

Linked-Data and the VO

and looking out what others are doing

Linked Data (still learning)

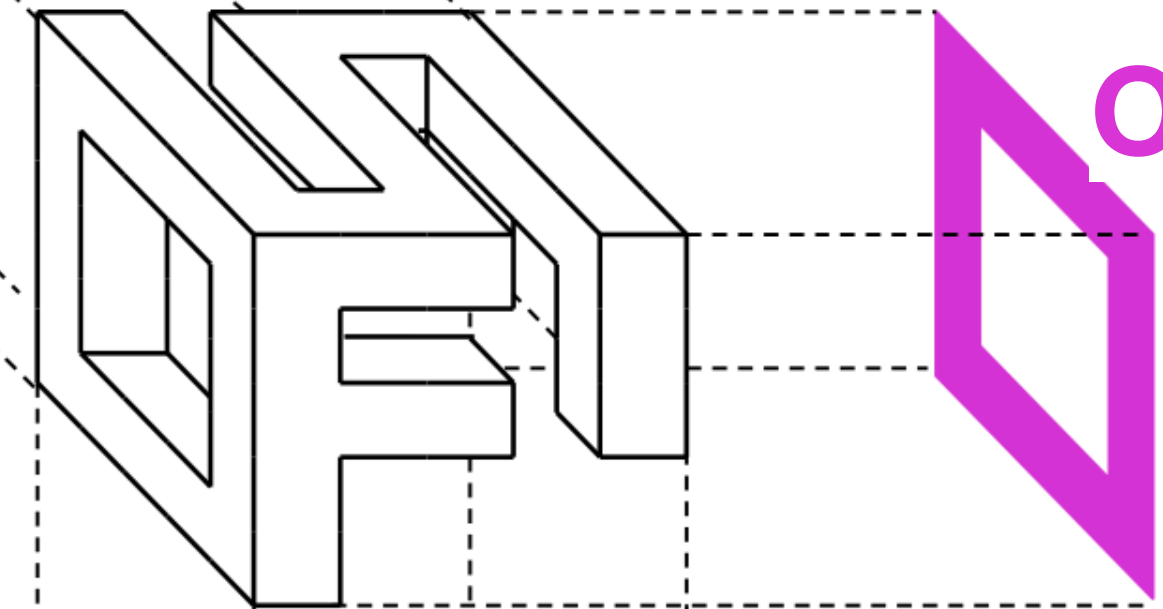
- goes back to the roots of the web

- linking resources using oriented and tagged graph
- Triples with object/prediccate/subject
- RDF (Resource Description Framework) is W3C standard
- Several serialisation (RDF/XML, Turtle, JSON-LD...)
- SPARQL is query language

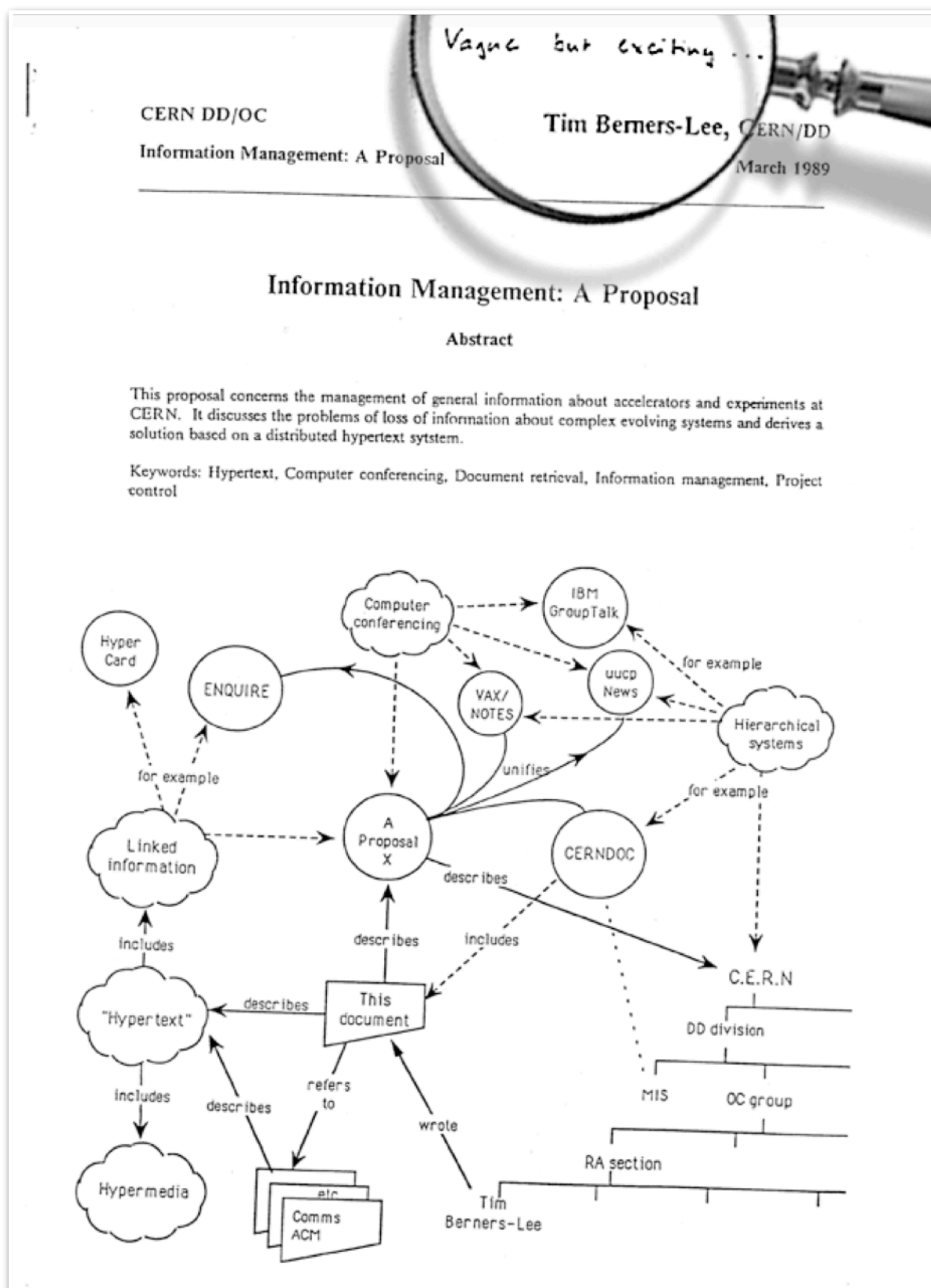
Predicate



Object



Subject



European Open Science Cloud



<https://eosc.eu>

- **European Open Science Cloud (EOSC):**

Pan-European initiative fostering collaboration in research and technology.

A comprehensive platform for seamless data sharing and accessibility.

- **Interdisciplinary Hub**

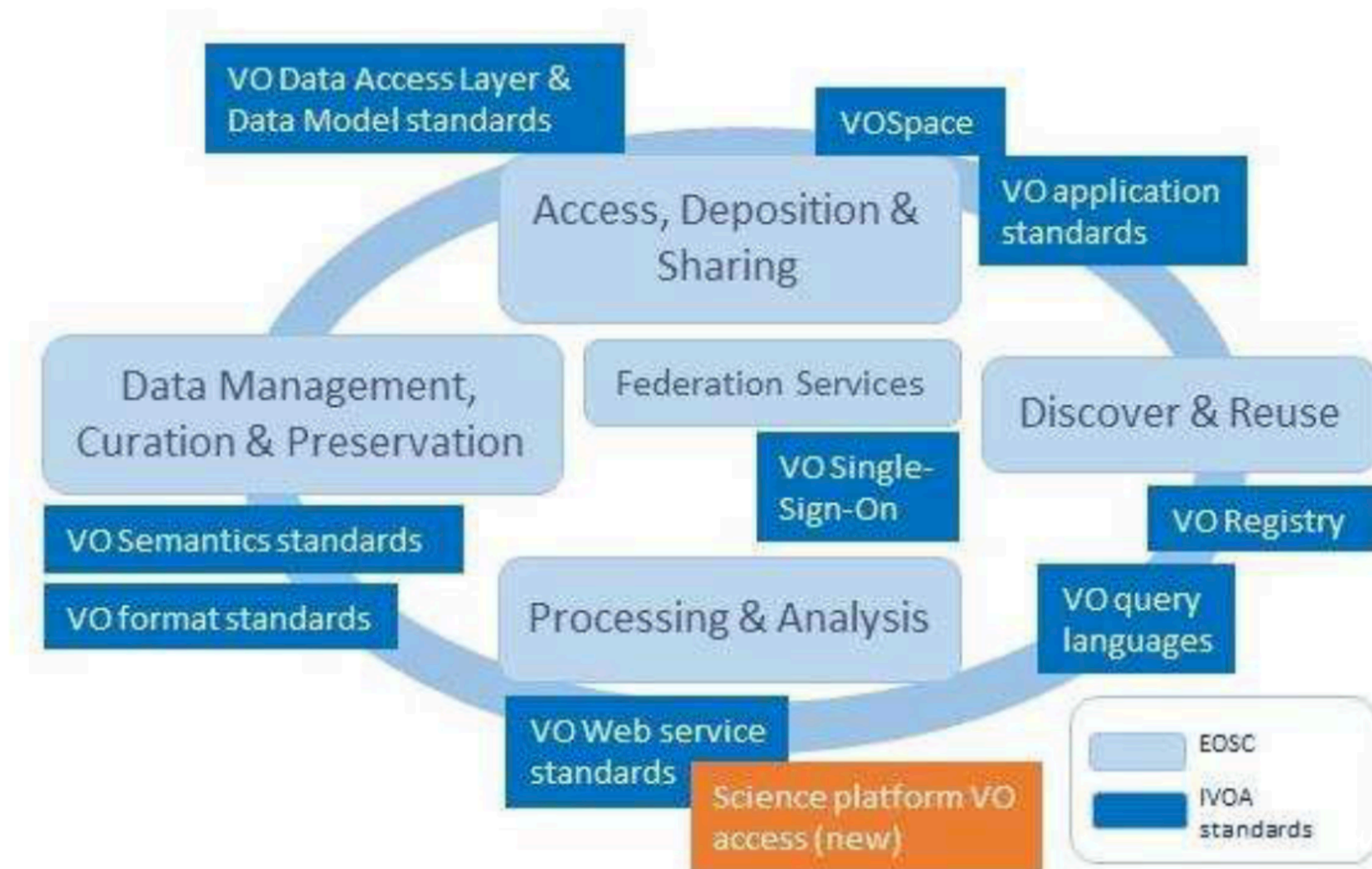
- **Enhanced Collaborations**

- **Data Management and Interoperability**

- **Transparent and Reproducible Science**

- **EOSC Portal:** <https://eosc-portal.eu/>

« unified access to the European hub of research data, tools and services for innovation and education »



© Marco Molinaro

FAIR-IMPACT

<https://fair-impact.eu/>



- Focus on **semantic artefacts** for enhancing EOSC semantic interoperability.
- Federation of Semantic Artefact Catalogs (SAC) based on <https://ontoportal.org/> instances.
- Many communities involved:
 - Biology/Medicine
 - Agriculture/food
 - Environment
 - Industry
 - Earth Sciences
 - **Astronomy** (helio+planets+astro)
 - Chemistry

A screenshot of the OntoPortal Appliance web interface. The header is teal with the "OntoPortal" logo and navigation links: "Ontologies", "Search", "Annotator", "Recommender", "Mappings", "Login", and "Support". The main content area is white and titled "Welcome to OntoPortal Appliance, your ontology repository for your ontologies". It contains four panels: 1. "Search for a class" with a search input field containing "Enter a class, e.g. Melanoma" and a search button, plus a link to "Advanced Search". 2. "Find an ontology" with a search input field containing "Start typing ontology name, then choose from list" and a search button, plus a "Browse Ontologies" button. 3. "Ontology Visits (April 2023)" with a line graph showing a flat line at zero and a "More" link. 4. "OntoPortal Appliance Statistics" with a table showing: Ontologies (2), Classes (100), Properties (36,286), and Mappings (2). The footer is grey and contains "OntoPortal Appliance 3.1.1", "Powered by BioPortal", and "Projects".

OntoPortal Appliance Statistics	
Ontologies	2
Classes	100
Properties	36,286
Mappings	2

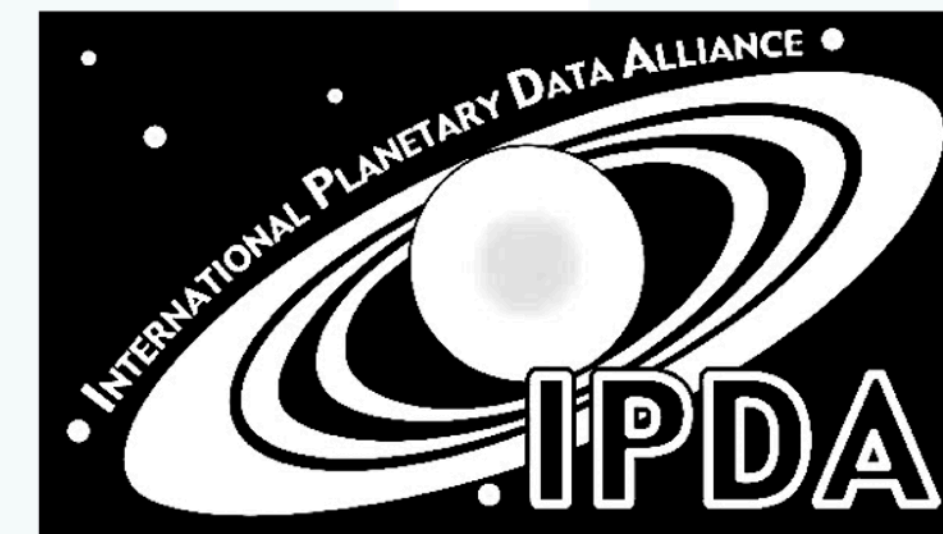
Astronomy in FAIR-IMPACT

a new comer community

- Presentation of IVOA/IHDEA/IPDA semantic frameworks in various meetings.
=> *comparing how we do things / ideas on how we could improve*
=> *also comparing IVOA, IHDEA & IPDA*
- Presentation of semantics governance aspects for IVOA
=> *we are really bottom-up, and that's not so usual !*
- Working on mappings/crosswalks for bridging between communities
=> *building on previous work in RDA metadata crosswalk WG*
(see https://doi.org/10.1162/dint_a_00186)
- Preparation of a prototype *semantic artefact catalog* portal
=> *exploring previous works*

Semantic artefacts in astronomy & astrophysics

- **Several communities** (with different semantic ecosystems):
 - **IVOA** (International Virtual Observatory Alliance)
<http://ivoa.net>
 ⇒ **interoperability driven** (schemas, protocols, vocabularies)
 NB: vocabularies = controlled lists for schemas
 - **IPDA** (International Planetary Data Alliance)
<https://ipda.jpl.nasa.gov>
 ⇒ **archive and reuse driven** (information model based on OAIS)
 Description of observational products in an archive (for future reuse)
 - **IHDEA** (International Heliophysics Data Environment Alliance)
<https://ihdea.net>
 ⇒ **catalogue of products** (registry)
 ⇒ **access and reuse driven** (data/metadata formats, protocols, tools)
 Community tools and protocols



Ontology / semantic artefact cataloguing prior work (2)

- **Vocabulary broker prototype developed by German team**
(in the frame of the ESPAS FP7 EC project)
See here: <http://wdcosf.fh-potsdam.de> (started in 2016, last update in 2019)
- Several vocabularies have been processed:
 - Unified Astronomy Thesaurus: **UAT**
 - Space Physics Archive Search and Extract: **SPASE**,
 - Near Earth Space Data Infrastructure for e-Science: **ESPAS**
 - Global Change Master Directory: **GCMD**
 - GEneral Multilingual Environmental Thesaurus: **GEMET**
- Nice prototype, but seems not maintained (no contact with team, yet)

magnetic field >

OSF Search

The search found 62 results in 0.303 seconds.

Search results

Magnetic Field

Description: The DC magnetic field strength and direction
inScheme: ESPAS Observed Property,
closeMatch: Magnetic Field,

Magnetic Field

Description: Pertaining to the magnetic field generated by the Earth, consisting of both the dipole and non-dipole components.
relatedMatch: Field,
inScheme: GCMD Solid Earth,
closeMatch: Magnetic Field,

Magnetic Fields/Magnetic Currents

Description: An Electromagnetic field (EM field) is the region of space near electric currents, magnets, broadcasting antennas etc., regions in which electric and magnetic forces may act, for example on charged particles.
inScheme: GCMD Sun-Earth Interactions,

Magnetic Field

Description: A region of space near a magnetized body where magnetic forces can be detected (as measured by methods such as Zeeman splitting, etc.).
inScheme: SPASE Wave Quantity, SPASE Measurement Type,

Magnetic fields

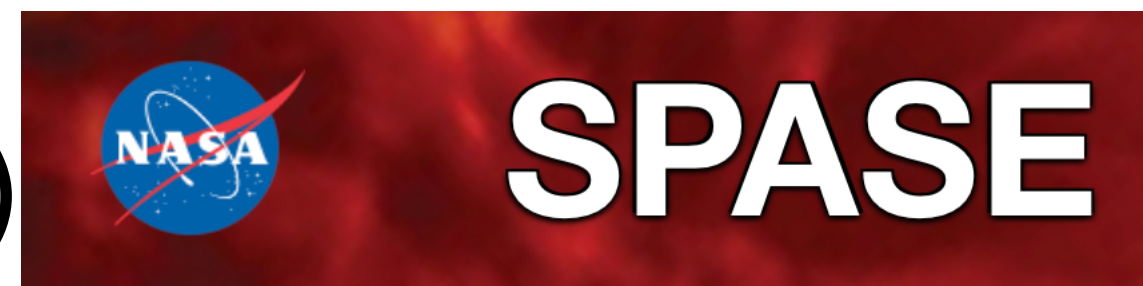
Description: not available
inScheme: The Unified Astronomy Thesaurus,

Magnetic Field

Ontoportals prototype

<http://voparis-ontoportals-dev.obspm.fr/>

- Goal: gathering semantic artefact catalogues from astronomy, heliophysics, planetary sciences
- Sources:
 - IVOA: <http://ivoa.net/rdf>
 - UAT (Unified Astronomy Thesaurus)
 - SPASE (Space Physics Archive Search and Extract)
 - PDS4 Information model etc.



The screenshot shows the Ontoportals web interface. At the top, there is a navigation bar with the Ontoportals logo and links for Ontologies, Search, Annotator, Recommender, and Mappings. The main heading is "Browse" with a sub-heading "Browse the library of ontologies". A search bar is present, and the current view shows 19 ontologies sorted by "Classes count".

Ontology Name	Classes	Instances
PDS4 Information Model (Full dump) (PDS4-IM-FULL)	1,038	
PDS4 Information Model Classes (PDS4-IM-1L00)	221	
draft CfHA (CFHA)	41	336
IVOA Content types of VO resources (CONTENT_TYPE)	22	
IVOA Reference Frames (REFFRAME)	21	
IVOA Messengers (MESSENGERS)	10	
IVOA Time Scales (TIMESCALE)	9	
IVOA Reference Positions (REFPOSITION)	6	
IVOA Content levels for VO resources (CONTENT_LEVEL)	3	
Unified Astronomy Thesaurus (UAT)	2,373	

Ontoportals prototype

Current Status

- **Successfully imported catalogues:**

- IVOA Reference Frames
- IVOA Messenger
- IVOA Time Scales
- IVOA Reference Positions
- IVOA Content levels for VO resources
- IVOA Content types of VO resources
- IVOA Unified Astronomy Thesaurus
- Unified Astronomy Thesaurus (UAT)
- PDS4 Information Model Classes

- **Errors while importing catalogues:**

- IVOA Relationship types in the VO
- IVOA Roles of dates
- IVOA DALI Examples
- IVOA Semantics
- IVOA Datalink core

The screenshot displays the 'IVOA Messengers' web interface. At the top, it shows the title 'IVOA Messengers' and the date 'Last uploaded: July 24, 2023'. There are navigation icons for download, home, and user profile. Below the title, there are tabs for 'Summary', 'Classes', 'Properties', 'Notes', 'Mappings', and 'Widgets'. The 'Classes' tab is active, and a 'Jump to:' search box is present. A tree view on the left shows a hierarchy of classes: 'Neutrino' (selected), 'Photon', 'Gamma Ray', 'Infrared', 'Millimeter', 'Optical', 'Radio', 'Ultraviolet', 'Extreme UV', and 'X-Ray'. The right pane shows the 'Details' for the 'Neutrino' class, with sub-tabs for 'Details', 'Visualization', 'Notes (0)', and 'Class Mappings ()'. The details table lists the following information:

Preferred Name	Neutrino
Definitions	This term comprises all generations of neutrinos (electron, μ , τ), and particles as well as antiparticles.
ID	http://www.ivoa.net/rdf/messenger#Neutrino
comment	This term comprises all generations of neutrinos (electron, μ , τ), and particles as well as antiparticles.
label	Neutrino
prefLabel	Neutrino
subClassOf	http://www.w3.org/2002/07/owl#Thing

Next steps

New vocabularies & Mapping between vocabularies

- Semantic Artefacts:
 - Need to map SPASE model (XML Schema document) into RDF-like structure
 - New upcoming vocabularies, e.g., ObsFacility
 - Extension of vocabularies, e.g., RefFrame
 - What to do with UCDs in this context?
 - Can we revive part of PDL?
- Mapping between communities using ontoportal tool.

Next steps

Knowledge graphs & representing quantities

- Other EU project (starting in Jan 2024): OSTrails, with focus on building Science Knowledge Graphs
Prototype with MASER: using **linked data** to build a **knowledge graph**
=> graph joining the IVOA Registry, the Datacite DOI metadata, the EPNcore tables and the associated datalinks
- Explore use of RDA **I-Adopt** framework (<https://i-adopt.github.io>) for describing measurements and quantities