	0	1	2	29
	NIBRNXFIP	2	2	1	0	5	1	3	2	1	4	2	1	4	0	1	3	3	4	4	3		3	0	2	1	52
	RCTP	3	3	1	0	5	0	4	1	1	6	2	1	4	0	0	6	6	2	2	3	3		0	3	0	56
social sciences	SSSR	2	1	4	1	1	2	2	1	3	3	2	1	3	0	0	1	1	0	0	0	0	0		8	0	36
	EduSocDL	3	2	4	5	7	4	5	1	4	7	2	3	5	0	4	3	3	0	0	1	2	3	8		0	76
generic	OSURIS	2	9	3	2	4	1	2	1	3	3	2	5	2	0	2	0	0	0	0	2	1	0	0		0	44
SUM/Community		74	87	76	38	115	47	85	32	62	119	56	61	92	0	25	70	72	38	38	29	52	56	36	76	44	

FAIR Convergence by Resource Overlap

		biodiversity-ecosystem sciences					marine sciences				atmosphere sciences			material sciences			health sciences						social sciences		generic	SUM/Community	
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biodiversity-ecosystem sciences	GBIF		4	4	5	8	5	7	0	3	6	2	2	6	0	2	1	3	2	2	0	2	3	2	3	2	74
	AnaEE	4		5	3	7	2	6	2	5	8	4	8	3	0	2	3	3	1	1	3	2	3	1	2	9	87
	eLTER-RI	4	5		2	7	3	2	2	9	9	5	6	6	0	0	2	1	0	0	0	1	1	4	4	3	76
	DiSSCo	5	3	2		3	1	3	0	1	3	1	0	3	0	4	1	0	0	0	0	0	0	1	5	2	38
	LWERIC Ecosystem	8	7	7	3		7	11	4	5	9	3	3	7	0	4	4	5	2	2	2	5	5	1	7	4	115
marine sciences	LW marine	5	2	3	1	7		2	0	3	2	1	4	5	0	1	1	2	0	0	0	1	0	2	4	1	47
	ARGO	7	6	2	3	11	2		3	1	8	2	2	5	0	2	4	5	2	2	2	3	4	2	5	2	85
	SeaDataNet-CDI	0	2	2	0	4	0	3		3	3	2	1	3	0	0	1	1	0	0	1	2	1	1	1	1	32
	SeaDataNet-Sextant	3	5	9	1	5	3	1	3		5	3	7	3	0	0	1	1	0	0	0	1	1	3	4	3	62
atmosphere sciences	ICOS	6	8	9	3	9	2	8	3	5		5	4	12	0	1	8	7	2	2	2	4	6	3	7	3	119
	SIOS	2	4	5	1	3	1	2	2	3	5		6	5	0	0	3	2	1	1	0	2	2	2	2	2	56
	IAGOS	2	8	6	0	3	4	2	1	7	4	0		3	0	0	0	2	0	0	2	1	1	1	3	5	61
material sciences	materialscloud	6	3	6	3	7	5	5	3	8	12	5	3		0	2	4	3	2	2	0	4	4	3	5	2	92
	Materiom	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
	optimade	2	2	0	4	4	1	2	0	0	1	0	0	2	0		0	0	0	0	0	1	0	0	4	2	25
health sciences	VODAN	1	3	2	1	4	1	4	1	1	8	3	0	4	0	0		18	2	2	2	3	6	1	3	0	70
	HPA	3	3	1	0	5	2	5	1	1	7	2	2	3	0	0	18		2	2	2	3	6	1	3	0	72
	AZCD	2	1	0	0	2	0	2	0	0	2	1	0	2	0	0	2	2		14	2	4	2	0	0	0	38
	AZTM	2	1	0	0	2	0	2	0	0	2	1	0	2	0	0	2	2	14		2	4	2	0	0	0	38
	BRWE	0	3	0	0	2	0	2	1	0	2	0	2	0	0	0	2	2	2	2		3	3	0	1	2	29
	NIBRNXFIP	2	2	1	0	5	1	3	2	1	4	2	1	4	0	1	3	3	4	4	3		3	0	2	1	52
	RCTP	3	3	1	0	5	0	4	1	1	6	2	1	4	0	0	6	6	2	2	3	3		0	3	0	56
social sciences	SSSR	2	1	4	1	1	2	2	1	3	3	2	1	3	0	0	1	1	0	0	0	0	0		8	0	36
	EduSocDL	3	2	4	5	7	4	5	1	4	7	2	3	5	0	4	3	3	0	0	1	2	3	8		0	76
generic	OSURIS	2	9	3	2	4	1	2	1	3	3	2	5	2	0	2	0	0	0	0	2	1	0	0		0	44
SUM/Community		74	87	76	38	115	47	85	32	62	119	56	61	92	0	25	70	72	38	38	29	52	56	36	76	44	

FAIR Convergence by Reuse



Reuse



ZonMw COVID-19 Program

Reuse



Reuse

INCENTIVE





https://link.springer.com/chapter/10.1007/978-3-030-65847-2_13


[International Conference on Conceptual Modeling](#)

ER 2020: [Advances in Conceptual Modeling](#) pp 138-147 | [Cite as](#)

Reusable FAIR Implementation Profiles as Accelerators of FAIR Convergence

Authors

[Authors and affiliations](#)

Erik Schultes, Barbara Magagna , Kristina Maria Hettne, Robert Pergl, Marek Suchánek, Tobias Kuhn

Conference paper

First Online: 22 December 2020

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Downloads

Part of the [Lecture Notes in Computer Science](#) book series (LNCS, volume 12584)

Abstract

Powerful incentives are driving the adoption of FAIR practices among a broad cross-section of stakeholders. This adoption process must factor in numerous considerations regarding the use of both domain-specific and infrastructural resources. These considerations must be made for each of the FAIR Guiding Principles and include supra-domain objectives such as the maximum reuse of existing resources (i.e., minimised reinvention of the wheel) or maximum interoperability with existing FAIR data and services. Despite the complexity of this task, it is likely that the majority of the decisions will be repeated across communities and that communities can expedite their own FAIR adoption process by judiciously reusing the implementation choices already made by others. To leverage these redundancies and accelerate convergence onto widespread reuse of FAIR implementations, we have developed the concept of FAIR Implementation Profile (FIP) that captures the comprehensive set of implementation choices made at the discretion of individual communities of practice. The collection of community-specific FIPs compose an online resource called the **FIP Convergence Matrix** which can be used to track the evolving landscape of FAIR implementations and inform optimisation around reuse and interoperability. Ready-made and well-tested FIPs created by trusted communities will find widespread reuse among other communities and could vastly accelerate decision making on well-informed implementations of the FAIR Principles within and particularly between domains.

Pre-print
<https://osf.io/2p85g/>

Metadata for Machines Workshops



Making it easy for humans to make metadata for machines

Metadata for Machines Workshops



Making it easy for humans to make metadata for machines
...so that machines can better do FAIR for people.

Metadata for Machines Workshops



Making it easy for humans to make metadata for machines
...so that machines can better do FAIR for people.

M4M FAQ

<https://docs.google.com/document/d/1XBUsLeX8SEBamsd-km0G-FKXDQQw79DBr4K5GWmNz9I/edit?usp=sharing>

Metadata for Machines Workshops



Making it easy for humans to make metadata for machines
...so that machines can better do FAIR for people.

M4M FAQ

<https://docs.google.com/document/d/1XBUsLeX8SEBamsd-km0G-FKXDQQw79DBr4K5GWmNz9I/edit?usp=sharing>

This is a screenshot of the GO FAIR website. The top navigation bar includes 'FAIR Principles', 'Implementation Networks', 'News', 'Events', 'Resources', and 'About GO FAIR'. The main content area has a dark green background with the text 'Making FAIR Metadata' and the URL 'https://www.go-fair.org/today/making-fair-metadata/'. At the bottom, there is a breadcrumb trail 'Home > GO FAIR Today > Making FAIR Metadata' and a section titled 'Three Point FAIRification Framework'.

This is a screenshot of the GO FAIR website's M4M page. The top navigation bar includes 'M4M', 'Projects', 'Certification', 'FAIR market development', 'News', 'Resources', and 'About us'. The main content area has a white background with the text 'Home > M4M' and the URL 'https://www.gofairfoundation.org/m4m/'. Below the URL is a search bar containing 'M4M champions' and a button labeled 'M4M'. At the bottom, there is a yellow banner with the text 'Welcome to the Metadata for Machines resource page'.

Metadata for Machines Workshops



Metadata for Machines Workshops

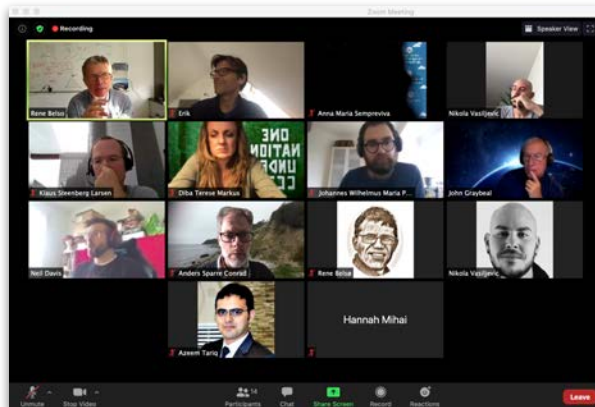


Metadata for Machines Workshops



Community (decision making) is central

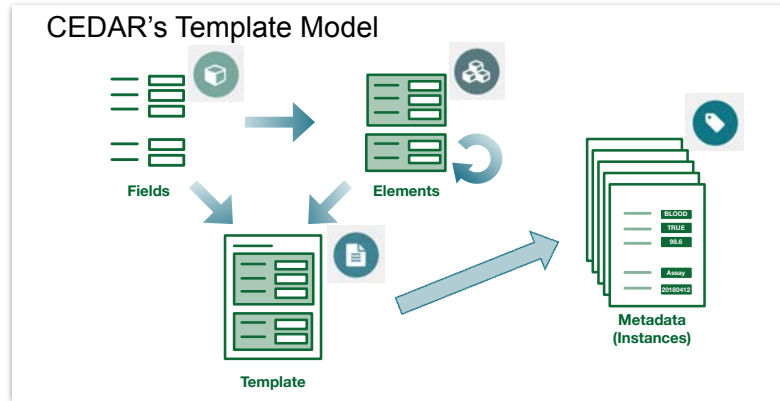
Metadata for Machines Workshops



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```

Community (decision making) is central

Metadata for Machines Workshops



CEDAR Workbench

- Metadata **schema** > **template** > **form** to be “filled in”
- The “questions”

Project Cedar - Metadata Editor

COVID-19 Project Content_V5

Read & Understood

Read & Understood*

Project Title (1..N)

Project Title - Multiple answers are allowed.*

Language*

Scope

Focus Area

To which focus area of the ZonMw COVID-19 program does your project belong?*

Most projects have been classified by ZonMw in one of these focus areas. If you can not find your focus area, please contact us.

For all terms provided in the drop-down list it is useful to check the definitions in BioPortal <https://bioportal.bioontology.org/ontologies/ZONMW-CONTENT>.

care and prevention - care and prevention for vulnerable citizens

care and prevention - organisation of care and prevention

care and prevention - palliative care and bereavement

care and prevention - transmission and epidemiology

effects on society - impacts of measurements and strategies

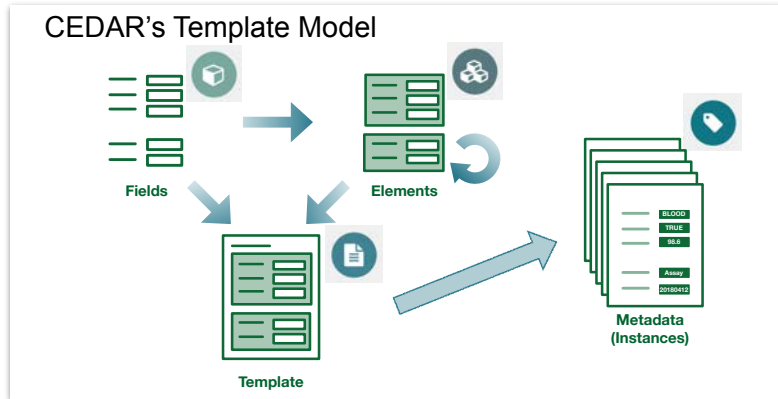
effects on society - impacts of measurements and strategies

Area Level (1..N)

Area Level - Multiple answers are allowed.

Disease (1..N)

Metadata for Machines Workshops



CEDAR Workbench

- Metadata **schema** > **template** > **form** to be “filled in”
- The “questions”



- Controlled **vocabularies**
- Drop-downs and autocomplete
- The “answers”

The screenshot shows the 'Project Cedar - Metadata Editor' interface. The title bar indicates the project is 'COVID-19 Project Content_V5'. The form contains several sections:

- Read & Understood**: A text input field with the label 'Read & Understood*'. Below it is a 'Project Title (1..N)' field with a pagination control showing '1' and a note 'Project Title - Multiple answers are allowed.*'. Below that is a 'Language*' field.
- Scope**: A section with a 'Focus Area' dropdown. The dropdown is open, showing a list of focus areas: 'care and prevention - care and prevention for vulnerable citizens', 'care and prevention - organisation of care and prevention', 'care and prevention - palliative care and bereavement', 'care and prevention - transmission and epidemiology', 'effects on society - impacts of measurements and strategies', and 'effects on society - impacts of measurements and strategies'. Below the dropdown is an 'Area Level (1..N)' field with a pagination control showing '1' and a note 'Area Level - Multiple answers are allowed.'. Below that is a 'Disease (1..N)' field with a pagination control showing '1'.

Metadata for Machines Workshops

M4M workshop overview <https://www.gofairfoundation.org/m4m/>

Workshop	Date	Community	Topic	Sponsor
M4M.1	October 2019	Inaugural	Setting up the concept	GO FAIR
M4M.2	January 2020	Funders	ZonMw + HRB	GO FAIR
M4M.3	January 2020	PreClinicalTrails	pre-registration form	GO FAIR
M4M.4	April-Sept 2020	VODAN Africa	Metadata for the FDP	Phillips Foundation
M4M.5	Summer 2020	AnnaEE	Climate data	DeiC
M4M.6	Summer 2020	DTU and others	Wind Energy	DeiC
M4M.7	November 2020	COVID-19 Program	Care (Treatment) / Prevention	ZonMw
M4M.8	November 2020	COVID-19 Program	Diagnostic / Testing	ZonMw
M4M.9	November 2020	COVID-19 Program	Prognosis / Risk assessments	ZonMw
M4M.10	November 2020	COVID-19 Program	Virus / Immunology / Molecular	ZonMw
M4M.11	November 2020	COVID-19 Program	Organisational / Process related	ZonMw
M4M.12	November 2020	COVID-19 Program	Socio-economic / Behavioral	ZonMw
M4M.13	February 2021	COVID-19 Program	Vocab	ZonMw
M4M.14	February 2021	COVID-19 Program	Vocab	ZonMw
M4M.15	June 2021	COVID-19 Program	Rapid M4M for datasets	ZonMw
M4M.16	June 2021	COVID-19 Program	I-ADOPT M4M for variables	ZonMw
M4M.17	June 2021	ID & AMR	R4R, COVID—>ID&AMR	ZonMw

Metadata for Machines Workshops

ZonMw
COVID-19 Program
62 Projects

**Brainstorm
 controlled
 lists**

M4M.7
 13 projects
 21 participants

1. Data
2. Images
3. Biomaterials
4. Services
5. Standards

M4M.8
 10 projects
 17 participants

1. Data
2. Images
3. Biomaterials
4. Services
5. Standards

M4M.9
 6 projects
 12 participants

1. Data
2. Images
3. Biomaterials
4. Services
5. Standards

M4M.10
 7 projects
 13 participants

1. Data
2. Images
3. Biomaterials
4. Services
5. Standards

M4M.11
 9 projects
 16 participants

1. Data
2. Images
3. Biomaterials
4. Services
5. Standards

M4M.12
 14 projects
 21 participants

1. Data
2. Images
3. Biomaterials
4. Services
5. Standards

November

**COVID-19 Program
 controlled list**
 1. Data
 2. Images
 3. Biomaterials
 4. Services
 5. Standards

February

Feb 9: Consolidation of lists and terms describing the project assets
Feb 17: Building the COVID-19 Program Vocabulary

March



**COVID
 Program
 Duration**

**COVID-19 Program
 metadata input forms**

observed property	
observable property	
average physical activity duration per day	
observed property	
duration	
observed property	
physical activity	
metric	
duration	
constraint	
per day	
metric	
average	
unit	
id	



**Data Stewards
 support researchers
 to routinely create
 metadata instances**

**FAIR
 Data
 Points**

Metadata for Machines Workshops

ZonMw
COVID-19 Program
62 Projects

Brainstorm controlled lists

M4M.7
 13 projects
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4. Services
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M4M.12
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4. Services
5. Standards

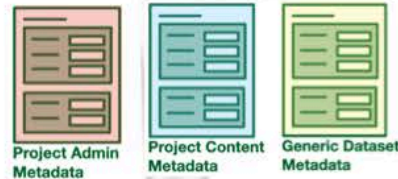
November

COVID-19 Program controlled list
 1. Data
 2. Images
 3. Biomaterials
 4. Services
 5. Standards

February

Feb 9: Consolidation of lists and terms describing the project assets
Feb 17: Building the COVID-19 Program Vocabulary

March



COVID Program Duration

COVID-19 Program metadata input forms




FAIR Data Points



Metadata for Machines Workshops

https://covid19initiatives-test.health-ri.nl/p/ProjectOverview





Initiatives Dashboard **Projects**

Project overview

Request data Reset

1 to 25 of 98

Lead institution	De maatschappelijke impact van COVID-19	Last changed 02/11/2021
Data availability	ZonMw - Netherlands Organisation for Health Research and Development Erasmus University Rotterdam	
ZonMw focus area	Investigating the immune response to COVID-19 Vaccination in Lung Transplantation patients (COVALENT study)	Last changed 01/11/2021
Type of provided assets	Covalent	
Provided data	ZonMw - Netherlands Organisation for Health Research and Development University Medical Center Groningen	
Type of provided biomaterial	Aanhoudende Klachten na COVID-19: perspectief vanuit de populatie, patiënt, en zorg.	Last changed 01/11/2021
Type of provided service	ZonMw - Netherlands Organisation for Health Research and Development University Medical Center Groningen	
	Changes in the use and organization of care in general practices and out-of-hours services: lessons learned from the COVID-19 pandemic	Last changed 28/10/2021
	COVID-GP	
	ZonMw - Netherlands Organisation for Health Research and Development NIVEL - Netherlands Institute for Health Services Research	
	Is COVID-19 a threat to banks and financial stability in Europe?	Last changed 26/10/2021
	Erasmus University Rotterdam	
	Infectiepreventie van COVID-19 in ziekenhuizen - omgevingsstudie	Last changed 26/10/2021
	COCON- environment	

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FAIR Data Point

GET <URL>

<http://www.w3.org/TR/vocab-dcat/>

Catalog 1

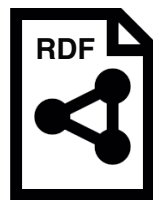
DATASET 1

DIST 1

DIST 2

DATASET 2

DIST 3



Catalog 2

DATASET 3

DIST 4

DIST 5



FAIR Data Point

<https://www.fairdatapoint.org>

FAIR Data Point

About FAIR Data Point

FAIR Data Point

What is a FAIR Data Point

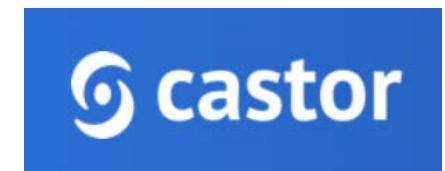
A FAIR Data Point (sometimes abbreviated to FDP) is the realisation of the vision of a group of authors of the [original paper on FAIR](#) on how (meta)data could be presented on the web using existing standards, and without the need of APIs.

A FAIR Data Point ultimately stores *information about data sets*, which is the definition of *metadata*. And just like the *webserver* in the WWW in the beginning of the 1990s brought the power of publishing text to anyone, a FAIR data point aims to give anyone the power of putting their own data on the web.

The system is called a **FAIR** data point because it takes care of a lot of the issues that need to be taken care of to make data FAIR; especially with the metadata needed for **F**indability and **R**eusability, and a uniform open way of **A**ccessing the data. The FAIR data point also addresses the Interoperability of the metadata it stores, but it leaves the Interoperability aspects for the data itself to the data provider.

Components

The FAIR Data Point as we have implemented it has three components



Generic Pyramid stack for FAIR and GDPR compliant reuse of personal data
(all green FAIR data points contain FDO's)

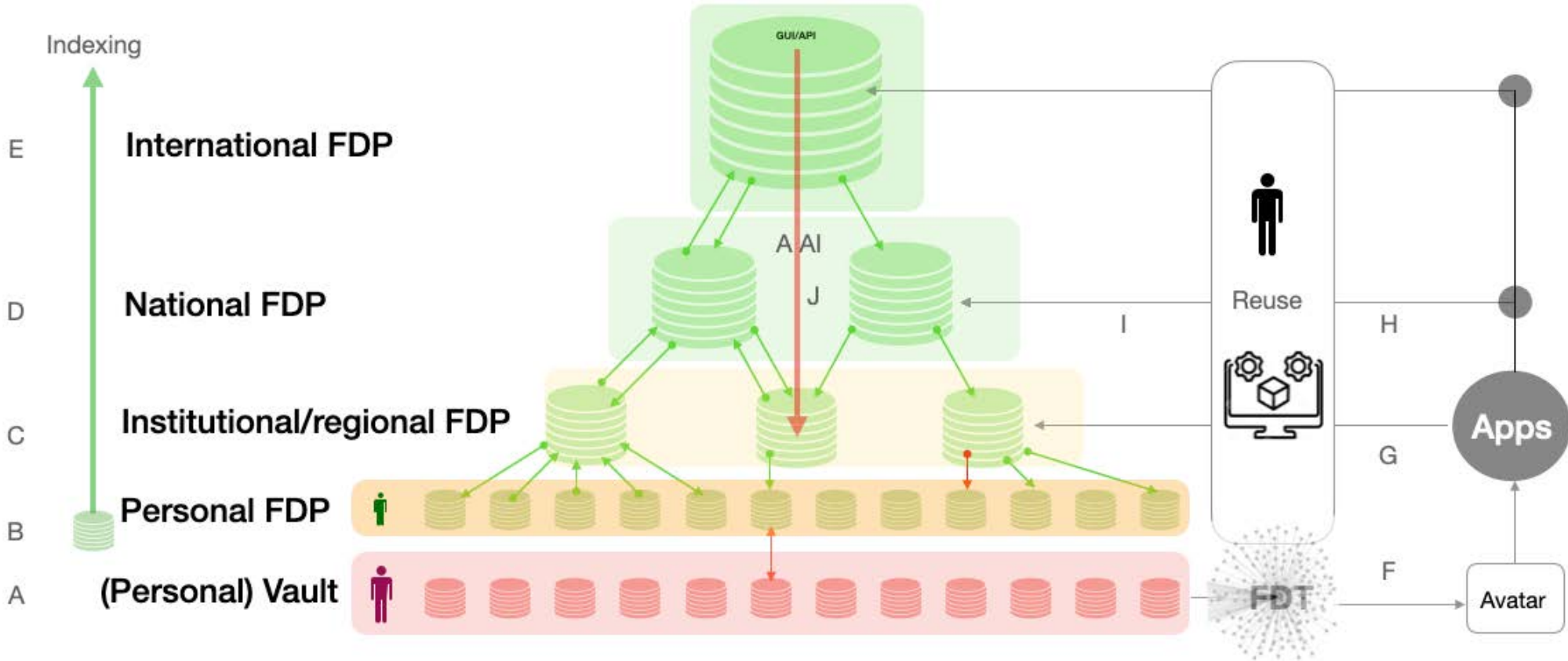
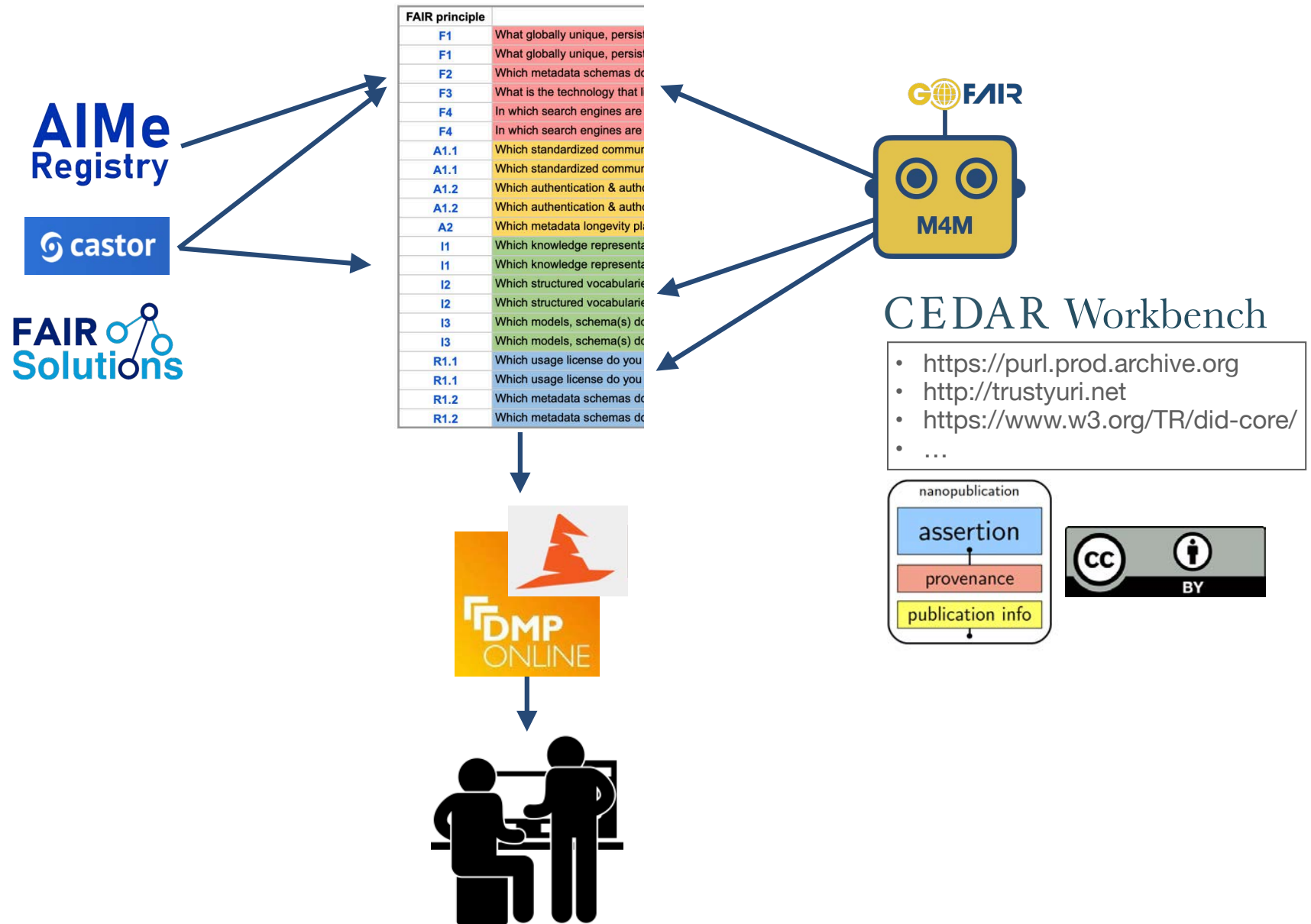


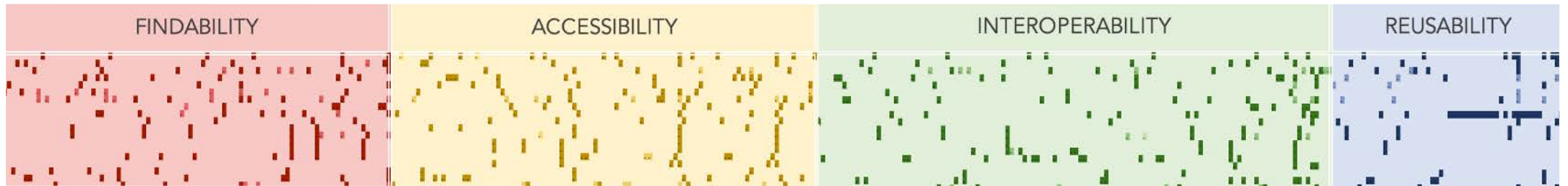
Image stolen from Barend Mons

Getting Systematic about FAIR Data Stewardship

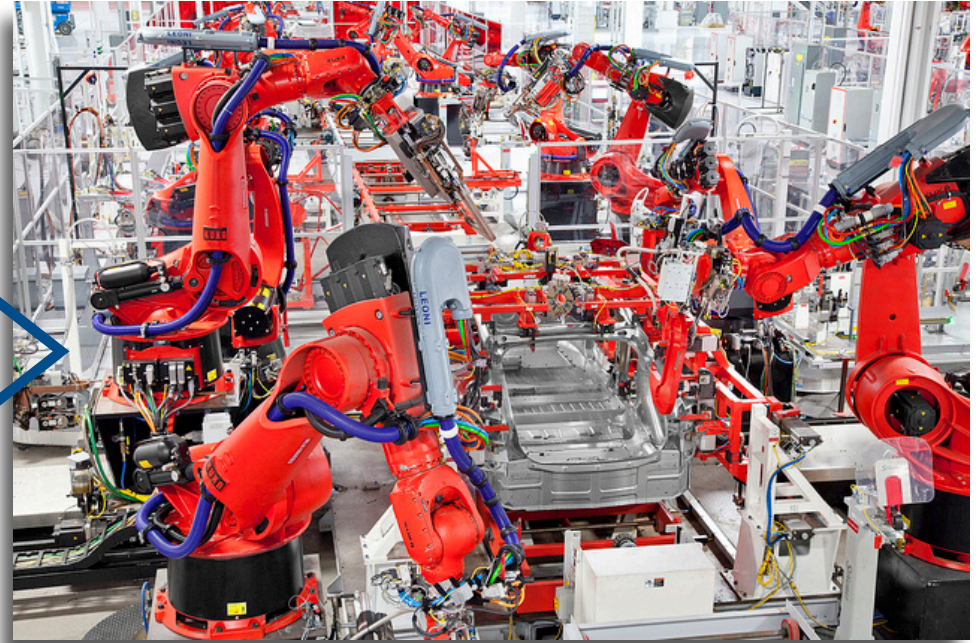


FAIR challenges & opportunities

Challenge 1: Show cross-disciplinary convergence by FIPs



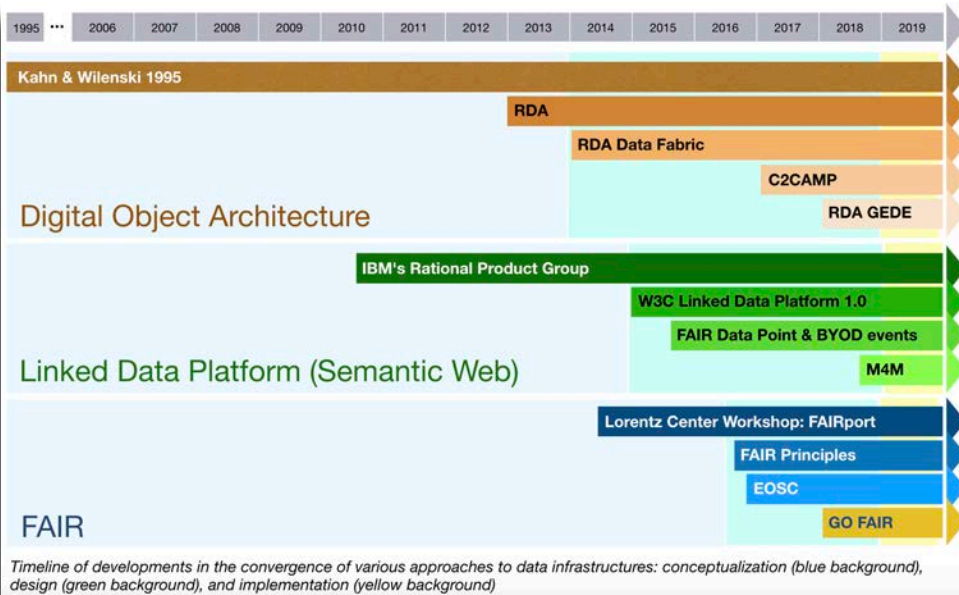
Challenge 2: FAIR metadata at scale



Train the trainer

Challenge 3: Convergence on FAIR Digital Objects

<https://www.go-fair.org/today/fair-digital-framework/>



FAIR DIGITAL OBJECTS  FORUM

FAIR DIGITAL OBJECTS  FORUM

OUR WORK

Leiden City of Science, October 2022

**Thank you &
FAIR well !**