The GO FAIR Matrix:

Maximizing the reuse of FAIR resources in building an Internet of FAIR Data and Serivces

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&
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A Framework for Distributed Digital Object Services

Robert Kahn
Corporation for National Research Initiatives

Robert Wilensky
University of California at Berkeley

May 13, 1995
cnri.dlib/tn95-01

1. Introduction

This document describes fundamental aspects of an infrastructure that is open in its architecture and which supports a large and extensible class of distributed digital information services. Digital libraries are one example of such services; numerous other examples of such services may be found in emerging electronic commerce applications. Here we define basic entities to be found in such a system, in which information in the form of **digital objects** is stored, accessed, disseminated and managed. We provide naming conventions for identifying and locating digital objects, describe a service for using object names to locate and disseminate objects, and provide elements of an access protocol.

We use the term **digital object** here in a technical sense, to be defined precisely below. Files, databases and so forth that one may ordinarily think of as objects with a digital existence are not digital objects in the sense used here, at least not until they are made into an appropriate data structure, etc., as we will describe shortly.

Only the most basic elements of the infrastructure are described herein. These elements are intended to constitute a minimal set of requirements and services that must be in place to effect the infrastructure of a universal, open, wide-area digital information infrastructure system ("the System"). We anticipate that many other services and elaborations will come into existence as the System is further developed, either building upon or otherwise added to these elements.

This paper focuses on the network-based aspects of the infrastructure, namely those for which knowledge of the contents of digital objects is not required. Definition of the content-based aspects of the infrastructure is purposely not addressed in this paper. An important goal in limiting the description of the infrastructure in this way is not to constrain the higher level user and service level choices that, for many reasons, might be inappropriate to fix upon at this point in time. With only the most basic elements of the infrastructure in place, technological evolution would not be overly constrained. Further, the likelihood of achieving widespread interoperability of services at some early point in the future will be preserved. No doubt the resulting capability will have a greater potential for enhancement and evolution through the participation of many others in helping to define it.
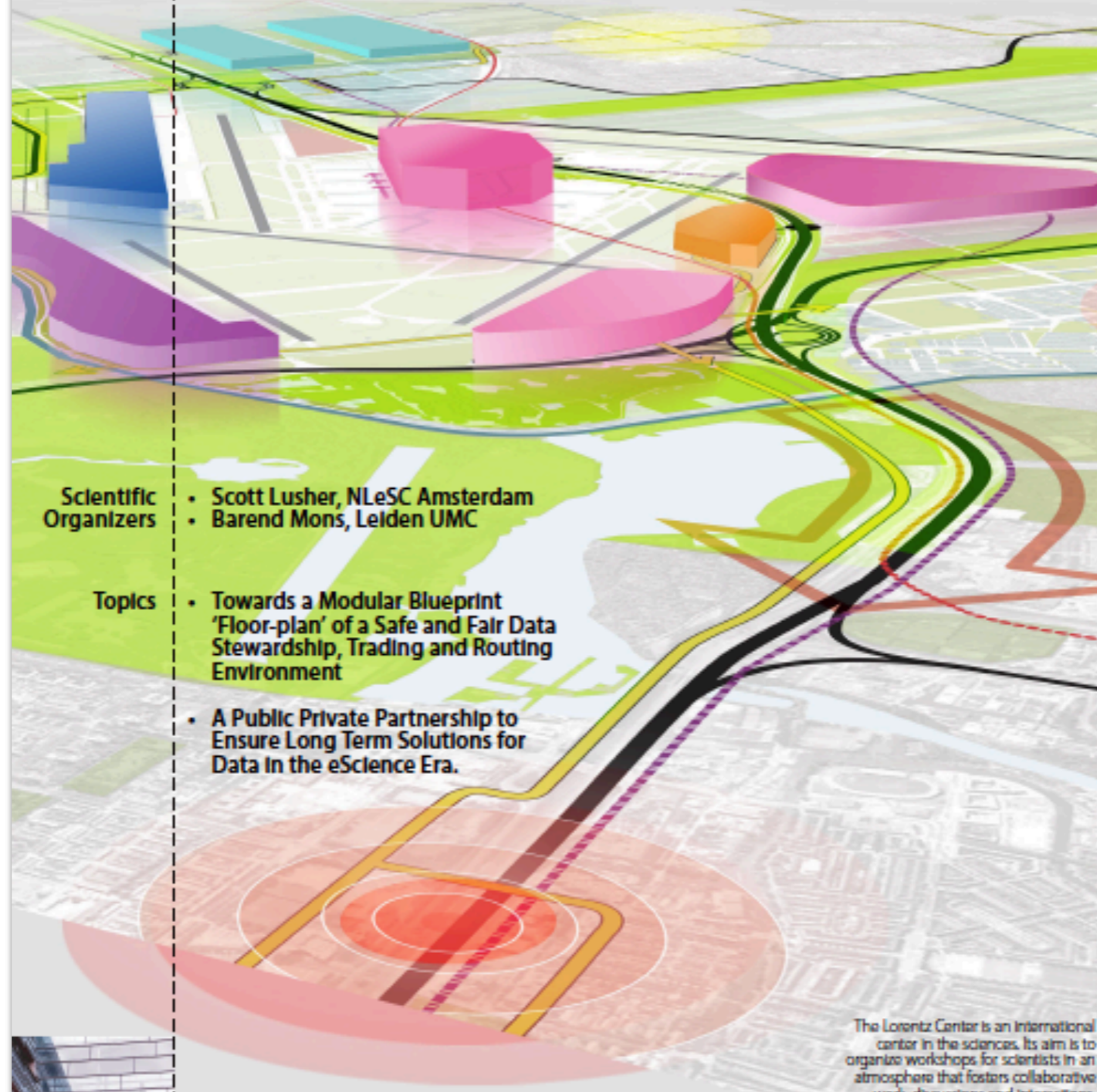
2. Overview and Definitions

In this section, we first present an informal overview of the elements of the System, sketching its elements and how they are supposed to function together. These elements include the notions of **digital objects** , **handles**, **metadata** and **key metadata**, **repositories**, **handle generators**, **originators**, **users**, **global naming authorities** and **local naming**

2014

FAIR Guiding Principles

2016

The FAIR Guiding Principles for scientific data management and stewardship

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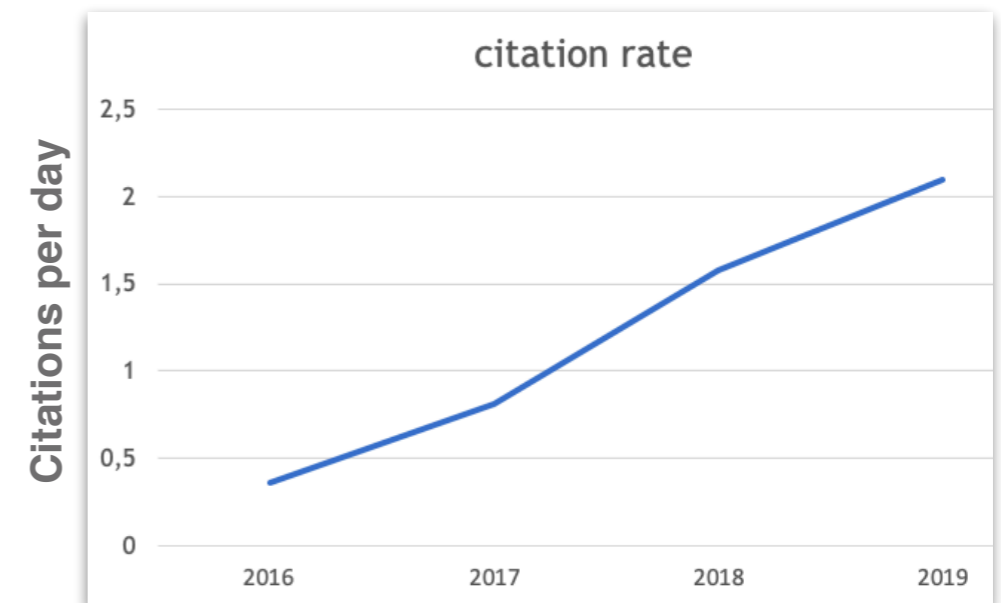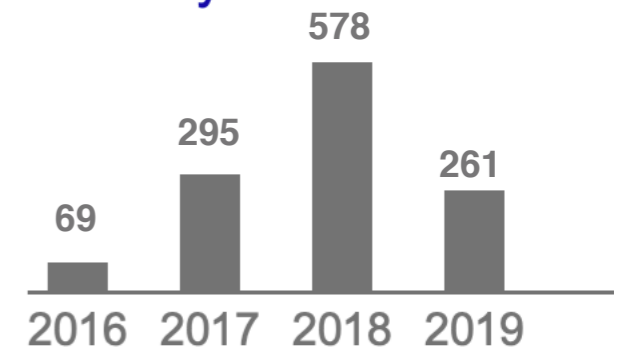
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"Data and services that are **f**indable, **a**ccessible, **i**nteroperable, **r**e-usable both for machines and for people."

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data management and...

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Box 2 | The FAIR Guiding Principles

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
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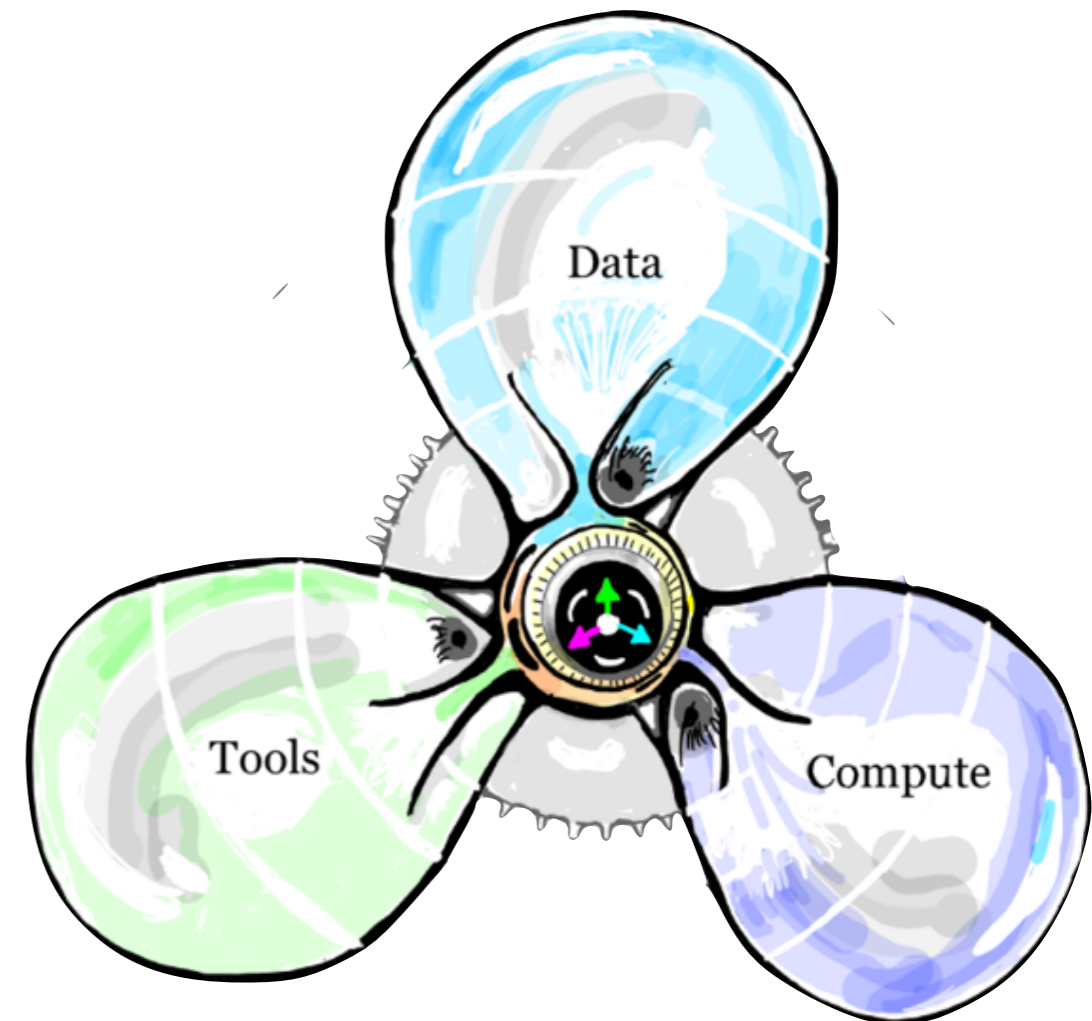
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**Internet of FAIR
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2017 What FAIR is not…

FAIR is not a standard

FAIR is not a semantic web / LOD

FAIR is not equal to 'Open' or 'Free'

Data are often Open (Access) but not FAIR

Some data can never be Open, yet be perfectly FAIR

By design, FAIR is not explicit about data quality, trustworthiness, responsibility, ethics, etc.

2017

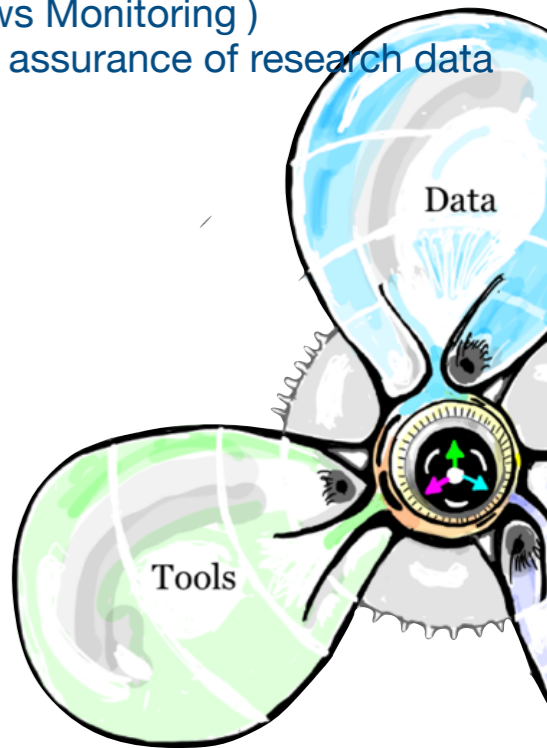**FAIR
Principles**

GO**FAIR**

**FAIR
Implementations**

Community Implementation Choices & Challenges
https://osf.io/4v9pm/

15 FAIR Guiding Principles
Digital Object Framework

Define metadata functions

Self-Identified
Domain Communities
aiming to become more FAIR

- *EOSC*
- *NIH Data Commons*
- *Preclinical Trials*
- *Funders*
- *American Geophysical Union*
- *Bayer*
- *Journalists*
- *Financial industry*

Matrix
Communities x Resources

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Matrix
Communities x Resources

Implementation
Choice

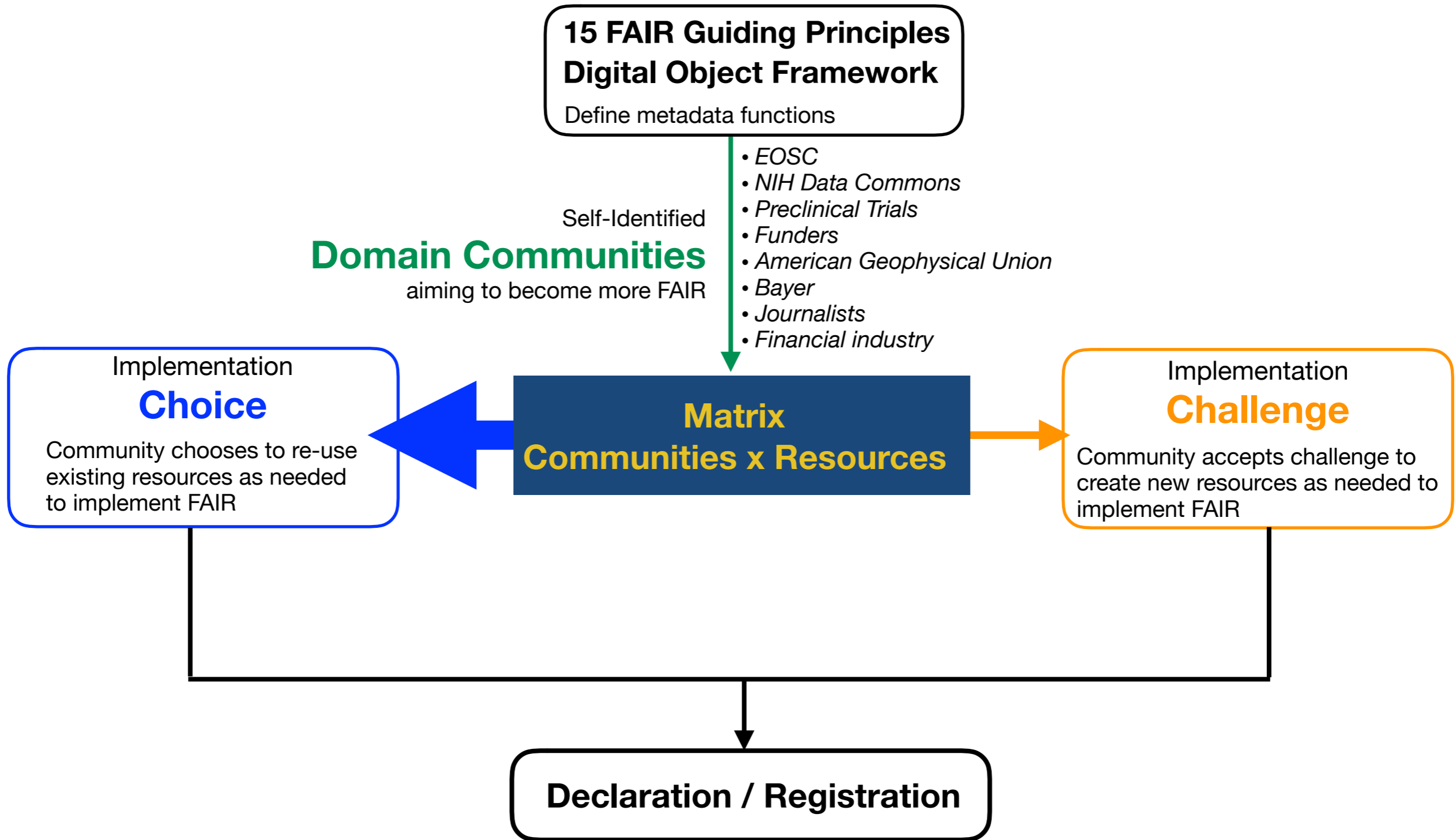Community chooses to re-use existing resources as needed to implement FAIR

Implementation
Challenge

Community accepts challenge to create new resources as needed to implement FAIR

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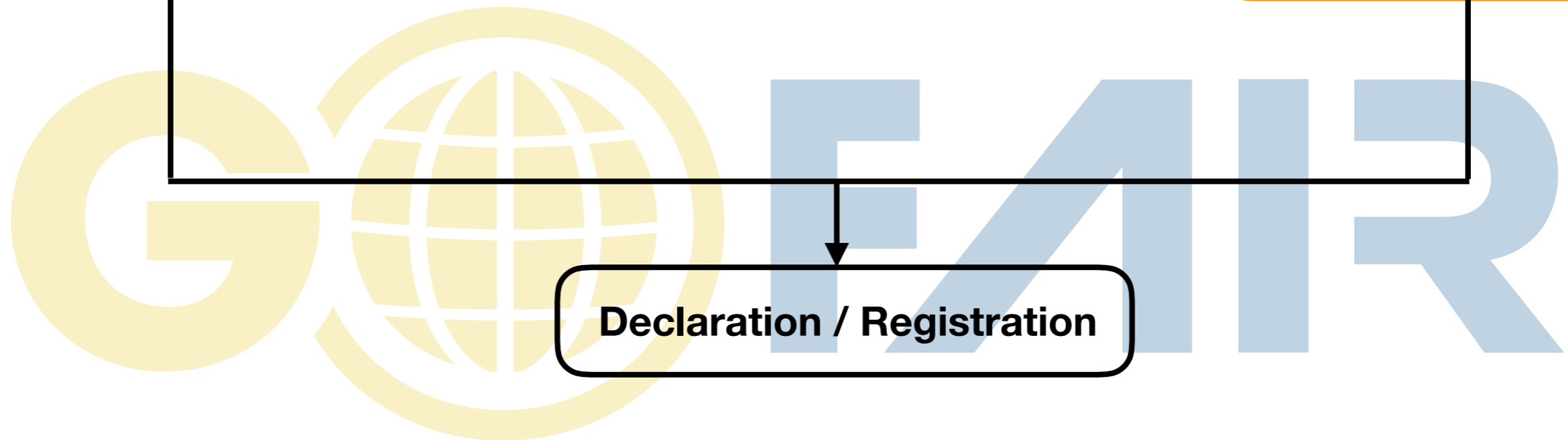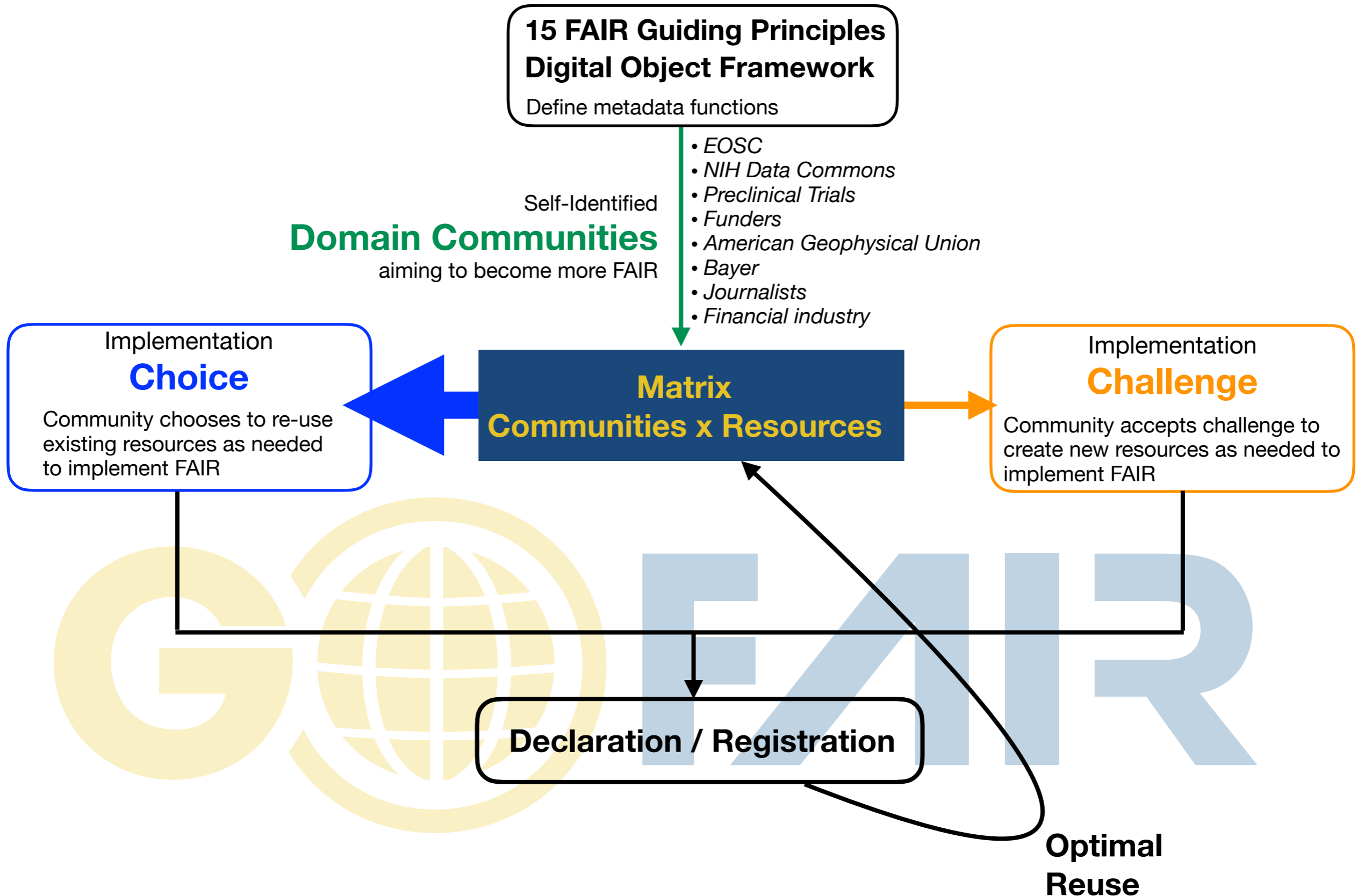Community chooses to re-use existing resources as needed to implement FAIR

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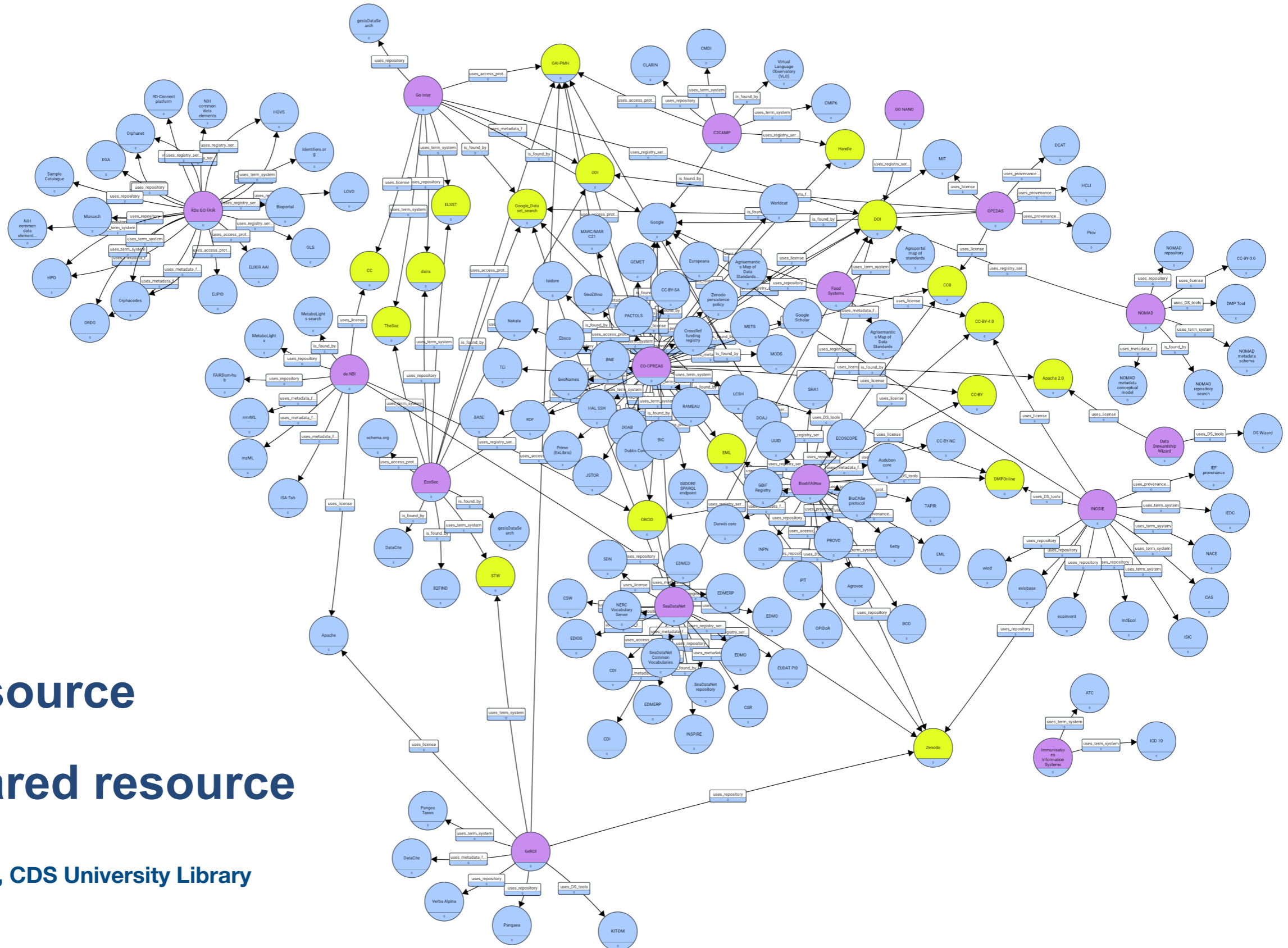
Declaration / Registration

Optimal Reuse

Community Implementation Choices & Challenges
https://osf.io/4v9pm/

INs

Resource

Shared resource

Kristina Hettne, CDS University Library

Matrix Development

Kristina Hettne

Peter Wittenburg

Tobias Kuhn

Robert Pergl

https://osf.io/n7uwp/

Matrix Development
https://osf.io/4v9pm/

Additional Community Profiles

- *ENVRIFAIR*
- *CS3*
- *MPS Hackathon*
- *AGU Enabling FAIR Data*
- *Food Systems IN*

Open FAIR Data Point (hosted by trusted parties)
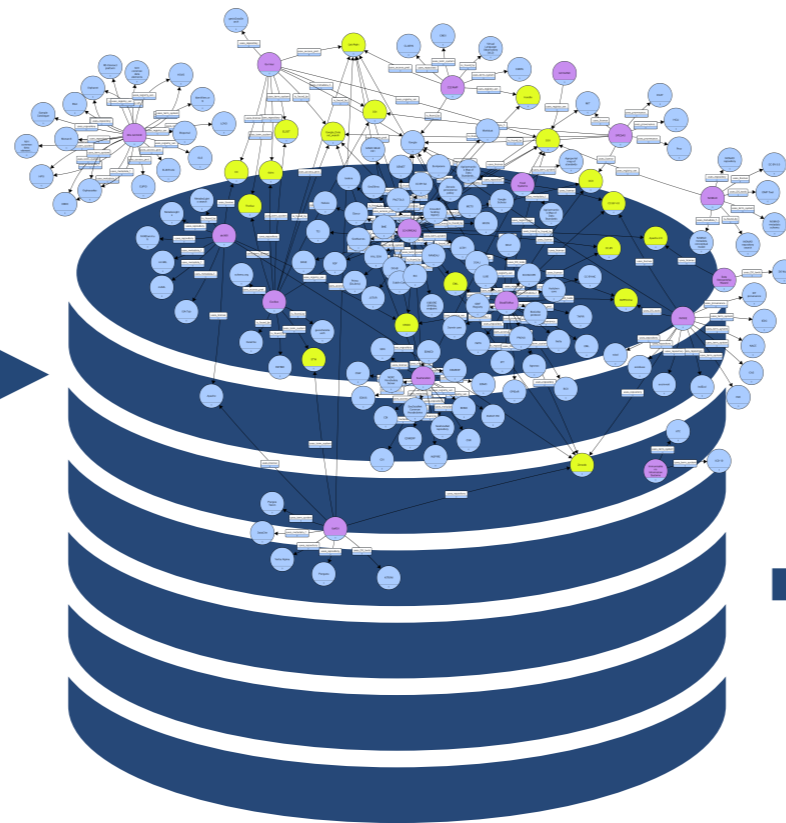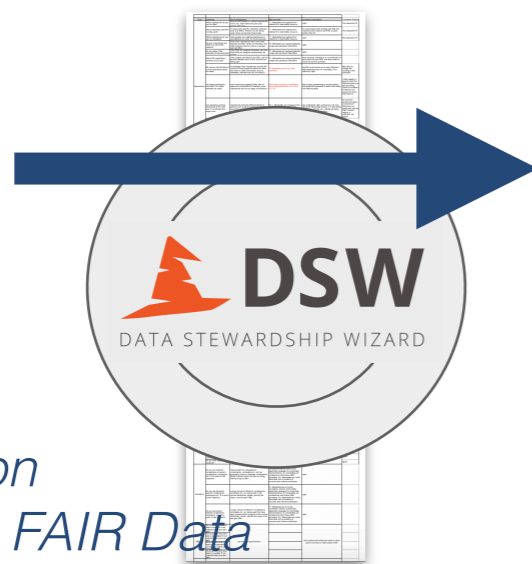
Bottom-up Best Practices

Analytics
- **Common use**
- **Optimal reuse**