

Data Access Layer standards: current status for Multi-D data CDS new developments

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Thanks to M.Molinaro(DAL WG vice-chair: OAT/ INAF) and DAL WG



IVOA standards for multiD access priority

F.Bonnarel

(DAL WG chair, CDS / CNRS)

(Vice-chair: M.Molinaro, OAT/ INAF)



DAL landscape

- ▶ TAP,ADQL
ObsTAP ([Obscore 1.0])
- ▶ VOTABLE ConeSearch,SIAV1
SSA1.1
DALI 1.0 (common spec)
SIAV2.0
SODA 1.0 (AccessData)
DataLink 1.0

Multi-dimensional Data Access

minimal requirements from CSP:

- * Data Discovery (Query)
 - * A service shall be able to receive queries regarding its data collection(s) from a client, with the client placing one or more of the following constraints:
 - * RA,Dec
 - * Frequency/wavelength
 - * Polarization states
 - * Spatial size
 - * Angular resolution
 - * Integration time
 - * Time of observation
 - * A service shall return to the client a list of observations, and the corresponding metadata for each observation, meeting the user-imposed constraints. In the event that the user places no constraints, the entire list of observations, and the corresponding metadata for each data set, shall be returned. In the event that no data meet the user's constraints, the service shall indicate the absence of any matches.

Multi-dimensional Data Access

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- * Once a user has the list of observations that satisfy the constraints, they select all or a subset of the observations and:

- * Download the complete science data for each of the selected observations (the service shall return the complete multi-dimensional science data and metadata for each selected observation) or;

- * Download simple cutouts of the science data for each of the selected observations (the service shall be able to extract and return a user-specified subset of the complete multi-dimensional science data and metadata for each selected observation).

- * Simple Cutout

- * For a simple cutout, the user-specified subset is restricted to be a contiguous interval within each dimension of the multi-dimensional science data. The user should **not** be allowed to specify subsets with "gaps" or resampling or anything like that.

- * Spatial: a circle (a coordinate and a radius)

- * Energy: one interval (from energy1 to energy2)

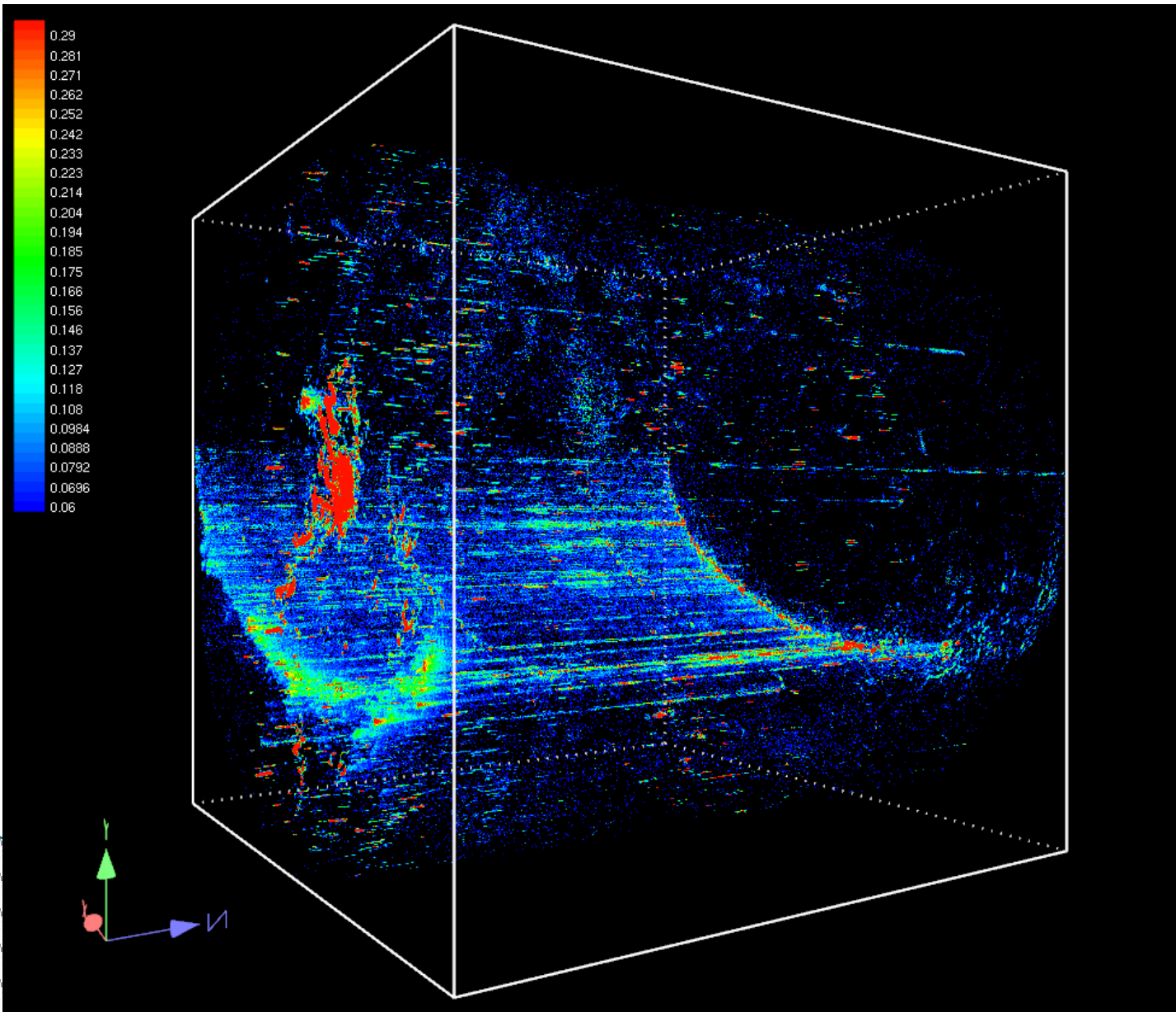
- * Time: one interval (from time1 to time2)

- * Polarization: a list

MULTI dimensional data access : cubes in spatial, spectral, time, polarization domain

Example of Radio data cube

- Green and red Axes*
 - *Spatial dimensions*
- Blue Axis :*
 - *Wavelength dimension*



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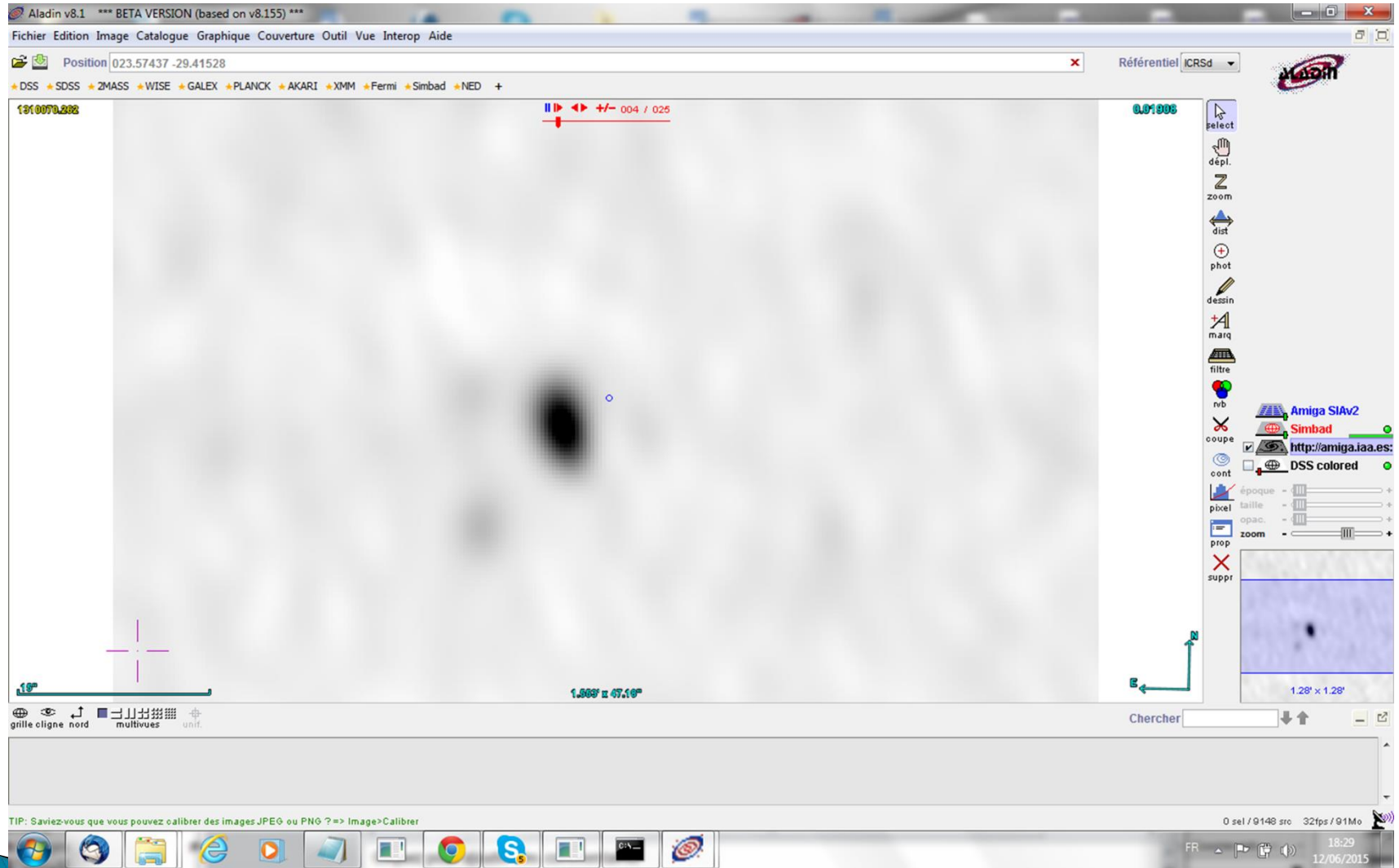
1.068" x 47.16"

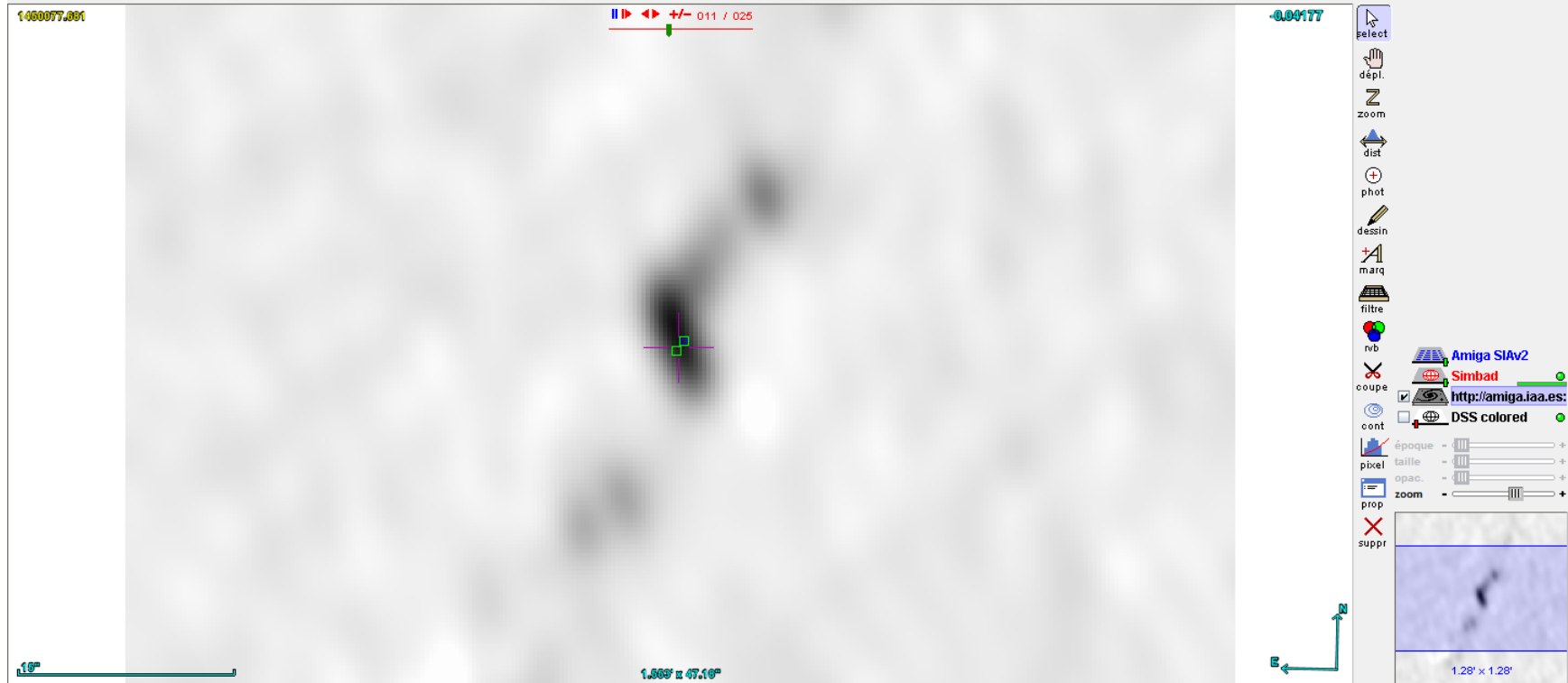
1.28" x 1.28"

select
dépl.
zoom
dist
phot
dessin
matq
filtre
rvb
coupe
cont
époque
pibrel
opac.
zoom
prop
suppr

Amiga SIAv2
Simbad
<http://amiga.iaa.es>
DSS colored

Chercher





access url	access f...	access e...	obs publ...	obs title	obs coll...	dataproduct	target n...	s ra	s dec	s fov	s resolu...	em min	em max	o stat e...	o unit	o ucd	pol states	fa
http://a...	applicat...	6412	ivo://sv...	NGC613	BODEGA	bodega.c...	NGC613	23.5758	-29.4183	0.0106667	4.6129			0.0207632	Jy/Beam	phot.fux		MK
NGC_613		EMG	01 34 18.235	-29 25 06.56					10.77	10.03	9.5	7.916	7.381	7.031	4...	2...	120	230

Cube Access scenario

- I) Scenario :
 - > find out cube services from registry.
 - **ObsTap (generic, ObsCore, ADQL)**
 - SIAV2 (cube-oriented, parameterQuery)
- II) Query from an ObsTAP service
 - « select * from Obscore where dataproduct_type = cube »
 - > the query response is a VOTABLE serializing the ObsCore model and describing the selected datasets.

Cube Access scenario

- I) Scenario :
 - > find out cube services from registry.
 - ObsTap (generic, ObsCore, ADQL)
 - **SIKV2 (cube-oriented, parameterQuery)**
- II bis) Query from a SIKV2 service
 - « `http://.....?pos=circle 3.0 2.0 1.0&band=0.001 0.003&time=56000 57000&POL=V` »
 - > the query response is a VOTABLE serializing the ObsCore model and describing the selected datasets.

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- * Spatial size

ADQL (ObsTAP) or PARAMETRIC (SIAV2) query

- * Angular resolution

- * Integration time

- * Time of observation

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QUERY RESPONSE: ObsCore TABLE

Cube Access scenario

- III) DataLink {links} resource
 - fixed links,
 - metadata services,
 - Custom services (DL service descriptor)
 - SODA service
- III bis) direct path to SODA (DL service descriptor)
- IV) SODA:
 - Cutout driven by parameters identical to Query
 - POS=CIRCLE 12 34 0.5
 - POS= POLY 12.0 14.0 12.0 16.0 15.0 16.0 15.0 14.0
 - BAND=500 550
 - TIME= 55000.0 56000.0
 - POL=Q,POL=.....

Multi-dimensional Data Access

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- * Download the complete science data for each of the selected observations (the service shall return the complete multi-dimensional science data and metadata for each selected observation) or; ← SIAV2 response access reference field or DataLink URL field

- * Download simple cutouts of the science data for each of the selected observations (the service shall be able to extract and return a user-specified subset of the complete multi-dimensional science data and metadata for each selected observation).

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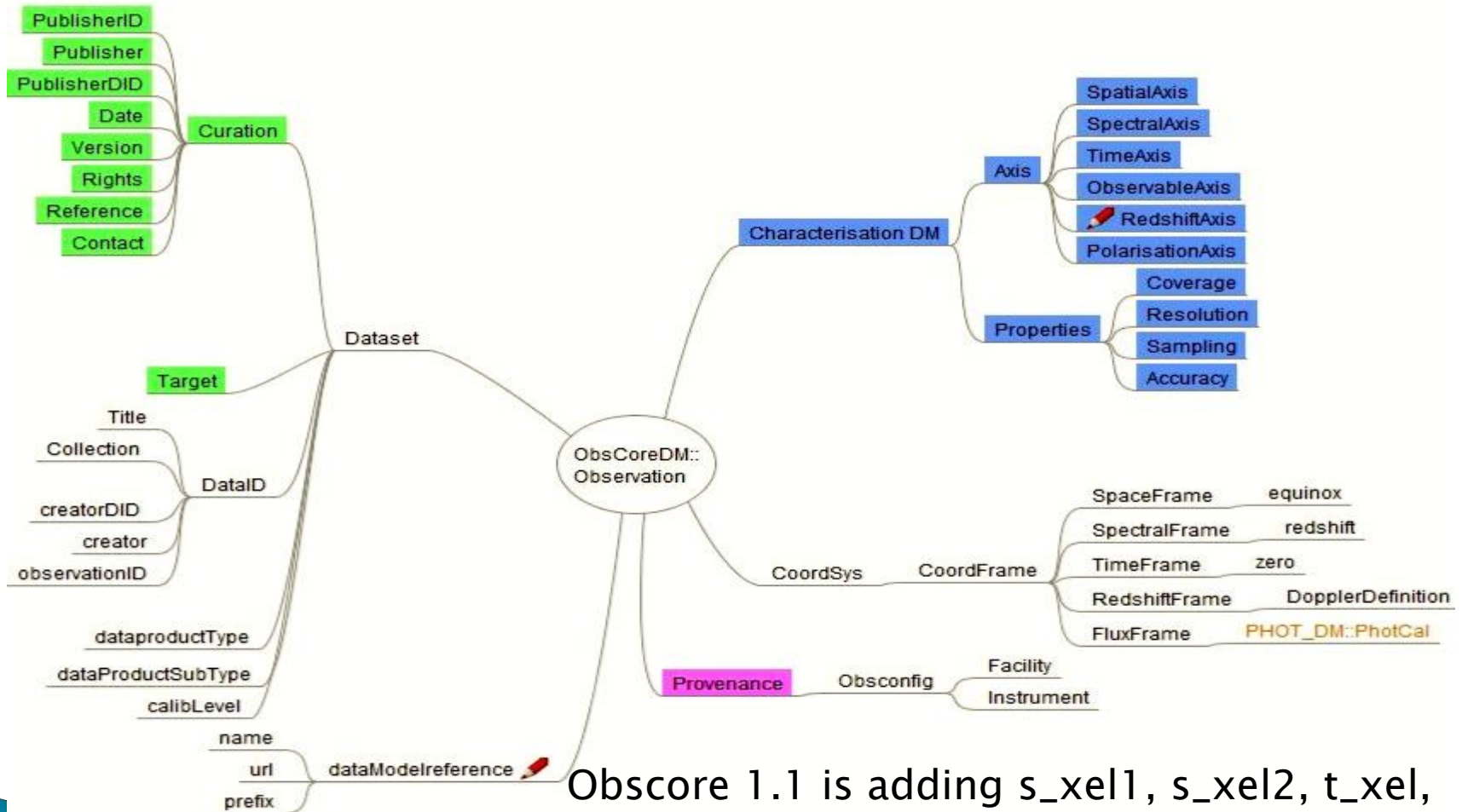
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ObsCore Heuristic Map



Obscore 1.1 is adding s_xel1, s_xel2, t_xel, em_xel dimensions
 Discovery of « doppler velocity » cubes,

SIAV2 / OBsTAP with Cubes implementations

▶ SIAV2

- Amiga,
- CADC,
- CASDA,
-

▶ ObsTAP with Cubes

- CADC,
- CASDA,
- GAVO,
- XMM SSC,
- ...

DataLink

service descriptor

- ▶ General mechanism for any PARAM=... based HTTP service description
- ▶ Based on the VOTABLE PARAM features.
- ▶ 3 factor semantics: name, unit, ucd

```
▶ <RESOURCE type="meta" utype="ad hoc:service" ID="soda-sync">
▶ <PARAM arraysize="*" datatype="char" name="accessURL" value="http://www.cadc-ccda.hia-ihh.nrc.cnrc.gc.ca/caom2ops/sync"/>
▶ <GROUP name="inputParams">
▶   <PARAM arraysize="*" datatype="char" name="ID" value="" ref="fileURIRef"/>
▶   <PARAM arraysize="*" ucd="obs.field" datatype="char" name="PAR1" >
▶     <VALUES>
▶       <MIN>.....</MIN>
▶       <MAX>.....</MAX>
▶       <OPTION>.....</OPTION>
▶     </VALUES>
▶   <PARAM arraysize="2" ucd="em.wl;stat.interval" datatype="double" name="PAR2" unit="m" />
▶   <PARAM arraysize="2" ucd="time;stat.interval" datatype="double" name="PAR3" unit="d" />
▶   <PARAM arraysize="2*" ucd="phys.polarization.stokes" datatype="char" name="PAR4" />
▶ </GROUP>
▶ </RESOURCE>
```

DataLink

service descriptor

- ▶ Can describe custom and standard services (to help clever clients)
 - SIA, SSA, COneSearch
 - DataLink {links} resource
 - SODA

```
▶ <RESOURCE type="meta" utype="adhoc:service" ID="soda-sync">
▶   <PARAM arraysize="" datatype="char" name="resourceIdentifier" value="ivo://cadc.nrc.ca/soda#sync">
▶   <PARAM arraysize="" datatype="char" name="standardID" value="ivo://ivoa.net/std/SODA#sync-1.0"/>
▶   <PARAM arraysize="" datatype="char" name="accessURL" value="http://www.cadc-ccda.hia-ihp.nrc.cnrc.gc.ca/caom2ops/sync"/>
▶   <GROUP name="inputParams">
▶     <PARAM arraysize="" datatype="char" name="ID" value="" ref="fileURIRef"/>
▶     <PARAM arraysize="" ucd="obs.field" datatype="char" name="POS" value=""/>
▶     <PARAM arraysize="2" ucd="em.wl;stat.interval" datatype="double" name="BAND" unit="m" value="" xtype="interval"/>
▶     <PARAM arraysize="2" ucd="time;stat.interval" datatype="double" name="TIME" unit="d" value="" xtype="interval"/>
▶     <PARAM arraysize="2*" ucd="phys.polarization.stokes" datatype="char" name="POL" value=""/>
▶   </GROUP>
▶ </RESOURCE>
```

DataLink

{links} RESOURCE

Historical DataLink

The list of links that is returned by the {links} resource can be represented as a table with the following columns:

name	description	required	UCD
ID	Input identifier	yes	meta.id;meta.main
access_url	link to data or service	one only	meta.ref.url
error_message	error if an accessURL cannot be created		meta.code.error
service_def	reference to the description of a service at access_url	no	meta.ref
description	human-readable text describing this link	no	meta.note
semantics	limited vocabulary describing this link	no	meta.code
content_type	mime-type of file the link returns	no	meta.code.mime
content_length	size of download the link returns	no	phys.size;meta.file

- Cube average (fixed links), accesdata, (*custom services*)
- Calibration data, metadata, SODA (with help of descriptor)

SODA : points still in discussion

- ▶ When and How to make clear PARAMETER domain metadata appear
- ▶ Various Pathes from discovery phase to SODA service execution. Service descriptors
 - In the discovery Query response ?
 - In the DataLink Query response ?
 - As a SODA « autodescription » (Hardly discussed) ?
- ▶ Is SODA
 - immediatly a generic protocol (= valid for any kind of data)
 - something Datatype (cube) and model (ObsCore) dependant
- ▶ Time for implementing and prototyping
 - going back to the Draft and to the CSP Requirements
 - adding only strictly required features for easilly fulfilling the CSP
 - Cape Town Interop demos and final discussion
 -

Current protocol status

- ▶ DataLink 1.0 is a recommendation since June 2015
- ▶ SIAV2.0 is a recommendation since December 23rd 2015
- ▶ SODA 1.0 (Server-side Operations for Data Access , former AccesData). → Working draft. Mostly done. Still in Active discussion for details.
- ▶ ObsCore 1.1 coming up
- ▶ -----
- ▶ VOTP (VOEvent transport protocol, will start the RFC),
- ▶ DALI 1.1 Working draft
- ▶ ADQL 2.1 in internal working Draft
- ▶ TAP 1.1 is internal Working Draft

DAL landscape

- ▶ TAP,ADQL
ObsTAP ([Obscore 1.0])
→ ObsCore 1.1
- ▶ VOTABLE ConeSearch, SIAV1
SSA1.1
DALI 1.0 (common spec)
→ DALI 1.1
SIAV2.0
SODA 1.0 (AccessData)
- ▶ DataLink 1.0

Plenty of use cases for next versions of DataLink
SIAV2 and SODA, but we need feedback on the first
steps

SIKV2 + DataLink + SODA integration within Aladin

- New developments in Aladin by Chaitra.
 - SIAV2 hierarchical menu
 - FOV on top
 - DataLink popup
 - Custom services and SODA menus

SIAV2 Aladin interface, current status

The screenshot displays the Aladin v8.1 interface, which is a BETA VERSION based on v8.155. The main window shows a star field with a green circle highlighting a specific source. The interface includes a menu bar (Fichier, Edition, Image, Catalogue, Graphique, Couverture, Outil, Vue, Interop, Aide), a position field (022.24521 -29.83011), and a toolbar with various icons for navigation and analysis. A table at the bottom lists data for various sources, including columns for data production, calibration, observation, facility, instrument, observation ID, release date, access URL, and access frequency.

The 'Sélecteur de serveurs' dialog box is open, showing a list of servers and a form for selecting a server. The selected server is 'Cadc SIAV2 archive prototype'. The form contains the following fields:

- POS: CIRCLE 23.5 -29.4 0.2
- BAND: (empty)
- TIME: (empty)
- POL: (empty)
- FOV: (empty)
- SPATRES: (empty)
- EXPTIME: (empty)
- ID: (empty)
- COLLECTION: (empty)

The table below the main window contains the following data:

dataproduct	calib le...	obs coll...	facility	instrume...	obs id	obs rele...	access url	access f...	access
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead504m	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead506m	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead505m	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead502m	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead501m	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	2	JCMT	JCMT	SCUBA	19970909...	1999-02-...	http://w...	applicat...	
<input type="checkbox"/> image	2	JCMT	JCMT	SCUBA	19970909...	1999-02-...	http://w...	applicat...	
<input type="checkbox"/> image	3	HSTHLA	HST	WFPC2	hst 0904...	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	3	HSTHLA	HST	WFPC2	hst 0904...	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	3	HSTHLA	HST	WFPC2	hst 0904...	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	3	HSTHLA	HST	WFPC2	hst 0904...	2001-08-...	http://w...	applicat...	

Aladin v8.1 *** BETA VERSION (based on v8.155) ***

Fichier Edition Image Catalogue Graphique Couverture Outil Vue Interop Aide

Position Référentiel

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Simbad NED +

DSS colored

select
 dépl.
 zoom
 dist
 phot
 dessin
 marq

Contrôle par la souris:
 ◦ Gauche: sélection des sources.
 ◦ Milieu: déplacement du champ.
 ◦ Droite: ajustement du contraste.

CADC SIAv2
Amiga SIAv2
DSS colored

Sélecteur de serveurs

Autres: MIPDS, File, all VO, Watch, FoV..., Amiga, CADC SIAv2, Tools...

Serveurs d'image:
 Aladin, SkyView, UKID, Stoa, DSS., VLA., Archive, Others

Serveurs de tables:
 All Vizier, Surveys, Missions, SIMBAD, NED, MOC, SkyBot, Others..

**SPATIAL
 TIME
 SPECTRAL
 POLARIZATION**

dataproduct	calib le...	obs coll...	facility	instrume...	obs id	obs rele...	access url	access f...	acces
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead504m	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead506m	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead505m	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	2	HST	HST	WFPC2	u6ead502m	2001-08-...	http://w...	applicat...	
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<input type="checkbox"/> image	3	HSTHLA	HST	WFPC2	hst 0904...	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	3	HSTHLA	HST	WFPC2	hst 0904...	2001-08-...	http://w...	applicat...	
<input type="checkbox"/> image	3	HSTHLA	HST	WFPC2	hst 0904...	2001-08-...	http://w...	applicat...	
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Réinit. Effacer **CHERCHER** Fermer ?

FR 12:48 18/06/2015

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DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Simbad NED +

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SPATIAL constraints

CIRCLE CENTER

CIRCLE RADIUS

RANGE MIN

RANGE MAX

POLYGON

FOV SIZE

SPATIAL RESOLUTION

Réinit. Effacer **CHERCHER** Fermer ?

FR 12:48 18/06/2015

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DSS colored

Full retrieval
Additional metadata
Calibration file
SODA service

Sélecteur de serveurs

Autres RIPS File all VO Watch FoV... Amiga CADC SIAv2 Tools...

Serveurs d'images

Accessing a selection of data

CIRCLE center

CIRCLE Radius

TIME Interval

SPECTRAL Interval

POL States

Aladin images SkyView UKIDSS Sloan DSS... VLA... Archives... Others...

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<input type="checkbox"/> image	3	HSTHLA	HST	WFPC2	hst 0904...	2001-08-...	http://w...	applicat...	

30' 2.021° x 49.01'

grille onlign nord multivues unit

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