

# CDS and the VO

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CDS Council -- 19 September 2012

# Virtual Observatory

- Framework for interoperable and efficient access to astronomical data and services
- e-Science for Astronomy
- Based on global standards
- co-ordination via IVOA



# Vision

- Archives and databases form a ‘digital sky’
- New possibilities via data discovery, efficient data access and interoperability

*Driven by:*

- Exploding data rates
- Multi- $\lambda$ , time-domain & survey science
- Astronomers demand/expectation of interoperability




# CDS involvement

- Development of VO standards
- Leadership roles in IVOA, EuroVO, VOFrance
- CDS services a major building block of VO
- VO science tools and services
- Science tutorials, outreach/education
- VO software libraries (UWS, TAP,...)

# CDS approach to VO

- Participate fully in VO development of standards -- it improves the CDS services
- Helping the community to become interoperable raises the global level, and increases use of CDS services
- Implementation of VO in CDS services alongside other access modes
- Use VO to foster more innovation and collaboration

# Projects

- **EURO**  European co-ordination
  - **AVO** (FP5)
  - **VOTech** (FP6)
  - **EuroVO-DCA** (FP6)
  - **EuroVO-AIDA** (FP7)
  - **EuroVO-ICE** (FP7)
  - **CoSADIE** (FP7) *Sept 2012 - Aug 2014*

# IVOA

- Leadership roles:

\*current

**Genova** - Chair 2006-7, Vice-Chair 2005-6, DCP IG Vice chair 2004-7,  
Comm. Standards and Processes 2007-

**Ochsenbein** - VOTable Chair 2003-9

**Fernique** - Applications WG Vice-Chair 2011-

**Allen** - Applications IG/WG Chair 2005-8, Comm. Science Priorities 2009-  
Newsletter Editor, Secretary 2009-

**Derriere** - Semantics WG Chair 2008-12

**Schaaff** - Grid and Web Services WG Vice Chair 2011-

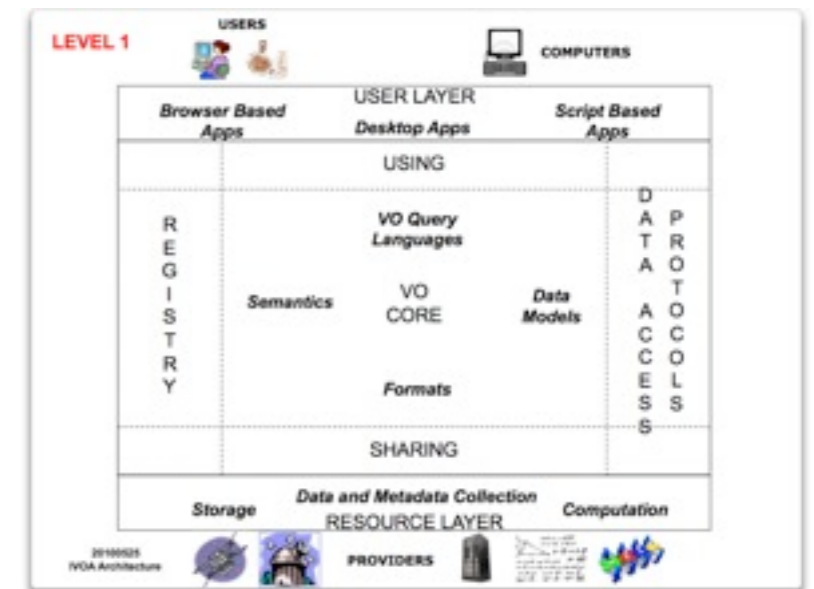
**Preite-Martinez (INAF)** - Semantics WG Chair 2005-8

**Louys (LSIIT)** - Data Models WG Chair 2007-11, Semantics WG Vice-Chair 2011-

**Wozniak (Obs. Strasbg.)** - Theory WG Chair 2008-11

# IVOA Improved:

- Architecture
- Technical Assessment and Roadmap
- Science Priorities
- Standards documents available via [arXiv.org](https://arxiv.org)



# IVOA Challenged:

- reduced resources across most member VO projects



# Specific CDS contributions to IVOA standards

- VOTable
- Data Access Layer
  - Simple Spectral Access (SSA), Simple Image Access (SIA), Table Access Protocol (TAP)
- Data models: Characterisation, ObsTAP, Spectrum, **Simulation**, **Photometry**
- Applications: **SAMP**
- GWS: **VOSpace 2.0**, Basic Profiles
- Semantics: UCDS, **Units**

*see the list of IVOA standards 'signed' by CDS members* **\*(most recent)**

# Technical Specifications

Group	Title	Most stable	In progress	Version
App	Simple Application Messaging Protocol	1.3		1.3 1.3 1.3  1.3 1.3 1.2 1.2 1.2 1.11 1.11 1.10
DAL	Data Access Layer Interface	1.0		1.0
	Simple Cone Search	1.03		1.03 1.02 1.01 1.00
	Simple Image Access	1.0		1.0 1.0 1.0 1.01 1.00
	Simple Line Access	1.0		1.0 1.0 1.0 1.0 1.0 1.0
	Simple Spectral Access	1.1		1.1 1.1 1.1 1.1 1.04 1.03 1.02 1.01 1.01 1.00
	Table Access Protocol	1.0		1.0 1.0 1.0 1.0 1.0 1.00
	TAPRegExt: a VOResource Schema Extension for Describing TAP Services	1.0	[RFC]	1.0 1.0 1.0 1.0 1.0 1.0
	IVOA Astronomical Data Query Language	2.00		2.00 2.00 2.00 1.01 1.00
DaM	IVOA SkyNode Interface	1.01		1.01 1.00
	Photometry DM	1.0	[RFC]	1.0 1.0 1.0 1.0  1.0
	Simulation Data Model	1.0		1.0 1.0 1.0 1.0 1.0 1.0
	Space-Time Coordinate Metadata for the Virtual Observatory (STC)	1.33		1.33 1.31 1.30 1.21 1.20 1.10 1.00
	Data Model for Astronomical DataSet Characterisation	1.13		1.13 1.12 1.12 1.11 1.10 1.00
	Simple Spectral Lines Data Model	1.0		1.0 1.0 1.0 1.0 1.0
GWS	IVOA Spectrum Data Model	1.1		1.1 1.1 1.1 1.03 1.02 1.01 1.01 1.01 1.00
	Observation Data Model Core Components and its Implementation in the Table Access Protocol	1.0		1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
	Parameter Description Language		[0.1]	[0.1]
	IVOA Single-Sign-On Profile: Authentication Mechanisms	1.01		1.01 1.01 1.00 1.00
	VOSpace service specification	1.15	[RFC]	2.0 2.0 2.0 2.0 2.0 2.0 1.15 2.0 1.15 1.15 1.1
ReR	IVOA Credential Delegation Protocol	1.0		1.0 1.0 1.01 1.01 1.00
	Universal Worker Service	1.0		1.0 1.0 1.0 1.0 1.0 1.0
	IVOA Support Interfaces	1.0		1.0 1.0 1.0 1.0 1.0 1.0
	IVOA Web Service Basic Profile	1.0		1.0 1.0 1.0 1.0 1.0
	Describing Simple Data Access Services	1.0	1.0	1.0
	IVOA Identifiers	1.12		1.12 1.11 1.10 1.10 1.10 1.00
	IVOA Registry Interfaces	1.0		1.0 1.0 1.00 1.02 1.01 1.00
	Resource Metadata for the Virtual Observatory	1.12		1.12 1.12 1.10 1.10 1.01 1.01 1.00 1.00
Semantics	StandardsRegExt: a VOResource Schema Extension for Describing IVOA Standards	1.0		1.0 1.0 1.0 1.0 1.0 1.0 1.0
	SimpleDALRegExt: Describing Simple Data Access Services	1.0	[RFC]	1.0 1.0
	VOResource: an XML Encoding Schema for Resource Metadata	1.03		1.03 1.02 1.02 1.01 1.00
	VODataService: a VOResource Schema Extension for Describing Collections and Services	1.1		1.1 1.1 1.1 1.1 1.1 1.10
	Units in the VO	1.0	[RFC]	1.0 1.0 1.0
	An IVOA standard for Unified Content Descriptors	1.10		1.10 1.10 1.06 1.05 1.03
	UCD1+ Controlled Vocabulary	1.23		1.23 1.22 1.21 1.20 1.20 1.11 1.11 1.10 1.02 1
SDP	Maintenance of the list of UCD words	1.20		1.20 1.20 1.10 1.00
	Vocabularies in the Virtual Observatory	1.19		1.19 1.18 1.16 1.15 1.13 1.00
	IVOA Document Standards	1.2		1.2 1.2 1.2 1.2 1.2 1.1 1.1 1.0 1.0
	VOE	2.0		2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 1.11 1.11 1.10
VOT	1.2		1.2 1.2 1.2 1.20 1.20 1.10 1.00	

Maturity level: ■ Recommendation ■ Proposed Recommendation ■ Working Draft

Most stable: New systems should be developed against this version with the highest maturity level.

In progress: Indicates if any a new version of the document under development (but with a lower maturity level than its predecessor) and a link to the relevant Request For Comments (RFC)

# VO in CDS services

- VO compliance in services
  - Significant improvements in VO access alongside existing modes (Vizier/Simbad/Aladin)
- Aladin ‘VO Portal’
- VO interoperability of tools (SAMP)
- Innovation (e.g. MOC, Cross-Match)

# Vizier SED example

Photometry metadata  
+ Standard services

➔ Vizier photometry interoperable with others (NED), and useable in VAO SED tool 'Iris'

METAfilter  
Post annotation

The view with METAPhot METAftr (1043 rows)

photid	filterid	famid	ucdid	system	filter	lambda0	dlambda	freq0	dfreq	Emag0	Ncat	Ntup
						um	um	GHz	GHz	yr		
1	1	0	935	Johnson-Morgan U	0.3502	0.0639	8.565e+05	1.566e+05	1.790e+03	0	0	0 from ADPS( $\lambda_0$ ), <a href="http://nsed.ipac.caltech.edu/">http://nsed.ipac.caltech.edu/</a>
1	2	0	933	Johnson-Morgan B	0.4425	0.0928	6.876e+05	1.467e+05	4.063e+03	0	0	0 from ADPS( $\lambda_0$ ), <a href="http://nsed.ipac.caltech.edu/">http://nsed.ipac.caltech.edu/</a>
1	3	0	932	Johnson-Morgan V	0.5544	0.0843	5.481e+05	8.416e+04	3.636e+03	0	0	0 from ADPS( $\lambda_0$ ), <a href="http://nsed.ipac.caltech.edu/">http://nsed.ipac.caltech.edu/</a>
4	1	0	935	uvby	0.3451	0.0349	8.687e+05	8.785e+04	4.734e+03	1	1	0 from ADPS( $\lambda_0$ )+201
4	2	0	934	uvby	0.4108	0.021	7.298e+05	3.731e+04	4.871e+03	2	2	0 from ADPS( $\lambda_0$ )+201
4	3	0	933	uvby	0.4669	0.019	6.421e+05	2.613e+04	4.288e+03	4	4	0 from ADPS( $\lambda_0$ )+201
4	4	0	932	uvby	0.5478	0.0237	5.473e+05	2.368e+04	3.768e+03	46	46	0 from ADPS( $\lambda_0$ )+201
9	1	0	713	Johnson	0.3531	0.0619	8.49e+05	1.488e+05	1.810e+03	0	0	0 from ADPS( $\lambda_0$ )+NEI
9	2	0	682	Johnson	0.4442	0.0891	6.749e+05	1.354e+05	4.260e+03	101	101	0 from ADPS( $\lambda_0$ )+NEI



Load File



SED Builder



SED Viewer



Fitting Tool



SED Builder

SED: New Remove Save Duplicate Broadcast

Open SEDs

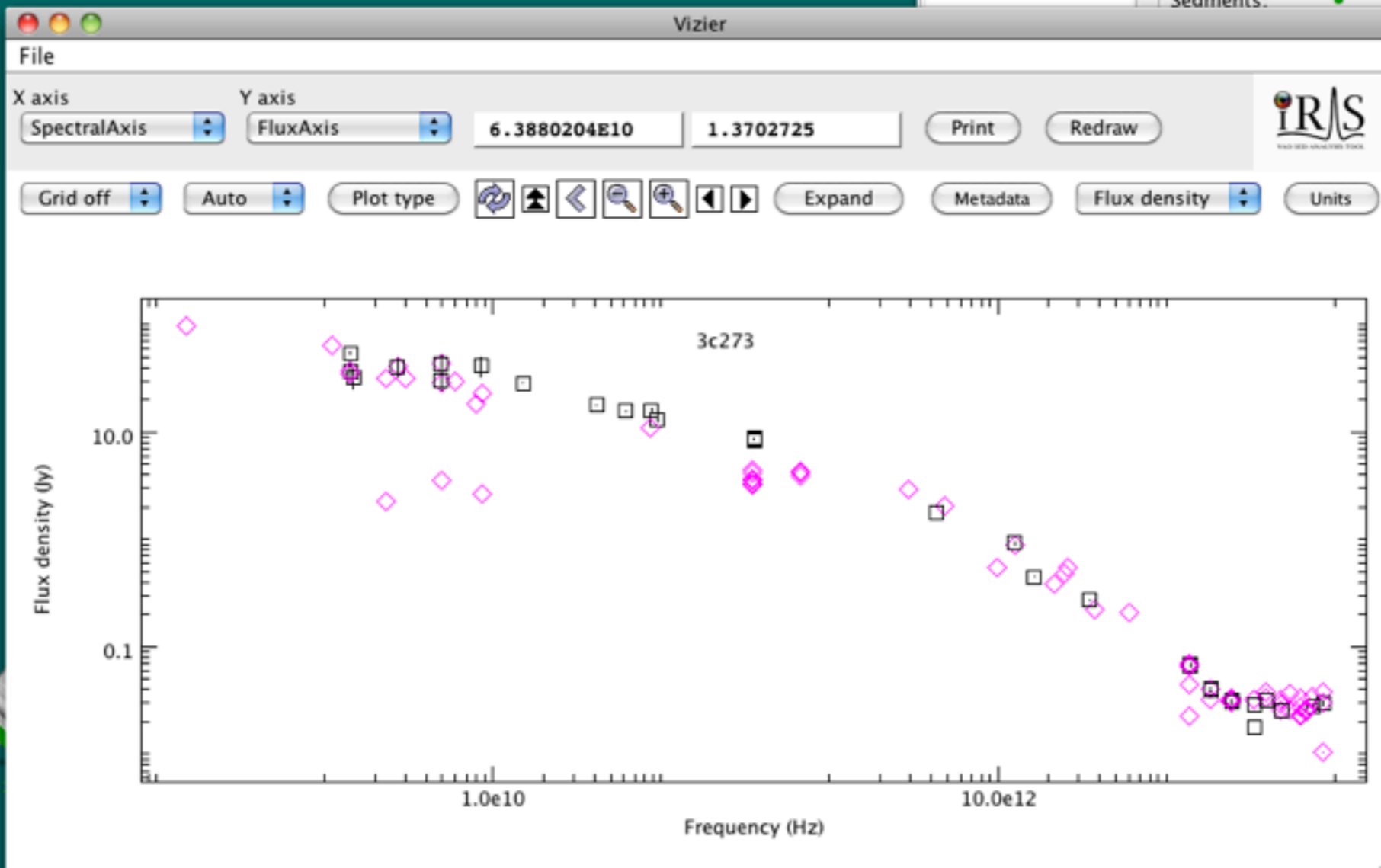
- VizieR (Segments: 53)
- Sed0 (Segments: 1)

Selected SED

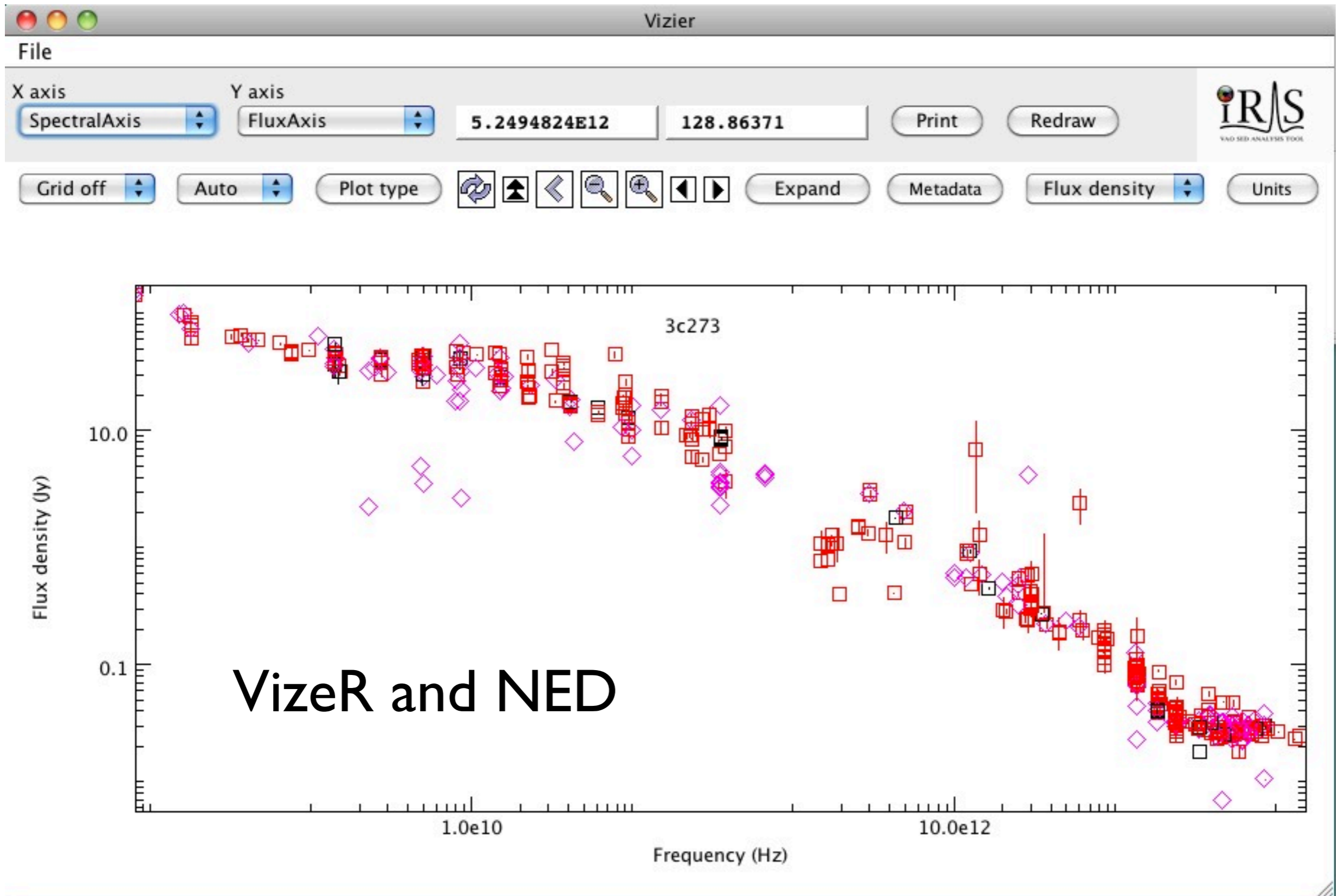
ID: VizieR

Target Name:  NED Names Resolve RA:  DEC:

Segments: New Point Remove Save Edit



	Publisher
526	VizieR - CDS
523	VizieR - CDS
519	VizieR - CDS
53	VizieR - CDS
524	VizieR - CDS
524	VizieR - CDS
523	VizieR - CDS



# Simbad & VizieR TAP services

The image displays two overlapping browser windows. The top window is the Simbad TAP Service interface, showing an ADQL query execution page. The bottom window is the VizieR TAP Service interface, showing a query execution page with a yellow banner for the beta version and a table of results.

**Simbad: TAP Service**

Execution options:  
Query name: Example 1  
Format: VOTable  
Max records: All  
Batch mode  
Check before start  
Upload(0)  
TAP resources  
Help  
• What is TAP ?  
• ADQL cheat sheet  
• Simbad tables

ADQL QUERY TO EXECUTE (or choose an example: Get object by identifier)

```
SELECT basic.OID,  
RA,  
DEC,  
main_id AS "Main identifier",  
coo_bibcode AS "Coord Reference",  
noref AS "References",  
plx_value AS "Parallax",  
galvel AS "Radial velocity",  
galvel_maxabs,  
galvel_minabs,  
FROM basic JOIN ident ON oidref = oid  
WHERE id = 'm13';
```

LIST OF YOUR TAP QUERIES

ID	Name	Start	Duration	Phase	Search	Results
Showing 0 to 0 of 0 entries						

No data available in table

**Tap VizieR**

First beta version: some explanations about the implementation of VizieR is available here

TAPVizieR service provides VizieR tables using the ADQL (a SQL extension in Astronomy).

your ADQL Query in the bottom area or try an example  or use the VizieR capabilities to construct your ADQL query

Search by catalog, author's name, word(s) from title, position (resolved by Sesame), ...  
eg: Veron, 2Mass, redshift, M31...  
Note: The vizieR capability takes advantage of METAdata (described here)

```
SELECT objects From 2mass around NI within 1 arcmin  
FROM c2mass  
WHERE 1=CONTAINS(POINT('ICRS', raj2000,dej2000),  
CIRCLE('ICRS', 83.633083, 22.0145,1/60))
```

your TAP queries

name	phase	start	destruction	Search	results
2mass_around_M1	COMPLETED	Fri Sep 07 16:56:50 CEST 2012	Wed Sep 12 16:56:50 CEST 2012		result (csv)

- ... can also be queried via Topcat



# as a VO portal

Interactive Sky Atlas

Images

Catalogues

VO Access

All Sky

Scripting + ...

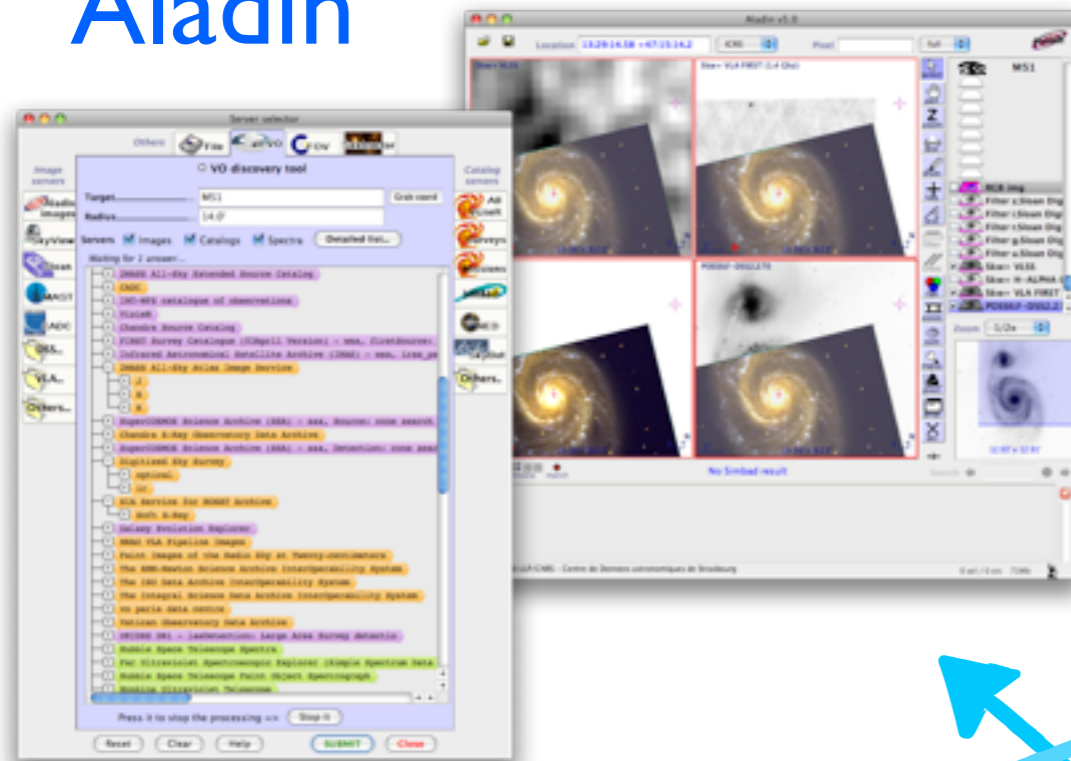
The image shows a screenshot of the ALADiN v7.0 web interface. The main window displays a multi-panel sky atlas for the region around NGC 4039. The panels include: a color image of the Antennae Galaxies (NGC 4039), a contour plot of the same region, a zoomed-in view of the central region, and a color image of the collision region. The interface includes a top navigation bar with various data sources (Allsky opt, Allsky IR, DSS, Simbad, NED, PPMX, 2MASS) and a toolbar with various tools (plot, draw, tag, filter, cross, zoom, assoc). A 'Server selector' dialog box is overlaid on the bottom right, showing a search for 'ngc 4039' with a radius of '14'. The dialog lists various image servers and catalog servers, including Chandra X-ray, XMM-Newton, ESO Science Archive, Sloan, DSS, VLA, and others. The 'Server selector' dialog has a 'VO discovery tool' section with checkboxes for 'Images', 'Catalogs', and 'Spectra'. The 'Image servers' list includes 'Aladin images', 'SkyView', 'UKIDSS', 'Sloan', 'DSS', 'VLA', 'Archives', and 'Others'. The 'Catalog servers' list includes 'All VizieR', 'Surveys', 'Missions', 'SDSS', 'NED', 'SkyBot', and 'Others'. The dialog also has a 'Stop it' button and a 'SUBMIT' button.



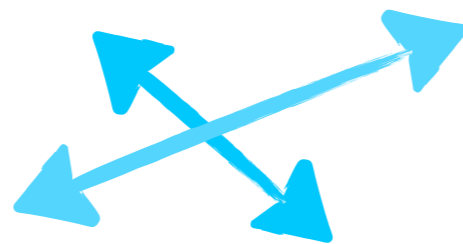
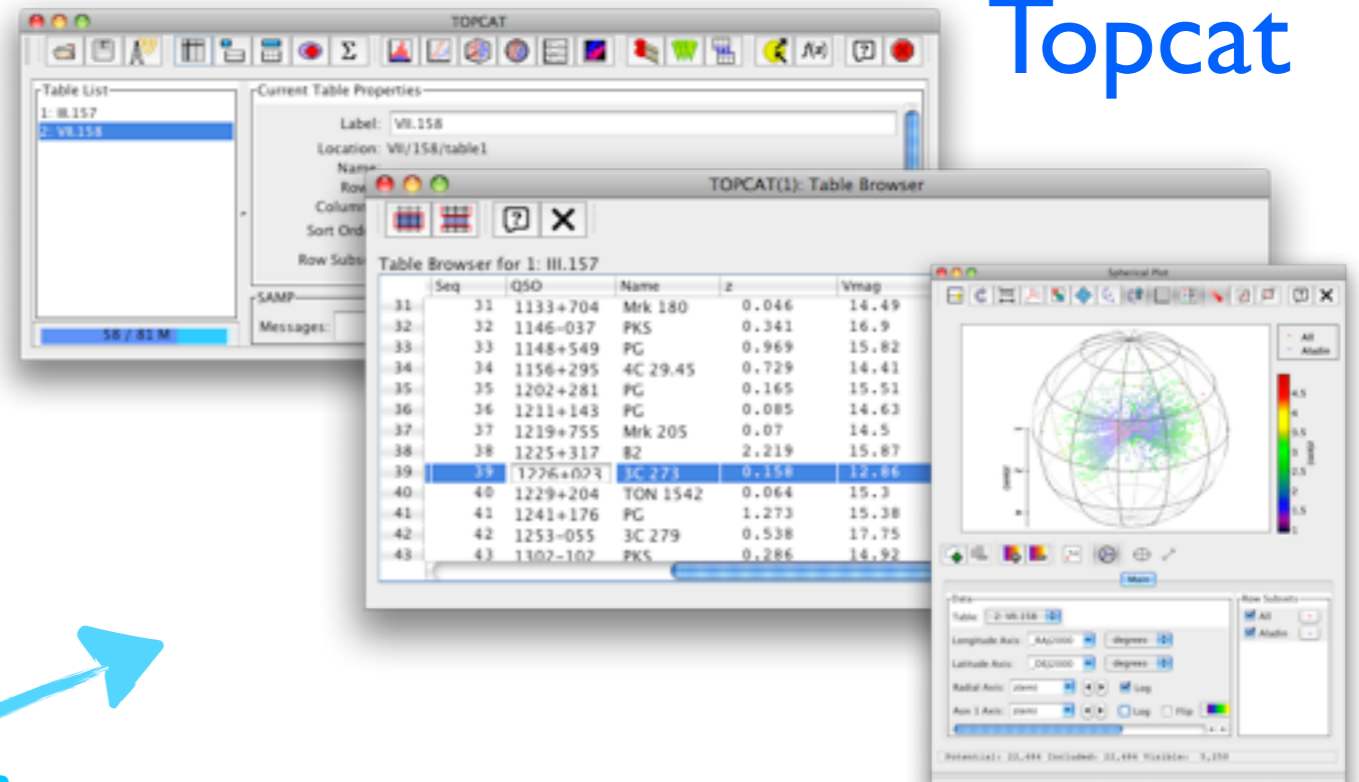


# SAMP tool interoperability

Aladin



Topcat



Your own programs



Web pages (VizieR)

# Assisting VO uptake

- Engaging the community: 2008 - *Census 2013 - CoSADIE Data Centre Forum*
- Software libraries:
  - TAP
  - UWS
- UCD and Units tools
- publish your own survey images via Aladin tools (multi-resolution Healpix maps)



# VO as Infrastructure

- VO in the ASTRONET Infrastructure roadmap
- recommendations for VO compliance
- Infrastructure sustainability to be addressed by EuroVO CoSADIE



→ *input to ASTRONET 2*