FAIR Data in Energy Systems Analysis

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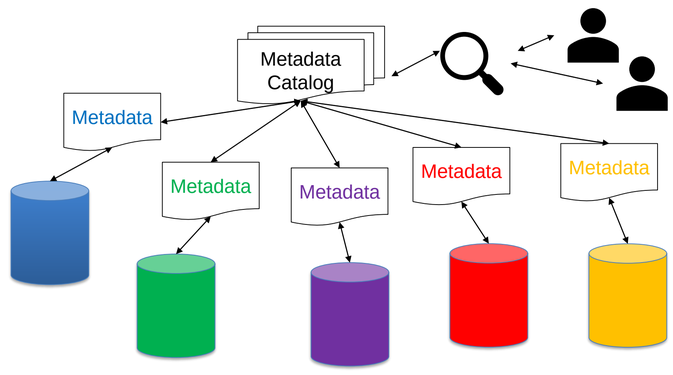
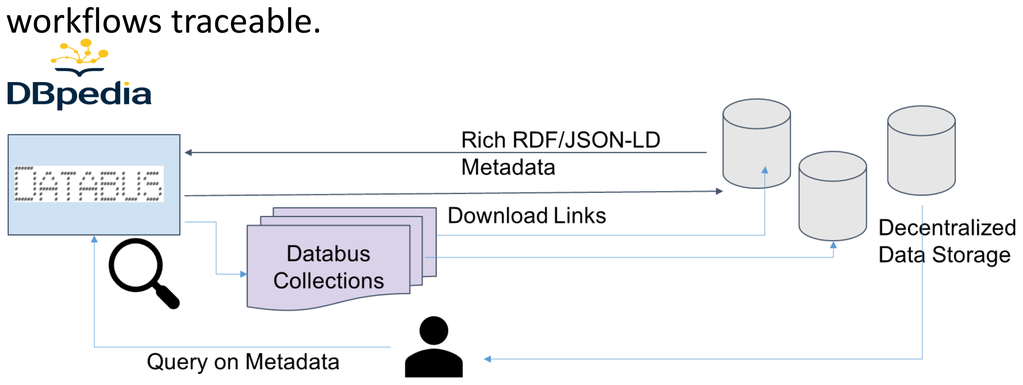
Databus as Metadata Catalog



A metadata catalog can be used to search for data across different data bases and repositories. All data sources register their data sets with **OEMetadata** to the central catalog to make all their content **findable**. Each entry contains a link to the actual data to make it **accessible.** Using the OEMetadata and the Open Energy Ontology enables **interoperability** and suitable licenses **reusability**. We use an instance of the DBpedia Databus, **Open Energy Databus** as a central catalog.

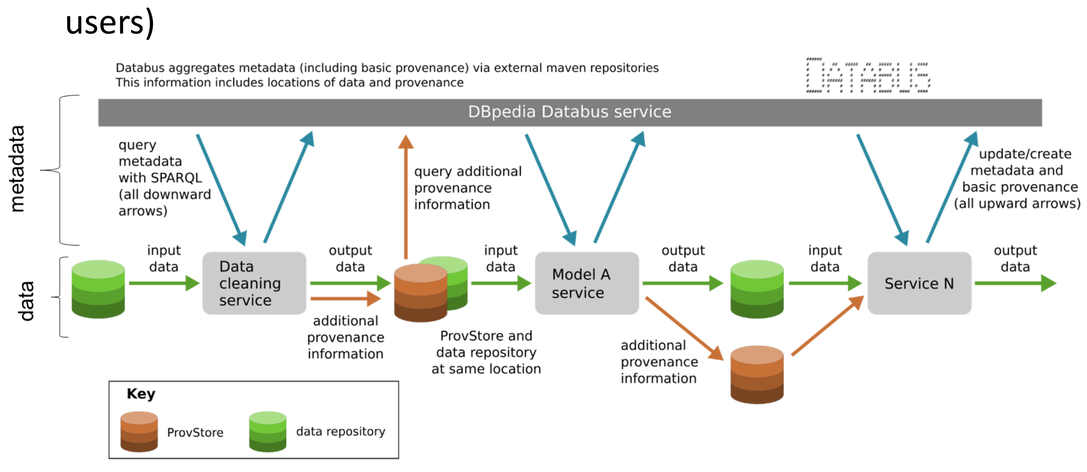
The Databus is a virtual bus. It can address files on the web and coordinate data flows based on DataID metadata. No actual data is uploaded to the bus. Different data sets can be linked to make data workflows traceable.



Decentralized data storages register their data with RDF or JSON-LD at the Databus. Users can query the metadata and find links to data sources or collections of connected data sources.

The Databus offers a number of services:

- Searching within the metadata
- Unique and persistent data identifiers (PID) of the type https://energy.Databus.dbpedia.org/user/group/artifact/version which make data citable
- Data sets are linked to their source data through the data IDs, data used in publications can be traced back to their source data which can be reused
- Discovery and reuse of Incremental modifications to data (e.g. people can reuse cleaned or aggregated newer versions of other users)



https://energy.databus.dbpedia.org

Open Energy Ontology

Meteorological information is one of the key input parameter in modeling of future energy systems with high shares of renewable energy. One of the challenges in finding suitable input data is, that many of the data sources come with its own annotations.

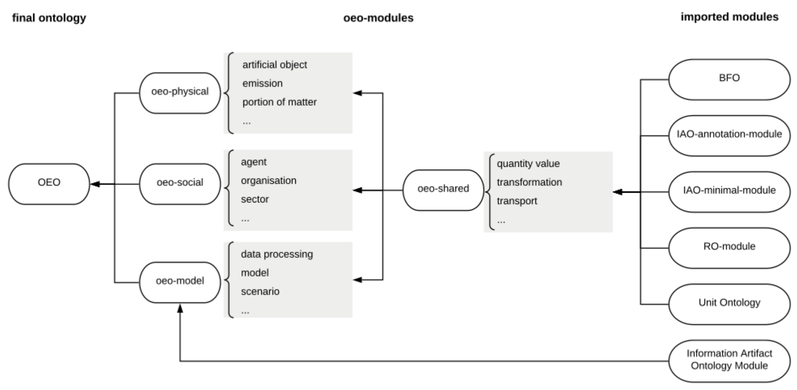
An example from solar meteorology:

- GHI: Global Horizontal Irradiation (Energy) or Irradiance (Power)
- Global: Could also be Global Horizontal Irradiation or Irradiance
- Surface downward irradiation: The usual term in climate science for what we usually call GHI

Taxonomies or ontologies create a data language or controlled vocabulary to annotate data and Ontologies can describe relations: direct radiation is a part of the global irradiation reaching the surface. Ontologies make data interpretable, also by machines and algorithms

Good ontologies are created on a consensus building and open development process within the community. We use the 'Open Energy Ontology' (OEO), which is a domain ontology of the energy system modeling context. It contains a formal naming and definition of classes, properties and their relationships. It serves as a reference for concepts, terms and definitions in energy and climate research.

The ontology is based on the Basic Formal Ontology (BFO) in its general structure, which eases mapping and imports of other ontologies following the same structure.



The modular structure and import into the OEO

https://github.com/OpenEnergyPlatform/ontology/
https://openenergy-platform.org/ontology/,
https://doi.org/10.1016/j.egyai.2021.100074

OEMetadata

Open Energy Family

InfAI Institute for Applied Informatics
Potsdam Institute for Climate Impact Research
JÜLICH Forschungszentrum
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DLR Deutsches Zentrum für Luft- und Raumfahrt
Universität Stuttgart IER Institut für Energiewirtschaft und rationelle Energieanwendung
REINER LEMOINE INSTITUT
HMC
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