Digital Open Marketplace Ecosystem (DOME) 4.0

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CMCL Innovations
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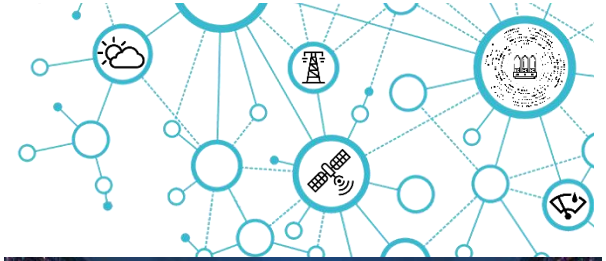
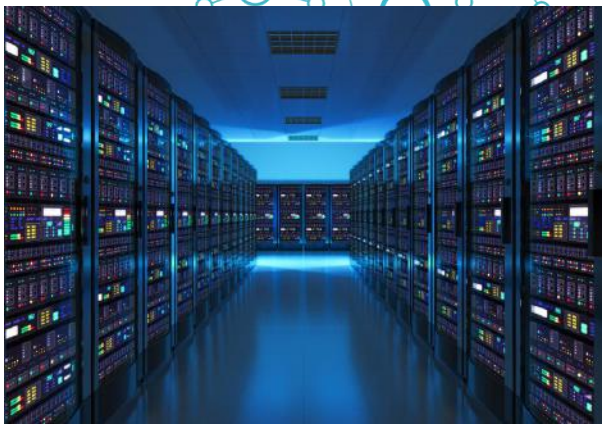
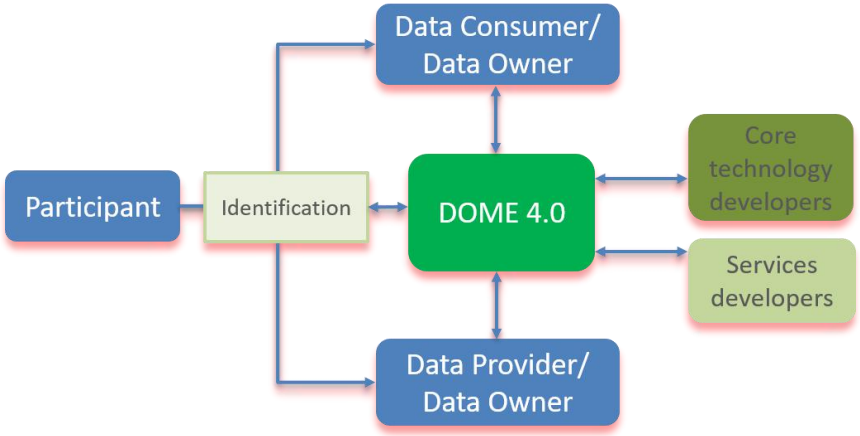
Problem space





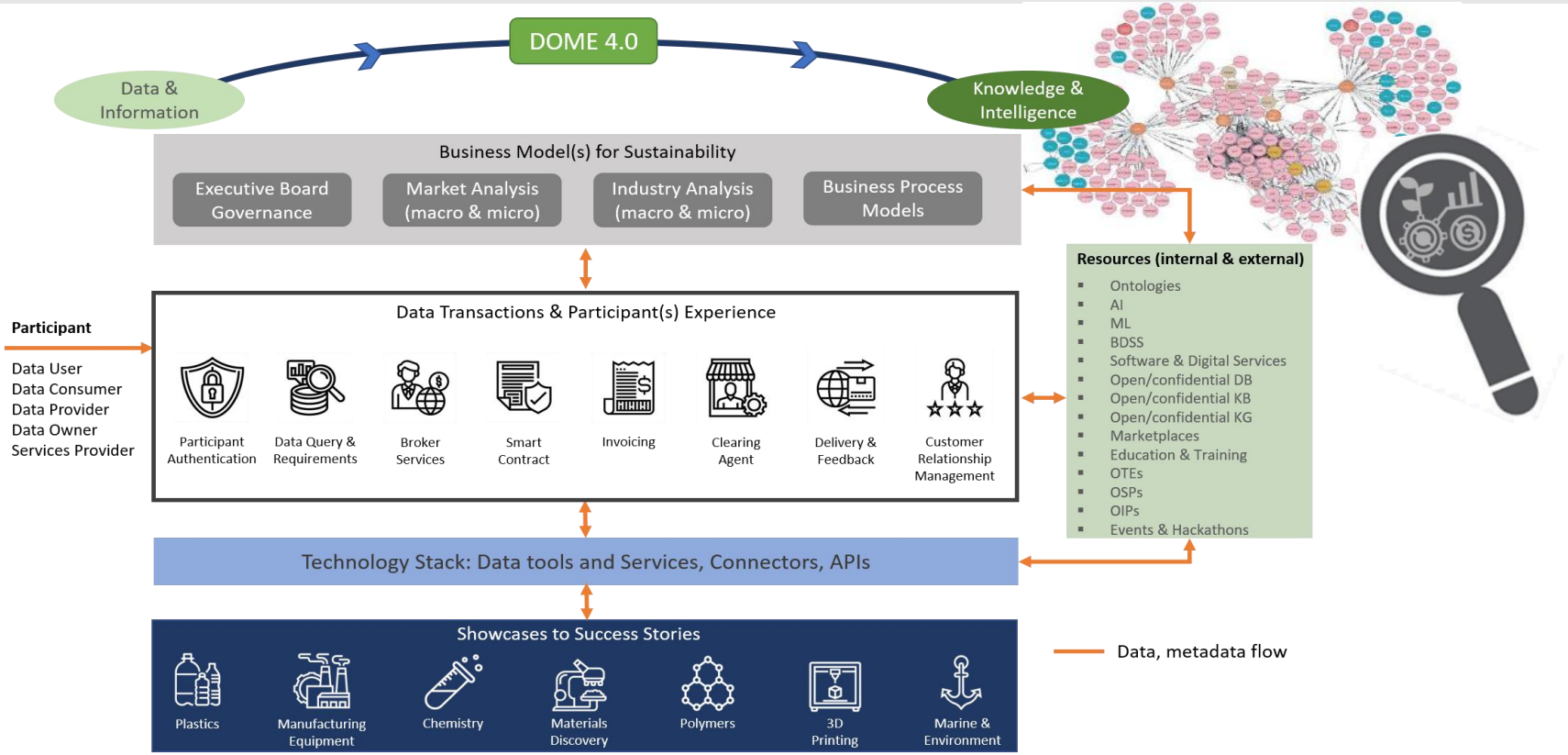
- Data abundance – sensors, Internet of Things/Senses/Services
- Data lakes store *all data:* substantial effort to make data actionable on-demand
- Data warehouses store data processed for very specific purposes
- Multiple tools and lack of interoperability
- Multiple Marketplaces at various TRLs
- *Ecosystem of Marketplaces* - requirements:
  - Access data from decentralised sources and deliver it to the customer
  - Trusted, connected and ready-to-use data
  - Data provenance and sovereignty



Digital **O**pen **M**arketplace **E**cosystem **4.0**

- An ecosystem for transactions between **data prosumers** and **data services** providers
- **Connects** with other marketplaces, OSPs, OTEs, databases and knowledge bases
- **Semantically-enriched** core and industrial/B2B showcases
- Demonstrate **added value** via **9 B2B** showcases
- **FAIR** principles of data – Findable, Accessible, Interoperable, Reusable

Approach


DOME 4.0
Data & Information
Knowledge & Intelligence
Business Model(s) for Sustainability
Executive Board Governance
Market Analysis (macro & micro)
Industry Analysis (macro & micro)
Business Process Models
Participant
Data User
Data Consumer
Data Provider
Data Owner
Services Provider
Data Transactions & Participant(s) Experience
Participant Authentication
Data Query & Requirements
Broker Services
Smart Contract
Invoicing
Clearing Agent
Delivery & Feedback
Customer Relationship Management
Resources (internal & external)
Ontologies
AI
ML
BDSS
Software & Digital Services
Open/confidential DB
Open/confidential KB
Open/confidential KG
Marketplaces
Education & Training
OTEs
OSPs
OIPs
Events & Hackathons
Technology Stack: Data tools and Services, Connectors, APIs
Showcases to Success Stories
Plastics
Manufacturing Equipment
Chemistry
Materials Discovery
Polymers
3D Printing
Marine & Environment
Data, metadata flow

B2B showcases

DOME 4.0

NO.	B2B SHOWCASES	DATA SOURCES	INDUSTRIAL SECTORS
1	Chemistry Knowledge Graph (KG) – marine, air quality	Ontokin KB: species, thermodynamics, chemical kinetics, sensors and geo-location data	MARINE, ENVIRONMENTAL, NANOPARTICLES
2	Light weight construction – fibre reinforced plastics	Laboratory experiments, multiscale models	PLASTICS
3	Polymeric additives for coatings: anti-corrosion	Thermodynamic, Laboratory Regulatory, Modelling	POLYMERS
4	Structural adhesives: Fatigue behaviour	Experimental data, MatWeb: Materials property data	ADHESIVES
5	Production equipment tools and service catalogues (metals, plastics, high-tech)	Semantic data repositories of MARKET4.0	MANUFACTURING
6	Turnkey services & custom workflows integrating simulations and data	Materials Cloud (Open Science, FAIR data principles)	MATERIALS
7	Formulated consumer products	gPROMS (SPSE), molecular simulation (UKRI), Cheméo (Céondo), and REFPROP (NIST)	CHEMICAL PROCESSES AND MATERIALS
8	Semantic Analytics of Manufacturing Assets	Bosch I4.0 Knowledge Graph, manufacturing production data	SMART MANUFACTURING
9	Virtual development of composite materials	Experimental data, material data sheets	COMPOSITE MATERIALS

Examples with three B2B Showcases

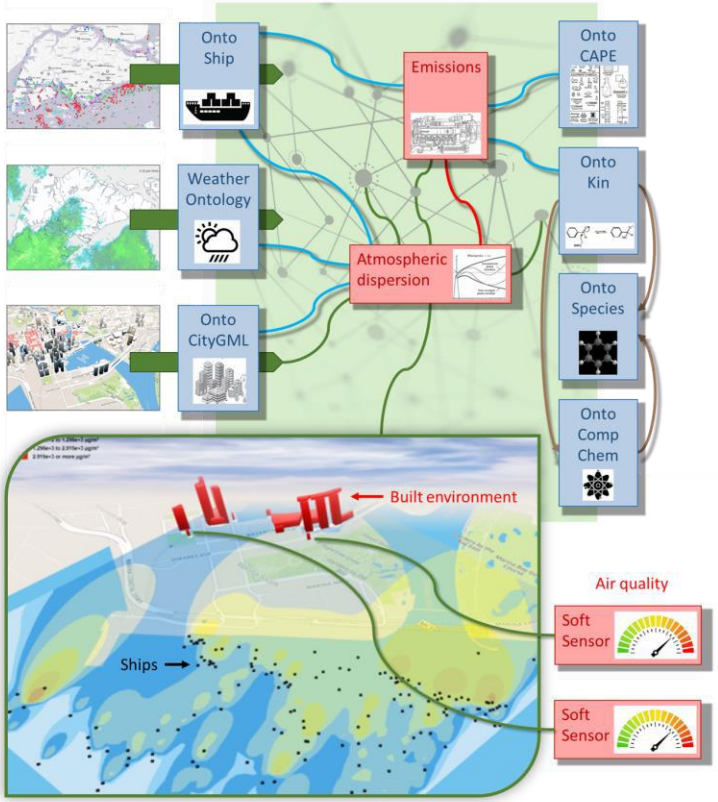
- **Offline**
  - Shared (and other) data sources
  - Software sources
  - Data outputs
  - Ontologies
- Example: Showcase 1

- **Online**
  - Attributes and experience from offline PoC
  - DOME 4.0 core
- Example: Showcase 5 and Showcase 6

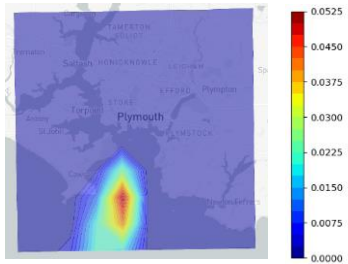
Chemistry KG – marine AQ showcase

- Data sharing across domains/sectors
- **Knowledge Graph: Cross-domain interoperability**
- Air Quality (AQ) virtual sensor
  - Augment physical sensors at port/harbour cities
  - Emissions apportionment
- Utilise real-time weather and ship location data to update air quality estimates
- City architectural data
- 3 x commercial and open-source software
- Decision support for local authorities and industry – air quality, resource optimisation

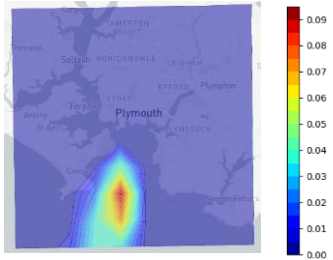
Chemistry KG – marine AQ showcase



Ship Type



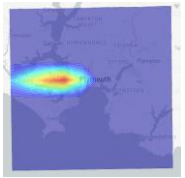
General Cargo Ship



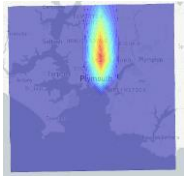
Container Ship

Wind Direction

North East



East



South

Examples with three B2B Showcases

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- Example: Showcase 1

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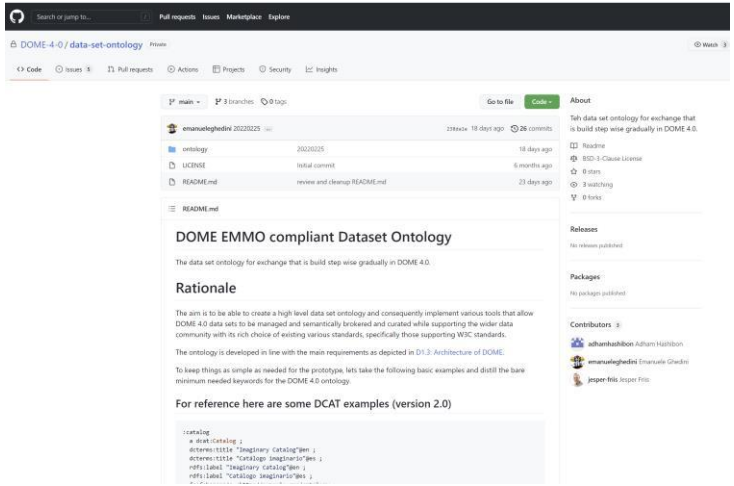
- Example: Showcase 5 and Showcase 6

Semantic enhancement of data documentation

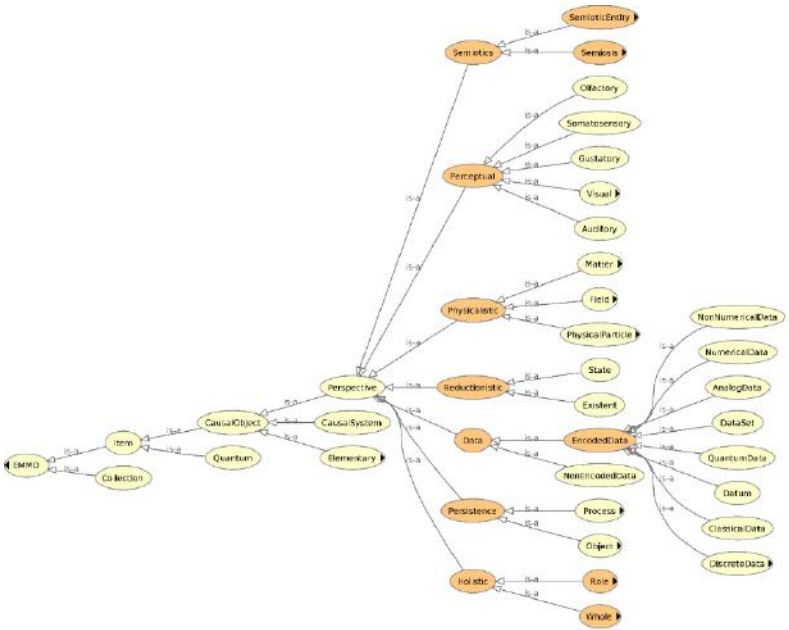


- Development of ontology for semantic FAIR exchange of data between data prosumers
- Semantic enhancement of metadata schemas for data documentation and exchange
- RDF based data exchange vocabularies (RDF-DEV) – DCAT 3 → FOAF, DCTERMS, SKOS
- Combining syntactic description of data with semantic mapping using EMMO
- Results to be ported to OntoCommons Top Reference Ontology

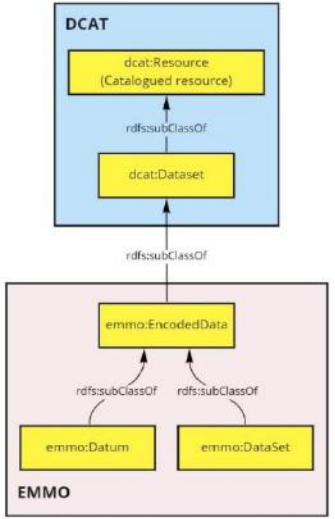
Ontologies

Hierarchy of the EMMO perspective level

http://emmo.info/emmo/1.0.0-beta3/middle



Semantic enhancement of basic data documentation



Semantic exchange across marketplaces and databases

DOME 4.0

Manufacturing

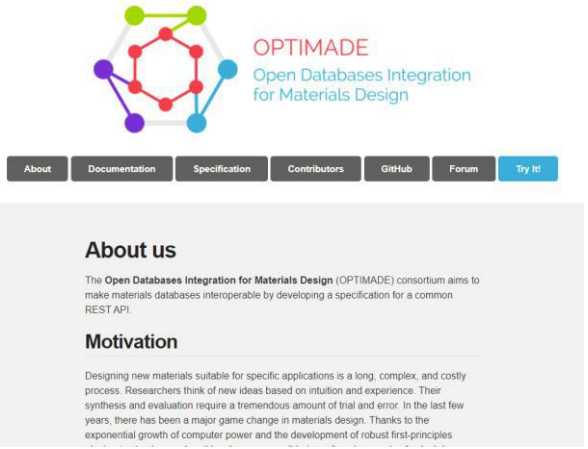
MARKET 4.0

DOME 4.0

User

Materials

OPTIMADE



Semantic exchange across marketplaces and databases

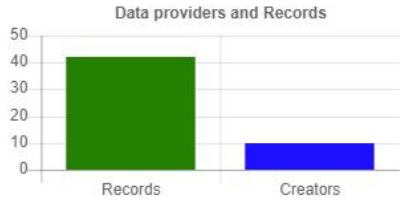
DOME 4.0

DOME 4.0 Explore Upload Data Upload File About Contact My Profile Logout

Search DOME

electro spindle Search

Statistics



Featured Dataset

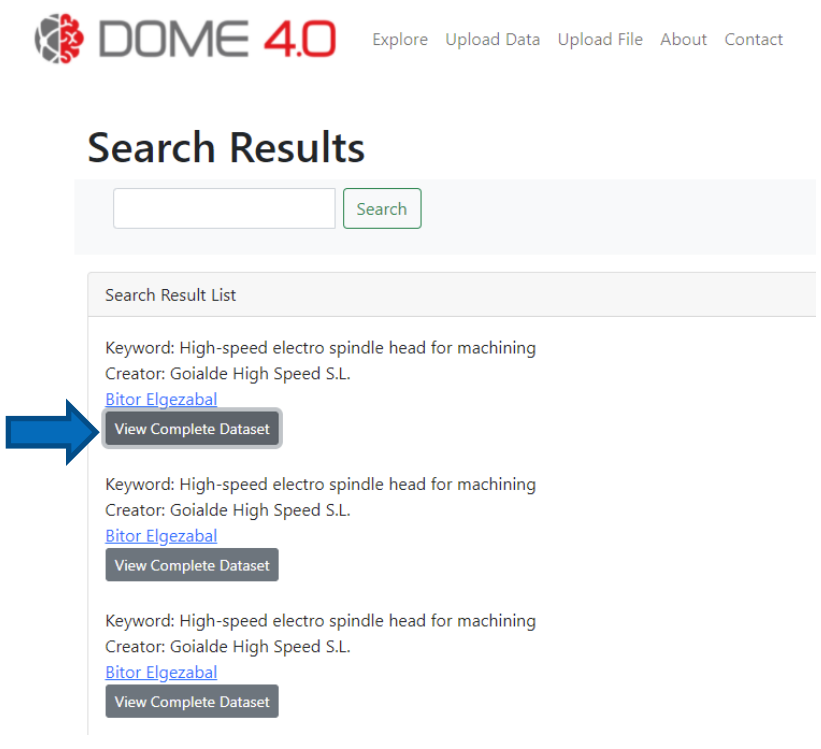
Keyword:

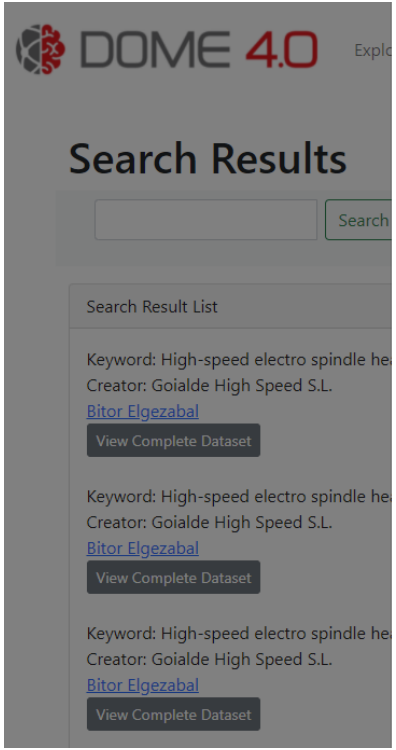
URL :

Upcoming Services

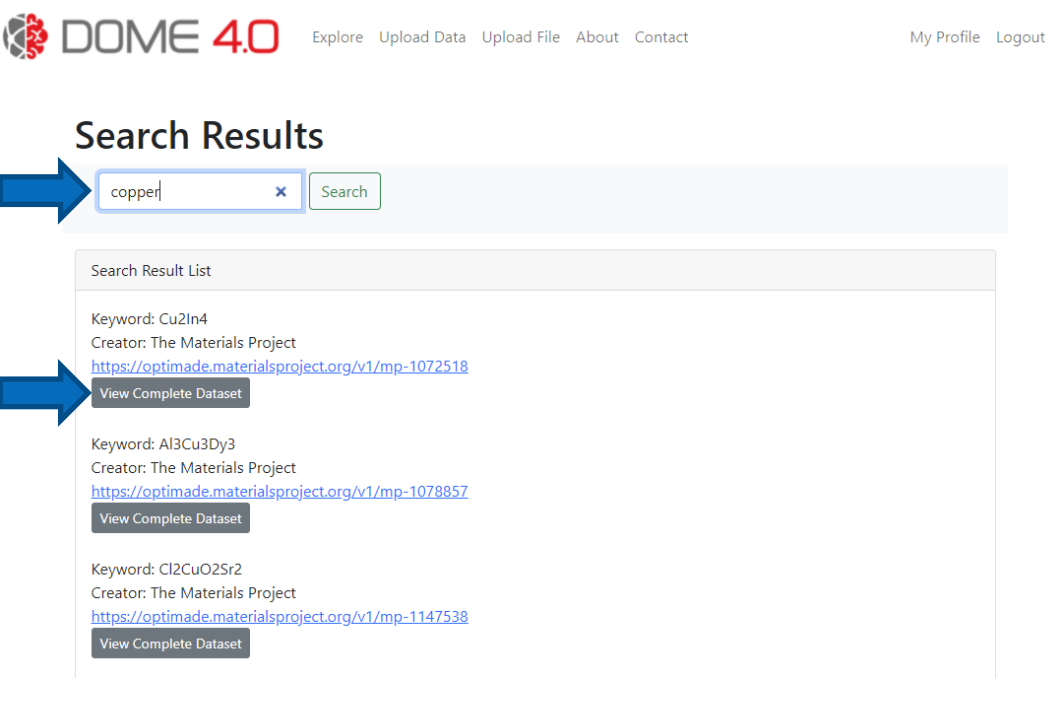
- FAIR Data Monitoring and Auditing Service
- Data sovereignty and provenance system
- Data transaction and clearing system

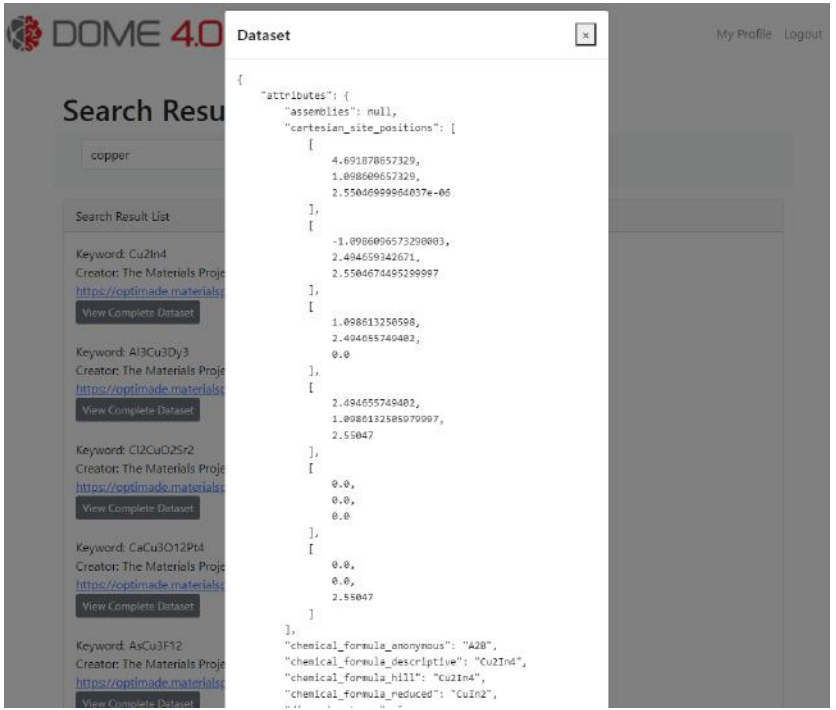
Machine data catalogue





Materials databases





Summary

- DOME 4.0, a digital marketplace ecosystem
- 9 B2B showcases to demonstrate cross-domain semantic interoperability
- Data documentation in collaboration with *OntoCommons*, EMMC, etc.
- Offline example: Data sharing across multiple domains – Showcase 1.
- Online example: Showcases 5 and 6 – datasharing across Market 4.0 and OPTIMADE.
- Developers and managers of marketplaces and innovation platforms - connect with us!

Project name: DOME 4.0
Digital Open Marketplace Ecosystem 4.0

Call DT-NMBP-40-2020:
Creating an open marketplace for industrial data (RIA)

The European Union Horizon 2020
Grant Agreement no. 953163

DOME 4.0

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THANK YOU

Any questions?