

# VO community standards

global to local efforts to enable FAIR data and services

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USC-VIII General Assembly 2024  
14-18 October 2024, Galzignano (PD)

Compatibility



De facto standard



Interoperability



(a “good” example of information disappearing from the net, no way to cite this properly)



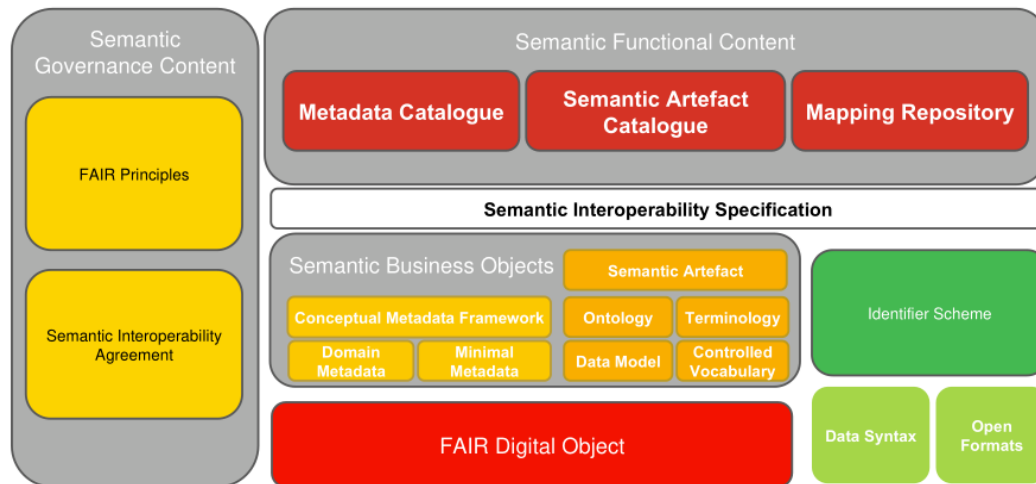
## 2 INTEROPERABILITY LAYERS .....

- ➔ Technical interoperability .....
- 2.2 Semantic interoperability ←
- 2.3 Organisational interoperability
- 2.4 Legal interoperability .....

<https://data.europa.eu/doi/10.2777/620649>

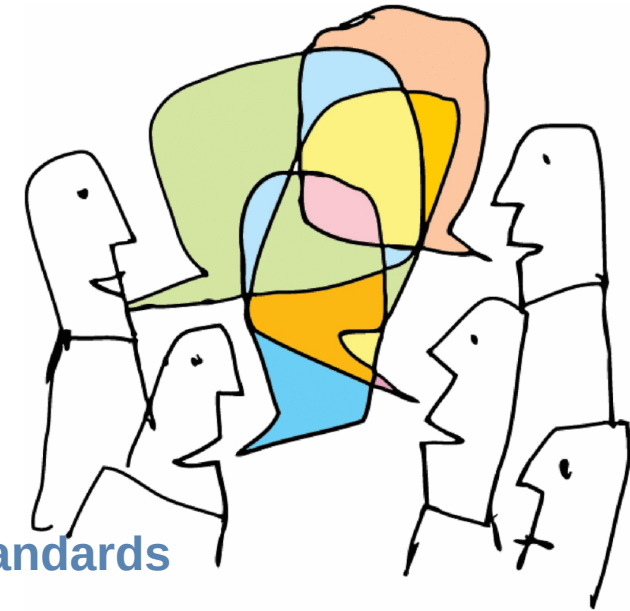
## Developing and implementing the semantic interoperability recommendations of the EOSC Interoperability Framework

*Deliverable of EOSC-A TF Semantic Interoperability (2021-2023)*

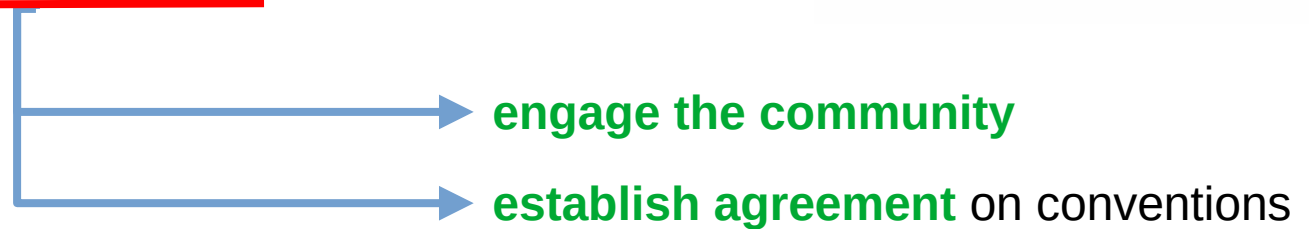


<https://doi.org/10.5281/zenodo.10843882>

- Open Science <> opposite of bad science
- Digital resources -> leverage FAIR principles
- Principle  $\neq$  Rule/Convention/Norm
- Research domain -> Intrinsic characteristics
- Characteristics -> turn principles into conventions
- Conventions -> Standards
- Research domain :: Community



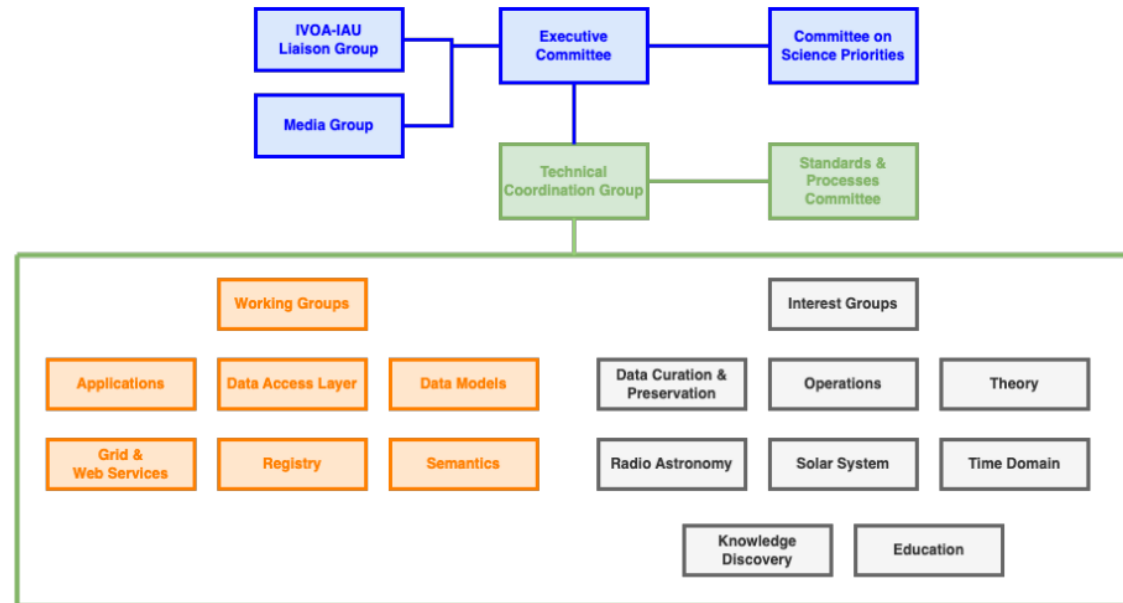
community shared conventions :: open standards



# IVOA community & organisation



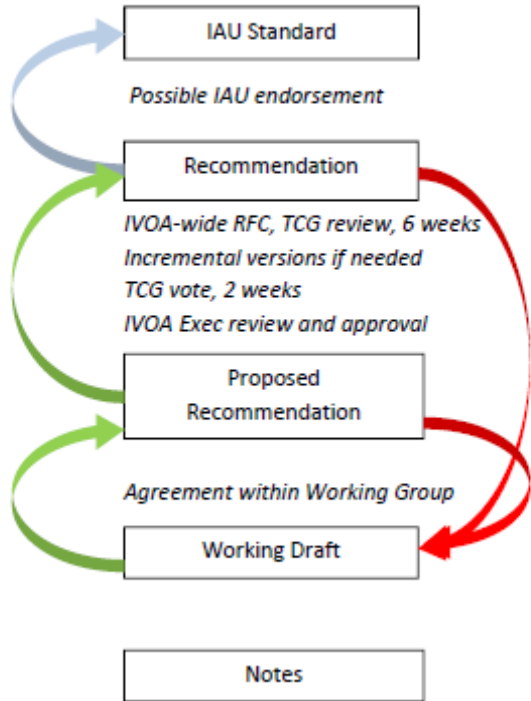
<https://www.ivoa.net/>



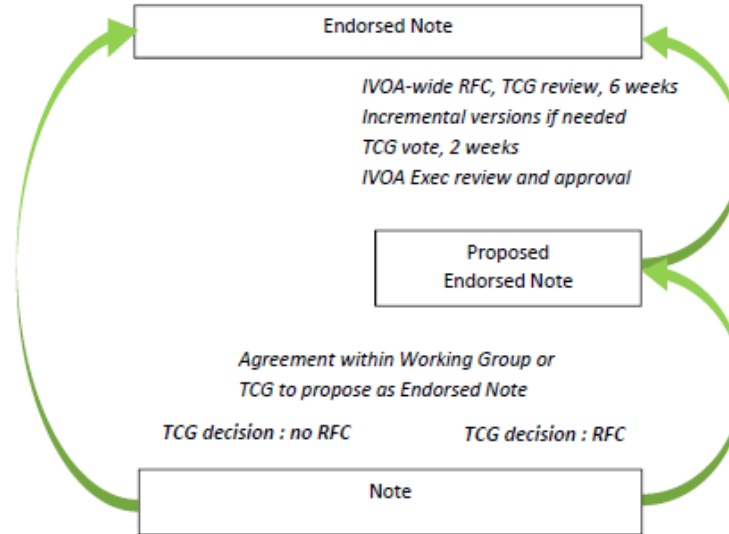
The Virtual Observatory (VO) is the vision that astronomical datasets and other resources should work as a seamless whole. [...] The International Virtual Observatory Alliance (IVOA) is an organisation that debates and agrees the technical standards that are needed to make the VO possible.



## IVOA Recommendation Process



## IVOA Endorsed Note Processes



## IVOA Document Standards 2.0

[10.5479/ADS/bib/2017ivoa.spec.0517G](https://doi.org/10.5479/ADS/bib/2017ivoa.spec.0517G)

## Vocabularies management

- vocabulary enhancement request
- Semantics WG management
  - UCD board (for UCD changes)
  - community discussion
- submission to TCG
- TCG approval/rejection

## Erratum process

- Erratum identification
- proposal submission
  - to relevant WG
- WG discussion
- submission to TCG
- TCG approval/rejection



# IVOA community results



NUMBER OF PARTICIPANTS PER IVOA INTEROPERABILITY MEETING



community workshop, twice a year  
 “Interoperability Meetings”

> 50 standards  
 + Endorsed Notes  
 + Vocabularies

<https://www.ivoa.net/documents/>  
 (<https://github.com/ivoa-std/>)

Group	Title	Version	
Technical Specifici	PHOTDM - Pho	2.0	
	VO Identifiers	2.0	
	VO Registry Interfaces	1.1	
	RM - Resource Metadata for the Virtual Observatory	1.12	
	StandardsRegExt: a VOResource Schema Extension for Describing IVOA Standards	1.0	
	SimpleDALRegExt - Describing Simple Data Access Services	1.2	
	VOResource - an XML Encoding Schema for Resource Metadata	1.1	
	VODataService - A VOResource Schema Extension for Describing Collections and Services	1.2	
	RegTAP - Registry Relational Schema	1.2	
	DocRegExt - Educational Resources in the VO		
DAL	DALI - Data /		
	DataLink		
	Simple Cone		
	SIA - Simple		
	SLAP - Simp		
	SSA - Simple		
	STC-S: Spac		
	TAP - Table /		
	TAPRegExt - Extension for		
	ADQL - Astr		
GWS	SimDAL - Sir		
	VOEvent Tra		
	SODA - Serv		
	Access		
	Object Visibil		
	EPN-TAP; P		
	Virtual Obser		
	LineTAP; IVC		
	Lines		
Semantics	VOUnits - Units in the VO	1.1	
	JCD - An IVOA standard for Unified Content Descriptors	1.10	
	JCD1+ Controlled Vocabulary	1.5	
	version <= 1.3: recommendation		
	Version >= 1.4: endorsed note		
	Maintenance of the list of UCD words	2.0	
	Vocabularies in the Virtual Observatory	2.1	
	DocStd - IVOA Document Standards	2.0	
	VOEvent - Sky Event Reporting Metadata (VOEvent)	2.0	
Endorsed Notes	Group	Title	Most stable
	GWS	XML Schema Versioning Policies	1.0
	ReR	Discovering Data Collections Within Services	1.1
	DAL	Catalogue of ADQL User Defined Functions	1.1
	Semantics	Adopting the UAT as an IVOA vocabulary	1.0
	TGC	IVOA Architecture	2.0



FAIR enabling: VO community standards  
 Marco Molinaro

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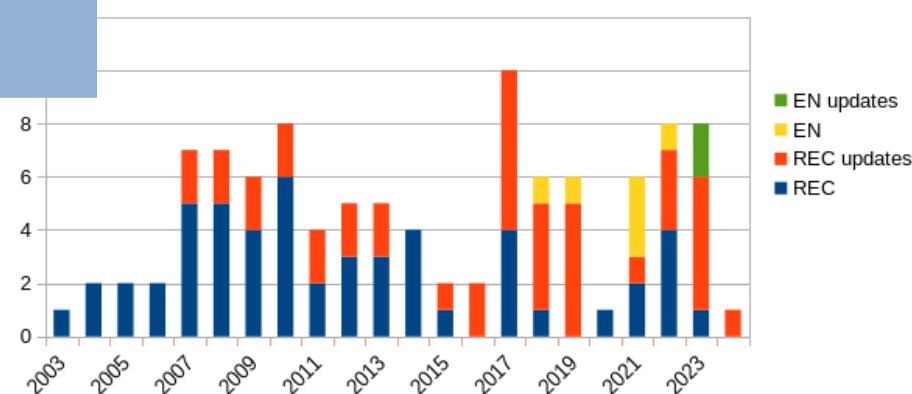
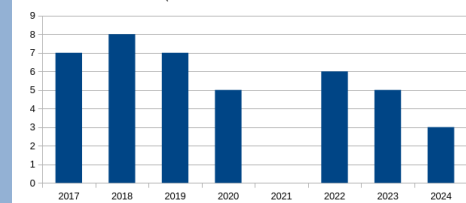
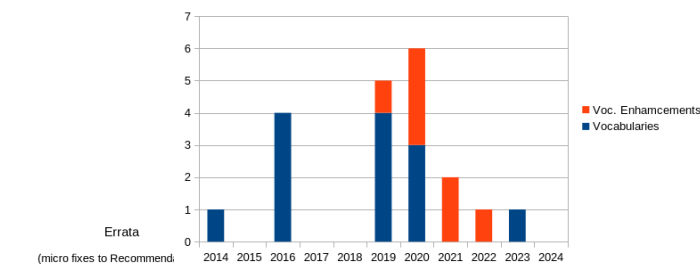
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Vocabularies & updates



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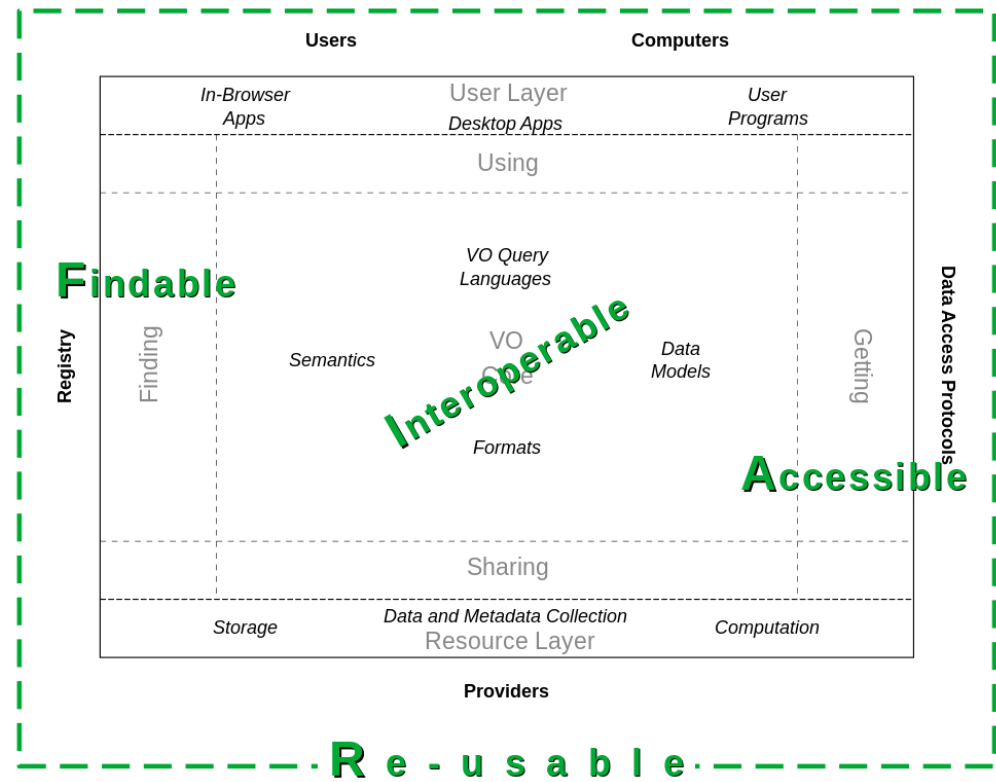
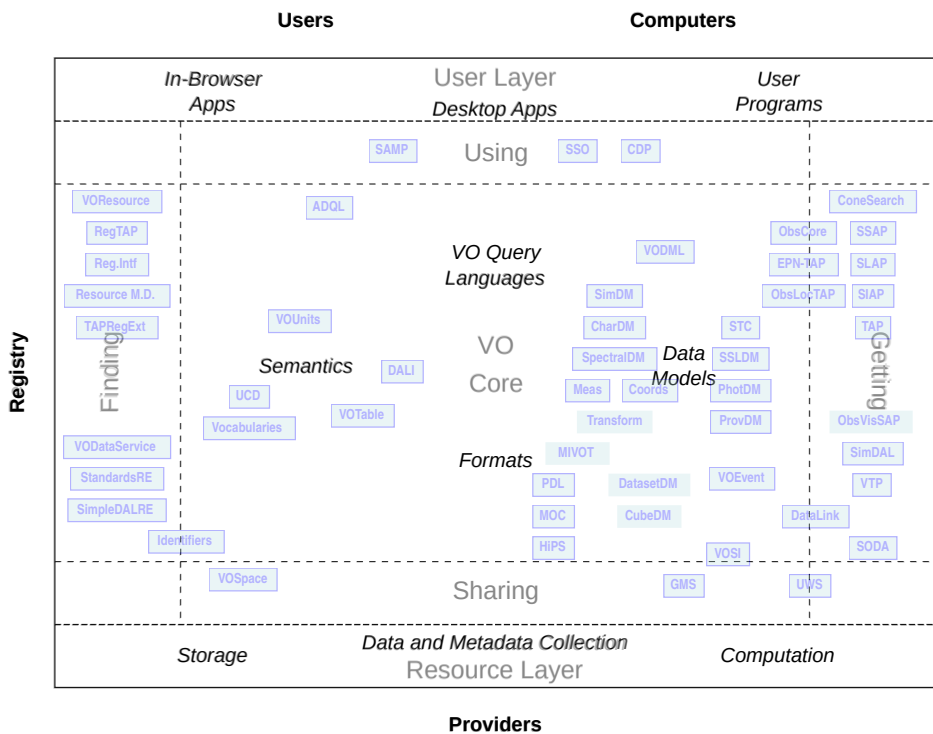
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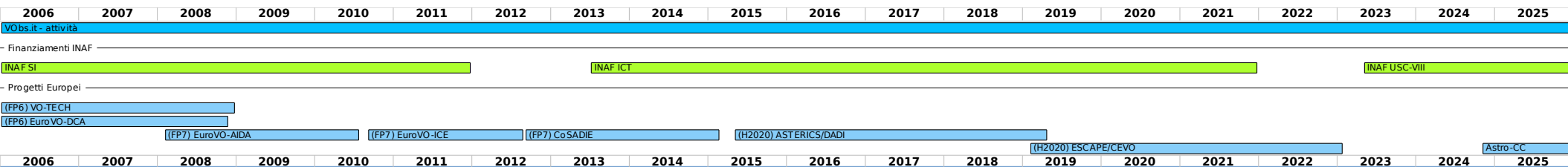


# FAIR enabling standards





VObs.it is the initiative allowing the **Italian astronomical community** to participate in the activities of the International Virtual Observatory Alliance (IVOA). The aim of VObs.it is to **coordinate within the unified VO approach the archives and databases developed by the Italian community.**



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## INAF contributed efforts

- ▶ staff
  - ▷ reference person in IVOA Exec
  - ▷ coordination roles in TCG
  - ▷ standardisation efforts
    - + archives
    - + computing solutions
  - ▷ IVOA organisational tools support
- ▶ USC-VIII
  - ▷ main financial support
  - ▷ relevant to Sector 2 "Data Curation"
  - ▷ relevant to Sector 3 "R&D synergies"
  - ▷ connects to "Standards and Interoperability" thematic group
- ▶ Open Science Working Group
  - ▷ relevant to Open Data internal group
  - ▷ connects to GLOS CoPER

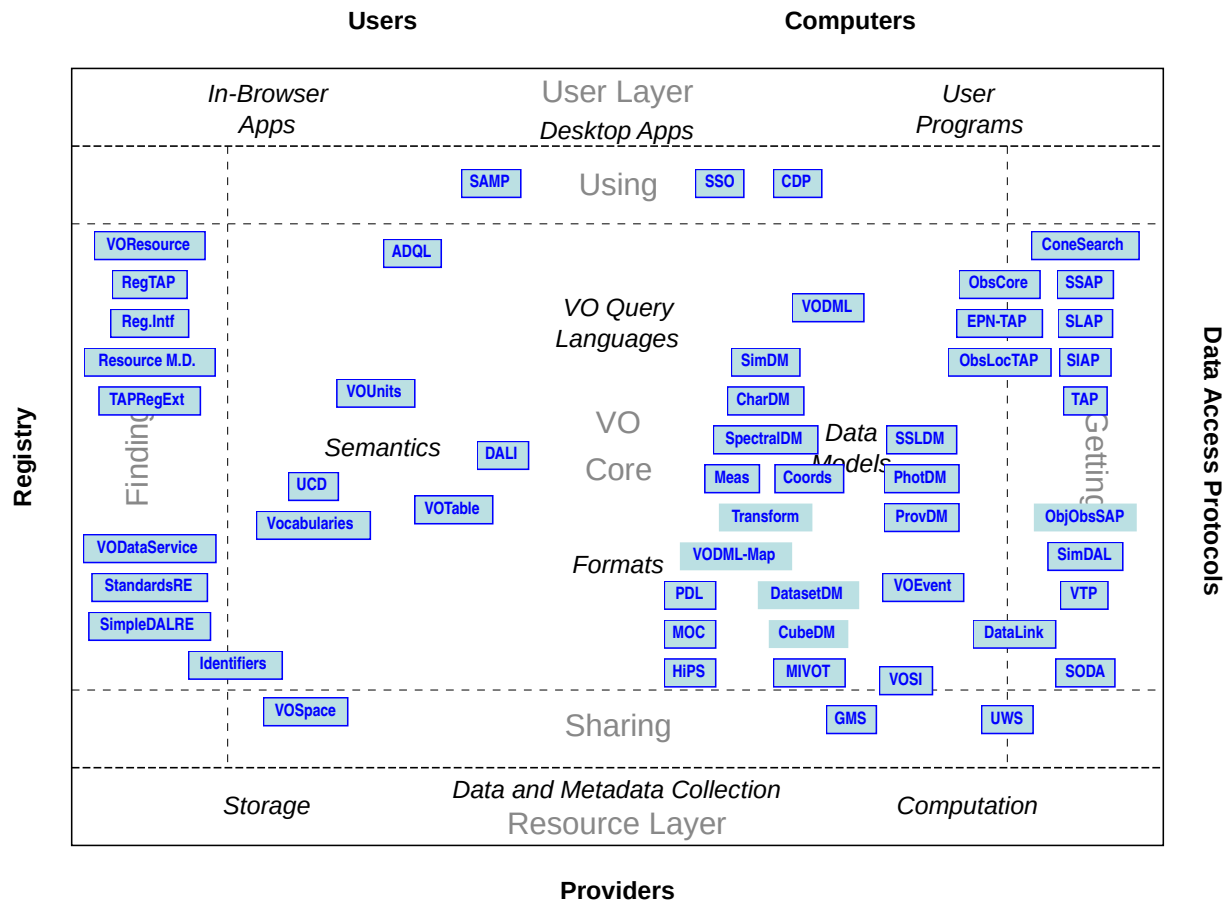
# VO Recommendations (standards)



IVOA Architecture 2.0

doi:10.5479/ADS/bib/2021ivoa.spec.1101D

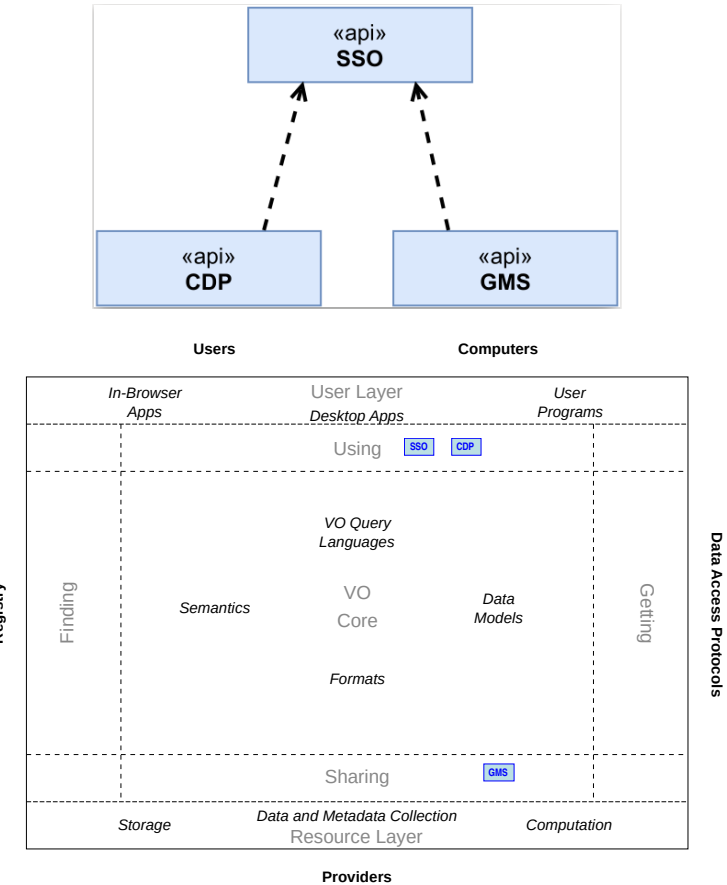
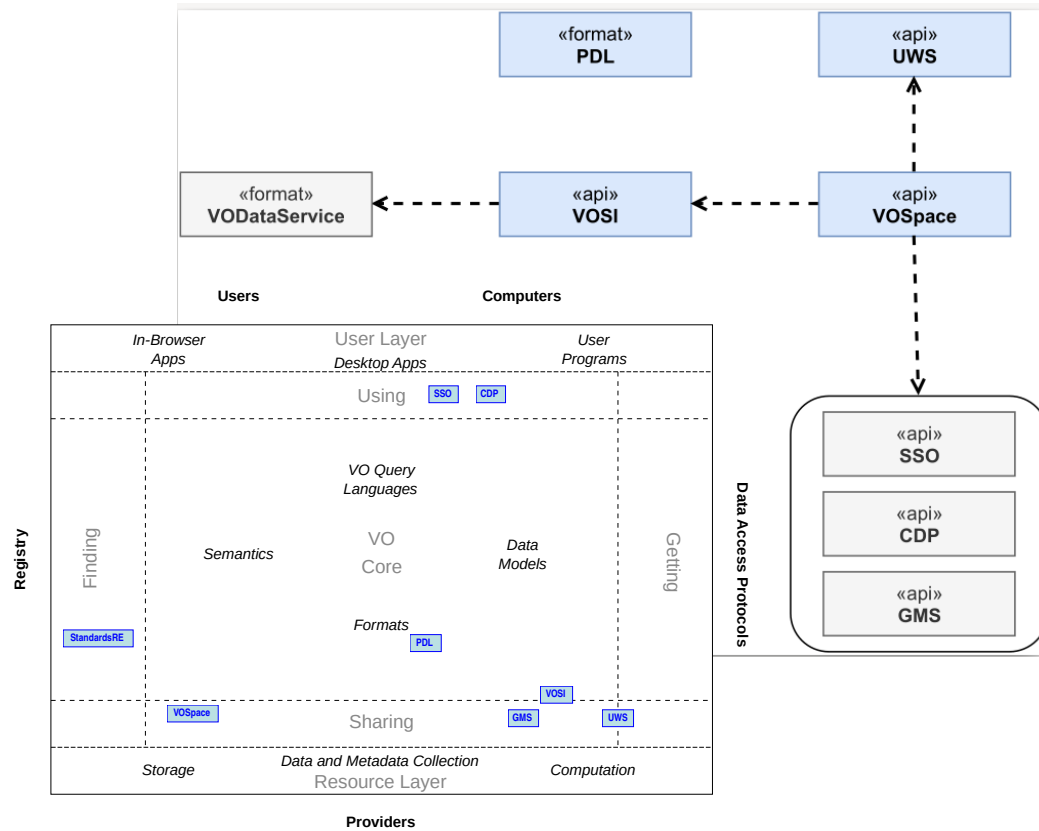
(2.1 coming soon)



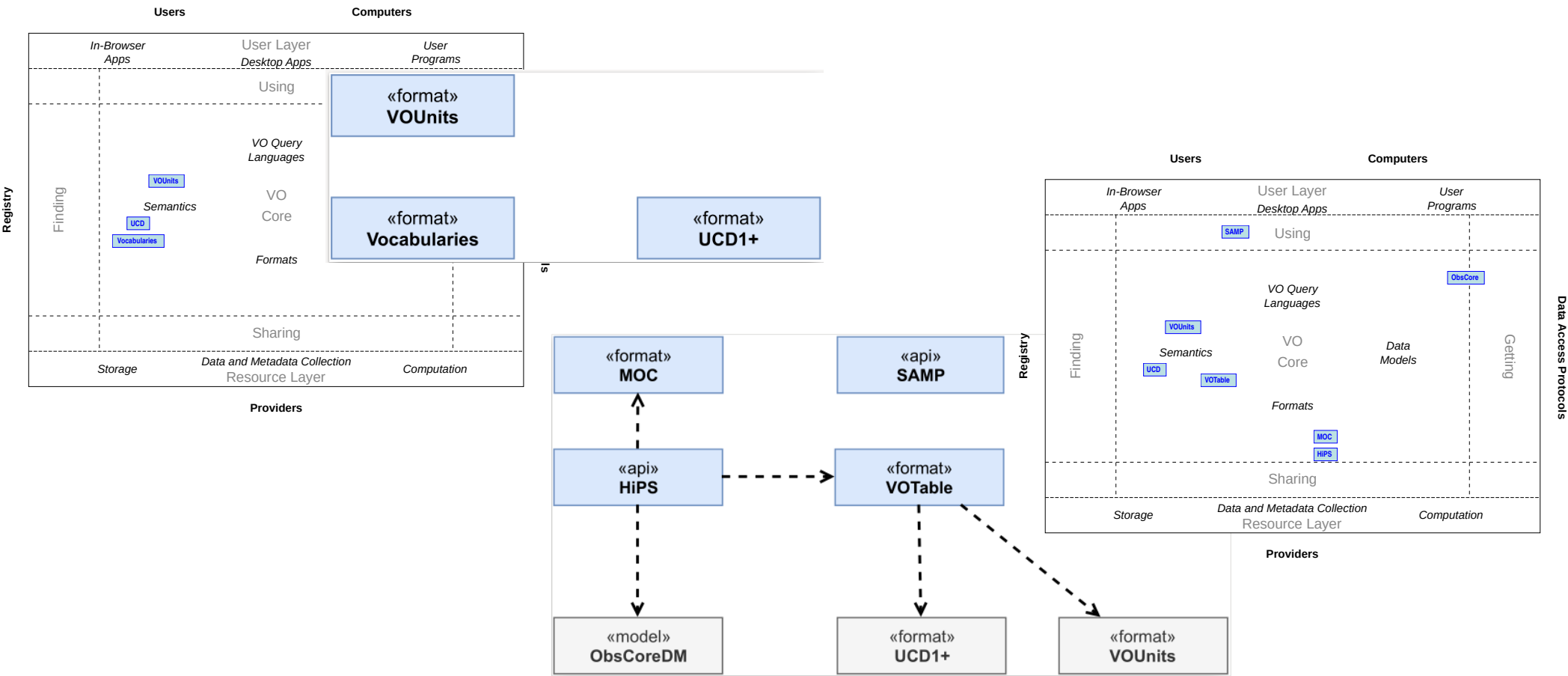
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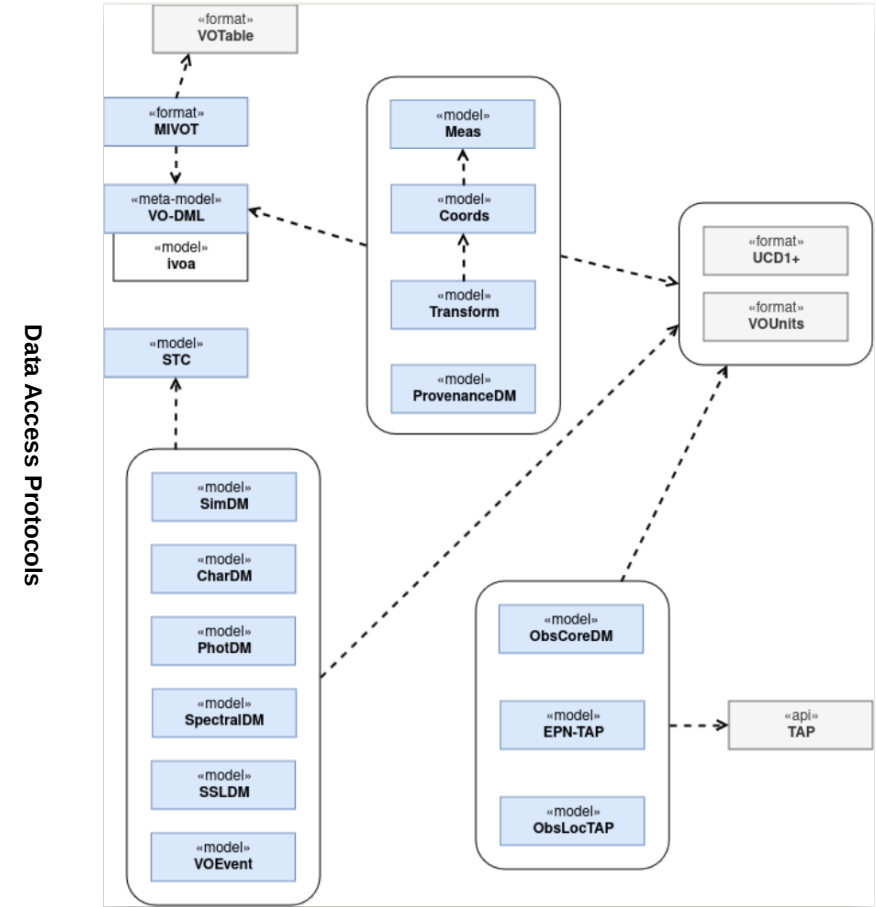
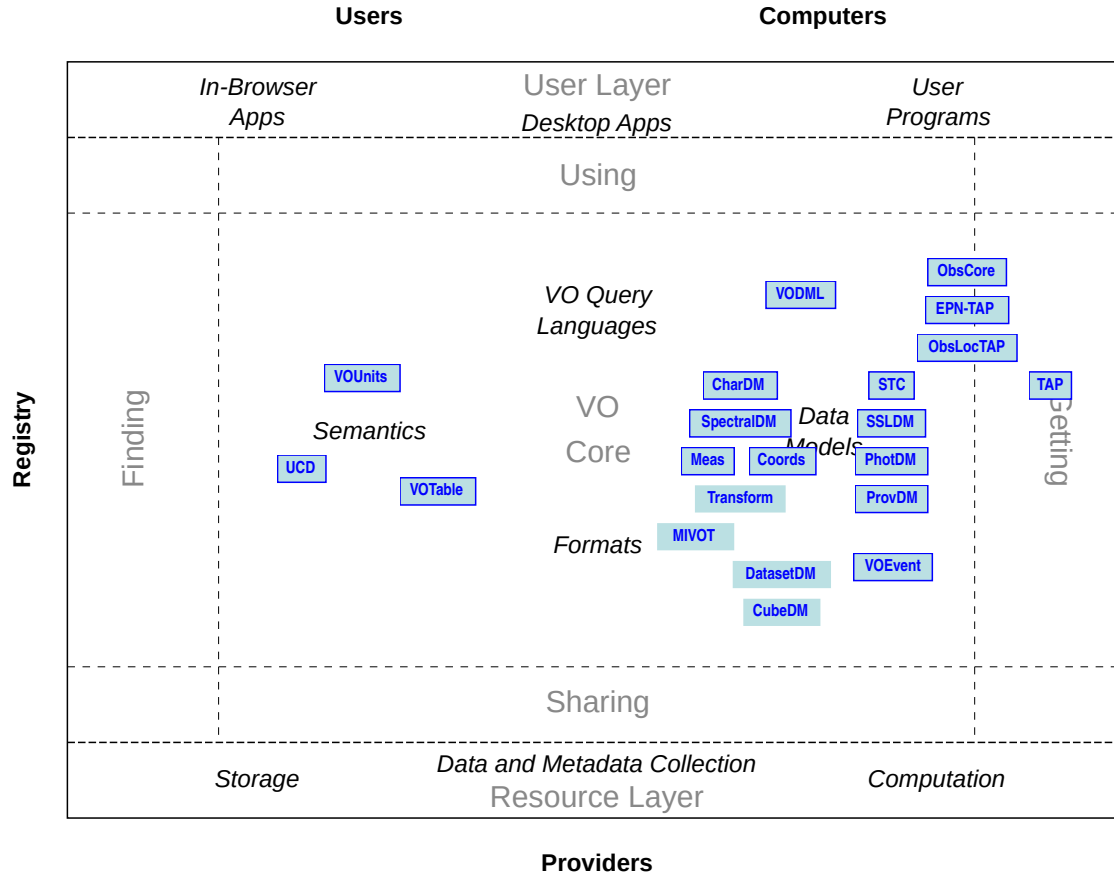


# Semantics & Formats

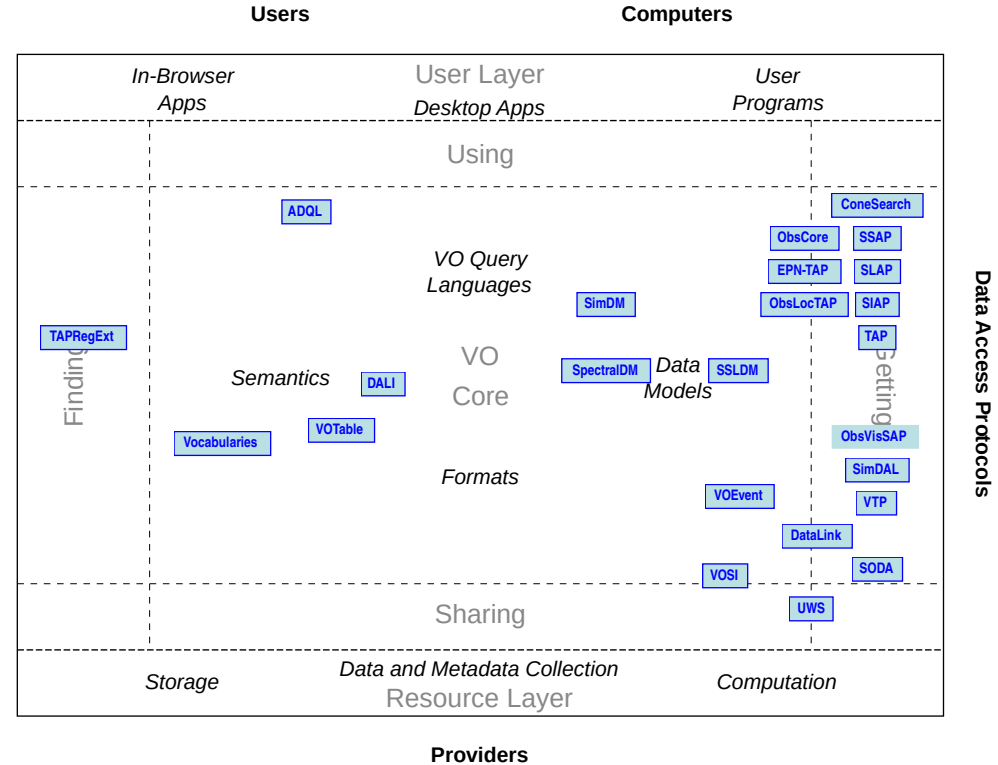
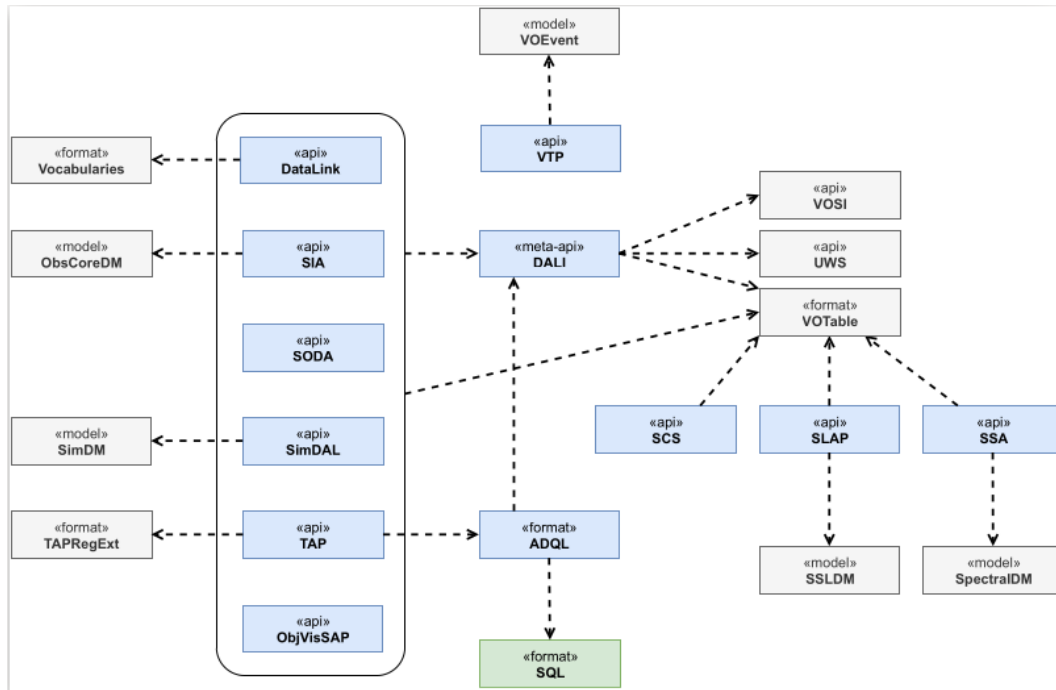


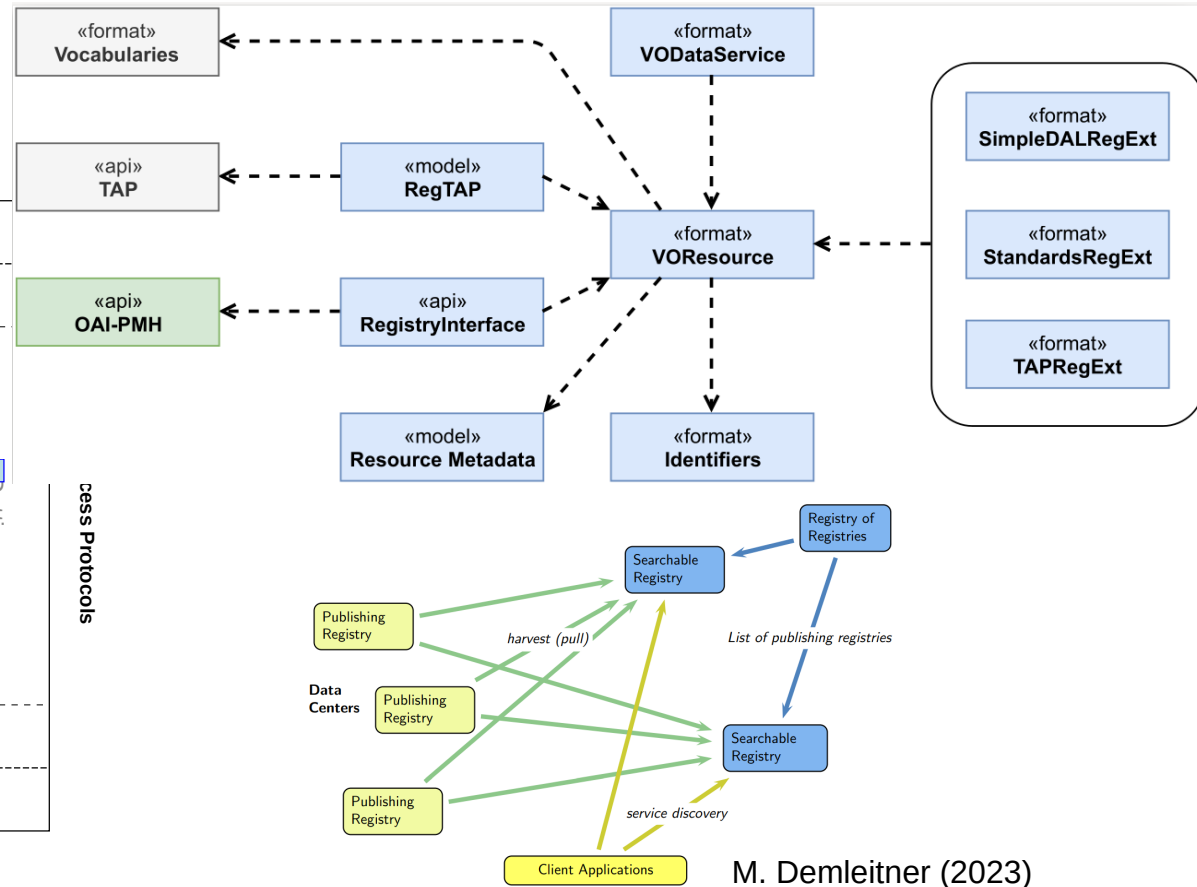
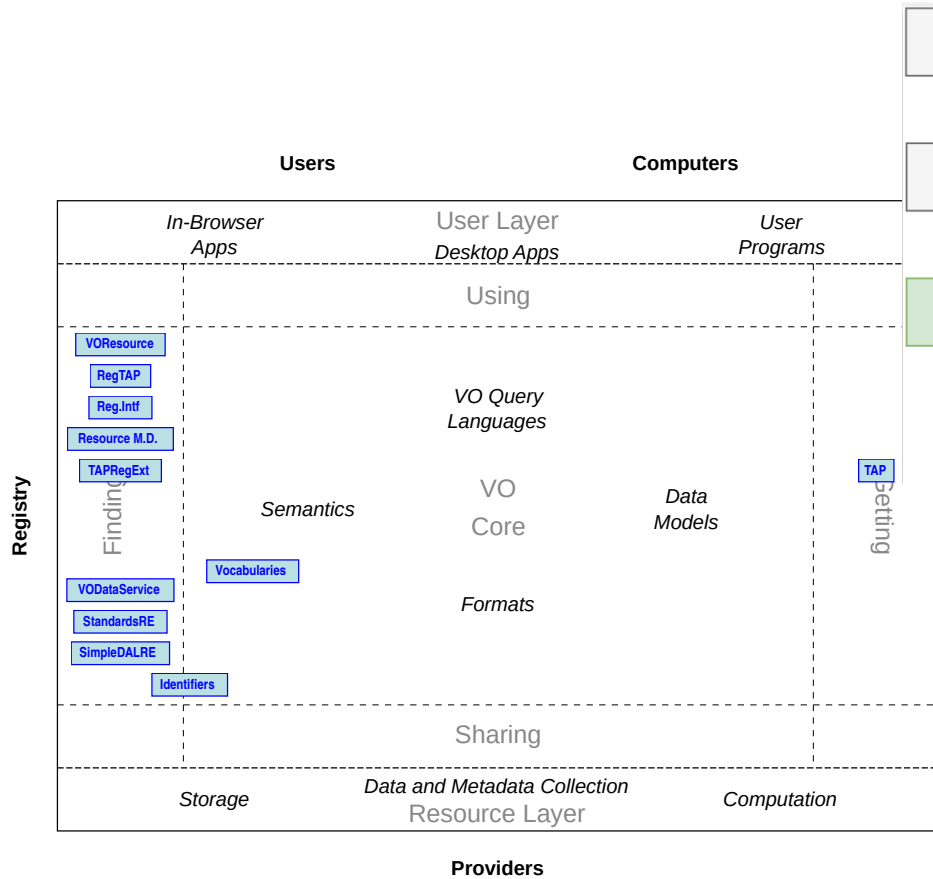


# Data Models



# Access Layer





M. Demleitner (2023)

Name	Last Change	URI	Description
Content levels for VO resources	2016-08-17	<a href="http://www.ivoa.net/rdf/voresource/content_level">http://www.ivoa.net/rdf/voresource/content_level</a>	This vocabulary enumerates the intended audiences for resources in the Virtual Observatory. It is designed to enable discovery queries like "only research-level data" or "resources usable in school settings".
Content types of VO resources	2016-08-17	<a href="http://www.ivoa.net/rdf/voresource/content_type">http://www.ivoa.net/rdf/voresource/content_type</a>	This vocabulary enumerates types of resources in the Virtual Observatory in a very general manner. Most actual services will be one of Archive, Catalog, or Survey.
DALI Examples	2023-05-07	<a href="http://www.ivoa.net/rdf/examples">http://www.ivoa.net/rdf/examples</a>	A vocabulary for expressing examples for the use of protocols. It contains concepts such as which parameters to pass to services or the standards implemented by it. Its main use is in RDFa documents described by section 2.3 of the DALI specification, < <a href="https://ivoa.net/documents/DALI/">https://ivoa.net/documents/DALI/</a> >.
Data Product Type	2024-05-19	<a href="http://www.ivoa.net/rdf/product-type">http://www.ivoa.net/rdf/product-type</a>	This vocabulary gives a high level classification for data products in astronomy. It is derived from a word list used by obscure to facilitate by-product type discovery ("find spectra") and is intended to cover similar use cases elsewhere (e.g., "find services serving spectra" in Registry). A related use case this is supposed to cover is "route data products to applications that can handle them," in particular in Datalink content_qualifier.
Datalink core	2022-01-27	<a href="http://www.ivoa.net/rdf/datalink/core">http://www.ivoa.net/rdf/datalink/core</a>	Terms in this vocabulary relate (abstract) datasets to files or other electronic artefacts, giving the relation between the two. They are originally intended for use in the semantics column in the output from the DataLink-1.0 {links} capability. As specified in DataLink-1.0, terms from this vocabulary are used in the semantics column of {links} output output using only the identifier prefixed with a hash (i.e., "#word").

<https://www.ivoa.net/rdf>

Currently 14 (+1 draft) vocabularies

- RDF, turtle, and "desise" formats
- UCD exception

There's a standard that describes maintenance.

## IVOA Vocabulary: Time Scales

This is the description of the vocabulary  
<http://www.ivoa.net/rdf/timescale> as of 2019-03-15.

Names of time scales as used, e.g., in VOTable 1.4  
 TIMESYS@timescale. See also  
<http://www.iauufs.org/res.html>.

Term	Label	
GPS	Global Positioning System time	Runs (approximately) synchronously with TAI
TAI	International Atomic Time TAI	atomic time standard, TT-TAI = 32.184 s.
TCB	Barycentric Coordinate Time TCB	Derived from TCG, but taking into account the Earth's orbit. See 1999A&A...348..642I for c
TCG	Geocentric Coordinate Time TCG	Time measured by a clock moving with the Earth
TDB	Barycentric Dynamical Time TDB	Runs slower than TCB at a constant rate so as to account for variations in the Earth's velocity relative to the Sun
TT	Terrestrial Time TT	Time measured by a continuous clock on the surface of the Earth, determined factor L_C. It is continuous with the TAI
UNKNOWN	Unknown or unavailable timescale	This value indicates clients cannot transform the timescale to TAI
UT	Earth rotation time UT	We do not distinguish between UT0, UT1, and UT2. It covers dates between 1925-01-01 and 1972-01-01
UTC	Universal Time, Coordinated UTC	This is TAI, with leap seconds inserted occasionally

Alternate formats: [RDF](#), [Turtle](#), [desise](#) (non-RDF json).

- conflicting behaviour
  - **interest** in interoperability-related activities
    - still **limited**
  - **needs** for interoperability-driven solutions
    - continuously **increasing**
- *puzzling* unbalance
  - big efforts in “big” data analysis
  - small efforts in curating the data

- IVOA community: [interop@ivoa.net](mailto:interop@ivoa.net)
  - (subscribe to: <http://mail.ivoa.net/mailman/listinfo/interop>)
- USC-VIII Standards & Interoperability thematic group: [Std-Int\\_usc8@inaf.it](mailto:Std-Int_usc8@inaf.it)
  - (info at: <https://usc8.inaf.it/tematic-groups/standards-and-interoperability/>)
- ...
- find **your community** interoperable/FAIR effort!
- ...
- if all fail: [marco.molinaro@inaf.it](mailto:marco.molinaro@inaf.it)



# Join us!

*Thank you for  
your attention!*

~~We are  
too busy~~

Molinaro M.  
Bertocco S.  
Galluzzi V.  
Pasian, F.  
Taffoni G.  
Vicinanza M.  
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