

# FAIR Implementation Profile

Erik Schultes

23 January 2025

**IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System**  
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-  
Mission 4 "Education and Research" - Component 2: "From research to business" - Investment  
3.1: "Fund for the realisation of an integrated system of research and innovation infrastructures"



# Welcome and Recap

13:00-13:15  
(Erik)

# Agenda

13:00-13:15 (15 minutes)	Welcome - Recap (Erik)
13:15-13:30 (15 minutes)	What are nanopublications (Barbara)
13:30-14:00 (30 minutes)	The role of nanopublications in FIPs (Barbara)
14:00-14:30 (30 minutes)	Explore nanopublications
14:30-14:45 (15 minutes)	Break
14:45-15:10 (25 minutes)	Managing nanopublications in the FIP Wizard (Barbara)
15:10- 15:50 (50 minutes)	Create Nanopublications in the Wizard
16:00-16:10 (10 minutes)	Break
16:10 -16:45 (35 minutes)	Managing nanopublications in nanodash - events (Barbara)
16:45-17:00 (15 minutes)	Nanopubs and FDOs (Erik)

[OSF Project Space](#)  
[Common notes](#)

# Systematic implementation of FAIR: From FAIR Principles to FAIR Implementation Profiles

## 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 to which they apply  
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 protocol  
A1.1 the protocol is open, free, and universally implementable  
A1.2 the protocol allows for an authentication and authorization procedure  
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 used 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 license and provenance  
R1.2. (meta)data are associated with detailed provenance  
R1.3. (meta)data meet domain-relevant community standards

Principles

Volume 2, Issue 1-2  
Winter-Spring 2020  
January 01 2020  
**FAIR Principles: Interpretations and Implementation Considerations**  
Annika Jacobsen, Ricardo de Miranda Azevedo, Nick Juty, Dominique Batista, Simon Coles, Ronald Cornet, Mélanie Courtot, Mercè Crosas, Michel Dumontier, Chris T. H. Baker, Kristina Hettne, Jaap Heringa, Rob W.W. Hoogstraaten, Christine R. Kirkpatrick, Tobias Kuhn, Ignasi Carro, Mirjam van Reisen, Philippe Rocca-Serra, Peter Wittenburg, Marco Roos, Barend M. van der Kraak, Juliane Schneider, George Strawn, Mark T. H. Chi, Peter Wittenburg, Marco Roos, Barend M. van der Kraak

Interpretations

**Interpreting FAIR**  
The interpretation of the FAIR Guiding Principles by the GO FAIR community, and adopted by the GO FAIR Foundation as a reference for guiding FAIR implementation.

GO FAIR Interpretations

**FIP Wizard**  
eLTER\_FIP\_2021  
Questionnaire | Metrics | Preview | Documents | Settings  
View | Comments | TODOs | Version history | Share

**Chapters**

- I. About ✓
- II. Implementation Community ✓
- III. Declarations for Findability **10**
- IV. Declarations for Accessibility 6
- V. Declarations for Interoperability 10
- VI. Declarations for Reusability 4
- VII. Register a new resource as a nanopublication ✓

**III. Declarations for Findability**  
Digital resources should be easy to find for both humans and computers. Extensive machine-actionable metadata are essential for automatic discovery of relevant datasets and services, and are therefore an essential component of the FAIRification process.

\*Answer the questions below using the drop-down lists to select the FAIR Enabling Resources your community uses to implement the FAIR Principles. You will see that many of the FAIR Enabling Resources in the drop-down list are associated with a GO FAIR Foundation Qualification badge. GFF Qualified Resources have been assessed for their compliance with the preliminary Qualification Criteria of the GO FAIR Foundation (referenced in Chapter 1: About). If you do not find the FAIR Enabling Resources you are looking for in the drop-down list, it will be necessary to register that Resource as a nanopublication. To do so, access the nanopublication Wizard in Chapter VII, "Register a new resource as a nanopublication". Once you create a nanopublication referencing your FAIR Enabling Resource, it will automatically become visible and selectable in the drop-down lists of the FIP Wizard. In addition to selecting FAIR Enabling Resources from the drop-down list, you are also asked to comment on status of the implementation (radio buttons) and to leave a free-text "consideration" that records the basis for these implementation choices (such as various requirements or constraints that impact your community). \*

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

Principle F1 states that digital resources, i.e., data and metadata, must be assigned a globally unique and persistent identifier in order to be found and resolved by computers. A service that provides globally unique, persistent and resolvable identifiers (GUPRIs) for digital objects such as metadata and data. The GO FAIR Foundation also recommends that the identifier be resolvable by machines (where 'resolvable' means that the object it identifies, and metadata about it, are automatically retrievable). Such identifiers are referred to using the acronym, GUPRI. Typically, communities will implement GUPRI's for their own purposes by using existing identifier services, such as for example, the commonly known Digital Object Identifier (DOI). Different identifier service providers offer different kinds of resolution services that could impact F2 and I. Select below, a service that provides globally unique, persistent and resolvable identifiers for digital objects such as metadata and data.

a. Declaration: No implementation choice has been made by this community

b. Declaration: FAIR Enabling Resource(s)

Clear answer

Answered 5 months ago by Barbara Magagna.

**1.b.1 List the FAIR Enabling Resource(s)**

**1.b.1.a.1 Select the FAIR Enabling Resource**

DOI|Digital Object Identifier GFF  
DOI is a persistent link to the digital object  
[http://purl.org/imp/IRAnAWGdel1GGmDAqv-vZjby5XqbL2ZUjNz1vgwK\\_6cRI#DOI](http://purl.org/imp/IRAnAWGdel1GGmDAqv-vZjby5XqbL2ZUjNz1vgwK_6cRI#DOI)

Clear answer

FIP Wizard



What is a  
FAIR Implementation Profile (FIP)?

The FIP is a **list of technology choices** made **by a community of practice** for **each of the FAIR Principles.**



# Homework

## Create:

2 FAIR Enabling Resource projects in the FIP Wizard  

## VII. Register a new resource as a nanopublication

### Why nanopublications?

If your resource is not already referenceable as a nanopublication you can create it here in the Wizard environment. The new nanopublication you create will register your resource by giving your resource a GUPRI (in the form of a Persistent URL or PURL) and a minimal metadata description. The nanopublication will allow your resource to be retrievable by the FIP Wizard in the drop-down lists of the answer field of the related question. As a nanopublication, your resource will also be considered by the GO FAIR Foundation for qualification assessment with respect to its Qualification Criteria. This procedure will require a few days. Nevertheless you can already use your newly minted nanopublication in the FIP Wizard or elsewhere.

### Create new nanopublications

To create a nanopublication referencing your **FAIR Implementation Community (FIC)** please use this [template](#)

To create a nanopublication referencing your **FAIR-Enabling Resource (FER)** with metadata from a FAIRsharing record please use this [template](#)

To create a nanopublication referencing your **FAIR-Enabling Resource (FER)** please use this [template](#)

## Read:

Magagna, B., Schultes, E., Fouilloux, A., Burger, G., Devriendt, D., Bramley, R., Kuhn, T., Moreira, J.L.R., da Silva Santos, L.O.B. and Pires, L.F., 2024. **Ontological Analysis of FAIR Supporting Resources**, FOAM: FAIR Principles for Ontologies and Medatata in Knowledge Management Workshop, JOWO 2024, Enschede.

<https://ceur-ws.org/Vol-3882/foam-5.pdf>

## Chapters

I. Author 1

II. Definition 5

- Short name
- Name
- Description
- This resource is:
- Type(s) of FAIR E...
- Further information
- Accessible via (U...
- Implements these...
- Related resource...

III. How to cre... 



# Nanopubs as FDOs

**16:45-17:00**  
**(Erik)**




# Digital Object Architecture




**Digital Object Services (Kahn & Wilensky 1995)**  
“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.”

## 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.

[https://www.doi.org/resources/2006\\_05\\_02\\_Kahn\\_Framework.pdf](https://www.doi.org/resources/2006_05_02_Kahn_Framework.pdf)



# Nanopub



## Nano-Publication in the e-science era

Barend Mons<sup>1,2,3</sup> and Jan Velterop<sup>1,2</sup>,

<sup>1</sup> Concept Web Alliance, <sup>2</sup> Netherlands BioInformatics Centre, <sup>3</sup> Leiden University Medical Center.

[barend.mons@nbic.nl](mailto:barend.mons@nbic.nl), [velterop@conceptweballiance.org](mailto:velterop@conceptweballiance.org)

[https://www.w3.org/wiki/images/4/4a/HCLS\\$\\$ISWC2009\\$\\$Workshop\\$Mons.pdf](https://www.w3.org/wiki/images/4/4a/HCLS$$ISWC2009$$Workshop$Mons.pdf) 2009

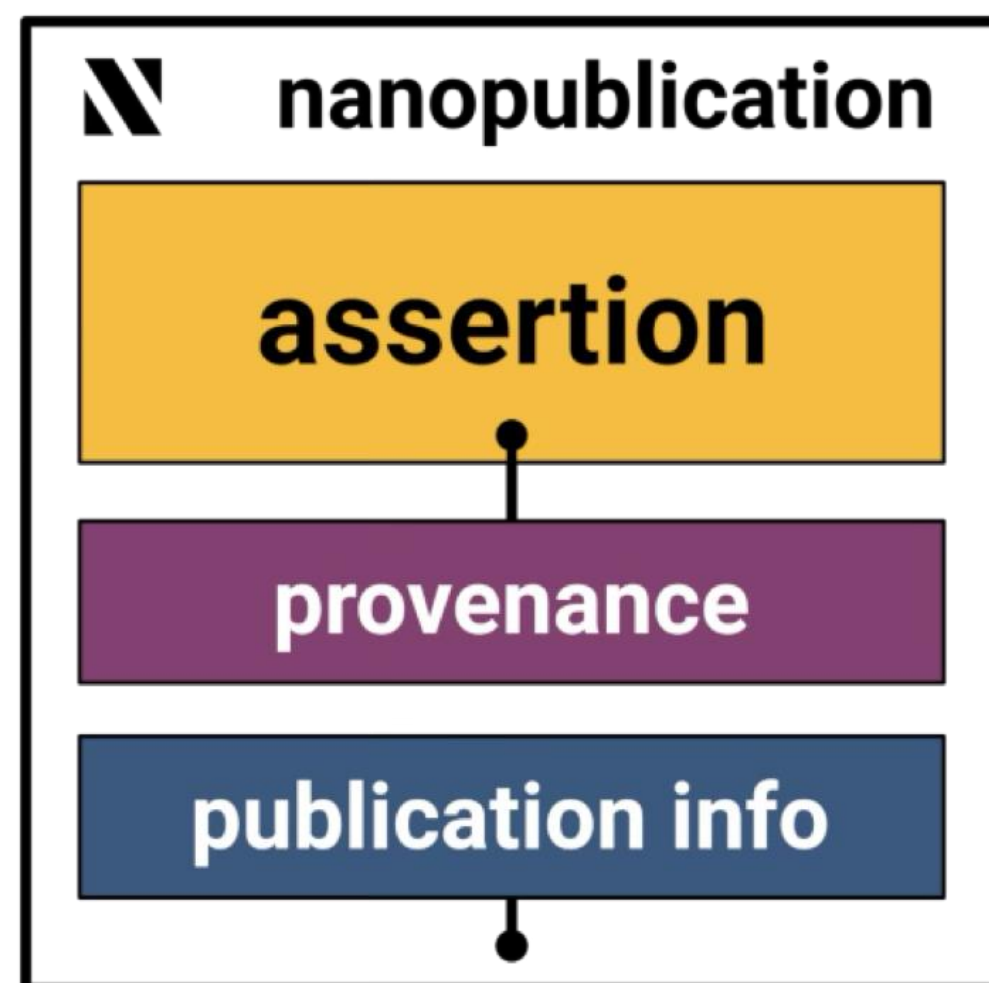
**Abstract.** The rate of data production in the Life Sciences has now reached such proportions that to consider it irresponsible to fund data generation without proper concomitant funding and infrastructure for storing, analyzing and exchanging the information and knowledge contained in, and extracted from, those data, is not an exaggerated position any longer. The chasm between data production and data handling has become so wide, that many data go unnoticed or at least run the risk of relative obscurity, fail to reveal the information contained in the data set or remains inaccessible due to ambiguity, or financial or legal toll-barriers. As a result, inconsistency, ambiguity and redundancy of data and information on the Web are becoming impediments to the performance of comprehensive information extraction and analysis. This paper attempts a stepwise explanation of the use of richly annotated RDF-statements as carriers of unambiguous, meta-analyzed information in the form of traceable nano-publications.

**Keywords:** Semantic web, rich RDF-triples, disambiguation, publication.

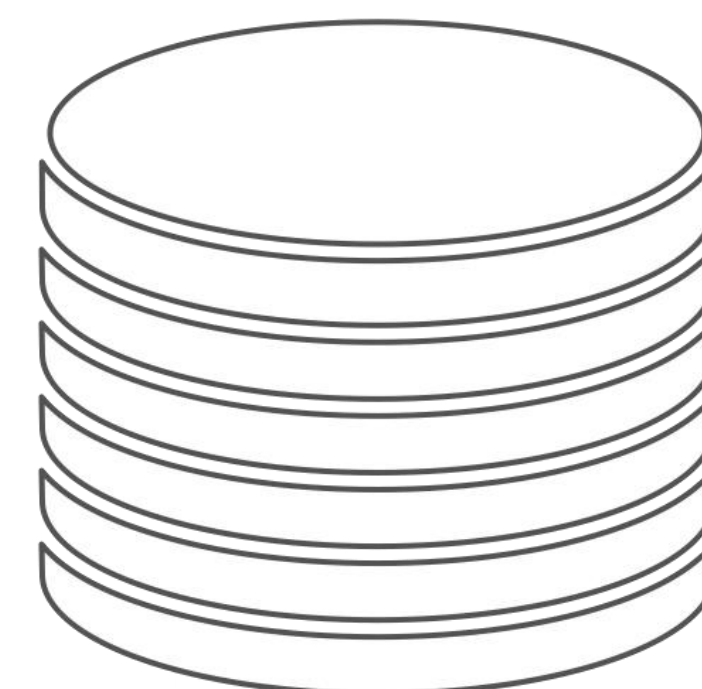
[https://www.w3.org/wiki/images/4/4a/HCLS\\$\\$ISWC2009\\$\\$Workshop\\$Mons.pdf](https://www.w3.org/wiki/images/4/4a/HCLS$$ISWC2009$$Workshop$Mons.pdf)



# Why Nanopubs?



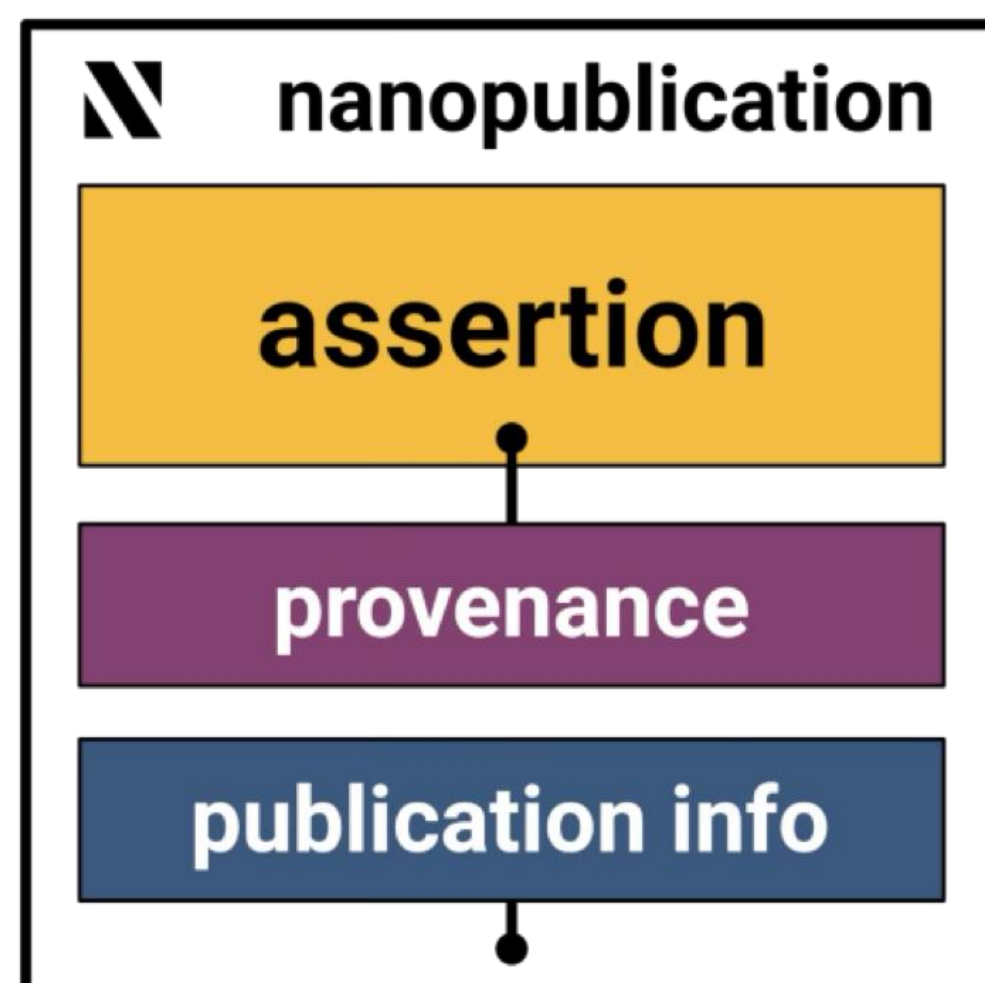
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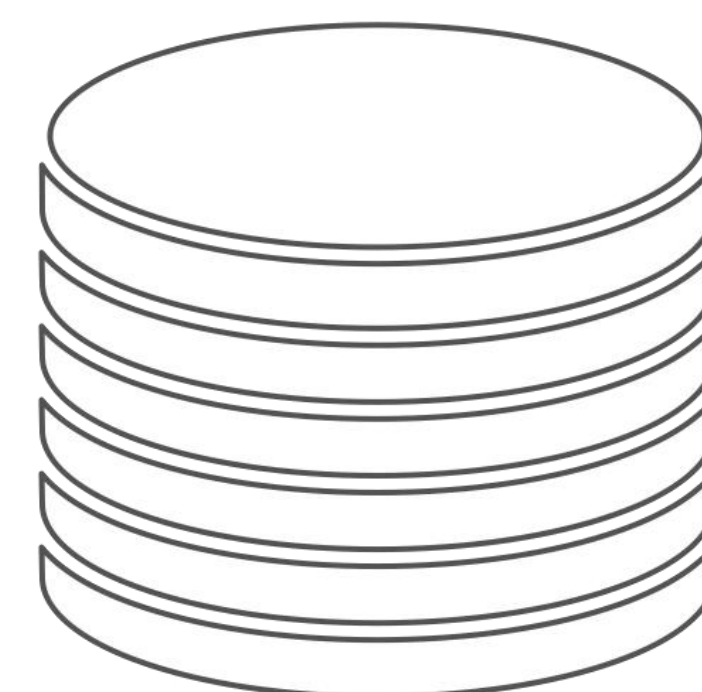
**Nanopub  
Server  
Network**

- Editing/authoring (Nanodash)
- Authentication
- Time/Date
- Licensing
- Storage
- Search
- Access
- Semantics & Interoperation









# Why Nanopubs?

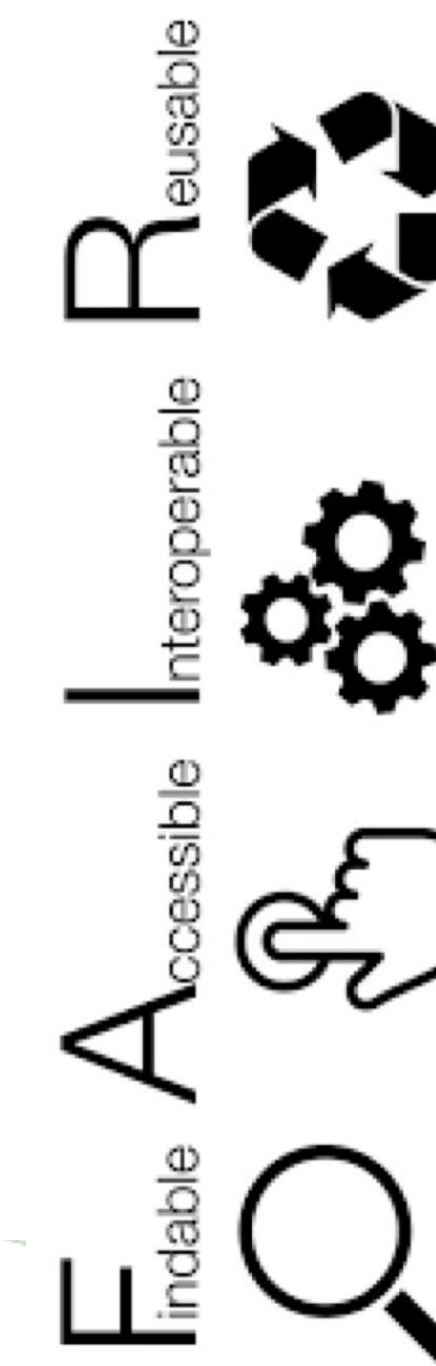


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# Nanopubs can be FDOs

International FAIR Digital Objects Implementation Summit

TIBconferencesession

TIB-OP will set DOI with \TIBdoi

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Submitted: 1970-01-01

## Nanopublications as FAIR Digital Object Implementations

Barbara Magagna<sup>12\*</sup>, Luiz Olavo Bonino da Silva Santos<sup>13</sup>, Tobias Kuhn<sup>4</sup>,  
Luís Ferreira Pires<sup>1</sup>, and Erik Schultes<sup>25</sup>

<sup>1</sup>Semantics, Cybersecurity and Services, University of Twente, Enschede, the Netherlands

<sup>2</sup>GO FAIR Foundation, Leiden, the Netherlands

<sup>3</sup>BioSemantics, Leiden University Medical Center, Leiden, the Netherlands

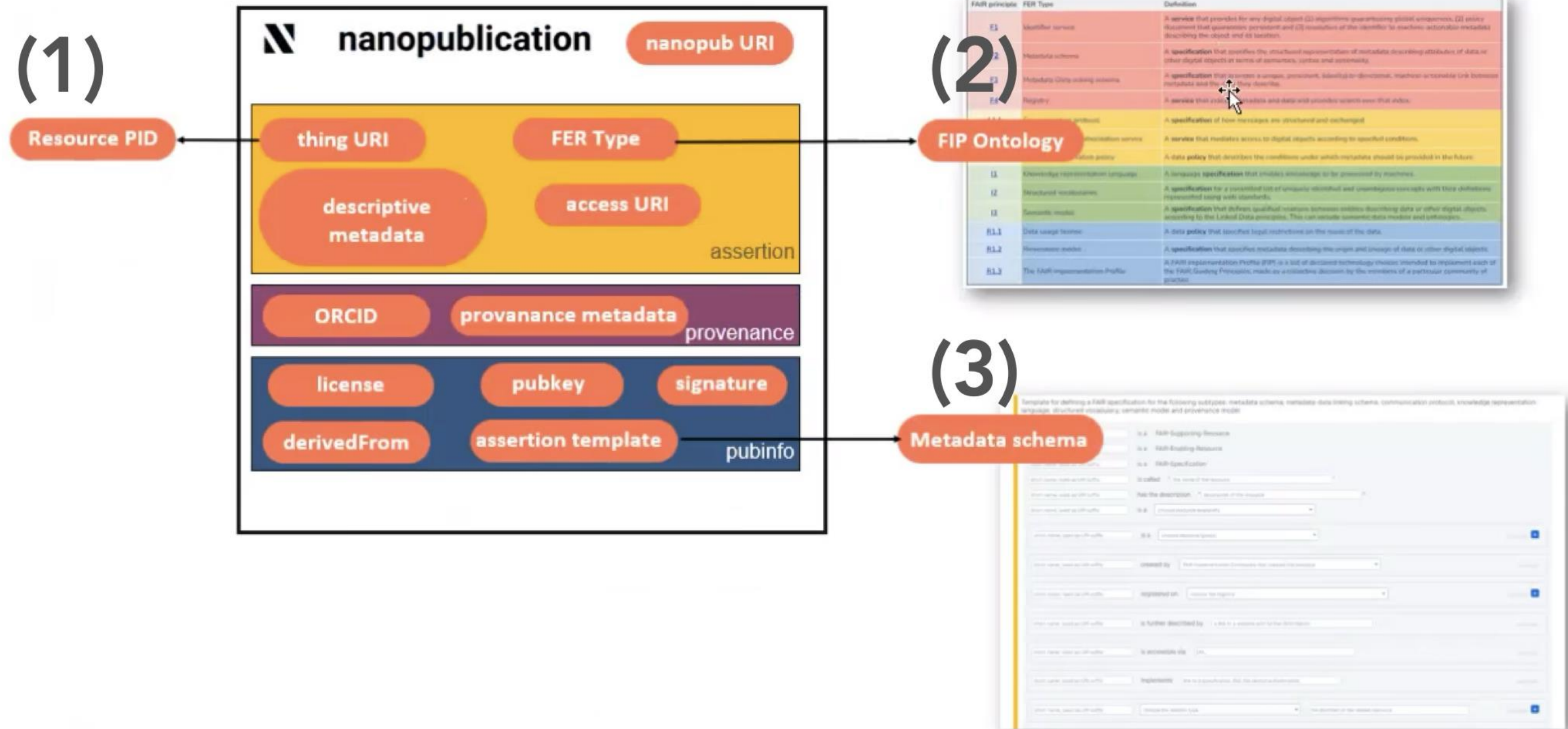
<sup>4</sup>Knowledge Pixels, Zurich, Switzerland / Vrije Universiteit Amsterdam, Amsterdam, the Netherlands

<sup>5</sup>Leiden Academic Center for Drug Research, Leiden University, Leiden, the Netherlands

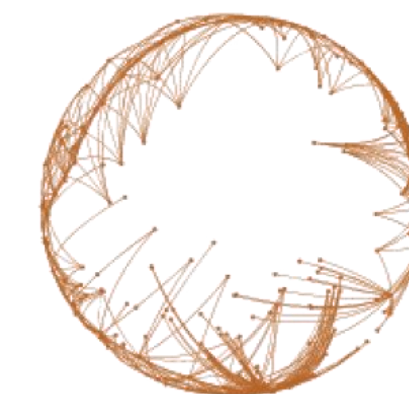
\*Correspondence: Barbara Magagna, barbara@gofair.foundation

**Abstract:** Numerous implementations of FAIR Digital Objects (FDOs) are actively emerging and are being evaluated against FDO specifications. Here, we focus on the Nanopublication Framework as a possible implementation of FDOs. Nanopublications are unitary, standardised, and self-contained RDF-based knowledge graphs consisting of three subgraphs: an assertion graph that includes the main content, a provenance metadata graph, and a publication information graph. In a thorough analysis of the FDO specifications (represented by the efforts of the FDO Forum) and based on Semantic Web (represented by the FDO Framework) we demonstrate that the existing Nanopublication Framework aligns with the overall FDO definitions and requirements. We conclude that appropriately designed nanopublications can indeed be deployed as a general purpose FDO implementation. This nanopublication-based FDO approach is initially applied through the extension of a commonly used nanopublication template, now aligned with the FDO Framework. The original template is currently used in real-world applications where communities of practice describe the FAIR Supporting Resources that constitute FAIR Implementation Profiles.

<https://osf.io/fu3ze>



# FAIR DIGITAL OBJECTS FORUM



# Nanopubs can be FDOs



International FAIR Digital Objects Implementation Summit

TIBconferencesession

TIB-OP will set DOI with \TIBdoi

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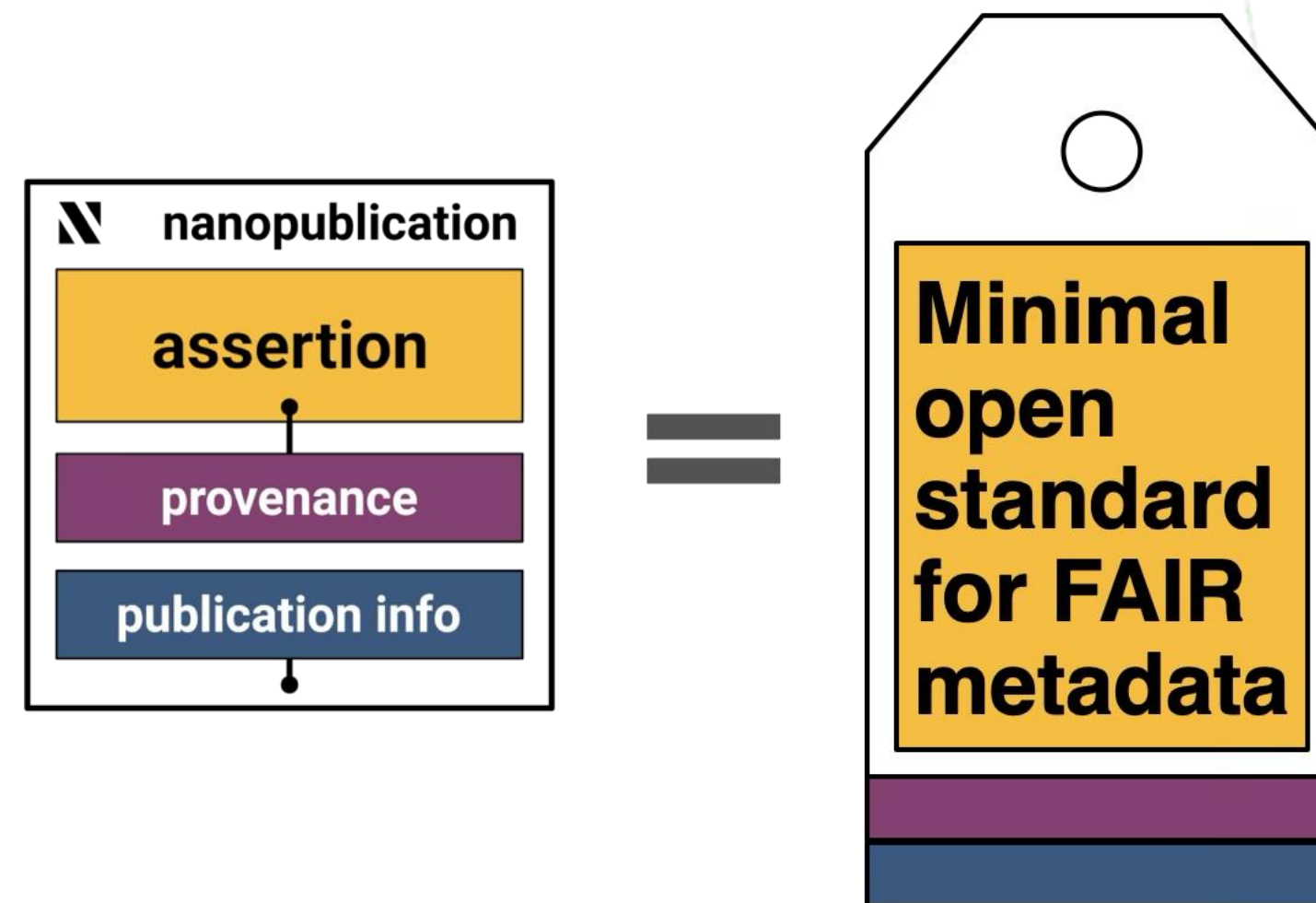
### Assertion

Declaring a FAIR Digital Object ^

GUPRI of this FDOI	is a	FAIR Digital Information Object (FDOI)	FDOI
GUPRI of this FDOI	has the label	"label or name for this FDOI"	FDOI
GUPRI of this FDOI	has the type of	FDOI Type URI	FDOI
GUPRI of this FDOI	is materialized by	URL of concrete object	FDOI
URL of concrete object	is a	FAIRDigitalMediaObject	FDOI
URL of concrete object	has the format	the MIME type	EF
URL of concrete object	has its metadata in	GUPRI of FDOI metadata	FMR
GUPRI of this FDOI	has its metadata in	this nanopublication	FMR

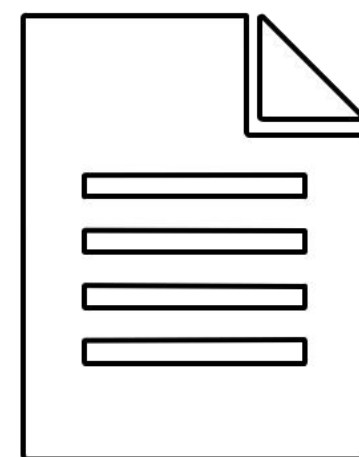


# FDOs can be minimal, standard metadata tags for any digital object



Digital  
Objects

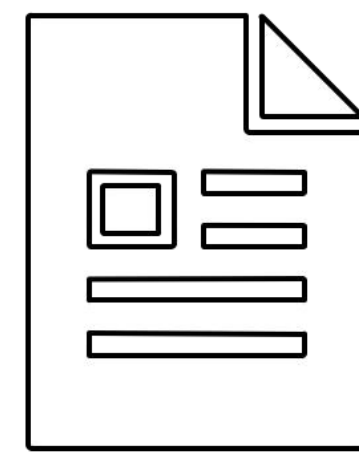
Articles



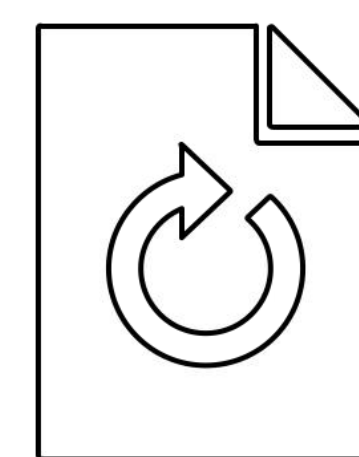
Datasets



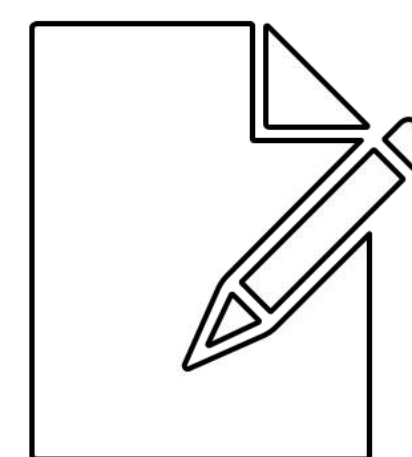
Methods



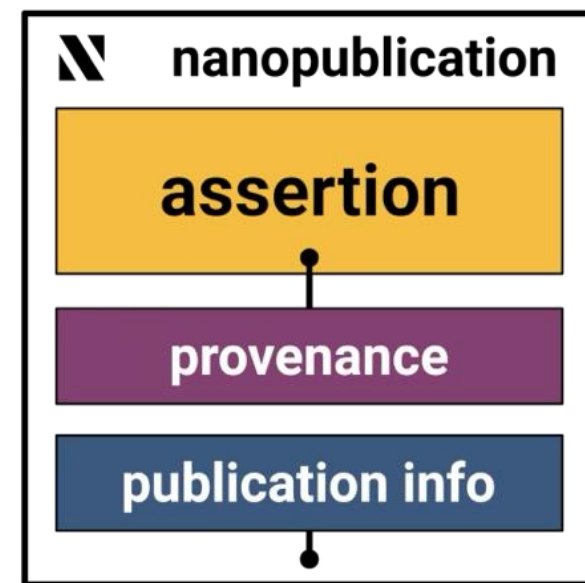
Code



Annotations



# FDOs can be minimal, standard metadata tags for any digital object

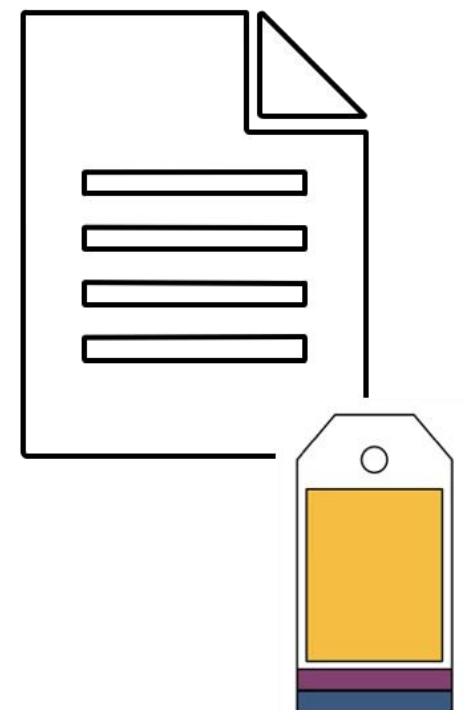


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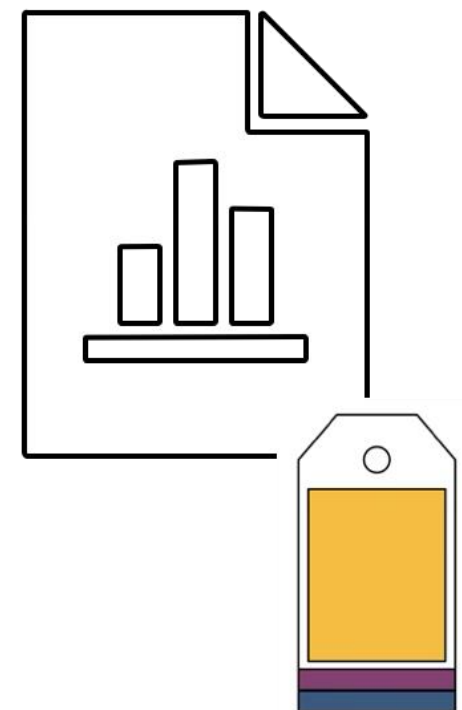


**FAIR**  
Digital  
Objects

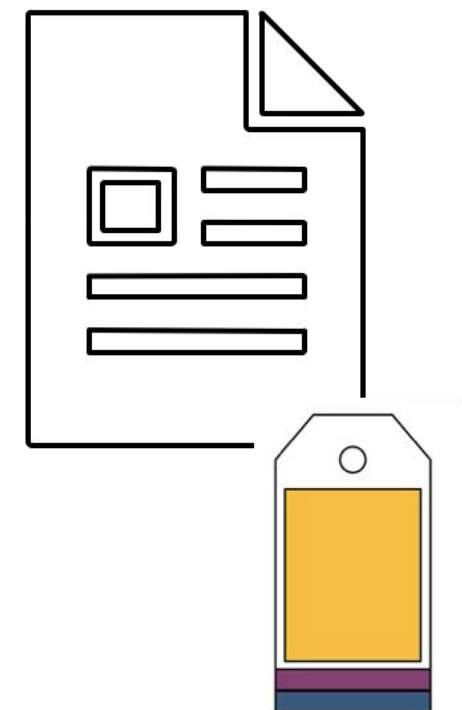
Articles



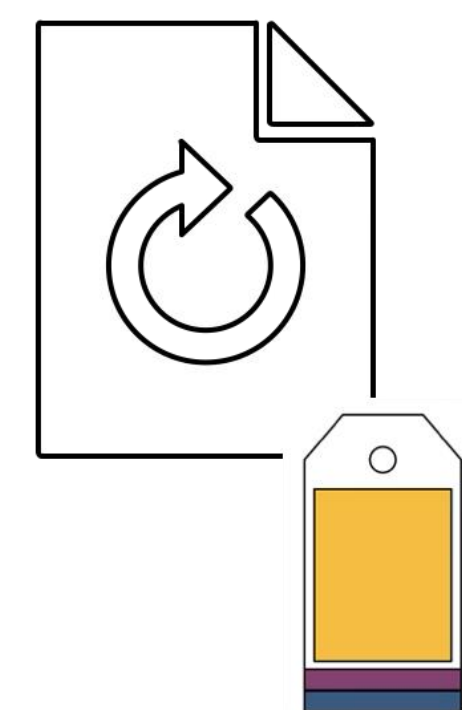
Datasets



Methods



Code



Annotations

