Semantic MediaWiki for community-wide Research Data Management

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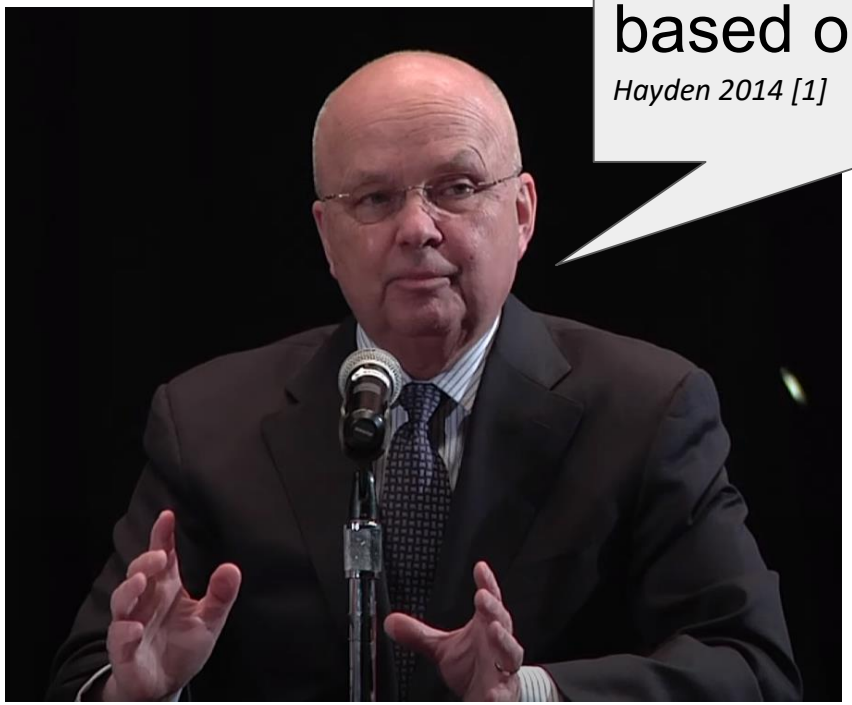
Why is metadata important?



General Michael Hayden,
former director of the CIA and NSA

Metadata provides enough knowledge for the NSA to decide whom to kill.

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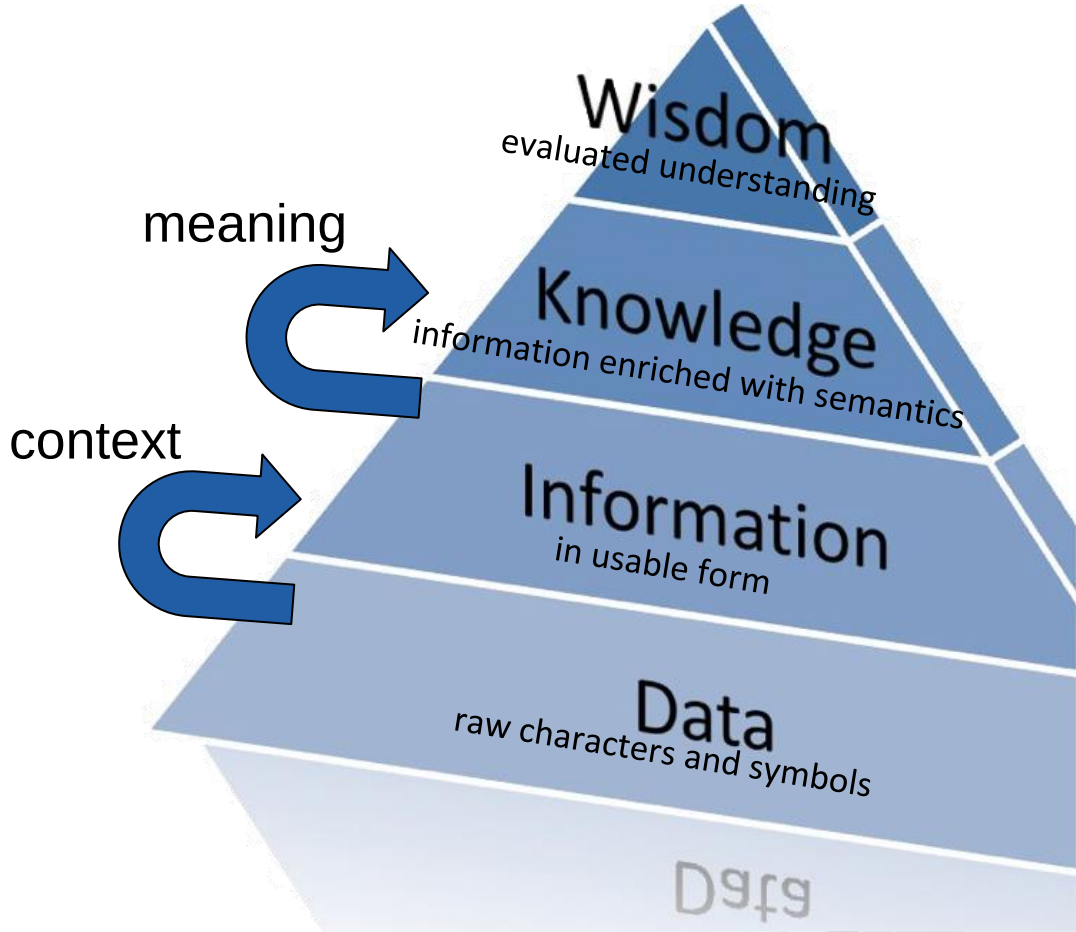
Why is **my** metadata important?

Get knowledge to make decisions

- What measurement device was used?
- Can I reproduce this experiment?
- Which experiments used kINPen® IND?

Knowledge

- Collection of information with intent to be useful
- Information
  - data that has been given meaning by way of relational connection



DIKW Pyramid, *Ackoff 1989 [2]*

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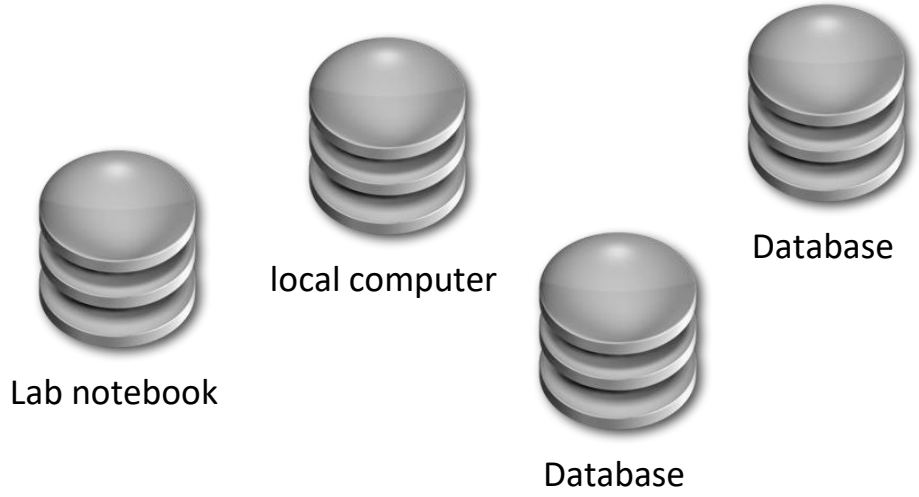
How do we get there?

Data is locked up in small data islands

- different formats, schemas
- no links between data

→ even saved metadata is hard to access



Make (meta)data **F**indable, **A**ccessible, **I**nteroperable, **R**eusable

- Apply linked data technology
- Make data machine-accessible, machine-understandable

→**formal knowledge representation**

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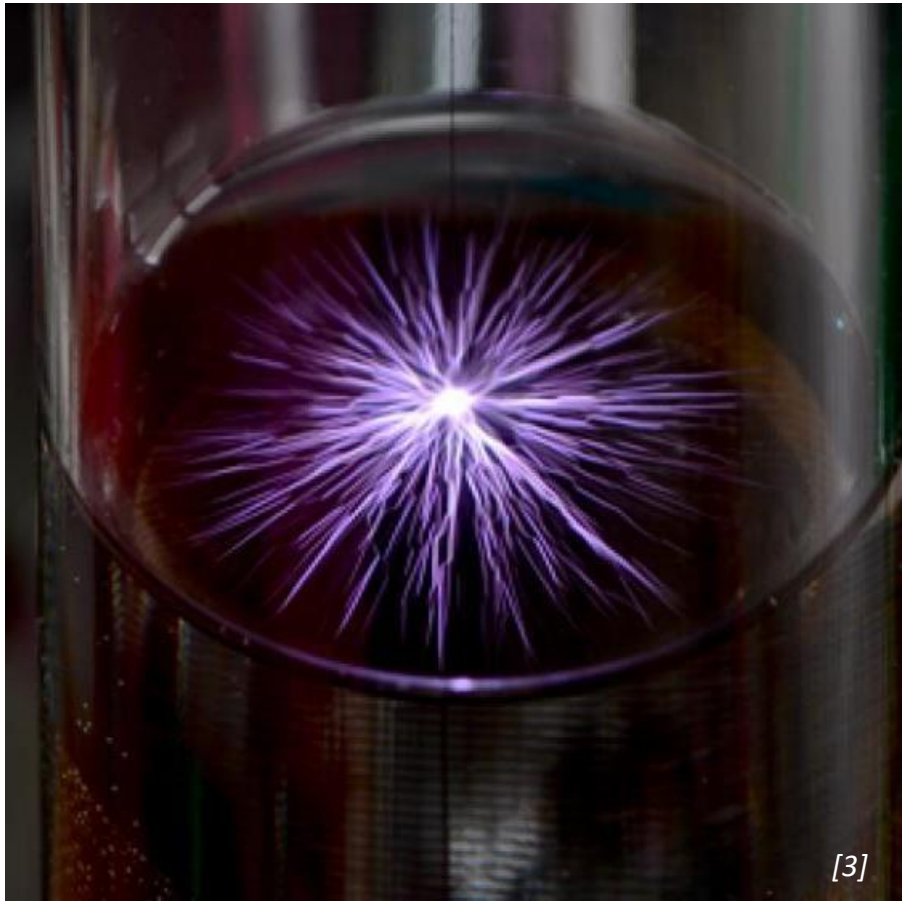
Overview

- Ontology Development
  - What is an ontology?
  - Advantages
  - Development process
- Community driven Development
  - Why is it needed for RDM?
  - Requirements
- Semantic MediaWiki
  - Workflow
  - Interface



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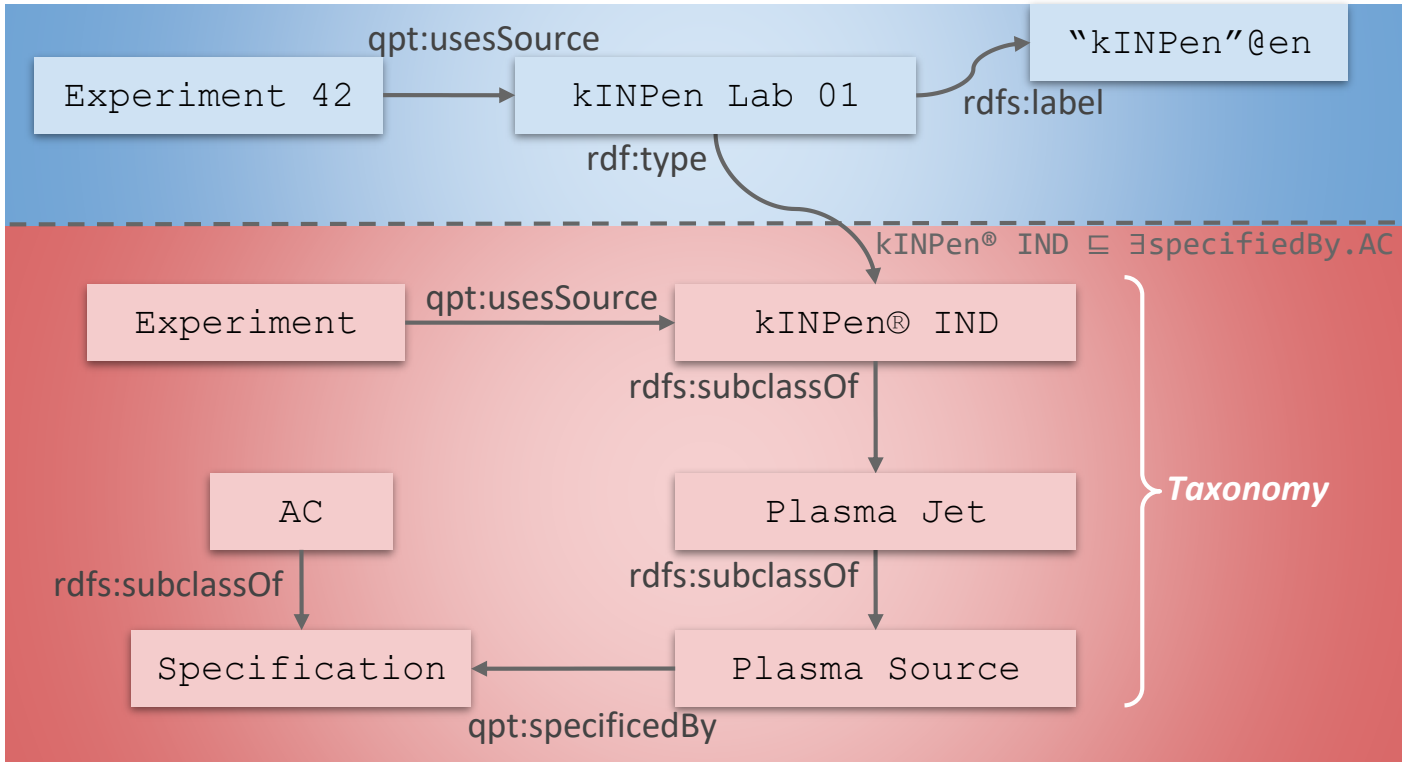
What is an ontology?

An ontology is an explicit, **formal** specification of a shared conceptualization.

→ **formal knowledge representation**



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Advantages

Ontologies

- Makes data FAIR
  - Findable
    - All classes, properties and instances have URIs
  - Accessible
    - Uses standards, like RDF, RDFS, OWL, SPARQL
  - Interoperable
    - uses a formal and broadly applicable language for knowledge representation
    - Ontologies are underspecified → easy to extend, connect to other ontologies
  - Reusable
    - well-documented and curated

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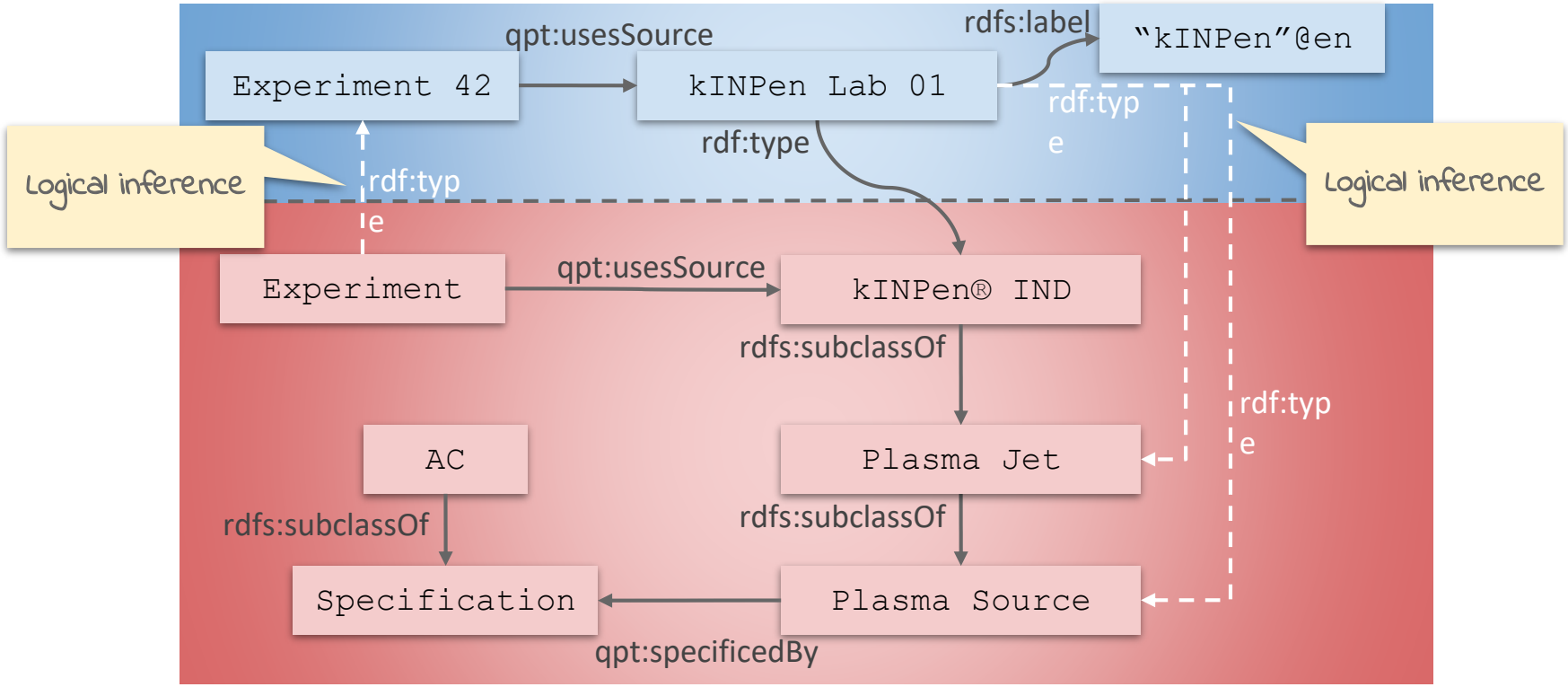
Advantages (II)

- Reasoning
  - Logical inference makes implicit knowledge explicit
  - Data can be checked for contradictions



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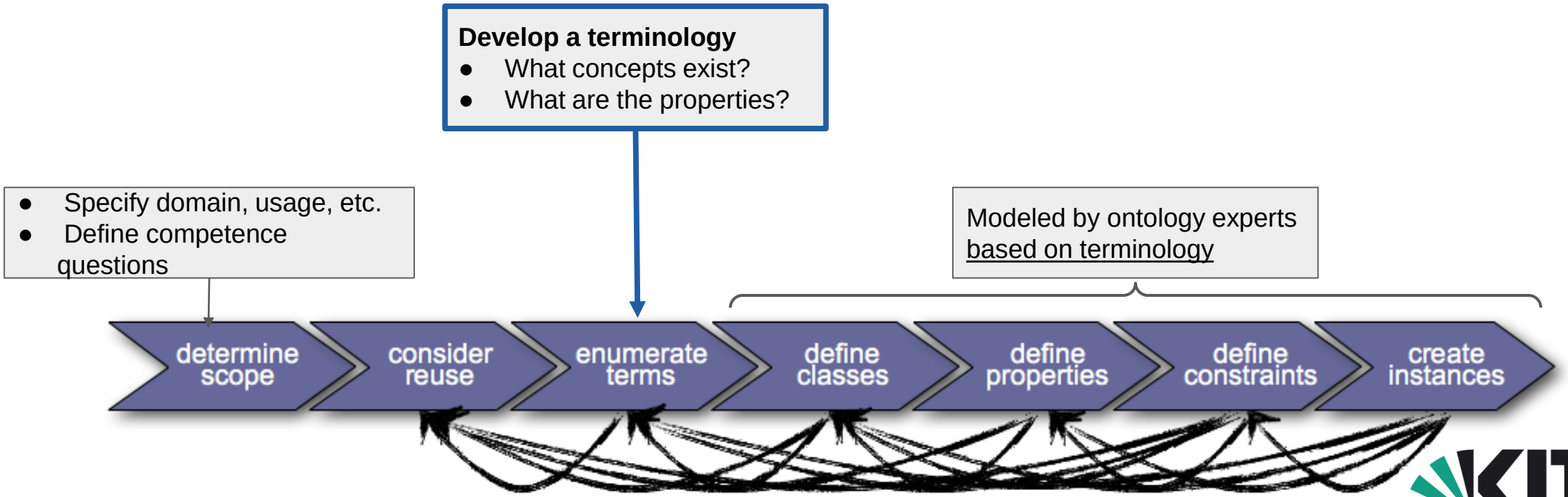
Development process

Ontology Development 101 *Noy, McGuinness, 2001 [4]*

- iterative process, constantly improving ontology



Research Data Management

Storing research data in a structured way with all required metadata.

- should be FAIR
- follow a common data schema

→ Knowledge Graphs, Ontologies

Community needs common schema

- Research is highly flexible
  → frequent changes
  → constant development effort necessary
- heterogenous interest of domain experts

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Community driven Development

Develop a terminology

- whole community has to agree on concepts, properties
- duplicates need to be identified
  → pure document based approaches are infeasible

Requirements

- Documentation of current development state
  - Already modeled concepts should be described in natural language
- Discussion platform
- Enable modelling of less complex elements by domain experts
- Easy linking towards concepts
- Small barrier to contribute
- Version Control System

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MediaWiki

Why not use the most successful community driven project?

MediaWiki

- well-known among researchers
  - small barrier to contribute
- Discussion platform
- Articles to describe single concepts
- Version Control

→ How to get the semantics?

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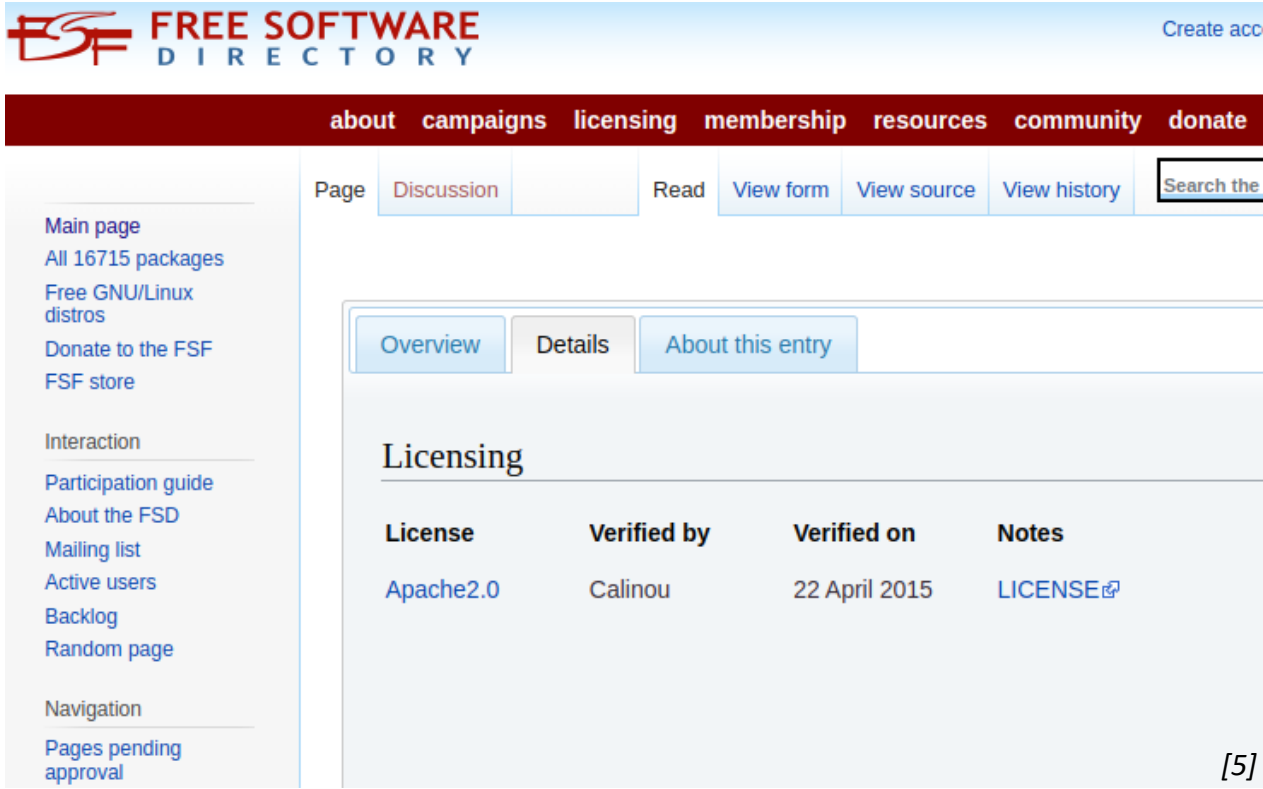
Semantic MediaWiki

MediaWiki Extension

- enables storing and querying of RDF data in wiki pages
- simple wikitext based syntax
  - Defining RDF triple
    - `[[property::value]]`
    - `[[Category:PlasmaSource]]`
  - Querying
    - ```
      {{#ask:
          [[Category:PlasmaSource]]
          |?label }}
      ```
- Triple Store with RDF data



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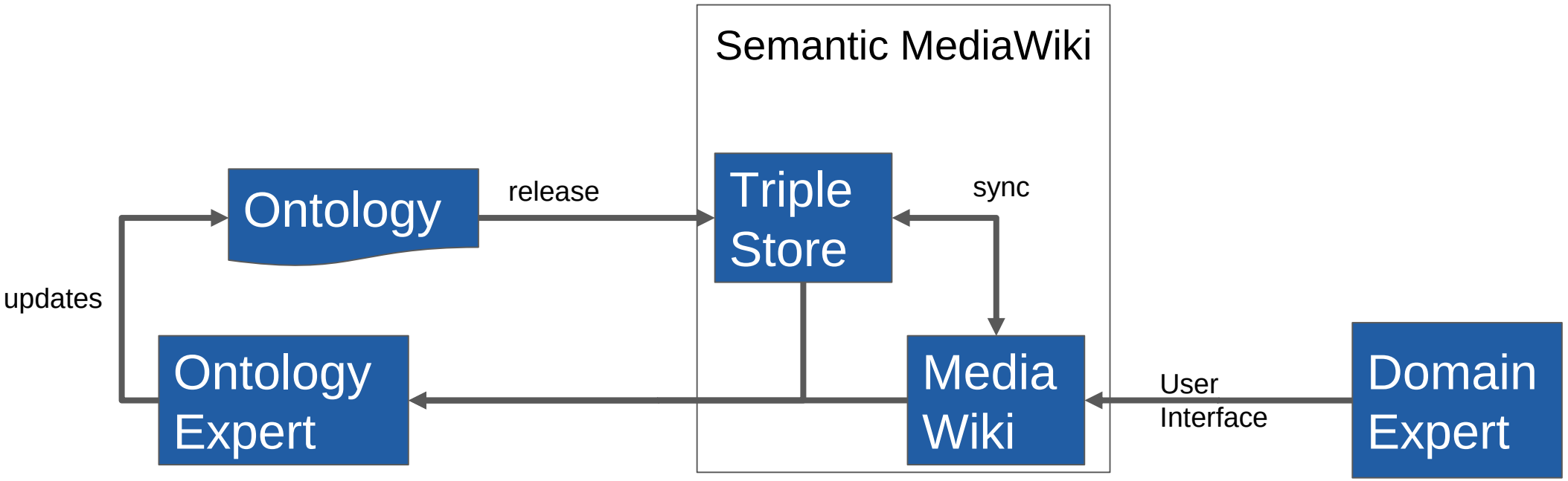
      ```

Workflow



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Interface

Category | Discussion

Category:PlasmaSource

Plasma Source

A plasma source is linked to Specification by the property specifiedBy.

Subcategories

This category has only the following subcategory.

P

- PlasmaJet

Category | Discussion

Editing Category:PlasmaSource

```
Plasma Source

A plasma source is linked to [[specifiedBy::Specification]]
by the property specifiedBy.
```

Conclusion

Key Takeaways

- Ontologies are a powerful tool for Research Data Management
- Semantic MediaWiki could be an easy way to involve the community

Discussion

- Are ontologies the right tool for your RDM?
  - Do you think the barrier to entry is to high?
- Would you contribute to an ontology?
  - Is using a MediaWiki an incentive to contribute?
  - What other incentives could be helpful?

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Thank you!

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