

FAIR Principles



FAIR Implementations



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Acknowledgements:



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Schultes

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

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Machine-actionable metadata

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Technical infrastructure (accepted generic services)

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Social decisions (domain specific agreements)

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2018

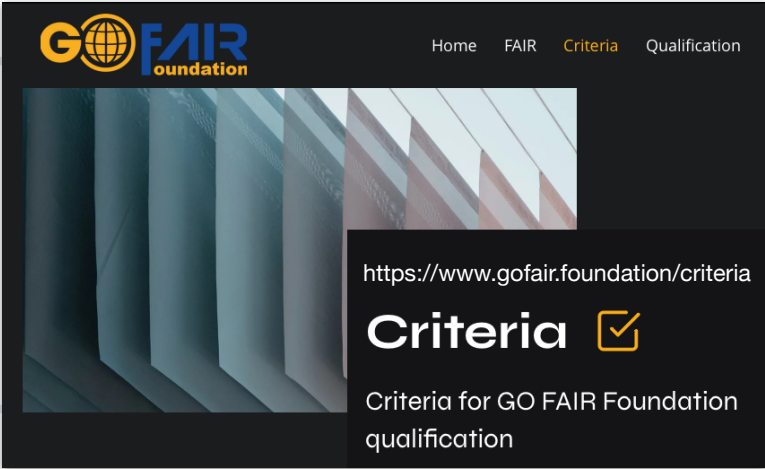
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2023

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Three-Point FAIRification Framework

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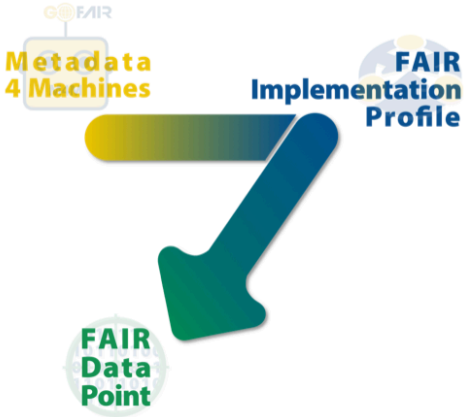


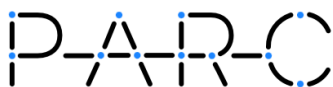
A framework guiding FAIRification

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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.

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Getting practical with the FAIR Principles

About the Event Series

The Getting Practical with FAIR series, hosted by the NIH Office of Data Science Strategy (ODSS) and the GO FAIR Foundation, provides an opportunity to learn about the theoretical and practical foundations of the FAIR (Findable, Accessible, Interoperable, and Reusable) Principles and how they can be applied to biological and biomedical research data. The principles, first published in Nature in 2016, created a standard for the sharing and reuse of data. Through this series, the FAIR Foundation will support participants who seek to learn how FAIR works in practice, the skills needed to implement FAIR, and how to make FAIR a more routine aspect of their data management strategy.



Event 1: So, Why Go FAIR?
April 17, 2023, 11:00 A.M.-12:00 P.M. EST

Event 2: Making Metadata FAIR
June 12-13, 2023

<https://datascience.nih.gov/getting-practical-with-the-fair-principles>

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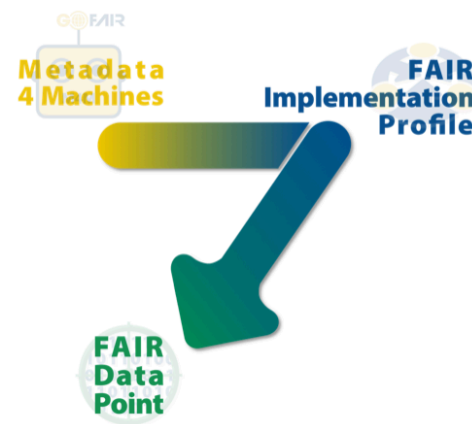


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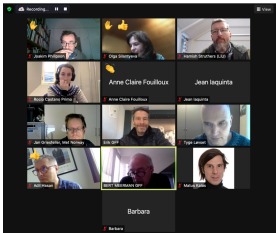
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- FAIR Metadata
- FAIR (schema/vocabs)
 - Domain-specific
 - Reusable



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{
  "@context": "https://doi.org/10.21961/rr11",
  "@type": "Dataset",
  "name": "FAIR Metadata",
  "description": "FAIR Metadata",
  "keywords": "FAIR, Metadata, FAIRification",
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  "version": "1.0",
  "datePublished": "2023-01-01",
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  "author": "FAIR Community",
  "publisher": "FAIR Community",
  "url": "https://www.go-fair.org/how-to-go-fair/",
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  "hasPart": "https://www.go-fair.org/how-to-go-fair/",
  "hasVersion": "https://www.go-fair.org/how-to-go-fair/",
  "isIdenticalTo": "https://www.go-fair.org/how-to-go-fair/"
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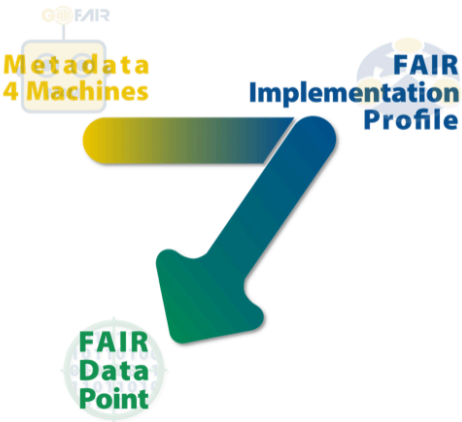


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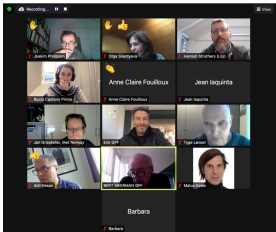
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Community decision making is key

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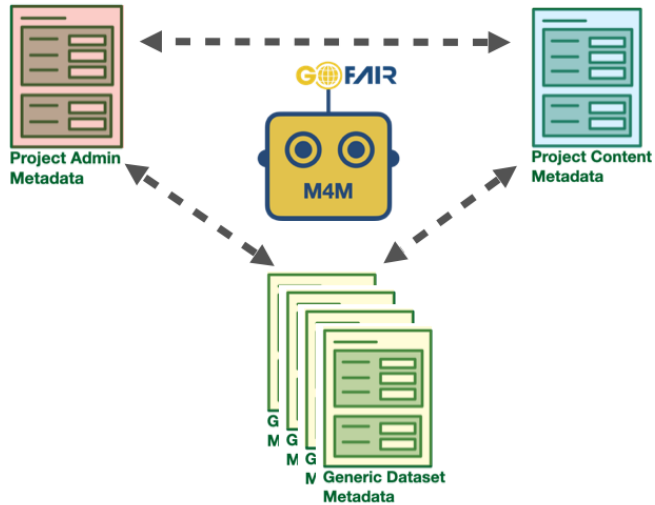
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ZonMw COVID-19 Program



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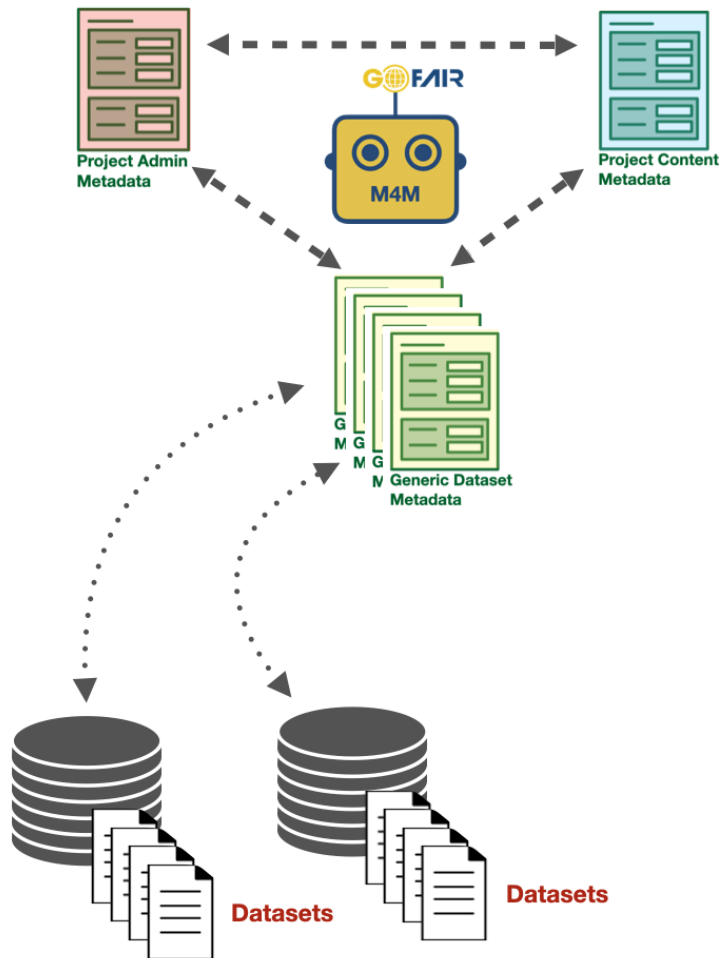
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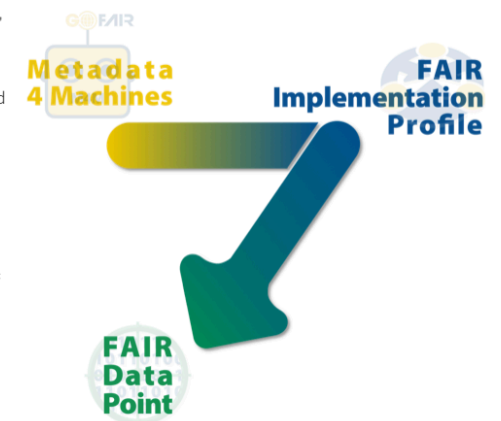


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Workshop Date	Community	Topic	Provider	Sponsor	
M4M.1	October 2019	Inaugural	Setting up the concept	GO FAIR Foundation	GO FAIR
M4M.2	January 2020	Funders	ZonMw + HRB	GO FAIR Foundation	GO FAIR
M4M.3	January 2020	PreClinicalTrails	pre-registration form	GO FAIR Foundation	GO FAIR
M4M.4	April-Sept 2020	VODAN Africa	Metadata for the FDP	GO FAIR Foundation	Phillips Foundation
M4M.5	Summer 2020	AnnaEE	Climate data	GO FAIR Foundation	DeiC
M4M.6	Summer 2020	DTU and others	Wind Energy	GO FAIR Foundation	DeiC
M4M.7	November 2020	COVID-19 Program	Care (Treatment) / Prevention	GO FAIR Foundation	ZonMw
M4M.8	November 2020	COVID-19 Program	Diagnostic / Testing – Recordings	GO FAIR Foundation	ZonMw
M4M.9	November 2020	COVID-19 Program	Prognosis / Risk assessments	GO FAIR Foundation	ZonMw
M4M.10	November 2020	COVID-19 Program	Virus / Immunology / Molecular – Recordings	GO FAIR Foundation	ZonMw
M4M.11	November 2020	COVID-19 Program	Organisational / Process related – Recordings	GO FAIR Foundation	ZonMw
M4M.12	November 2020	COVID-19 Program	Socio-economic / Behavioral – Recordings	GO FAIR Foundation	ZonMw
M4M.13	February 2021	COVID-19 Program	Vocab	GO FAIR Foundation	ZonMw
M4M.14	February 2021	COVID-19 Program	Vocab	GO FAIR Foundation	ZonMw
M4M.15	June 2021	COVID-19 Program	Rapid M4M for datasets	GO FAIR Foundation	ZonMw
M4M.16	June 2021	COVID-19 Program	I-ADOPT M4M for variables	GO FAIR Foundation	ZonMw
M4M.17	June 2021	ID & AMR	R4R, COVID—>ID&AMR	GO FAIR Foundation	ZonMw
M4M.18	Sept 2021	INCENTIVE	Influenza vaccine – Recordings	partners in FAIR	EU/Horizon2020
M4M.19	December 2021	NICEST2	Climate data	GO FAIR Foundation	EOSC Nordic
M4M.20	June 2022	FAIRware	Psychology – Recordings	GO FAIR Foundation	FAIRware
M4M.21	June 2022	FAIRware	Neuroscience – Recordings	GO FAIR Foundation	FAIRware
M4M.22	June 2022	INCENTIVE	Influenza vaccine	partners in FAIR	EU/Horizon2020

<https://www.gofairfoundation.org/m4m/>

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FAIR Implementation Community

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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	
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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	
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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	

<http://bit.ly/FIPminiquestionnaire>


considerations as machine-actionable metadata components. These considerations can be guided in **Metadata for Machines** (M4M) Workshops.



Metadata 4 Machines



FAIR Data Point



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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	

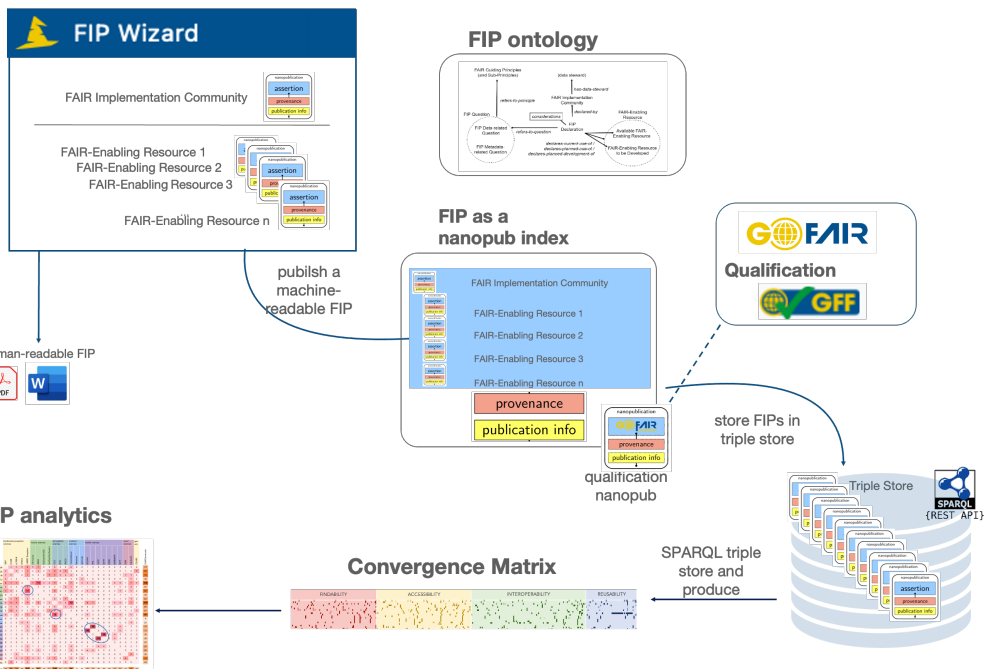
<http://bit.ly/FIPminiquestionnaire>

considerations as machine-actionable metadata components. These considerations can be guided in **Metadata for Machines** (M4M) Workshops.



Metadata 4 Machines



Community decision making is key

How to GO FAIR

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

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.

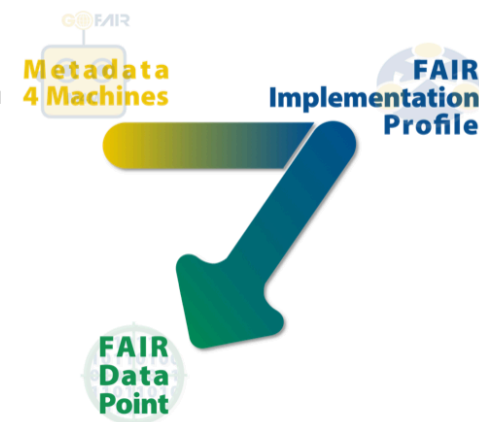


A framework guiding FAIRification

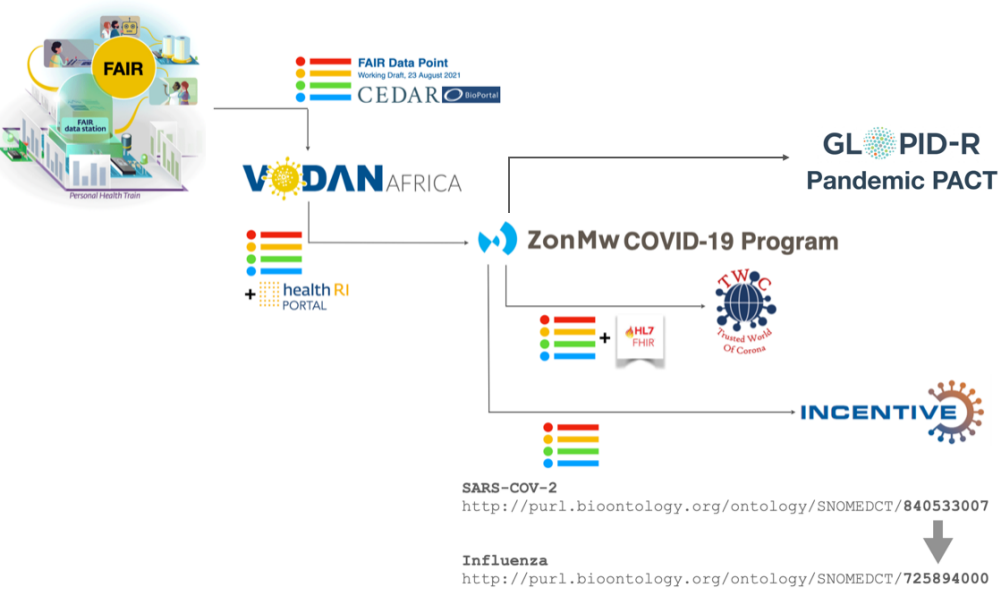
The Three-point FAIRification Framework provides practical "how to" guidance to stakeholders seeking to go FAIR.

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**.



FIPs for Convergence



Community decision making is key

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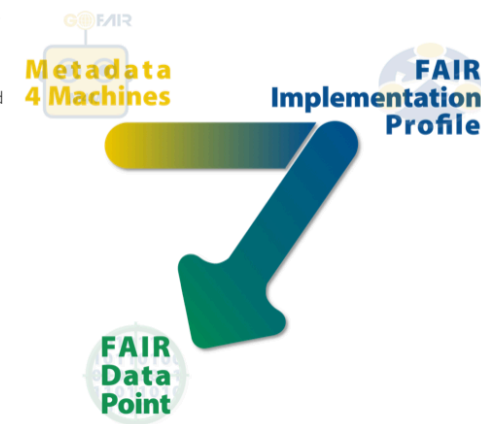


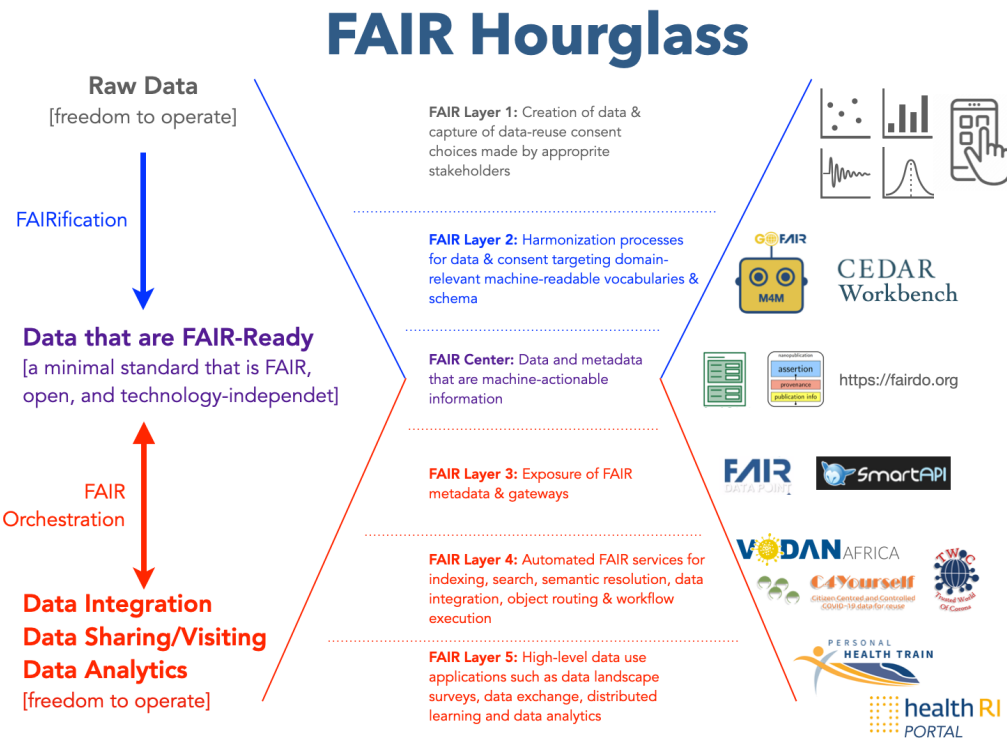
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The FAIR hourglass: A framework for FAIR implementation
<https://content.iospress.com/articles/fair-connect/fc221514>

How to GO FAIR

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

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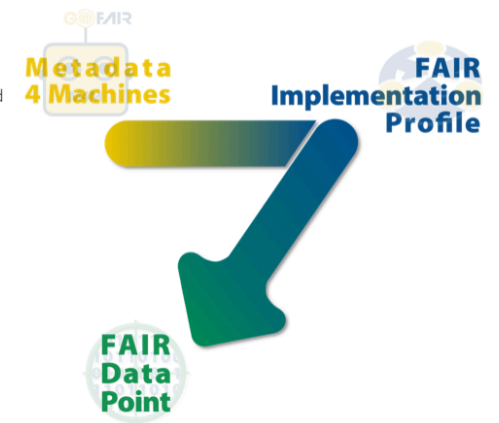


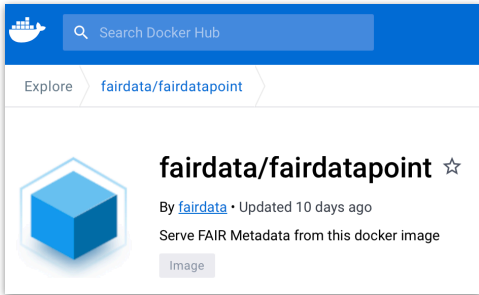
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FAIR Orchestration Platforms

https://docs.google.com/document/d/1hcwWeKpOVom8-nKn_5T-ZfoAl-SI-hHf3eslPGKV88A/edit?usp=sharing

https://www.eosc-nordic.eu/content/uploads/2020/04/EOSC-Nordic_workshop_-_FAIRification_of_NordicBaltic_data_repositories.pdf

EOSC
NORDIC

Workshop 'FAIRification of Nordic+Baltic data repositories'

April 22, 2020

Authors: Andreas O Jaunsen, Tuomas Altera, Josefine Nordling, Mari-Eliisa Kuusniemi, Bert Meerman, Erik Schultes

How to GO FAIR

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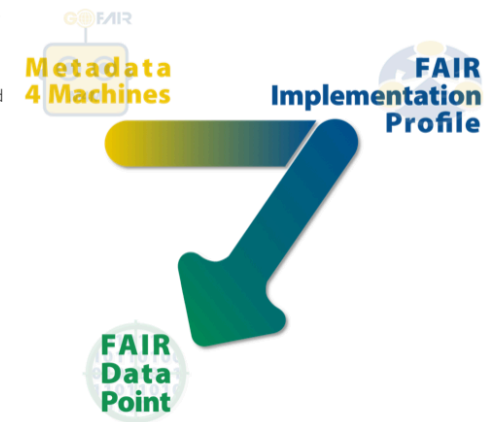


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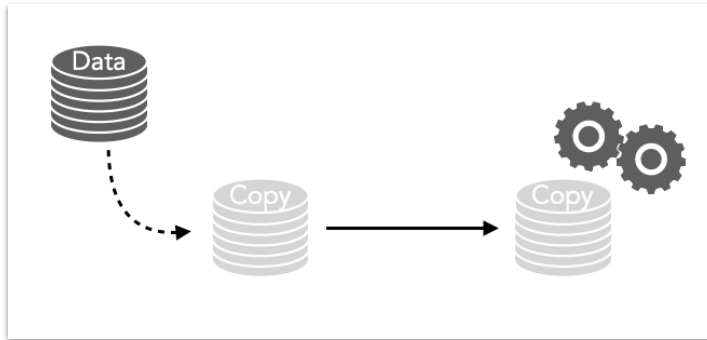
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FAIR Science: Data visiting

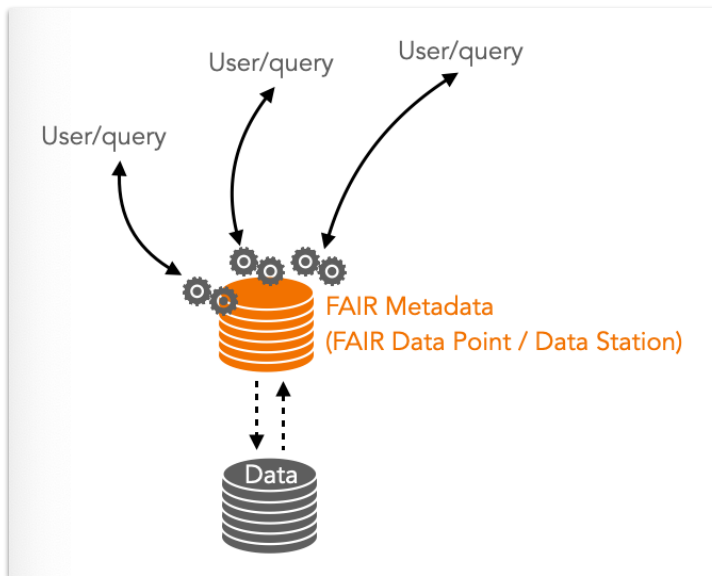
An alternative to "data centers" and "cloud" environments

<https://registry.ern-euro-nmd.eu/the-way-forward-is-not-data-sharing-but-data-visiting/>



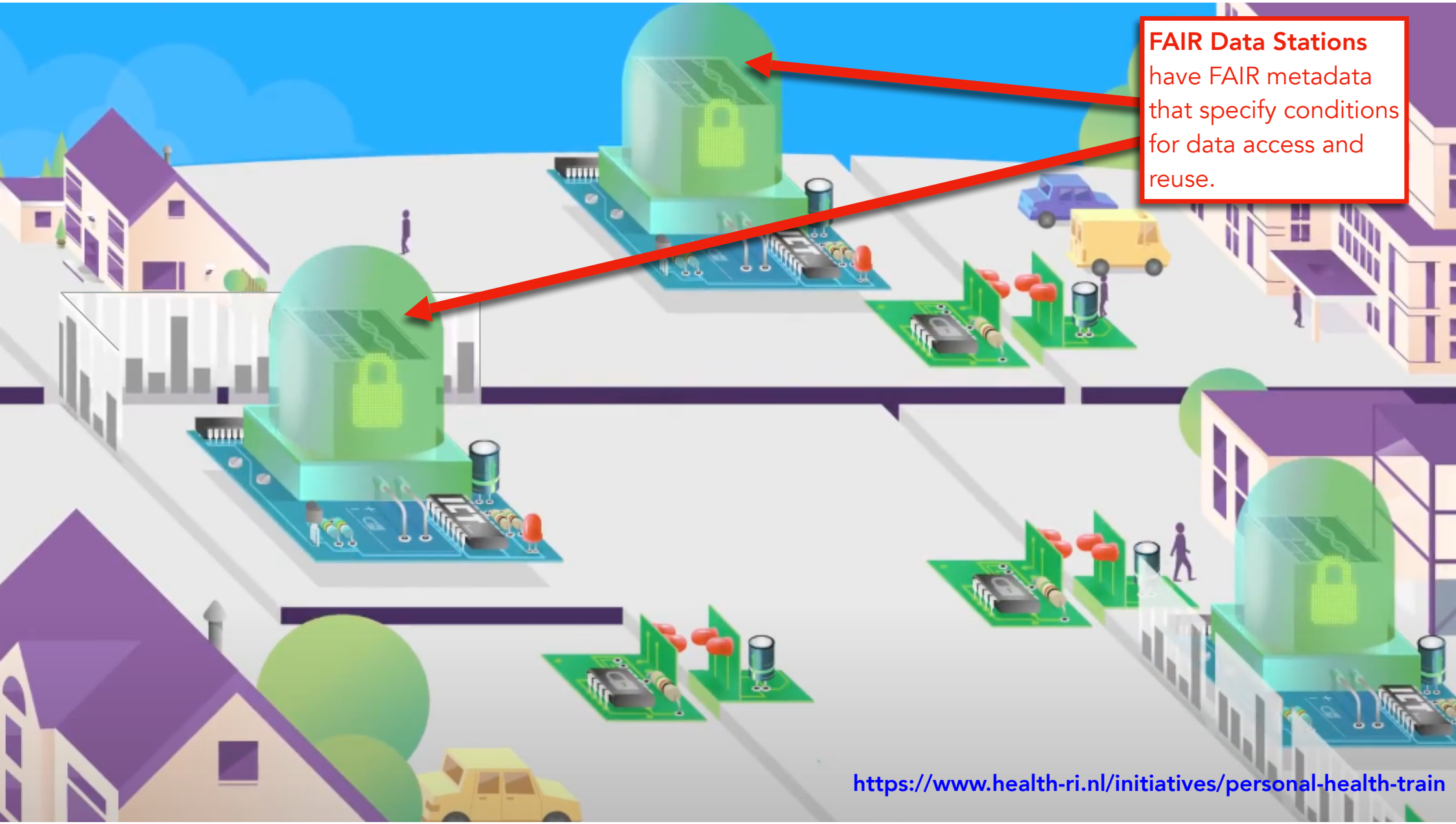
Data Sharing:

- copy and transport data
- analysis happens elsewhere
- data is out of your control



Data Visitation:

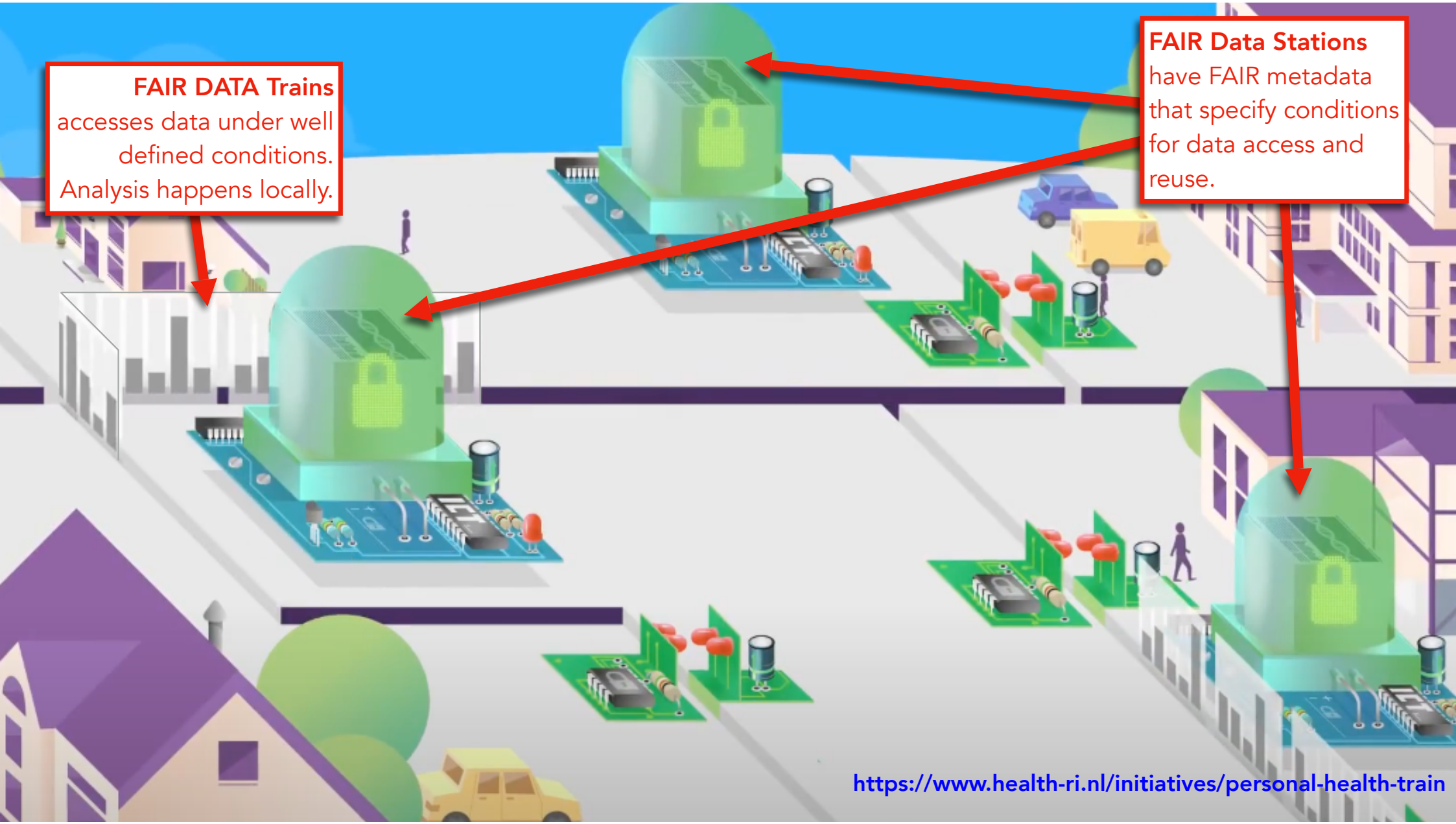
- data stay local (are not copied)
- analysis happens locally
- data access is known



FAIR Data Stations have FAIR metadata that specify conditions for data access and reuse.

FAIR DATA Trains
accesses data under well
defined conditions.
Analysis happens locally.

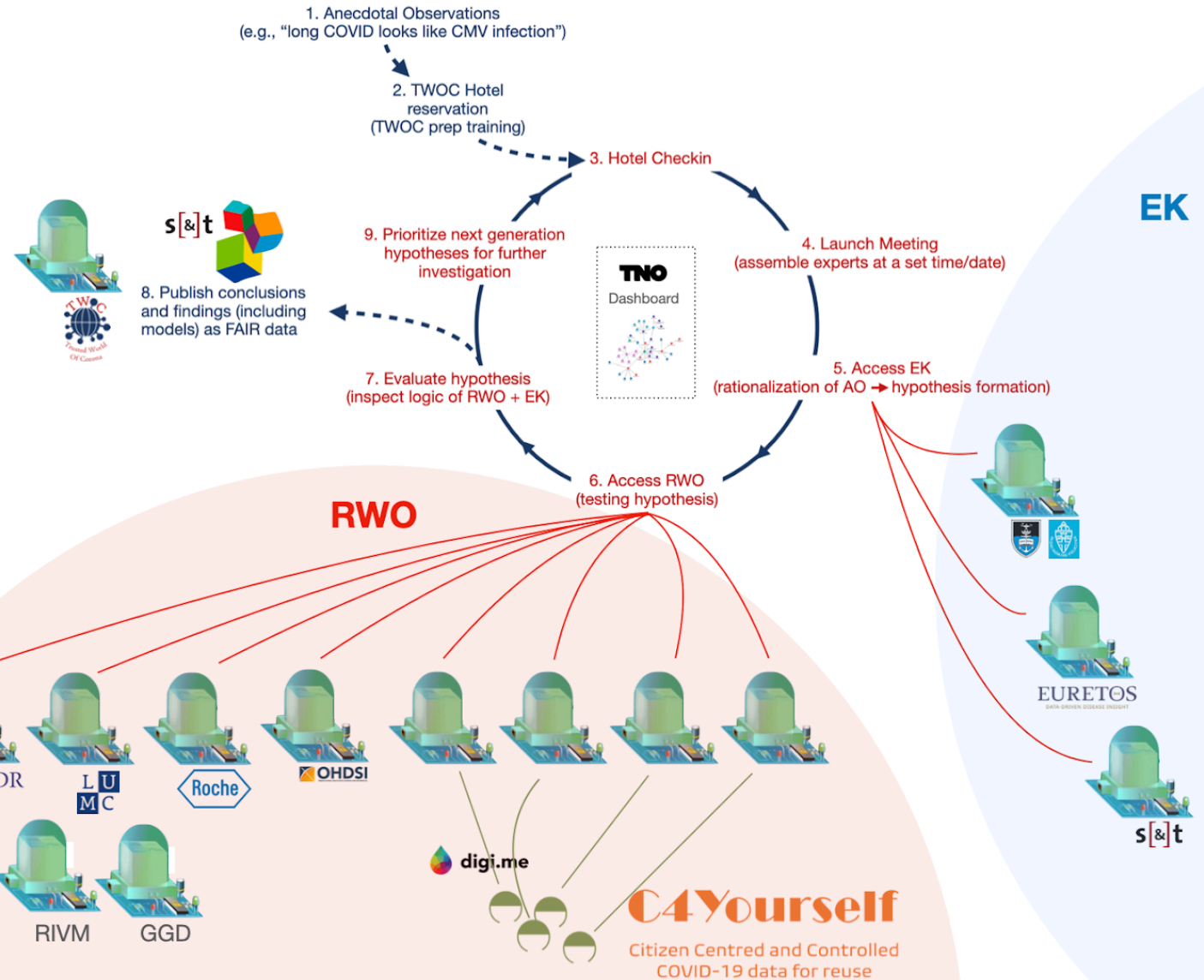
FAIR Data Stations
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for data access and
reuse.





C4Yourself
Citizen Centred and Controlled
COVID-19 data for reuse

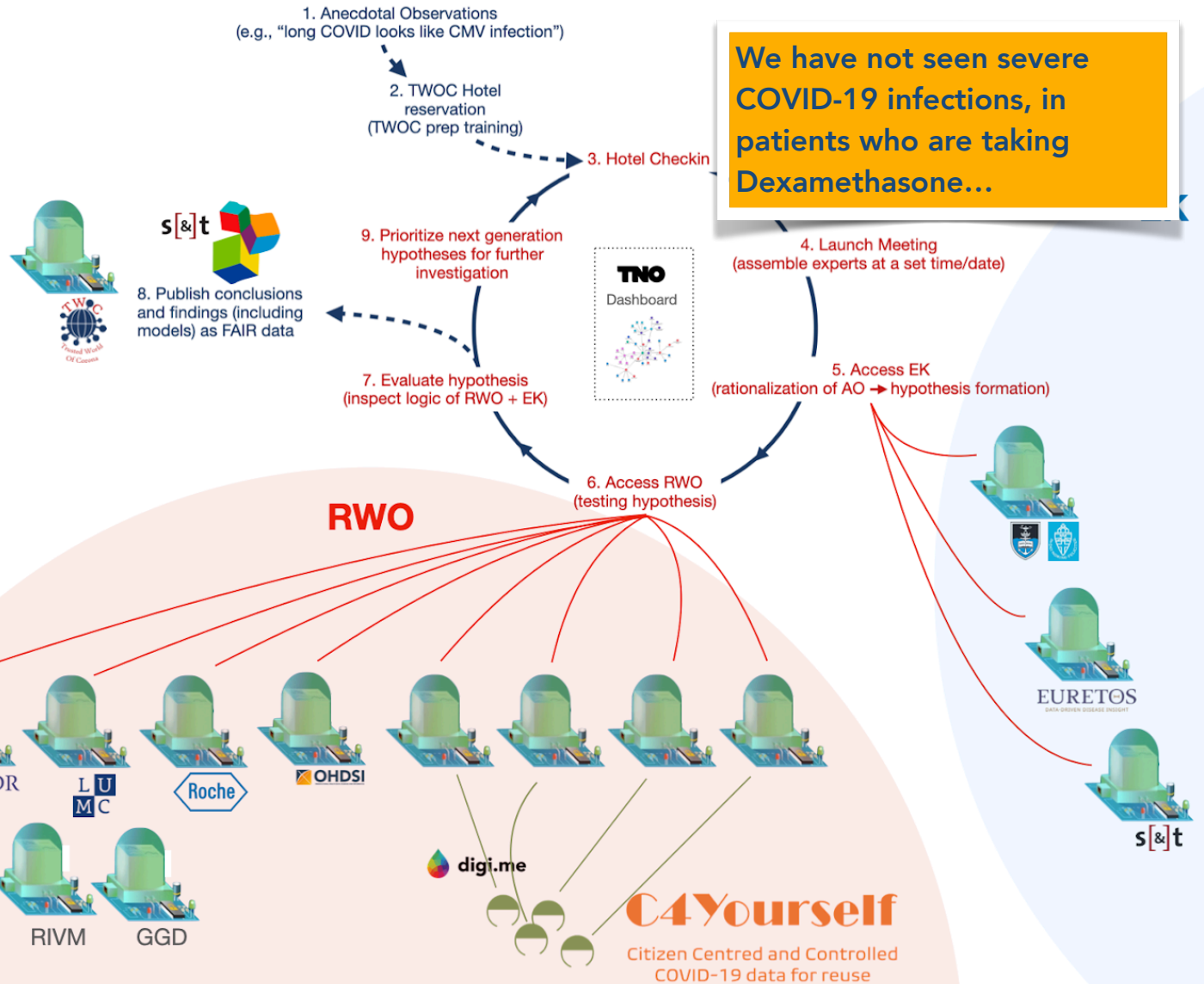
<http://www.twoc.eu>





C4Yourself
Citizen Centred and Controlled
COVID-19 data for reuse

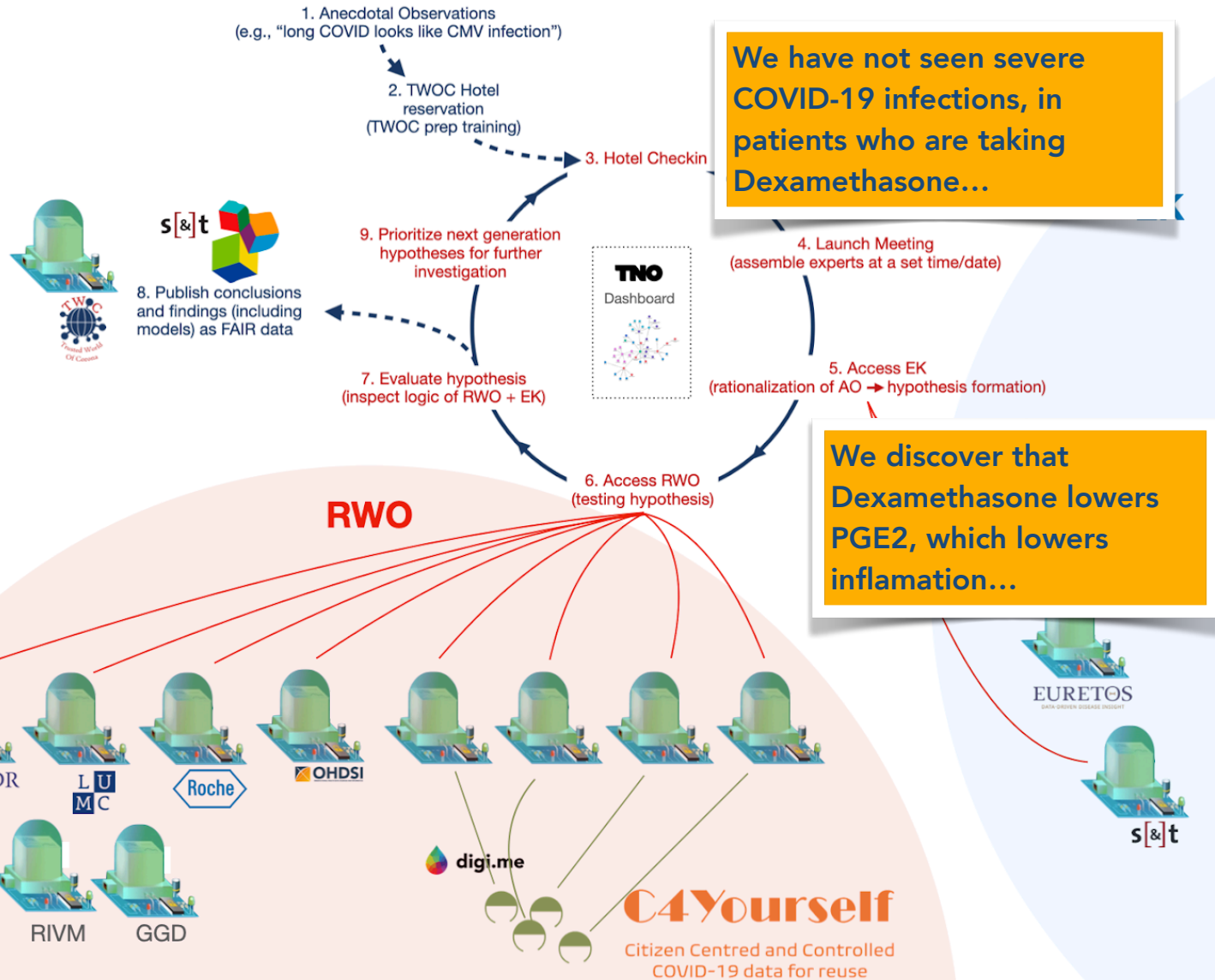
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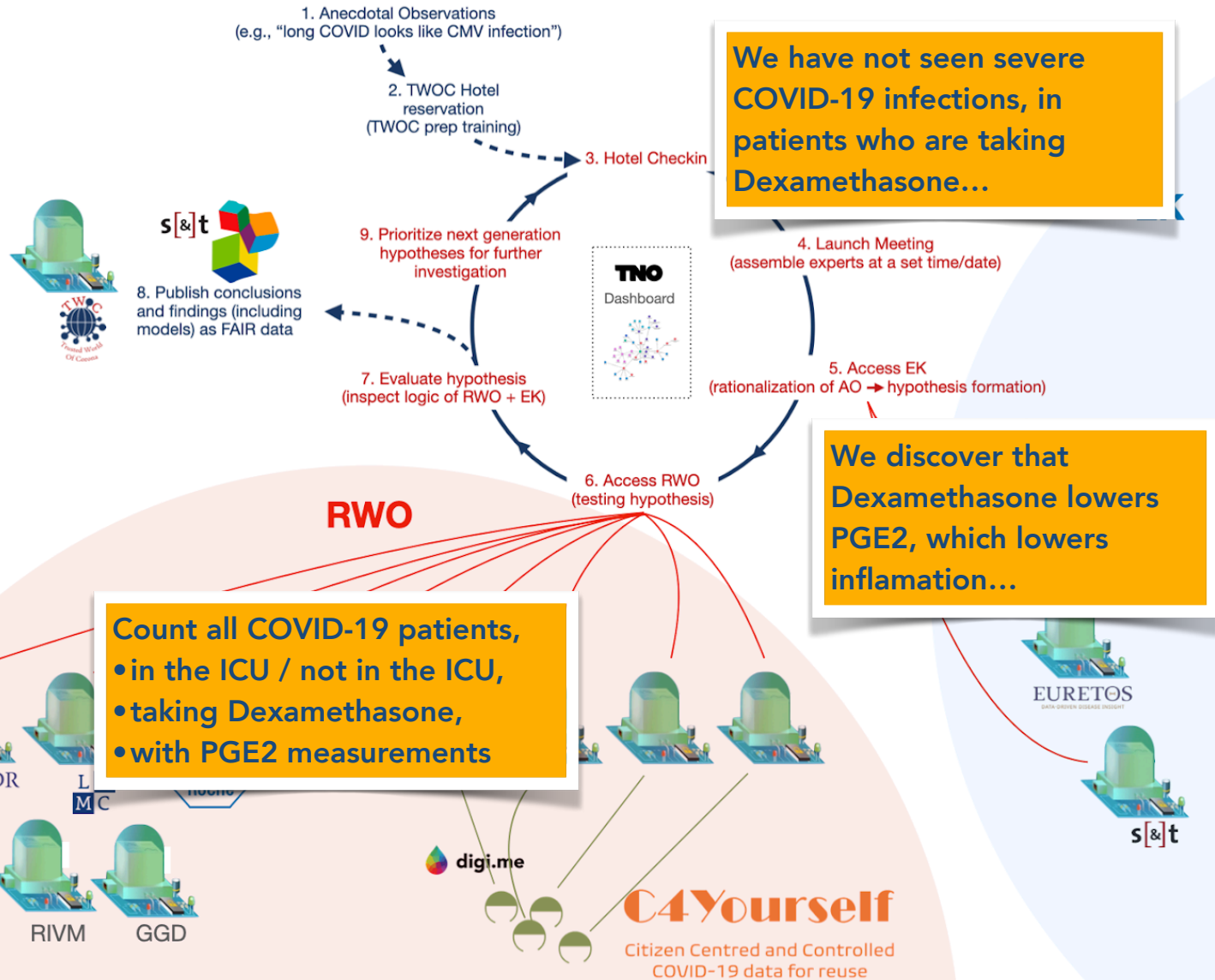
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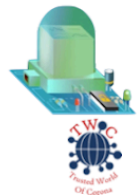
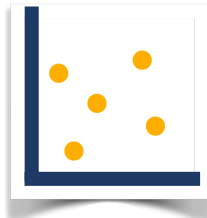
<http://www.twoc.eu>





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COVID-19 data for reuse

<http://www.twoc.eu>



s[t]
8. Publish conclusions and findings (including models) as FAIR data

1. Anecdotal Observations (e.g., "long COVID looks like CMV infection")

2. TWOC Hotel reservation (TWOC prep training)

3. Hotel Checkin

We have not seen severe COVID-19 infections, in patients who are taking Dexamethasone...

4. Launch Meeting (assemble experts at a set time/date)

5. Access EK (rationalization of AO → hypothesis formation)

We discover that Dexamethasone lowers PGE2, which lowers inflammation...

RWO

Count all COVID-19 patients,
• in the ICU / not in the ICU,
• taking Dexamethasone,
• with PGE2 measurements

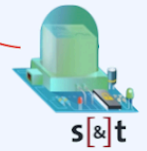
9. Prioritize next generation hypotheses for further investigation

7. Evaluate hypothesis (inspect logic of RWO + EK)

6. Access RWO (testing hypothesis)



C4Yourself
Citizen Centred and Controlled
COVID-19 data for reuse



FAIR Science: Data visiting

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Swarm Learning for decentralized and confidential clinical machine learning

[Stefanie Warnat-Herresthal](#), [Hartmut Schultze](#), [Krishnaprasad Lingadahalli Shastry](#), [Sathyanarayanan Manamohan](#), [Saikat Mukherjee](#), [Vishesh Garg](#), [Ravi Sarveswara](#), [Kristian Händler](#), [Peter Pickkers](#), [N. Ahmad Aziz](#), [Sofia Ktena](#), [Florian Tran](#), [Michael Bitzer](#), [Stephan Ossowski](#), [Nicolas Casadei](#), [Christian Herr](#), [Daniel Petersheim](#), [Uta Behrends](#), [Fabian Kern](#), [Tobias Fehlmann](#), [Philipp Schommers](#), [Clara Lehmann](#), [Max Augustin](#), [Jan Rybniker](#), [COVID-19 Aachen Study \(COVAS\)](#), [Deutsche COVID-19 Omics Initiative \(DeCOI\)](#), ... [Joachim L. Schultze](#) + Show authors

Nature 594, 265–270 (2021) | [Cite this article](#)

97k Accesses | 99 Citations | 479 Altmetric | [Metrics](#)

Abstract

YouTube NL Search

SPHN data ecosystem for FAIR data

Why you need more than an ontology

Dr sc ETH Sabine Österle

Team lead data interoperability, Personalized Health Informatics Group, SIB Swiss Institute of Bioinformatics

A project of SAMW SSM Swiss Institute of Bioinformatics

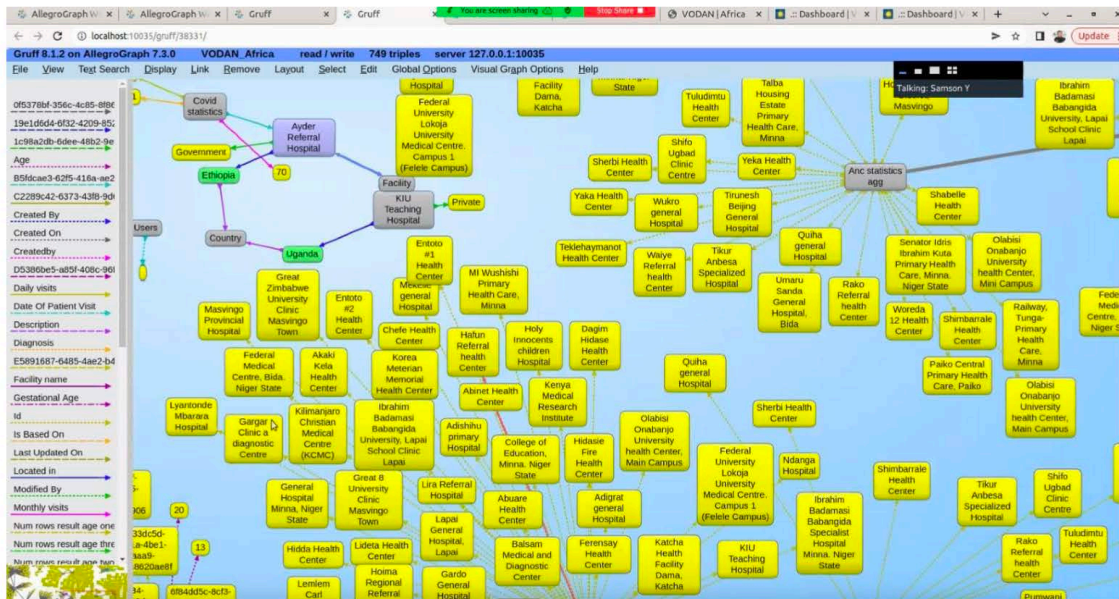
SPHN Data Ecosystem for FAIR Data

238 views • Oct 4, 2021

0 DISLIKE SHARE CLIP SAVE ...



Invitation VODAN-Africa platform Presentation



When: Wednesday 23 Nov 2022

Where: LUMC P-05-034 Leiden University
12:00-14:00 CET/14:00-16:00EAT

On-line video zoom-[link](#)

Programme:

- Demonstration of the data and platform
- Life demonstration of queries and analytics
- Presentation of next phase



AFRICAN UNIVERSITY
NETWORK
ON FAIR OPEN SCIENCE





Describe how ChatGPT makes FAIR data even more important

April 4 2023

As an AI language model, ChatGPT relies on large amounts of data to function effectively. This data can come from various sources, including academic research, news articles, social media posts, and other online content. To ensure that the data used by ChatGPT is of high quality and can be used effectively, it is essential that the data meets the FAIR data principles.

The FAIR data principles emphasize that data should be Findable, Accessible, Interoperable, and Reusable. These principles ensure that data can be easily located, accessed, and understood by both humans and machines. They also promote the use of open standards and data formats, which help to ensure that data can be used across different systems and applications.

By following the FAIR data principles, ChatGPT can access high-quality data from a wide range of sources, making it more effective at processing and analyzing information. FAIR data also helps to ensure that ChatGPT's outputs are accurate and reliable, which is essential for any AI system.

Moreover, by adhering to the FAIR data principles, ChatGPT can contribute to the wider goal of making data more accessible and usable for everyone. As an AI language model, ChatGPT has the potential to help researchers, policymakers, and other stakeholders make sense of complex data and draw insights from it. By using FAIR data, ChatGPT can ensure that the insights it provides are based on high-quality, trustworthy data, which can lead to more informed decision-making and better outcomes for society as a whole.

In summary, FAIR data is essential for AI language models like ChatGPT to function effectively and provide accurate insights. Following the FAIR data principles also promotes the wider goal of making data more accessible and usable for everyone, which can have significant positive impacts on society.

**Thank you
&
FAIR Well**



Facilitating data sharing and interoperability within the Materials and Manufacturing domains.

Key enablers of Materials and Manufacturing Commons:

Digital Marketplaces

FAIR Principles

Ontologies

Today: The FAIR principles will be introduced and existing tools and guidelines to leverage the FAIR principles in industrial context will be identified and discussed together with experts and participants.

Description of the event

The ambition to facilitate **data sharing and interoperability within the Materials and Manufacturing domains** is the core motivation for this event. Stemming from the OntoCommons H2020 project activities, this focused workshop provides a platform for academic researchers and industrial practitioners to meet and discuss about the **Materials and Manufacturing Commons** key enablers, in particular, **Digital Marketplaces, FAIR Principles and Ontologies**.

In this workshop, the **Digital Marketplaces concept** and its current status of implementation will be shown in order to continue the discussion about requirements and challenges using ontologies. Tools supporting **data documentation and interoperability** will be showcased, and concrete challenges, success stories, as well as experiences using **ontologies** will be shared.

A session and panel discussion on the future developments of **Materials and Manufacturing Commons** with focus on materials and manufacturing **data spaces** followed by **interactive input collection from participants** will round up the first part of the workshop and lead to the networking session in the evening.

In the second part, the FAIR principles will be introduced and existing tools and guidelines to leverage the **FAIR principles** in industrial context will be identified and discussed together with experts and participants.

The third day of the workshop will be dedicated to **participants' input, feedback and questions**, including an open pitch session for participants. Demos of the tools provided by the ontology commons ecosystem, a virtual tour of digital marketplaces and hands-on working sessions for enhancing the FAIRness score of participants' own ontologies will provide a tangible take-away result from the workshop. To deepen and consolidate the communication and networking between OntoCommons, the digital marketplaces, FAIR initiatives and interested users of semantic tools.

This workshop has received **high attention from the European Commission (EC)** and is very relevant to support the **collection of feedback required for further EC incentives/initiatives related to the implementation of Materials and Manufacturing Commons**. All participants are strongly invited to contribute to the discussions about the Materials and Manufacturing Commons concept and vision.

The workshop is open (no registration fee) and will take place on-site at the [Fraunhofer Forum Berlin](#) (Germany). Please register as soon as possible!
Registrations closes on Friday March 24th at noon for in-person participation.

Organisers/co-organisers:

- Joana Francisco Morgado, Dirk Helm and Monika Gall, Fraunhofer Institute for Mechanics of Materials IWM, Germany
- Gerhard Goldbeck and Alex Simperler, GCL Goldbeck Consulting Limited, United Kingdom
- Yann Le Franc, e-Science Data Factory, France
- María Poveda, Universidad Politécnica de Madrid, Spain
- Florina Piroi, Katharina Flicker and Marie Czuray, TU Wien, Austria
- Silvia Chiacchiera, UK Research and Innovation, United Kingdom
- Arkopaul Sarkar and Hedi Karray, Ecole Nationale D'Ingénierurs De Tarbes, France
- Lan Yang, University of Galway, Ireland
- Michela Magas, Industry Commons Foundation, Sweden
- Lars Erikson, Jonkoping University, Sweden
- Mark Illi, BEDA, Switzerland
- Cristina Mancarella, Rita Giuffrida, Trust-IT Services, Italy

Venue

Fraunhofer Forum Berlin (Anna Louisa Karsch Straße 2, 10178 Berlin, Germany; www.forum.fraunhofer.de)

Type of event

On site (hybrid participation possible)

Registration

The registration form for on site in Berlin is already closed, but please contact us if you would like to join in Berlin berlinworkshop@ontocommons.eu.

Registration possible until the event date for **online participation**.