




MACQUARIE
University



data  central



IVOA Interoperability Welcome

Macquarie University, Sydney, 20-24 May 2024



aus | SRC
SKAO Regional Centre Australia



ASTRO 3D



Some logistics

- Morning and afternoon tea, and lunch are served every day, but no afternoon tea on Friday
- **Welcome function:** 18:00 at Macquarie Ubar, 3 minutes down Wally's Walk towards the Central Courtyard
- For WiFi, if eduroam does not work, please do the following:
 - Connect to *Macquarie Events*
 - Browse to www.mq.edu.au where you will be redirected to insert the passcode: **welcome123**

State of the IVOA

*20-24 May 2024 Interoperability Meeting
Sydney Australia*

Simon O'Toole
IVOA Chair



ALL-SKY
VIRTUAL
OBSERVATORY



Current IVOA chair and vice-chair

Simon O'Toole - Chair

Nov 2023 - April 2025



JJ Kavelaars - Vice Chair

Nov 2023 - April 2025



What is the IVOA?

- IVOA founded in 2002
- 23 member projects
- Two interoperability meetings per year:
 - “Northern Spring”
 - “Southern Spring” (typically after ADASS)



Vision of the IVOA

Develop a FAIR data management framework for astronomy

- Interoperability standards (VO framework) amongst astronomical (ground and space based) archives
- Publishing tools for data centres

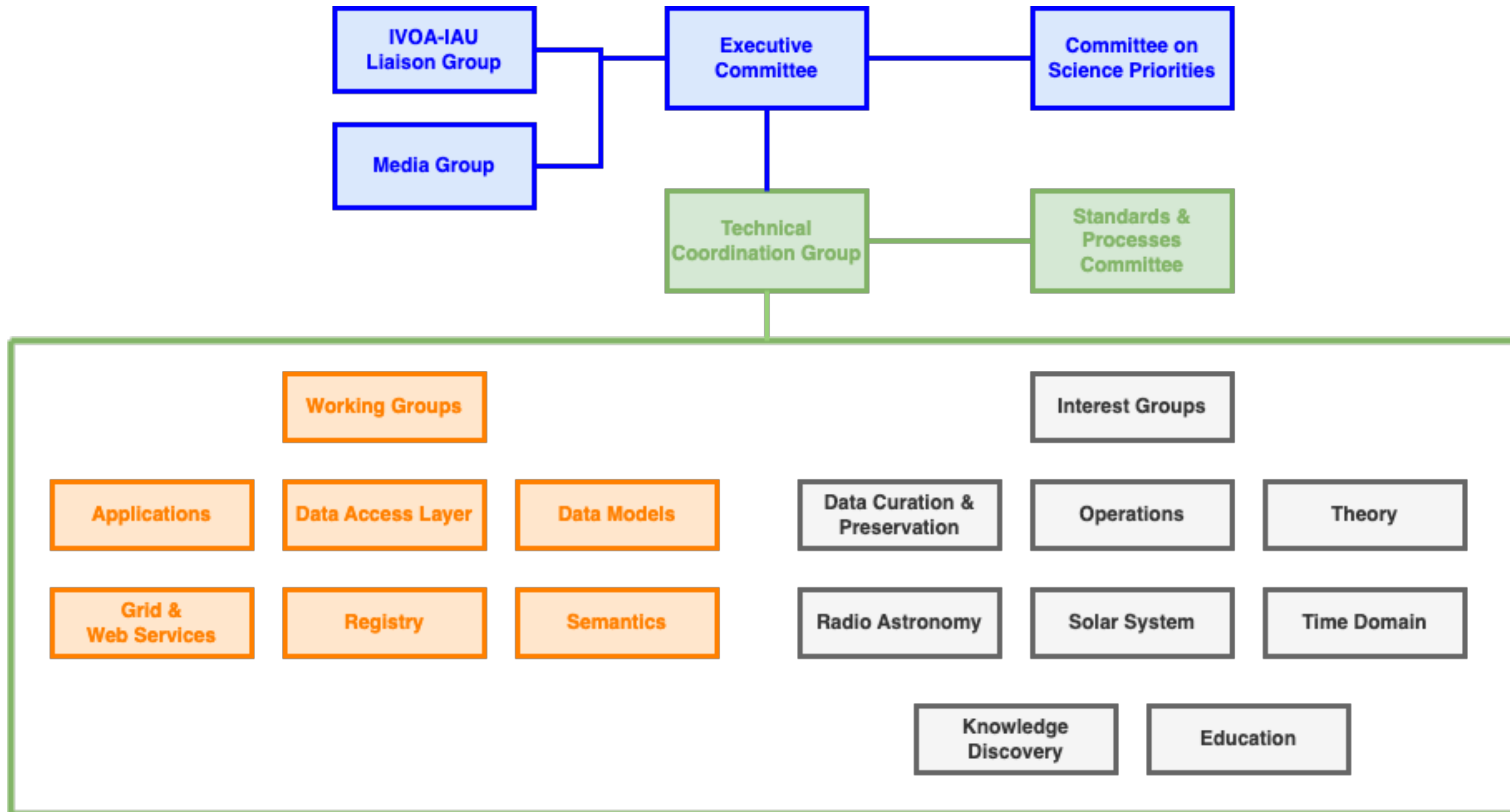
Enable new science through the VO

- Multi wavelength science, combining datasets from multiple sources
- Data discovery and data access tools
- Data analysis and visualization tools

World wide collaboration amongst astronomical VO projects

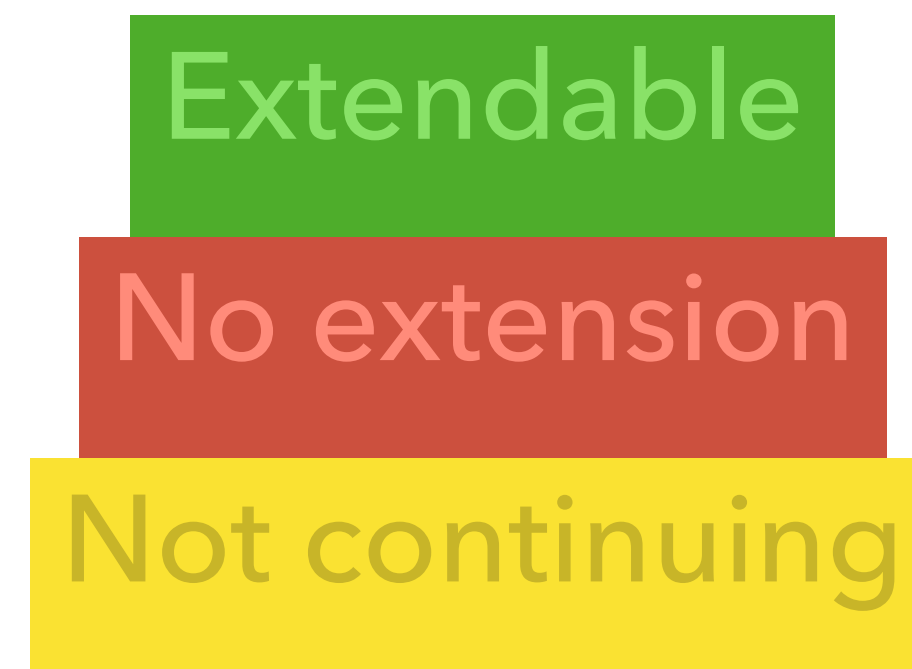
- No formal funding, nationally funded projects
- Diversity makes IVOA's richness

IVOA Organisation



Working and Interest Groups – Terms renewal

- WG/IG chairs and vice-chairs are three year terms, with one year extension possible
- Several terms are coming to an end:
- Working towards new candidates

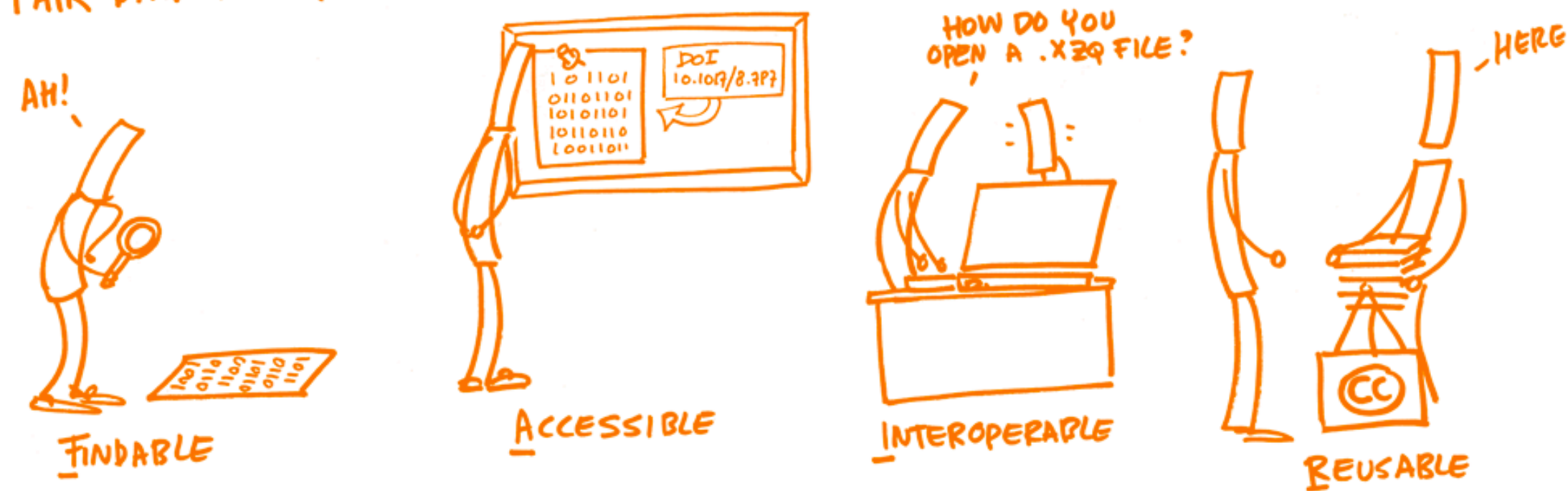


	Chair	Vice-Chair
TCG	Janet Evans	Marco Molinaro
Working Groups		
<u>Applications</u>	Pierre Le Sidaner	Adrian Damian
<u>Data Access Layer</u>	James Dempsey	Gregory Mantelet
<u>Data Model</u>	Mark Cresitello-Dittmar	Mathieu Servillat
<u>Grid and Web Services</u>	Jesus Salgado	Sara Bertocco
<u>Registry</u>	Renaud Savalle	Tess Jaffe
<u>Semantics</u>	Baptiste Cecconi	Sebastien Derriere
Interest Groups		
<u>Data Curation & Preservation</u>	Gilles Landais	Gus Muench
<u>Education</u>	Hendrik Heint	Shanshan Li
<u>Knowledge Discovery</u>	Raffaele D'Abrusco	Yihan Tao
<u>Operations</u>	Steve Groom	Tamara Civera
<u>Radio Astronomy</u>	Francois Bonnarel	Mark Kettenis
<u>Solar System</u>	Anne Raugh	Markus Demleitner
<u>Theory</u>	Simon O'Toole	Giuliano Taffoni
<u>Time Domain</u>	Rafael Martinez Galarza	Pierre Fernique
IVOA Committees		
<u>Exec</u>	Simon O'Toole	JJ Kavelaars
<u>Standard and Processes</u>	Patrick Dowler	
<u>Science Priorities</u>	Ada Nebot	Francesca Civano

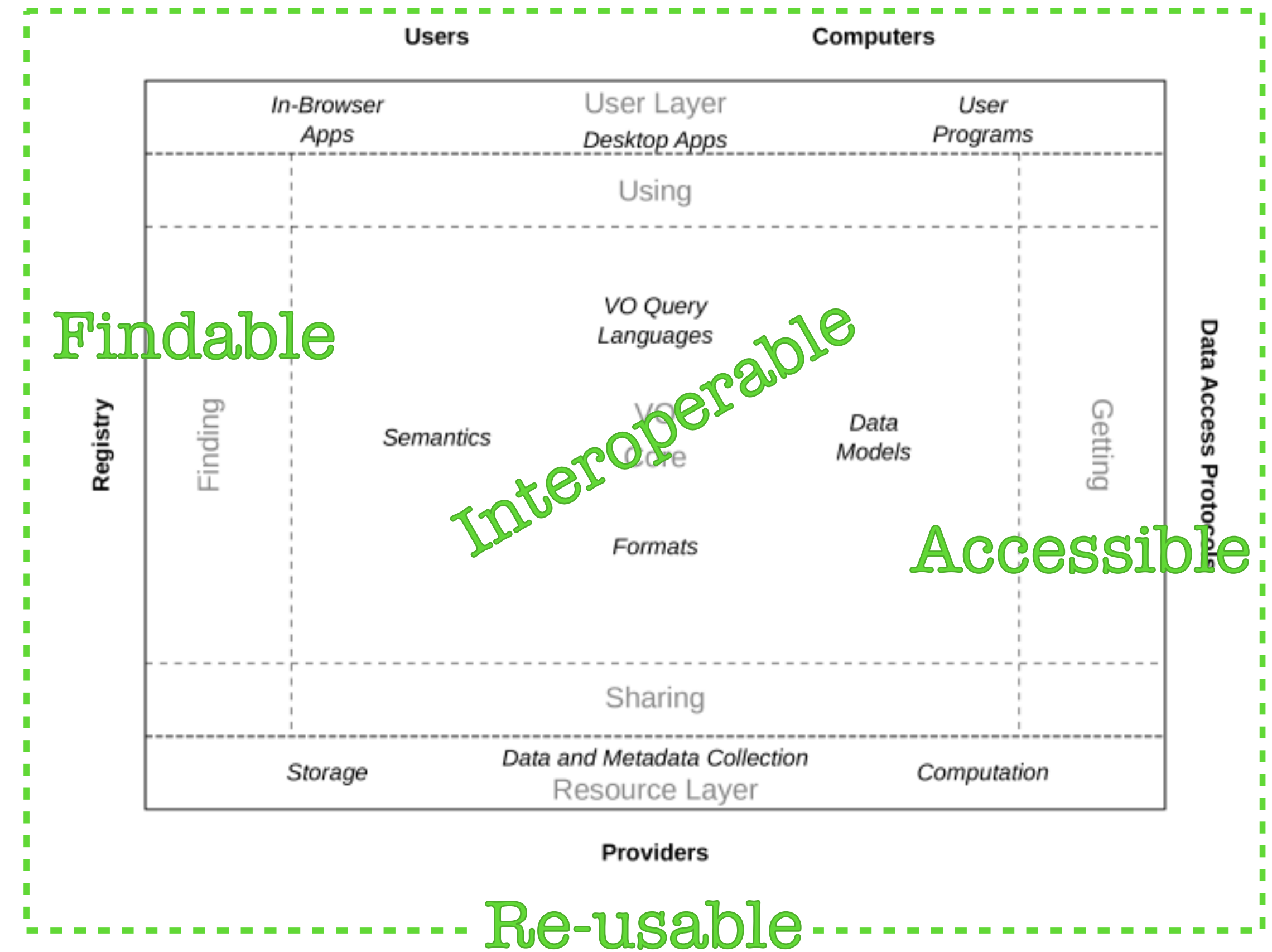
IVOA Architecture – FAIR Data

The Virtual Observatory has been FAIR from the beginning!

FAIR DATA PRINCIPLES

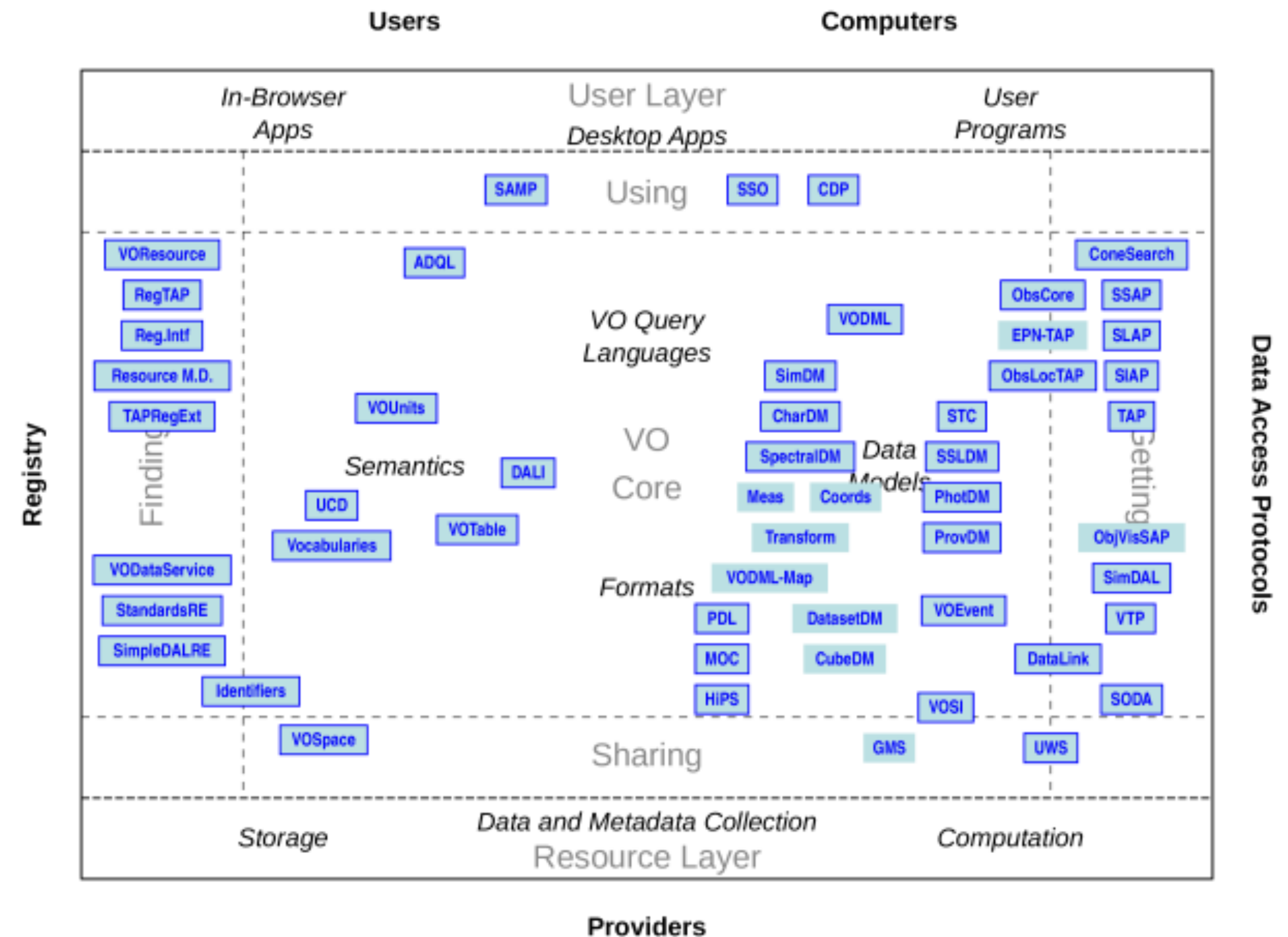


<https://www.fosteropenscience.eu/learning/assessing-the-fairness-of-data/>



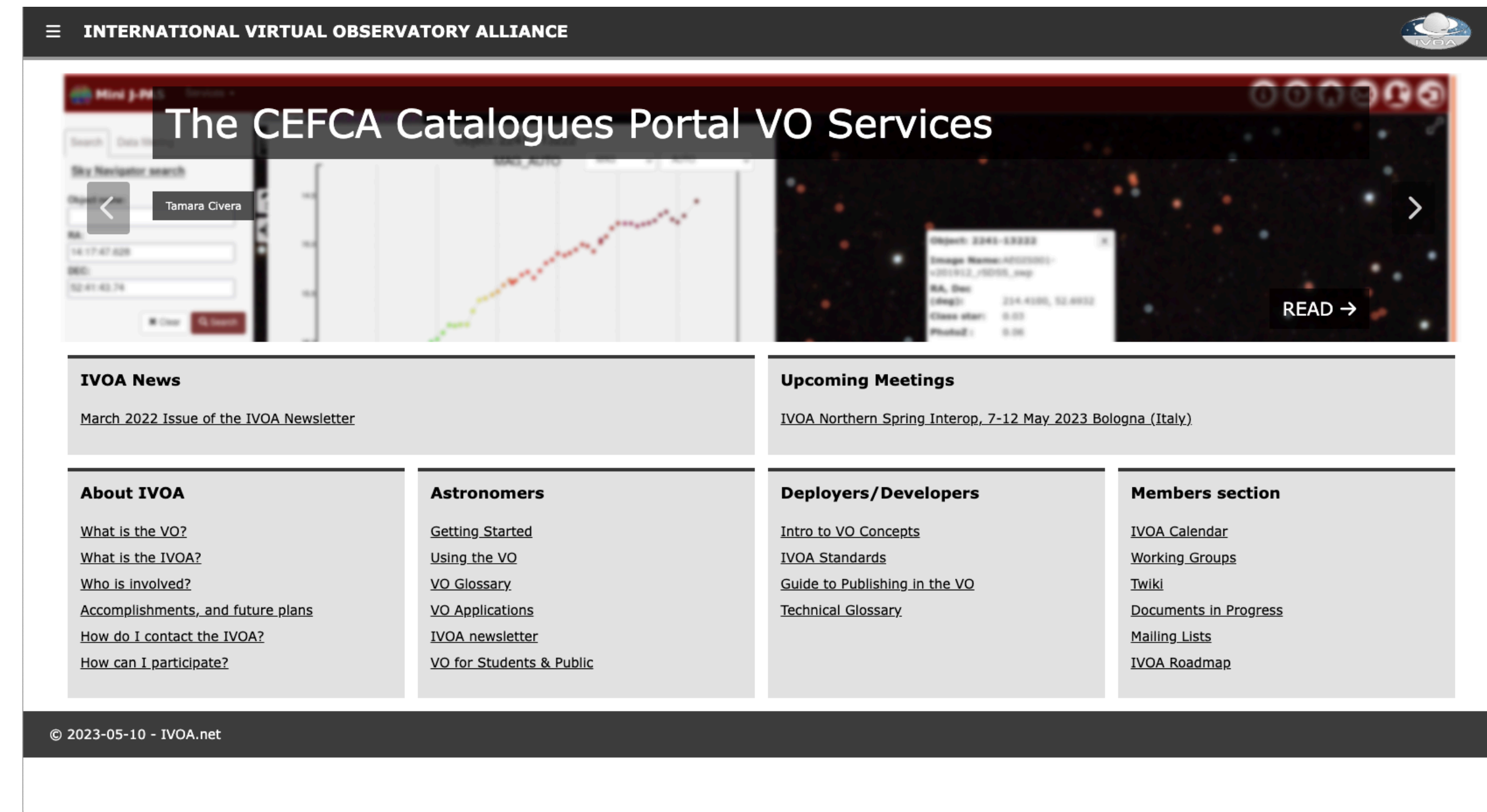
IVOA Architecture – All the Standards

- IVOA Architecture v2.0, last updated on 2021-10-29
- <https://tinyurl.com/IVOAArch2>
- IVOA is an open community – if a standard is close but doesn't fit – implement an extension & provide feedback to influence change to the standard



IVOA Website – we need YOU!

- New look and feel - see https://sdc-dev.astron.nl/ivoa_web/
- We need help to update and improve accessibility for Developers and Scientists
- Intro slides and worksheets: <https://tinyurl.com/3x9jtvdy>



Documentation Hackathon - Wednesday 14:00 onwards in C122

IVOA Newsletter – call for volunteers!

- The Newsletter will return!
- A great way to tell the IVOA and the world about the cool new projects you're working on!
- Advertise new services, workshops and other activities
- For this to happen we need 2-3 editors to volunteer – once a year
 - Call for and collate articles and items
 - Aiming for July releases



VO Project Updates

All-Sky Virtual Observatory



- Several talks in the Australian Data Landscape session (20 May 14:00 C122)
 - Data Central - James Tocknell
 - CASDA - Minh Huynh
 - MWA - Mouriyan Rajendran
 - Theoretical Astrophysical Observatory - Darren Croton
 - The Gravitational Wave Data Centre - Eric Thrane
 - Opportunities for Science Processing in the age of AI Foundation Models - Cormac Purcell

Canadian Virtual Observatory

Assisted in development and deployment of GMS, SSO and CADC-SI at SKA Regional Centre consortium sites.

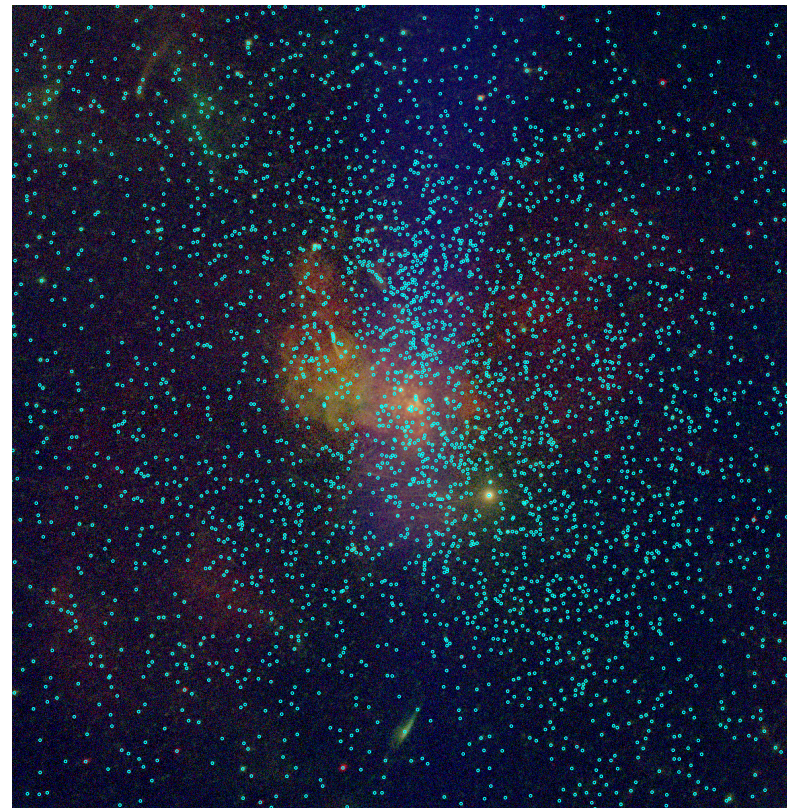
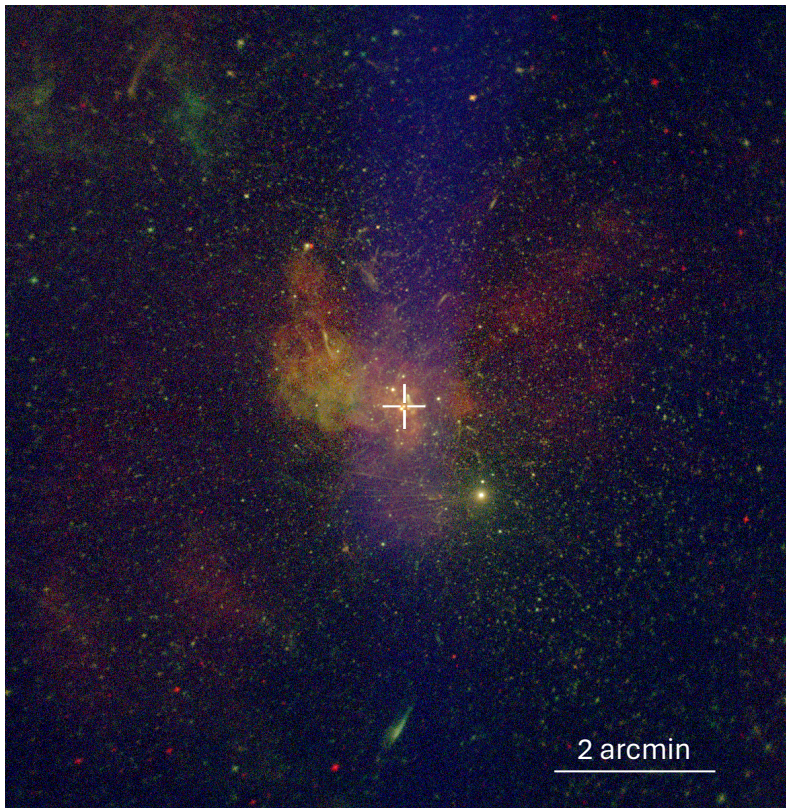
Deploying CANFAR at multiple SKA RC sites, integrated with GMS services for SKA-Regional Centre Network

Participating in Radio Interest Group development of ObsCore components needed to support Radio Astronomy in the VO

Continuing to contribute to *pyvo* project.

Chandra Source Catalog Release 2.1

- Catalog version 2.1 released publicly 2024 April 02
- Includes imaging data released publicly through 2021
- Observations stacked for fainter detection limit
- Detection limit $\sim 4\text{--}5$ photons on-axis
- Tied to Gaia-CRF3 astrometric frame
- 407,806 unique X-ray sources on the sky
- 2,143,847 detections + photometric upper limits
- 730.37 square degrees on the sky
- $\sim 45\text{TB}$ science ready FITS format data products
- IVOA compliant interfaces

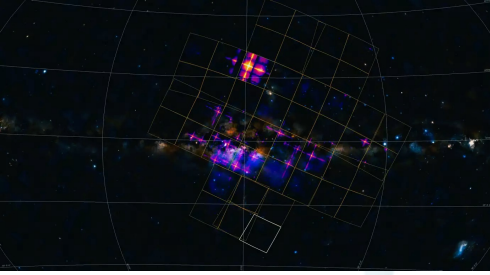


For more information see
<https://cxc.cfa.harvard.edu/csc/>

A cutout of a roughly 3 Ms observation stack (a co-add of 86 observations) from CSC 2.1, centered on Sgr A* (2CXO J174540.0-290028; identified by the cross). The positions of roughly 3,300 X-ray point sources in this region from CSC 2.1 are identified.

VO-based Einstein Probe (EP)

- Einstein Probe astronomical satellite was launched on January 9, 2024. Its first images were released on April 27, 2024.
 - The EP mission is led by Chinese Academy of Sciences (CAS). It is also an international collaboration mission with contributions from the ESA, the MPE in Germany, and the French space agency CNES.
 - The EP is a mission dedicated to time-domain high-energy astrophysics. Its primary goals are to discover high-energy transients and monitor variable objects.
- China-VO team contributed great efforts to the EP Scientific Application System, including Time-domain Astronomical Information Center, proposal system, science platform, etc.



Einstein Probe's view of our Milky Way

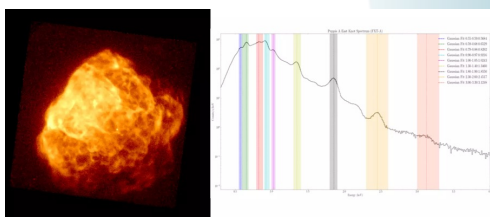
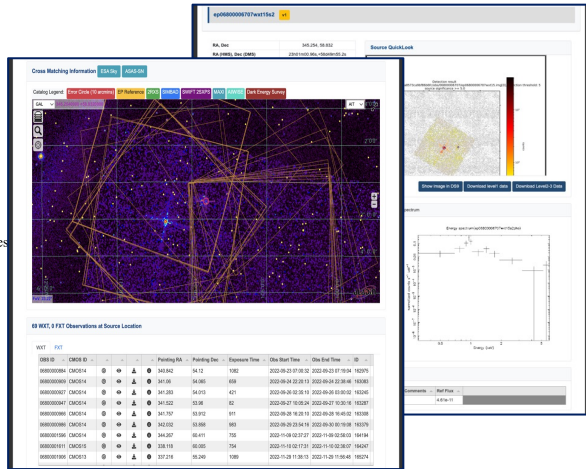
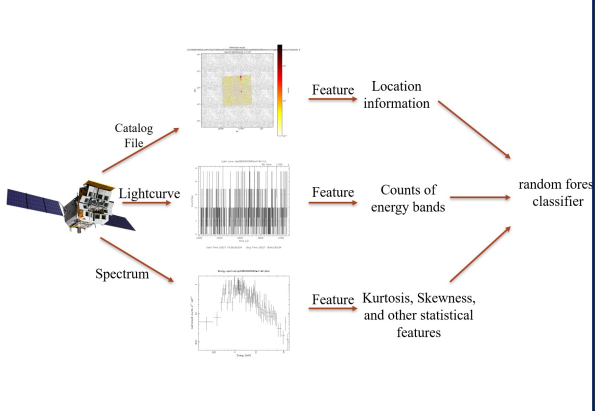


Image (left) and spectrum (right) of the supernova remnant Puppis A



NADC Science Platform for EP

Automatic X-Ray Source Classification and Multi-Wavelength Data Assisted Transient Identification

<https://nadc.china-vo.org/ep/>

ESDC VO highlights for IVOA Sydney Interop - May 2024

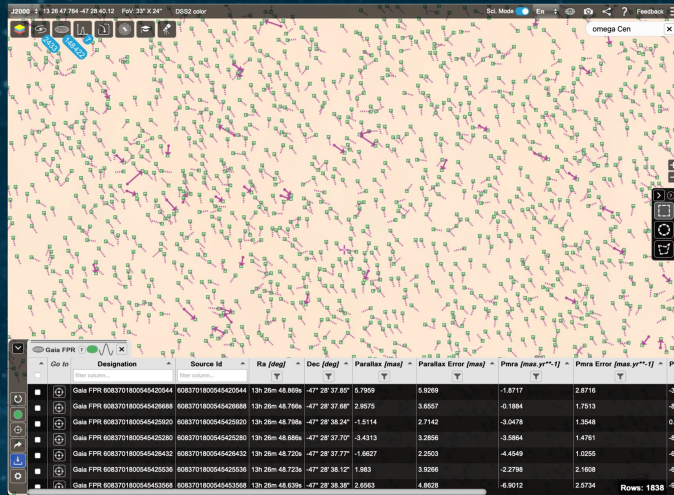
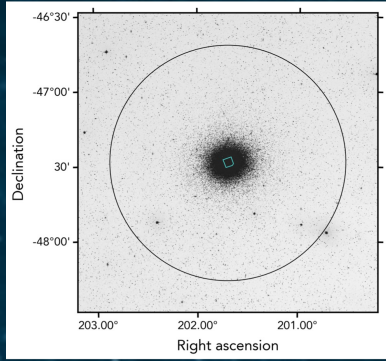
Christophe Arviset

13/05/2024

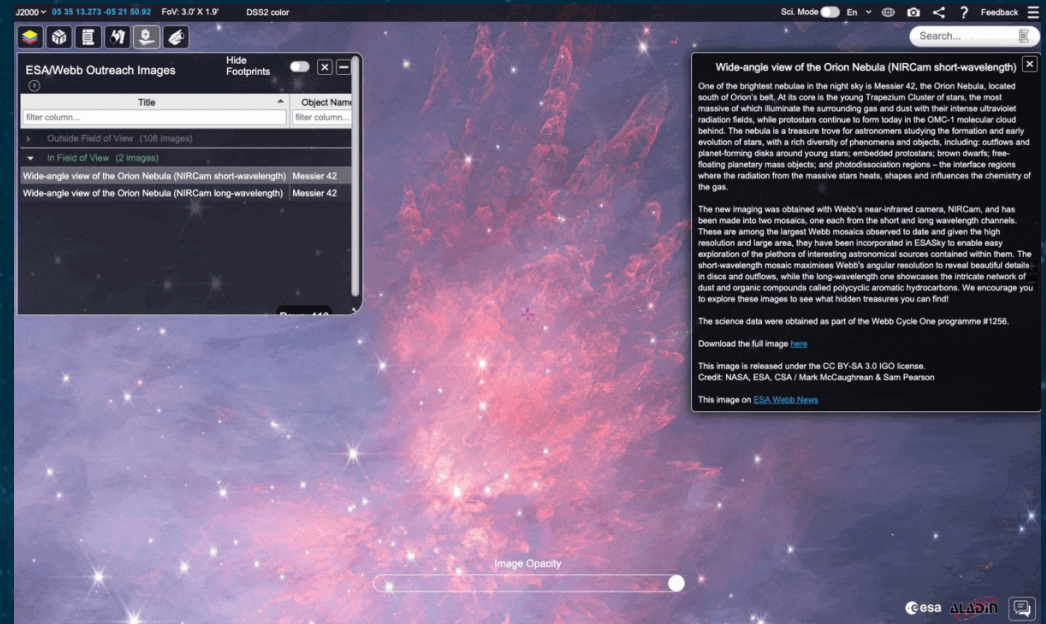
ESA UNCLASSIFIED – For ESA Official Use Only



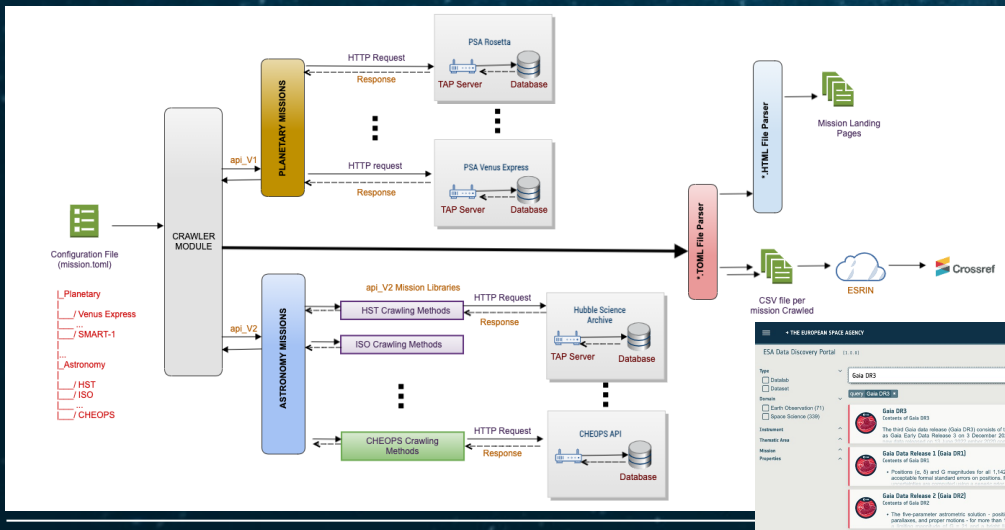
ESAC Science Data Centre (ESDC) – Archives Highlights



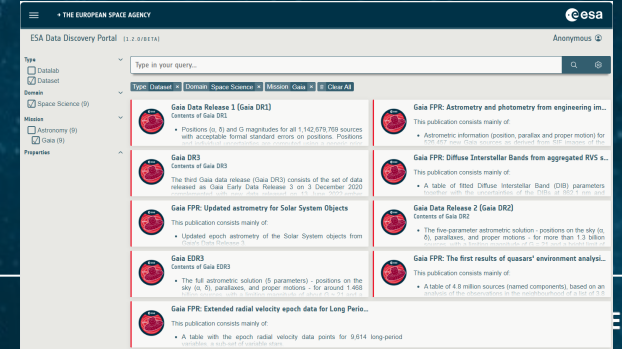
Gaia Focused Product Release, Oct'2023
TAP, ADQL and Datalink



ESASky w/Euclid and JWST outreach images
Many new Data added, User area new functionality



ESDC DOI Generator Tool and TAP service
Linked to ESA Data Discovery Portal



ESDC currently develops and maintains TAP+ v9.8 Common library used across ESA Science Archives services:

- Greenplum Database support
- Adding new IVO recommended UDFs
- Monthly release cadence

Continuous evolution / improvement of ESDC TAP+ services

Euclid Early Release Observations available through ESASky

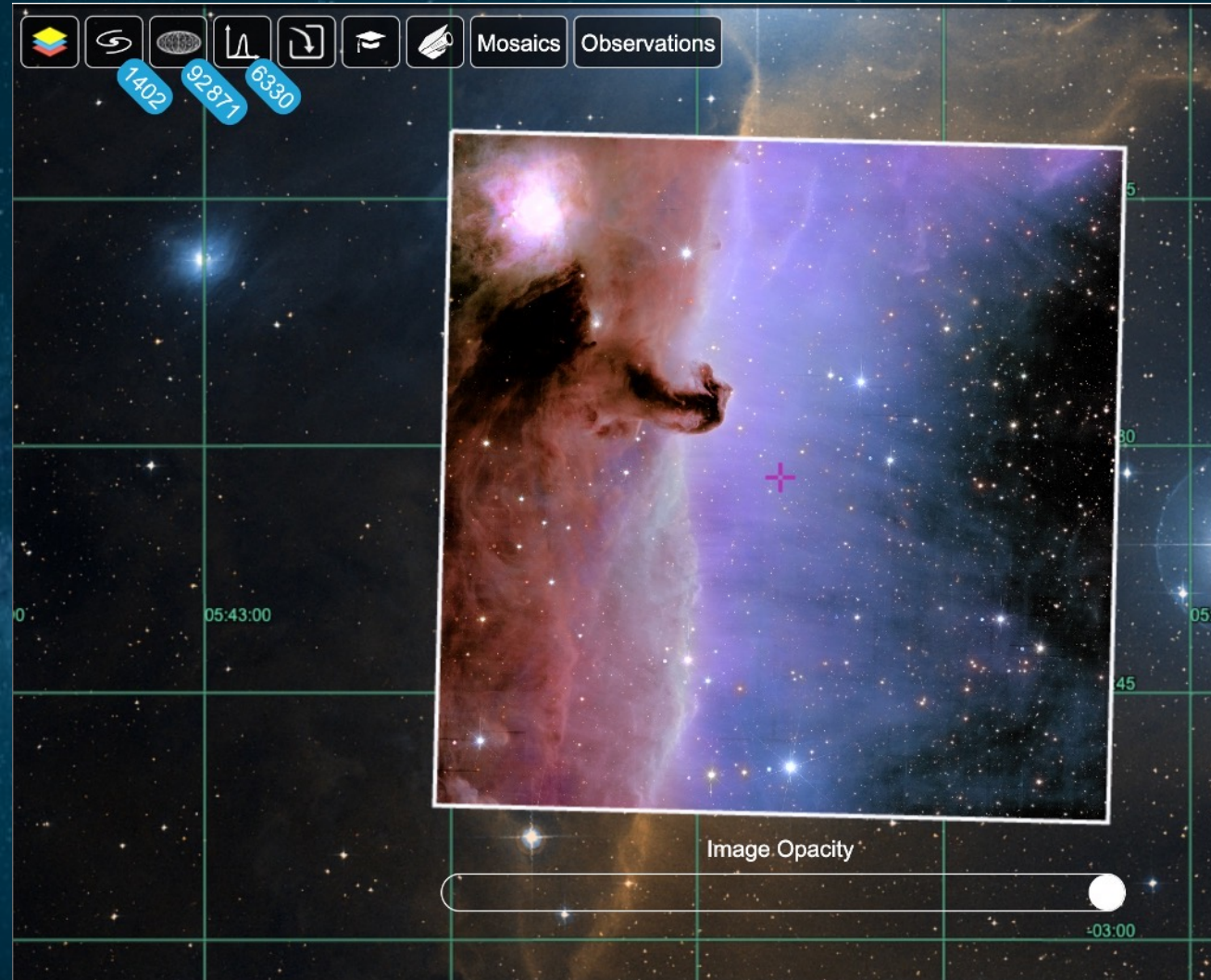
- #1 Nov 2023, #2 May 2024

Euclid On the Fly v1.1 data access through authorized TAP and DataLink (Feb 2024)

Adoption of Datalink beyond GAIA and Euclid projects

Work ongoing:

- TAP stateless service
- Use of GMS for TAP group authorization
- Row-level access authorization



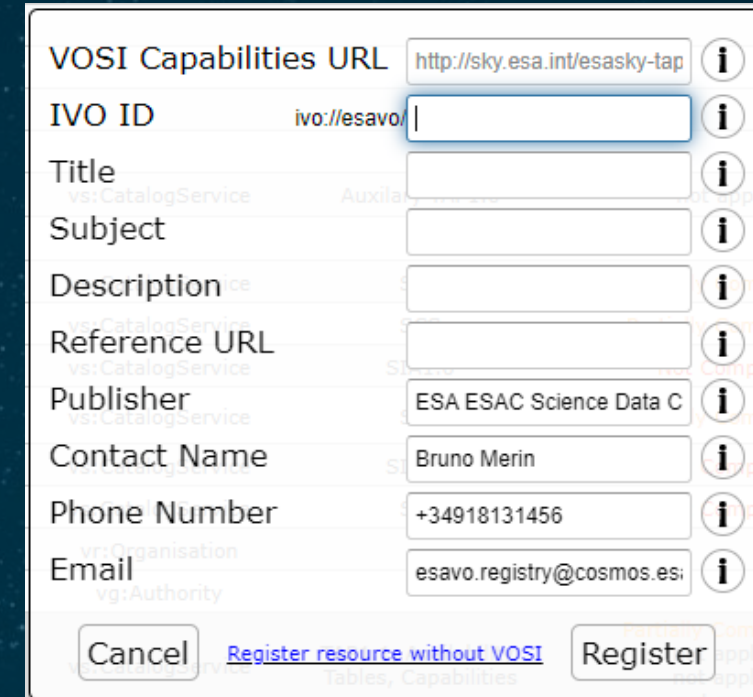
Various new versions over last year, and in particular v4.7 and 5.0 making use of VOSI to improve VO Resources registration and updates

New VO resource registration with VOSI support

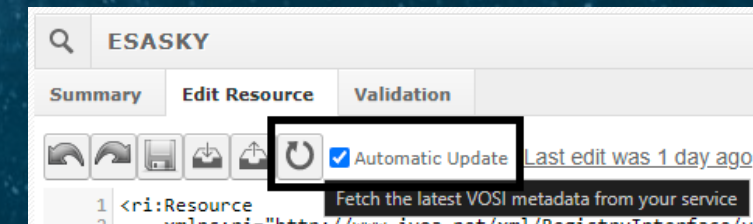
- Option to fetch the service's latest VOSI metadata information and automatically add it to your resource.

Existing VO resource updates with VOSI Updater

- Manually fetch the latest VOSI metadata from the service
- Euro-VO Registry will periodically poll services VOSI endpoints and update the resource XML to ensure the registered VOSI metadata is current.
- Service Publisher can opt out & therefore can easily browse and restore old versions



A screenshot of a web form for VOSI registration. The form includes the following fields: VOSI Capabilities URL (http://sky.esa.int/esasky-tap), IVO ID (ivo://esavo/), Title, Subject, Description, Reference URL, Publisher (ESA ESAC Science Data C), Contact Name (Bruno Merin), Phone Number (+34918131456), and Email (esavo.registry@cosmos.es). At the bottom, there are three buttons: 'Cancel', 'Register resource without VOSI', and 'Register'.



A screenshot of the ESASKY web interface. The page title is 'ESASKY'. There are three tabs: 'Summary', 'Edit Resource', and 'Validation'. Under the 'Edit Resource' tab, there is a 'Fetch the latest VOSI metadata from your service' button, which is highlighted with a red box. To its right, there is a checkbox for 'Automatic Update' which is checked, and a text label 'Last edit was 1 day ago'. Below the buttons, there is a list of resources with columns for ID, URI, and XML URI.

- EC funded **ESCAPE** Project – **concluded after 4 years** in 2023.
 - Project Website: <https://projectescape.eu>
 - VO-related Work Package: **CEVO "Connecting ESFRI to the EOSC via VO"**.
 - Involved Euro-VO partners with large Astronomy, Astroparticle and Solar physics partners.
- **ESCAPE continues** with an open collaboration agreement, including a “Virtual Observatory” activity.
- Proposal submitted: **“Astronomy Open Science Competence Centre”**.
 - A pilot project in the context of the European Open Science Cloud (EOSC)
 - Would provide events:
 - **Technology Forums; Data-Provider Forum ; Scientific Training Workshop/School**
 - Extends participation to Heliospheric Physics, Planetary Science, Space Weather



Euro-VO activities in the Open Science context

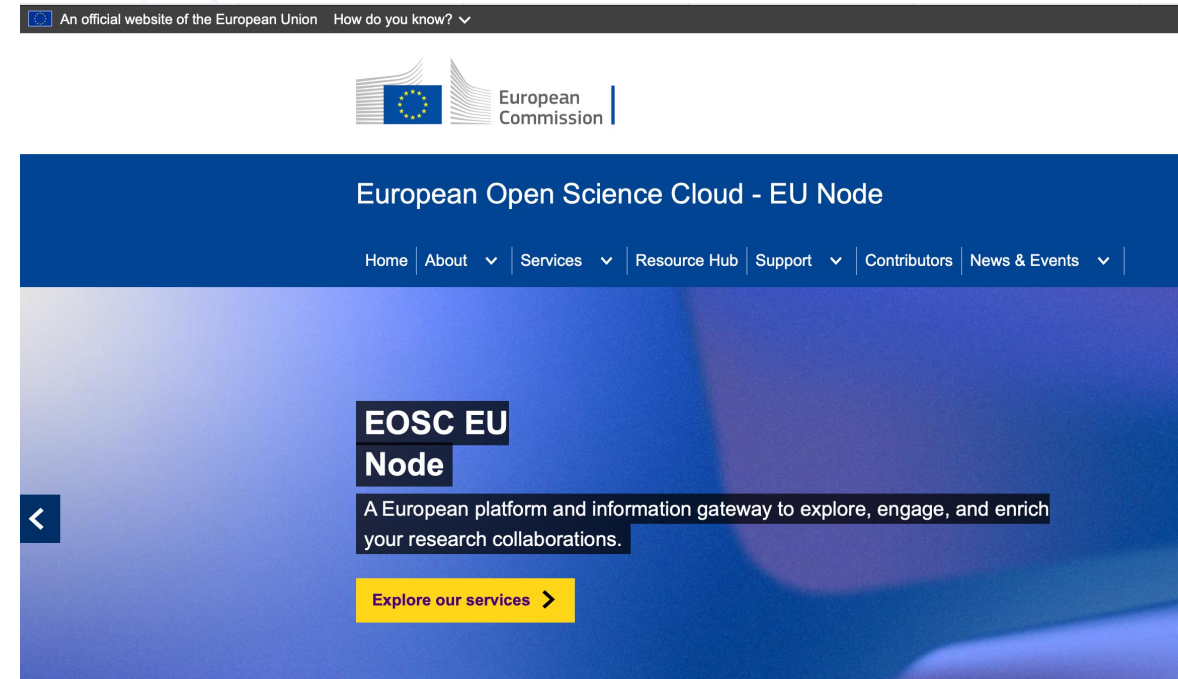
- VO resources / software / training resources are available in the European Open Science Cloud (EOSC)
- VO Registry harvested.
- VO software, e.g. mocpy, Aladin Lite
- Training tutorials:
 - e.g.

SOFTWARE


Year: 2022 | Views 159 | Downloads 149

Access and use of astronomy-related data from Python : a series of Jupyter notebooks tutorials

Euro-VO/ESCAPE repository of Python tutorials This repository contains Jupyter notebooks illustrating how astronomers can search, find, and access data they need from archives across the world. We offer a focus on data hosted at the Strasbourg astronomical Data Center (CDS) and o...



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HAPPY BIRTHDAY

VO France 20th anniversary

April 2024 :

Special VO annual meeting & semi-hackathon meeting at CDS where everything started

- ~40 participants

Several review talks

- 20 years of VO-France by F. Genova
- SSHADE
- Theory in VO
- Heliophysics
- Planetology
- High Energy
- ...

Also :

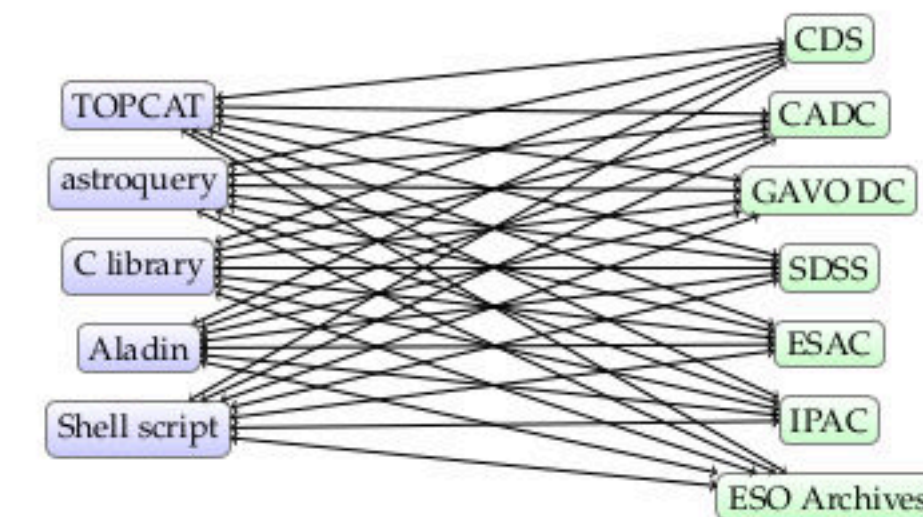
Feedbacks of the French IVOA chairs & vice-chairs to the French community

→ very useful so that people who do not participate to InterOps are aware of the actions



German Astrophysical Virtual Observatory

- Standards activities on RegTAP 1.2, VODataService 1.3 with product-type metadata, VO interfaces to bibliographic services
- Currently running a semester-long lecture on the VO. Material on <https://codeberg.org/msdemlei/vo-course>
- Read about new VO resources in the Fediverse: gavo@botsin.space.
- Re-publishing the DASCH plate metadata to the VO (see also blog.g-vo.org)



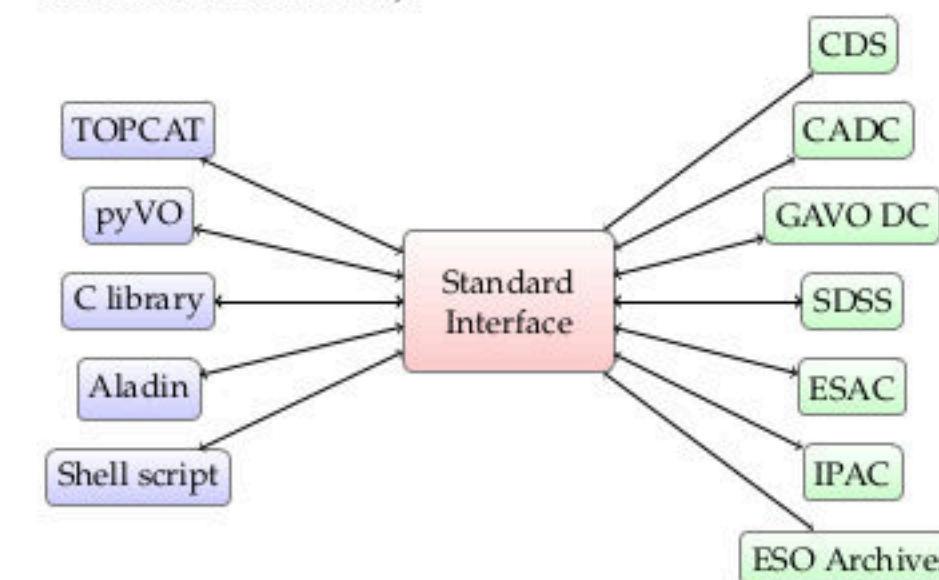
Note that M , the number of servers, is potentially pretty large. Try

```
SELECT DISTINCT gavo_getauthority(access_url)
FROM rr.interface
```

on the GAVO DC TAP server; for me, that's more than 200 different hosts running services. With a few clients in the mix, you'd quickly be up to hundreds of fragile adapter functions that would have to be maintained.

Data Access With Standards

With a standards there's just one thing to get right for each client and server (i.e., $N + M$ sources of brokenness):



NAVO activity summary for May 2024 Interop

- **Standards**
 - MAST heavily involved in VOTable 1.5
- **Implementations:**
 - MAST migrated servers to new Python-based infrastructure
 - IRSA validating new SOFIA data services in preparation for release
 - IRSA preparation for Euclid along with MAST preparation for Roman are both driving the NAVO archives to coordinate our ObsTAP+DataLink development.
 - IRSA developers contributed code to Astropy to provide support for Parquet serialization in VOTables.
 - HEASARC preparing a VO plugin to Jdaviz based on PyVO, see demo in Apps session.
 - NAVO continues to contribute to PyVO maintenance and development. HEASARC just recently added a fraction of a developer to tackle some of our To Do list.
- **Metadata:**
 - ObsCore being developed/modified to provide a consistent user experience.
- **Outreach:**
 - AAS Winter Workshop
 - Bruce organizing IAU General Assembly in South Africa a session on "Community Engagement , Open Science and the Virtual Observatory."

NAVO agenda for this Interop

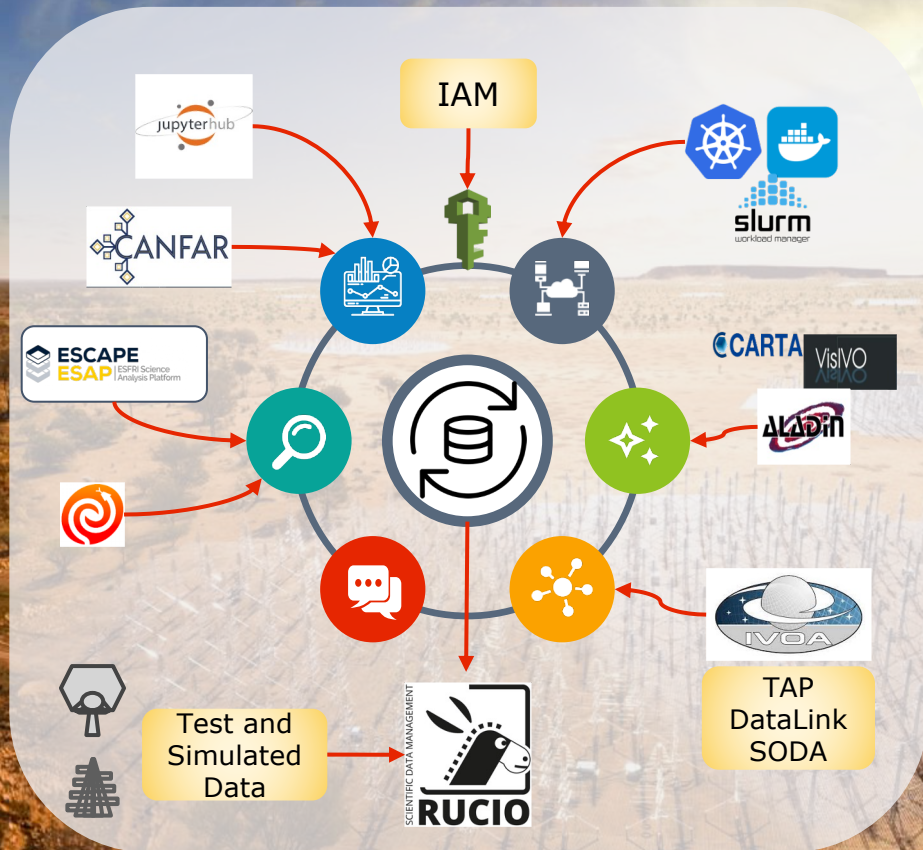
- Anastasia LAITY: summarizes NAVO experience so far in trying to implement cross-archive ObsCore+DataLink services that will allow smooth and consistent user experience across all NASA missions. (Ops)
- Duy NGUYEN: presents a new VO client for the Jdaviz pure-Python visualization suite developed at Space Telescope for JWST and beyond. (Apps2)
- Tess JAFFE: proposes a yearly Spring Cleaning exercise to regularly assess the metadata we use for service and data discovery (Registry)
- **NAVO+LINCC: demonstrate HipsCat+Parquet work ?**
- Session organization:
 - TJ for Registry
 - Steve GROOM for Operations

SKAO and IVOA

- First version of the SKA Regional Centre Network (SRCNet) planned for **Jan 2025**
- Architecture VO-Inside:
 - TAP+DataLink+SODA+...

Contributions:

- Support on SODA for other operations (apart from cut-outs)
- Support on the definition and implementation of ExecutionBroker (prev. known as ExecutionPlanner)
- SRC Astroquery module under development



Italian VO contribution

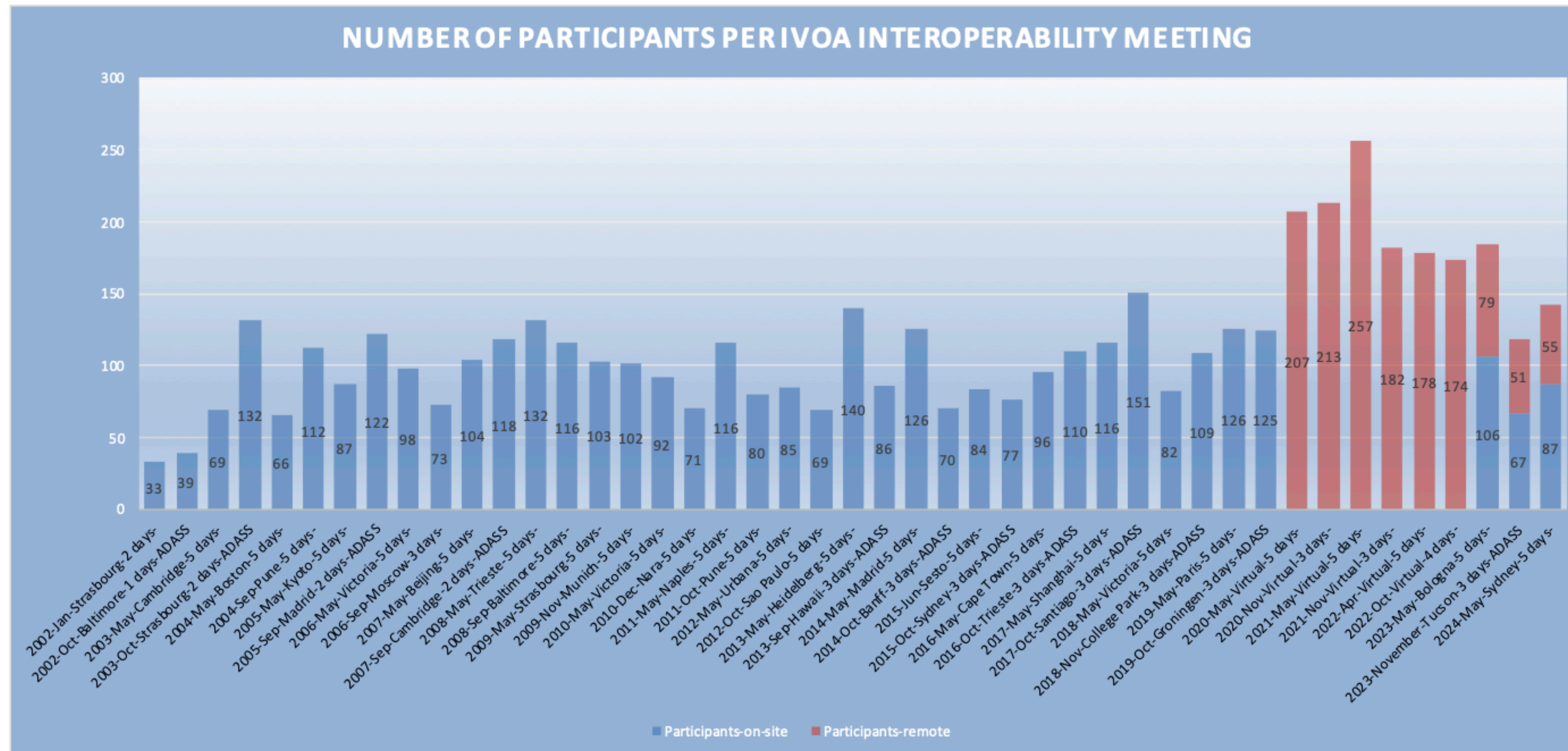


- Contribution to Radio VO:
 - WD "Obscore Extension for Radio data"
 - Note "Pulsar and FRB Radio Data Discovery and Access"
 - related vocabularies
 - Data collection and metadata curation for SRCNet Orange Team
 - visualization of SKA data (high volume of users and high amount of data)
- Gravitational Waves interoperability using VO standards environment
 - LIGO / Virgo / KAGRA / ET
 - participation in EU funded projects and proposals
- High Energy interoperability interest (MAGIC data)
- contribution to INAF events on dissemination of FAIR principles through VO lenses

VObs.it

- INAF, ASI-SSDC, INFN
- support to web assets
 - DNS, web, wiki, mail, docrepo
 - & their restructuring

Meeting attendance



Hybrid meeting

- 87 in person
- 55 online

Meeting codes of conduct

IVOA Code of Conduct

It is the policy of the IVOA that its members and all participants in IVOA activities should experience an environment that is free from harassment. We want to promote a diverse and inclusive environment with respectful and courteous behaviour and therefore we expect all participants to adhere to the following guidelines:

- Behave professionally. Refrain from harassment in any form, including: sustained disruption of talks or other events; inappropriate physical contact or intimidation; potentially offensive comments related to for example: age, gender, sexual orientation, disability, physical appearance, race, nationality, politics or religion.
- Ensure that all communications are appropriate for a professional audience that may include people with different backgrounds. Sexual or sexist language and imagery are never appropriate.
- Be considerate and respectful to others.
- Critique ideas, not people.

This code of conduct applies to all IVOA community interactions online and offline, including mailing lists, forums, social media, conferences, meetings, associated social events, and one-to-one interactions.

Because of the wide international nature of the IVOA, it is important to realize that behaviour and language that are welcome/acceptable in one particular cultural environment may be unwelcome/offensive in another. Consequently, individuals must use discretion to ensure that their words and actions communicate respect for others

Anyone who witnesses a deviation from these guidelines is asked to communicate confidentially to the Chair or Vice Chair or any member of the IVOA Executive Committee. The IVOA Executive will take the necessary corrective measures.

We thank you for helping us to make the IVOA a welcoming, diverse and respectful environment for all.

AAO RDS Code of Conduct

This is the default Code of Conduct for all RDS workshops, and outlines the minimum expectation for behaviour and conduct of all participants at RDS hosted or endorsed meetings or events, and RDS members at all meetings or events.

- Behave professionally. Harassment and sexist, racist, or exclusionary comments or jokes are not appropriate. Harassment includes, but is not limited to, sustained disruption of talks or other events, inappropriate physical contact, sexual attention or innuendo, deliberate intimidation, stalking, and photography or recording of an individual without consent. It also includes offensive comments related to issues including race, gender, sexual orientation, disability, physical appearance, body size or religion.
- All communication should be appropriate for a professional audience including people of many different backgrounds. Sexual or sexist language and imagery is not appropriate.
- Be considerate and respectful to others. Do not insult or put down other attendees. Critique ideas rather than individuals.

Individuals engaging in behaviour prohibited by this policy as well as those making allegations of harassment in bad faith will be subject to disciplinary action. Such actions range from a verbal warning to ejection from the meeting or activity in question without refund of registration fees and the reporting of their behaviour to their employer.

Anyone who wishes to report a violation of this policy is asked to speak confidentially to the meeting organisers.

Let's get to work

- Thanks to the **AAO Research Data & Software** team for organising this interop
- Thanks to all our sponsors
- Thanks to Janet and Marco and all **WG/IG** chairs for putting up the programme
- Looking forward for a fruitful, constructive and interactive meeting!
- Remember it's an hybrid meeting, keep including remote participants!