

Exploring TAP services with **TapHandle**



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TAP and the Simple Protocols

Simple protocols (SIAP, SSAP, CSP SLAP...):

- *One data collection per service*
- *One data category per protocol*
- *Parameter query language*
- *Output format defined by the protocol*

TAP is **not a simple** protocol

- *TAP exposes tabular data*
- *TAP services are self-describing.*
 - *TAP_SCHEMA, capability /table*
- *Data are selected by a structured query language (derived from SQL)*
 - *Geometrical functions but neither database update nor procedure*
- *Asynchronous query processing*





The TAP Client Challenge

Being both **interactive** and **generic**.

- **The client doesn't know about the data it will access**
 - *Data are discovered thanks to both TAP_SCHEMA and /tables capability*
- **The query editor has to tackle with the meta-data of the current service**
 - *Designing an ADQL editor both rich and user friendly is not that easy*
- **The client has to tackle with the capabilities really available**
 - *TAP being a complex protocol, we have to consider dealing with partial implementations*



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The Goal of TapHandle

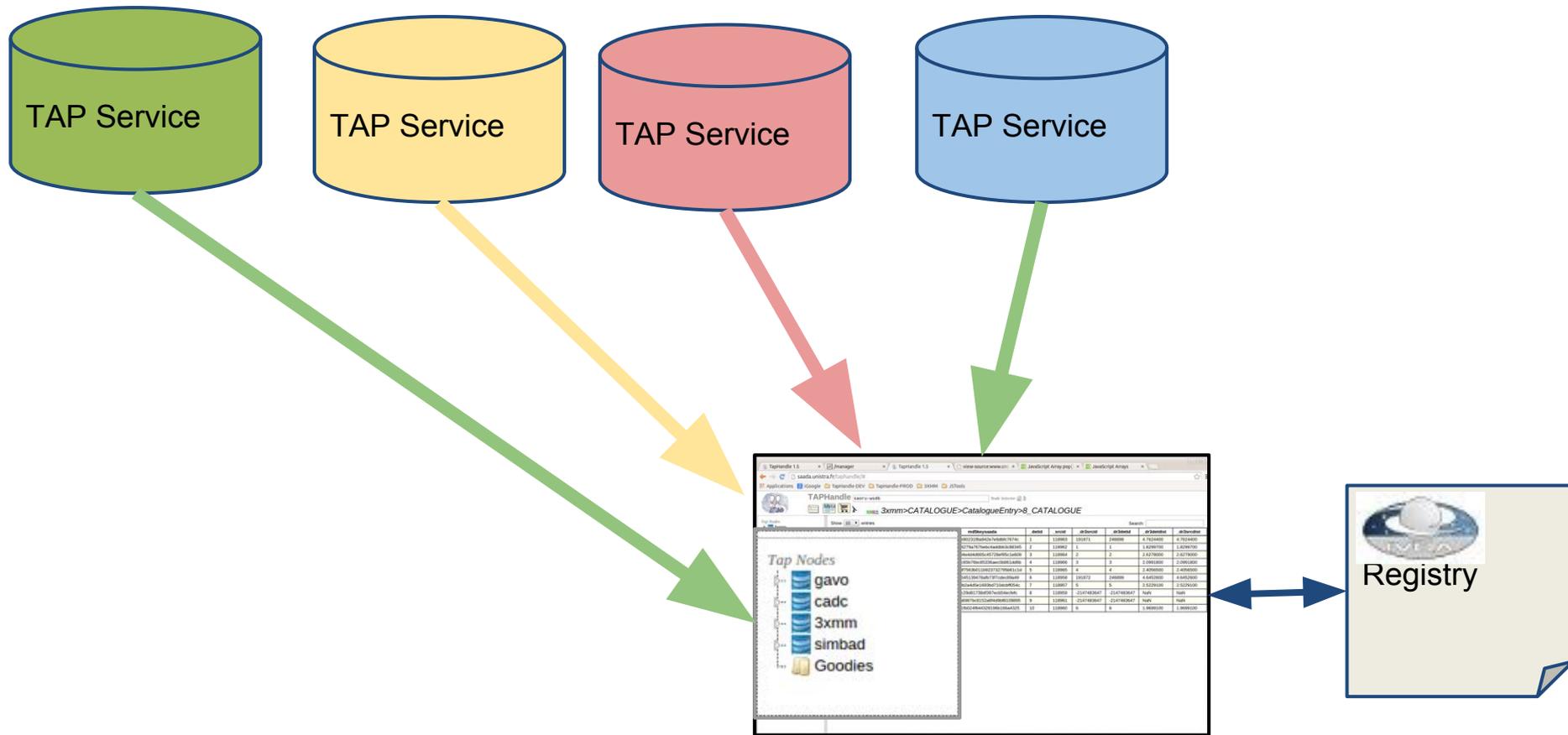
- **A tool designed for discovering data exposed in any TAP service.**
 - No prior knowledge about the data content
- **Accessing TAP services with a WEB browser.**
 - Accessing meta-data
 - Accessing data
 - Query editor
 - Downloading results
 - Interoperability
- **Accessing simultaneously multiple TAP services**
 - Services merged in a single view
- **Using the browser facilities as much as possible for data display**
 - VOTables displayed as HTML tables
 - File with universal types (PNG, JPEG, PDF, text...) are taken in charge by the browser
 - Astronomical data format can be redirected to SAMP clients



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The Concept of TapHandle



Several TAP services - One single view

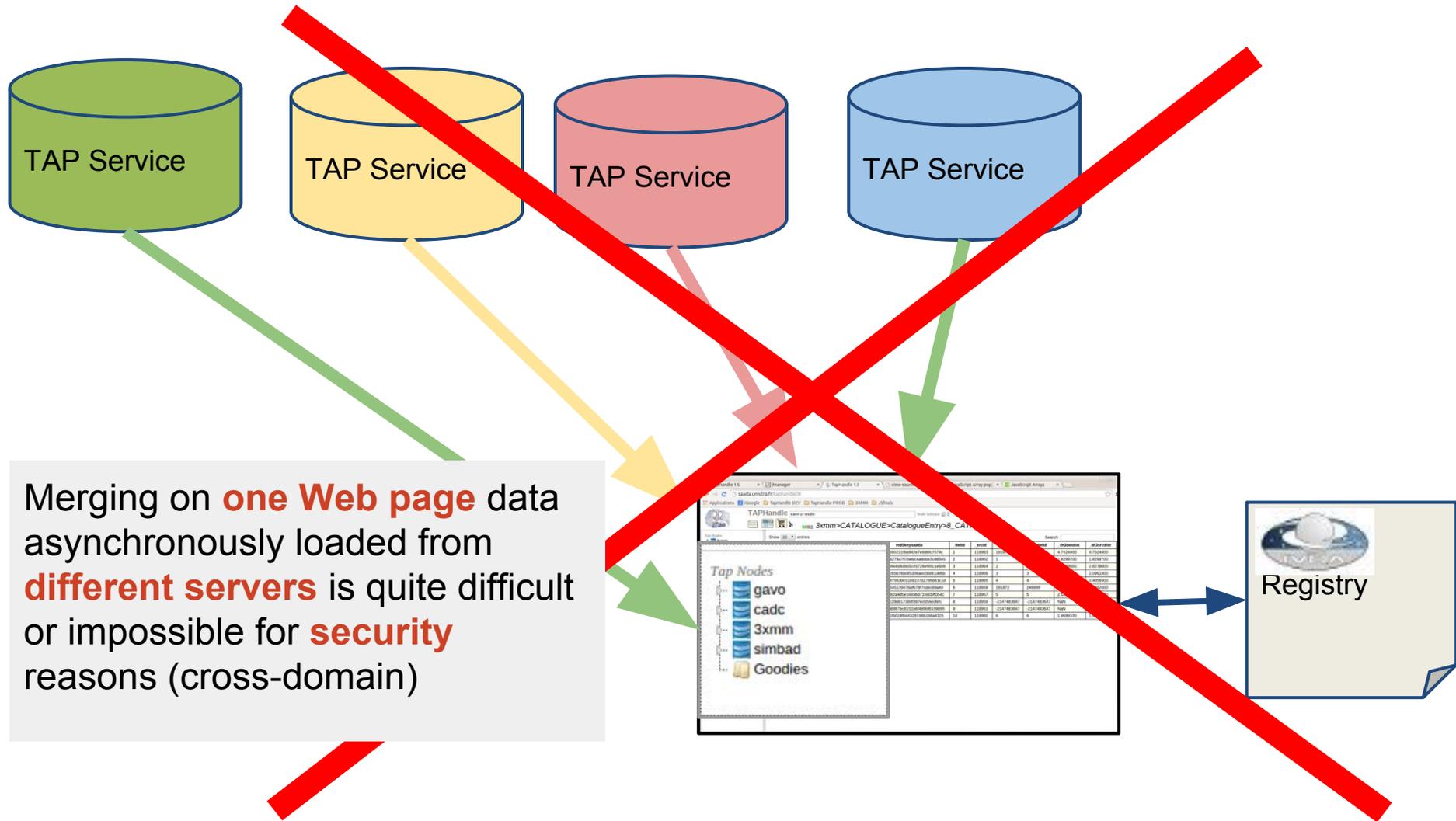


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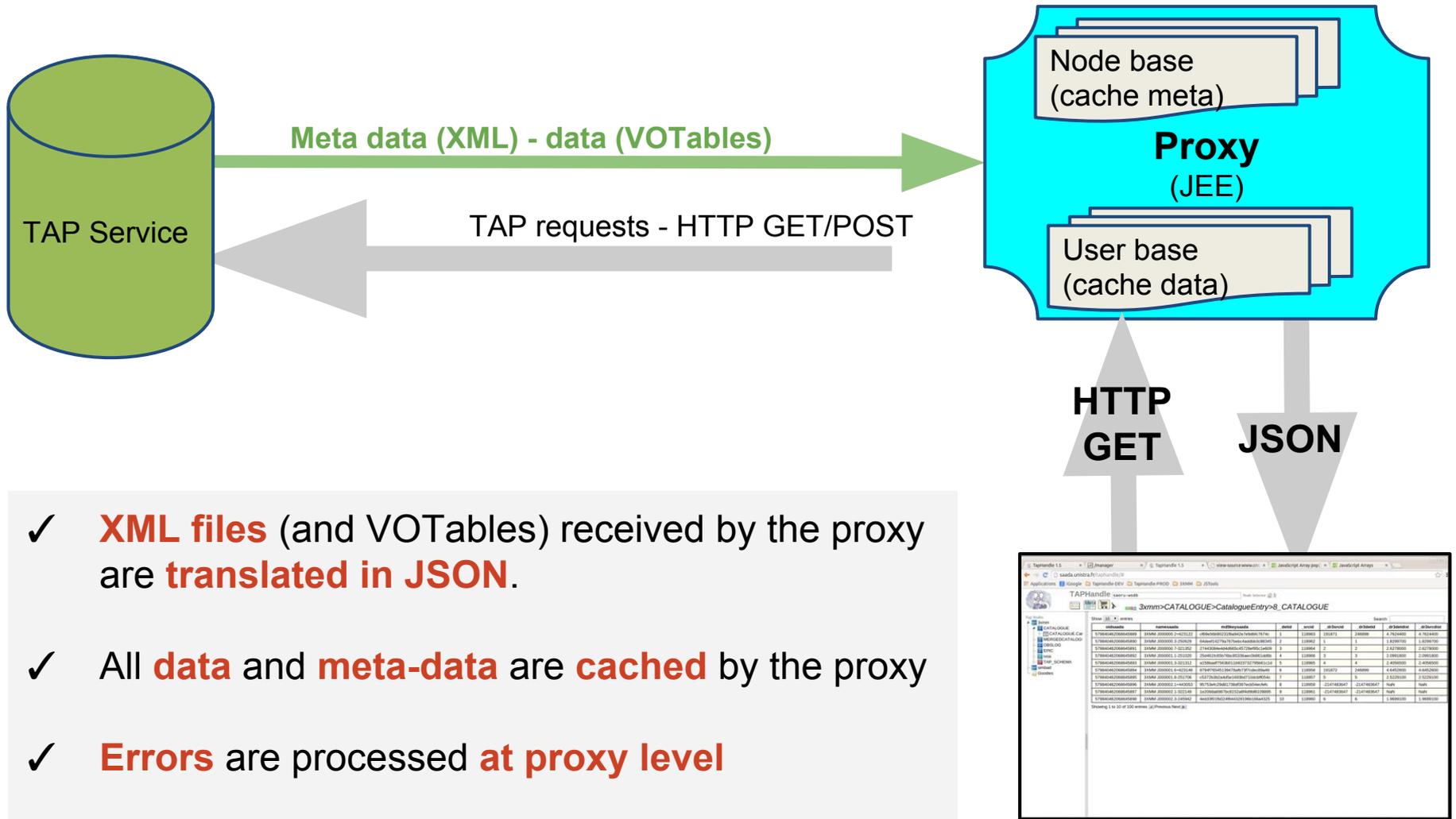




TapHandle Architecture



The TapHandle Proxy



- ✓ **XML files** (and VOTables) received by the proxy are **translated in JSON**.
- ✓ All **data** and **meta-data** are **cached** by the proxy
- ✓ **Errors** are processed **at proxy level**

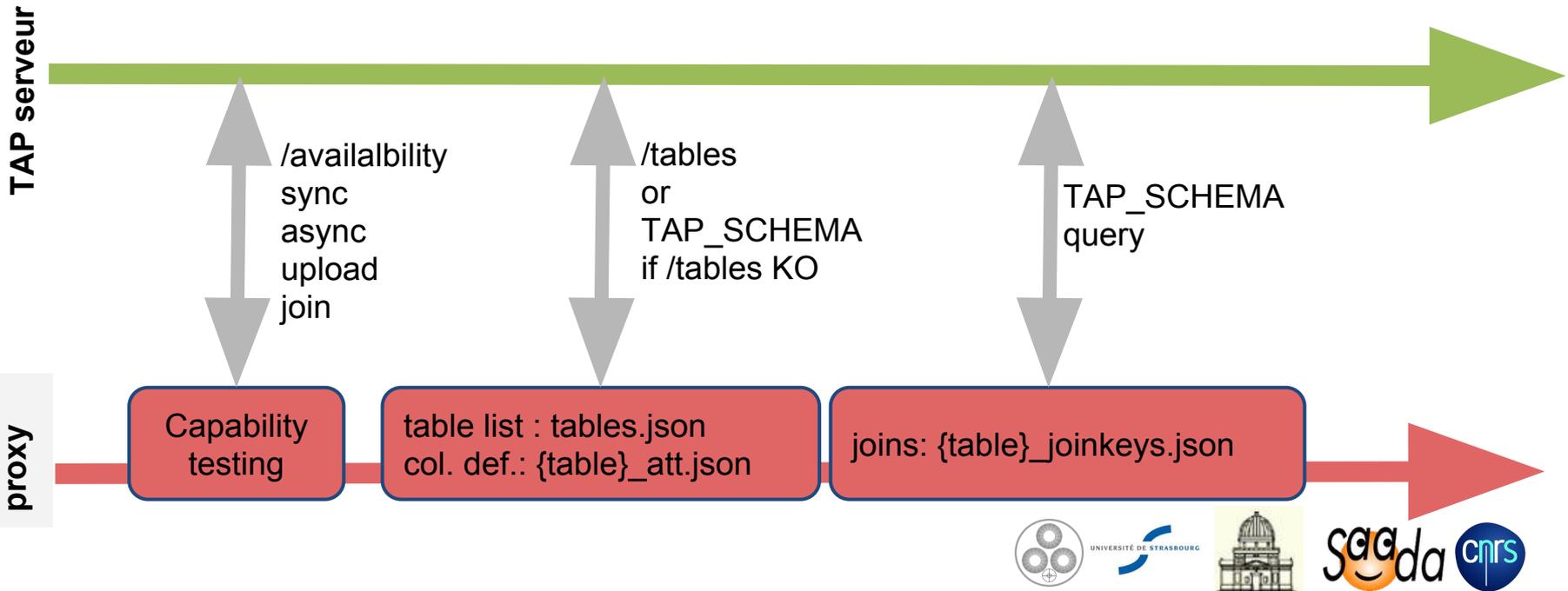


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TapHandle : Connecting a Service

- ✓ The `/tables` output is split into individual per table files
- ✓ Documented table joins are taken out from the TAP_SCHEMA
- ✓ Declared capabilities are tested one by one
 - sync, async, upload, table joins
- ✓ Job results are converted on the fly in JSON messages (Stilts)



The TapHandle Main Screen

Tree of accessible resources

Search bar for TAP services

Path of the current resource

Query result

The screenshot shows the TapHandle web interface. At the top, the browser address bar displays 'saada.unistra.fr/taphandle/#'. Below the browser, the page title is 'TAPHandle gavo'. A search bar is located to the right of the title. The main content area is divided into several sections:

- Tree of accessible resources:** A vertical tree on the left side showing a hierarchy of nodes: gavo, cadc, 3xmm, CATALOGUE, MERGEDCATALOG, OBSLOG, EPIC, ivoa, TAP_SCHEMA, simbad, and Goodies.
- Path of the current resource:** A breadcrumb path at the top right reads '3xmm>CATALOGUE>CatalogueEntry>8_CATALOGUE'.
- Search bar for TAP services:** A search input field with the placeholder text 'Search:'.
- Query result:** A table with 10 rows and 6 columns. The columns are labeled: 'oidsaada', 'namesaada', 'md5keysaada', '_detid', '_srcid', and '_dr3srcid'. The table contains numerical and alphanumeric data.
- Query editor:** A section at the bottom left with a 'SUBMIT' button and tabs for 'Select What', 'Where', 'Plain Text Query', and 'Job Control'.
- Job management:** A section at the bottom right titled 'List of UWS jobs' showing two entries: '3xmm.CATALOGUE.CatalogueEntry: job 8_CATALOGUE COMPLETED' and 'simbad public.mesUVBY: job 1410421597305A COMPLETED'.

Query editor

Job management



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Connecting the Registry

- ✓ The proxy gets the **description** of all TAP services harvested by the **GAVO TAP-Regext**
- ✓ Registry data are searched by a **TAP query**
- ✓ The list of **declared services** is sent to each client at **starting time**.



```
SELECT ivo_id, access_url, res_title
FROM rr.capability
      NATURAL JOIN rr.interface
      NATURAL JOIN rr.resource
WHERE standard_id='ivo://ivoa.net/std/tap'
      AND intf_type = 'vs:paramhttp'
```



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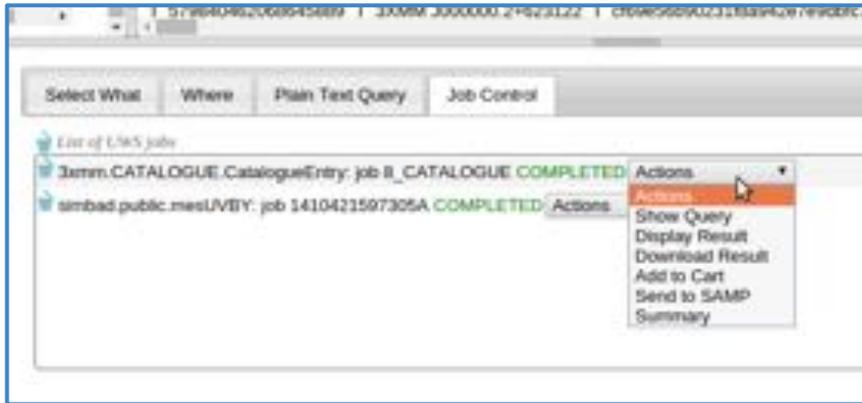
Tap Service Selection

- ✓ A suggest-list shows out the TAP services matching the typed text.





Job Management



- ✓ Jobs are **systematically** executed in **asynchronous** mode (if supported).
- ✓ The interface waits **10'' at the most** on the result.
- ✓ Output of **previous jobs** remain **accessible**
 - To display the result
 - To refine the query
 - To be put in the shopping cart
 - To be send to SAMP clients



Query Editor

The screenshot displays the Query Editor interface. On the left, there is a 'Result Limit' input set to 100. A table lists available columns with their data types and units:

designation	char(*)		
raj2000	double(f)	deg	
dej2000	double(f)	deg	
sigra	float(f)	deg	
sigdec	float(f)	deg	
sigradec	float(f)	deg	
glon	double(f)	deg	
glat	double(f)	deg	
wx	float(f)	pix	

On the right, the 'List of Active Constraints' section shows a container with two constraints:

- wise.main.POSITION inCircle 23.462083, +30
- AND wise.main.designation LIKE %M33%

Below this, a preview window shows the generated SQL query:

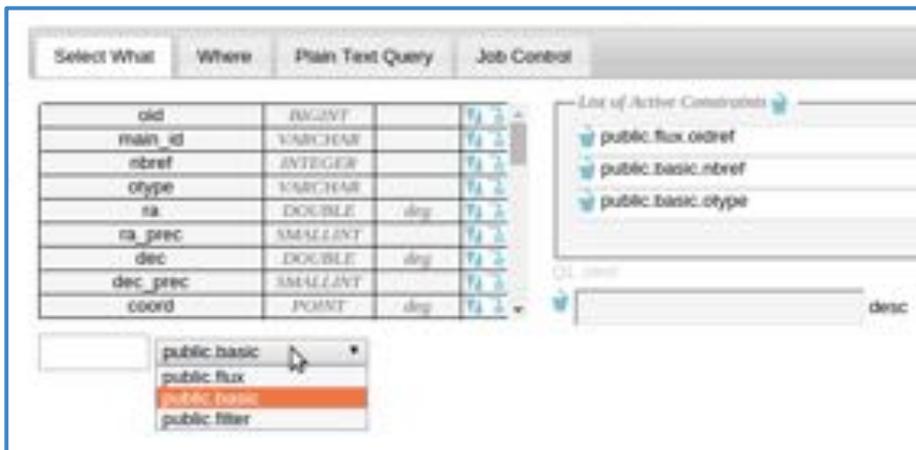
```
SELECT TOP 100 *
FROM wise.main
WHERE CONTAINS(POINT('ICRS', wise.main.raj2000, wise.main.dej2000), CIRCLE('ICRS', 23.462083, +30.659917, 0.016666666666666666)) = 1
AND wise.main.designation LIKE '%M33%'
ORDER BY wise.main.raj2000
```

- ✓ Constraints are **edited one by one** from the list of available columns.
- ✓ Constraints are **stacked** in a container.
- ✓ ADQL queries can be **refined by hand**



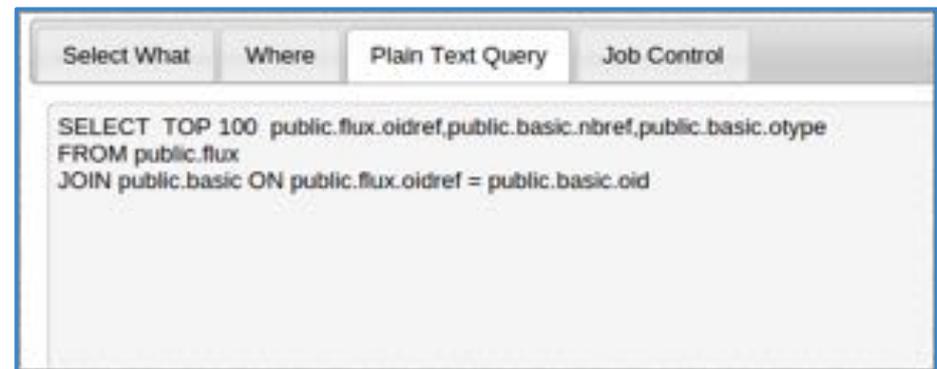
Table Join Management

- ✓ The query editor **gathers the tables** declared as **joined** in the TAP_SCHEMA
- ✓ **Join** statements are **automatically set** into the query



The screenshot shows a query editor interface with four tabs: "Select What", "Where", "Plain Text Query", and "Job Control". The "Select What" tab is active, displaying a table structure with columns and data types. A dropdown menu is open, showing a list of tables: "public basic", "public flux", "public basic", and "public filter".

Column	Data Type	Flags
oid	BIGINT	
main_id	VARCHAR	
nbref	INTEGER	
otype	VARCHAR	
ra	DOUBLE	drop
ra_prec	SMALLINT	
dec	DOUBLE	drop
dec_prec	SMALLINT	
coord	POINT	drop



The screenshot shows a query editor interface with four tabs: "Select What", "Where", "Plain Text Query", and "Job Control". The "Plain Text Query" tab is active, displaying a SQL query:

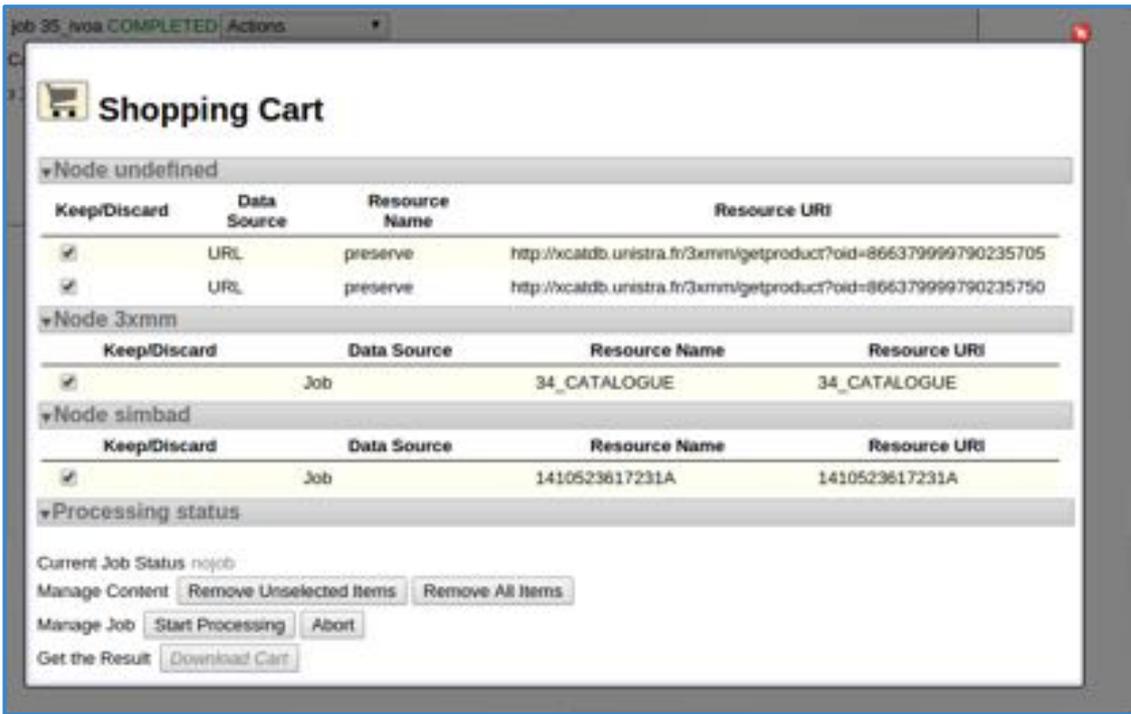
```
SELECT TOP 100 public.flux.oidref,public.basic.nbref,public.basic.otype
FROM public.flux
JOIN public.basic ON public.flux.oidref = public.basic.oid
```





Shopping Cart Facility

- ✓ **Query results** or **data files** referenced by them can be put in the **cart**.
- ✓ The **shopping cart** content can be downloaded in a **ZIP archive**.
 - Asynchronously processed



job 35_ivoa COMPLETED Actions

Shopping Cart

▼Node undefined

Keep/Discard	Data Source	Resource Name	Resource URI
<input checked="" type="checkbox"/>	URL	preserve	http://xcatdb.unistra.fr/3xmm/getproduct?oid=866379999790235705
<input checked="" type="checkbox"/>	URL	preserve	http://xcatdb.unistra.fr/3xmm/getproduct?oid=866379999790235750

▼Node 3xmm

Keep/Discard	Data Source	Resource Name	Resource URI
<input checked="" type="checkbox"/>	Job	34_CATALOGUE	34_CATALOGUE

▼Node simbad

Keep/Discard	Data Source	Resource Name	Resource URI
<input checked="" type="checkbox"/>	Job	1410523617231A	1410523617231A

▼Processing status

Current Job Status: nojob

Manage Content:

Manage Job:

Get the Result:



Interoperability

- ✓ **Data searched** in TAP nodes can be exported with **SAMP**
 - Query results
 - Data files referenced by query results

The screenshot displays the TAPHandle software interface. On the left, a 'Samp Info' window titled 'Available SAMP Clients' lists clients for data export. The main window shows a 'Table List' and 'Current Table Properties' for a selected table. A 'SAMP' section at the bottom provides controls for messages and clients.

ID	NAME	TYPE	IP	PORT	STATUS
1	PLA...	PLA...
2	Ela Car	Full	...	866379990790235833	30MM



Resource Filtering

- ✓ Both **schemas and tables** exposed by a service can be **filtered**
 - Essential for huge resources like VizieR

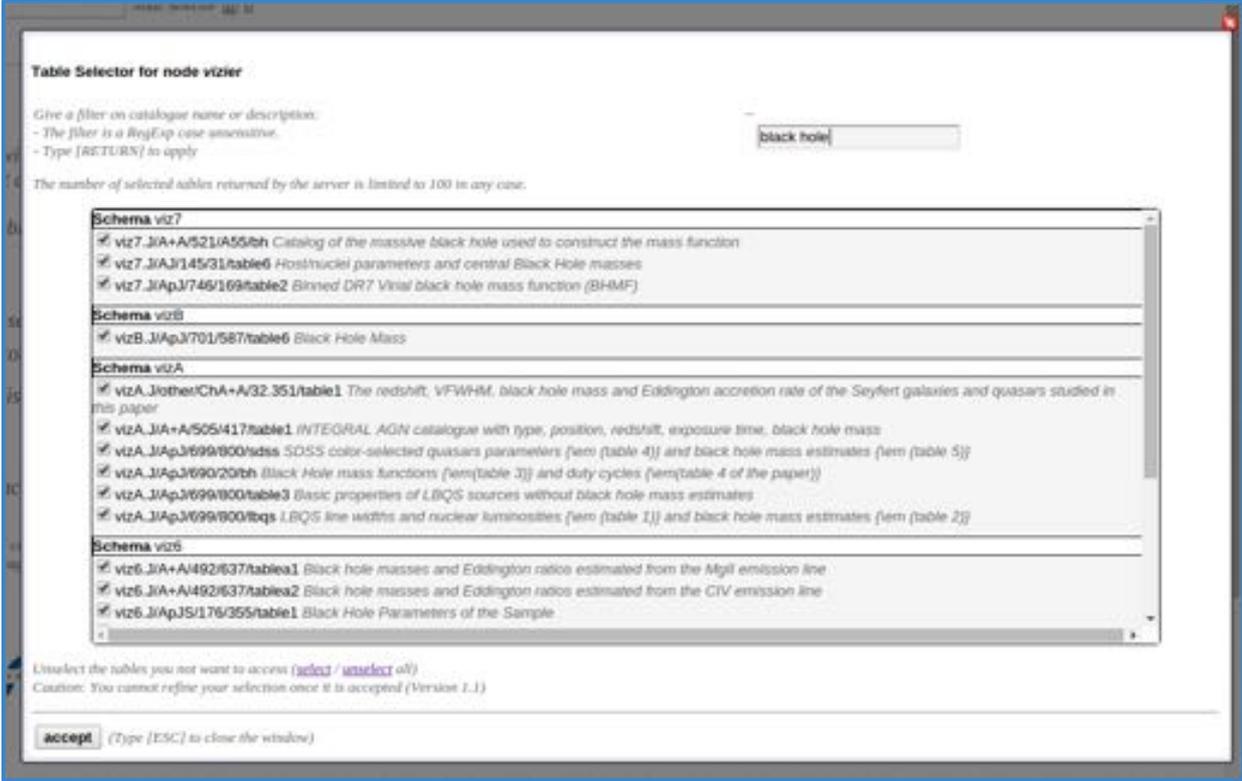


Table Selector for node vizieR

Give a filter on catalogue name or description.
- The filter is a RegEx case sensitive.
- Type [RETURN] to apply

The number of selected tables returned by the server is limited to 100 in any case.

Schema viz7

- viz7.JIA+A/521/A55/bh Catalog of the massive black hole used to construct the mass function
- viz7.JIAJ/145/31/table6 Host/nuclei parameters and central Black Hole masses
- viz7.JIAp/1746/169/table2 Binned DR7 Virial black hole mass function (BHMF)

Schema viz8

- viz8.JIAp/1701/587/table6 Black Hole Mass

Schema vizA

- vizA.JIAp/1699/900/ids SDDS color-selected quasars parameters (see (table 4)) and black hole mass estimates (see (table 5))
- vizA.JIAp/1699/20/bh Black Hole mass functions (see(table 3)) and duty cycles (see(table 4 of the paper))
- vizA.JIAp/1699/900/table3 Basic properties of LBQS sources without black hole mass estimates
- vizA.JIAp/1699/900/lbqs LBQS line widths and nuclear luminosities (see (table 1)) and black hole mass estimates (see (table 2))

Schema viz6

- viz6.JIA+A/492/637/tablea1 Black hole masses and Eddington ratios estimated from the MgII emission line
- viz6.JIA+A/492/637/tablea2 Black hole masses and Eddington ratios estimated from the CIV emission line
- viz6.JIApJS/176/355/table1 Black Hole Parameters of the Sample

Unselect the tables you not want to access (select / unselect all)
Caution: You cannot refine your selection once it is accepted (Version 1.1)

(Type [ESC] to close the window)



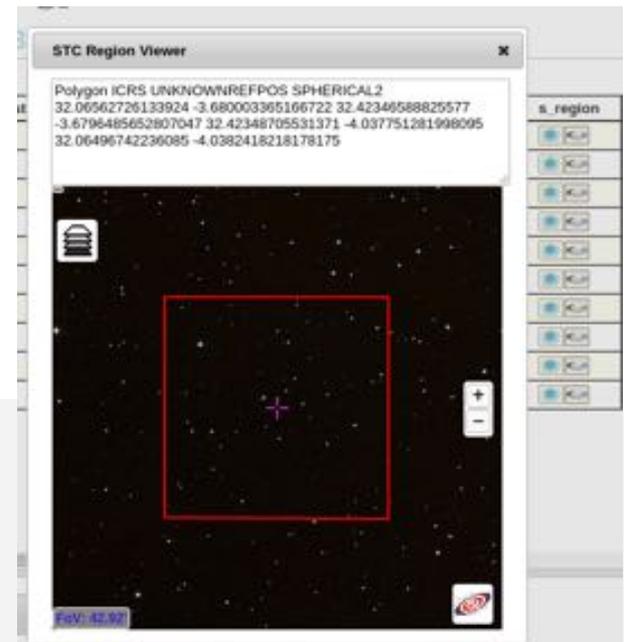
Data Formatting

target_name	s_ra	s_dec	s_fov	s_region	s_resolution	t_min	t_max	t_exptime	t_resolution	em_min	em_max	em_res_power
W1-2+3.E1.3	32.244389	-3.0589298	0.50648608		NaN	55469.409	55469.410	75.000000	75.000000	9.7000000e-7	0.0000010700000	10.200000
STC Region ✕ Polygon ICRS UNKNOWNREFPOS SPHERICAL2 32.06562726133924 -3.680003365166722 32.42348705531371 -4.037751281998095 32.06496742236085 -4.0382418218178175												
D2	150.11367	2.2113134	1.4004640		NaN	53848.384	53848.388	360.07100	360.07100	8.1590000e-7	0.0000010007000	4.9150433
0430+7206	85.163500	32.134444	0.005185493		NaN	65603.357	65603.363	360.00000	NaN	0.0013633167	0.0013632810	NaN

bibcode
2013AJ...146...78G
1062AmJ...127..1121K

position_naxes	position_naxis	position_scale
2		
Data Array ✕ Array[0.3037147065806119 0.3037147065806119]		

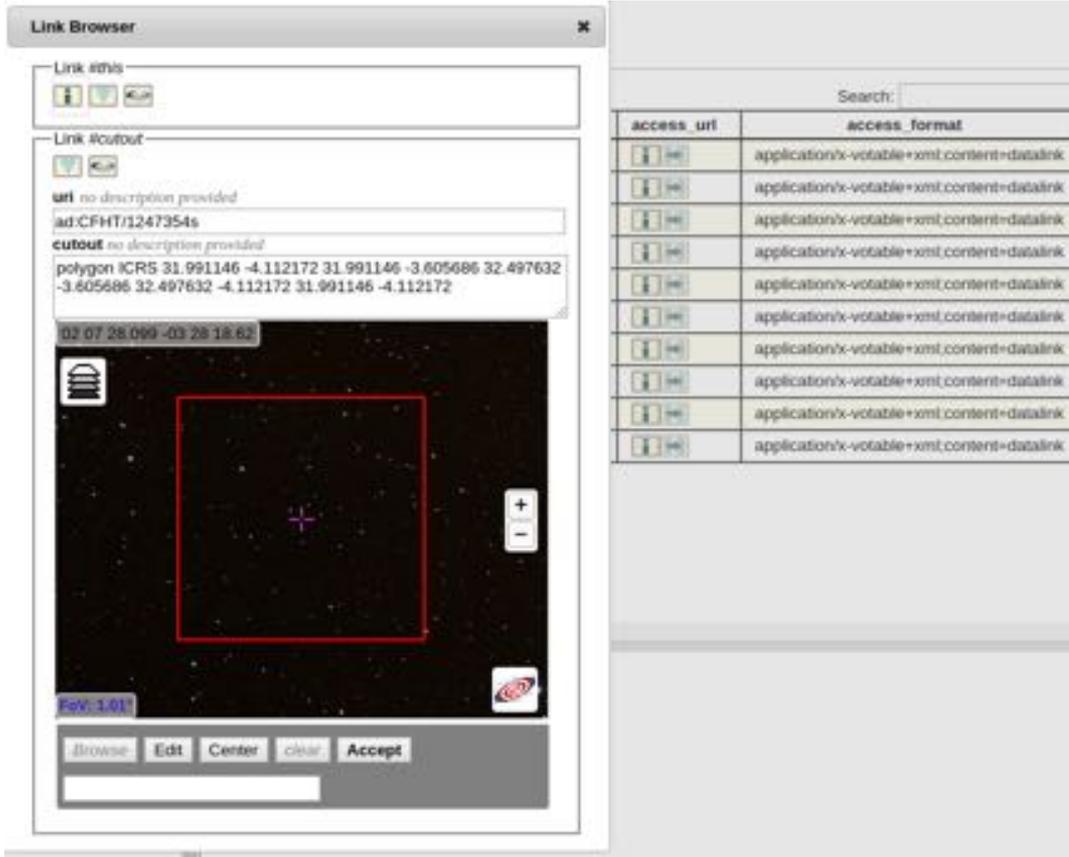
Search	
access_url	
	applic
	applic



- ✓ Displayed data are **formatted on the fly**
 - URLs
 - Vectors
 - Bibcodes
 - STC Regions



Datalink Support



The screenshot displays the 'Link Browser' window. On the left, there are two sections: 'Link #this' and 'Link #cutout'. The 'Link #cutout' section shows a 'url' field with 'no description provided', an 'id' field with 'CFHT1247354s', and a 'cutout' field with 'no description provided'. Below this is a 'polygon' field containing the coordinates: 'ICRS 31.991146 -4.112172 31.991146 -3.605686 32.497632 -3.605686 32.497632 -4.112172 31.991146 -4.112172'. A central panel shows a dark image with a red rectangular cutout and a crosshair. Below the image are buttons for 'Browse', 'Edit', 'Center', 'clear', and 'Accept'. On the right, a table lists datalink responses with columns 'access_uri' and 'access_format'. The table contains 10 rows, all with the same 'access_format' value: 'application/x-votable+xml;content=datalink'.

access_uri	access_format
	application/x-votable+xml;content=datalink

- ✓ Datalink responses are shown as **forms built on the fly**
 - SAMP connection for linked files
 - Region editor for cutouts
 - HTML forms when input parameters are requested





Service Survey

- ✓ Capabilities as tested by TapHandle
 - One row per server (not per service)

A	B	C	D	E	F	G	H	I	J
http://dc.zah.uni-heidelberg.de/tap	ivo://org.gavo.dc.gavo-tap		CAPABILITY	TABLES	JOIN	SYNC	ASYN	UPLOAD	GAVO Data Cent
http://wfaudata.roe.ac.uk/6df-dsa/TAP	ivo://wfauroe.ac.uk/wfauroe-6df-dsa		CAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	6df Galaxy Surv
http://dsa.roe.ac.uk/ukidssDR4-v1/TAP	ivo://wfauroe.ac.uk/wfauroe-ukidssdr4-v1		NOCAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	UKIDSS DR4 (5-
http://www.cadc-cada.hia-ihp.nrc-cnrc.gc.ca	ivo://cadc.nrc.ca/cadc		CAPABILITY	TABLES	JOIN	SYNC	ASYN	UPLOAD	CADC Table Que
http://cda.harvard.edu/cxctap	ivo://cxc.harvard.edu/cxch.harvard.edu/c		CAPABILITY	TABLES	NOJOIN	NOSYN	NOASYN	NOUPLOAD	Chandra X-ray O
http://voparis-tap.obspm.fr/_system_/tap/	ivo://vopdc.obspm.fr/voparis-epn		CAPABILITY	TABLES	JOIN	SYNC	ASYN	UPLOAD	Auroral Planetary
http://la2-tap.oats.inaf.it:8080/wgetap	ivo://la2.inaf.it/la2rafit-tap		CAPABILITY	TABLES	NOJOIN	SYNC	ASYN	UPLOAD	Laurino et al 201
http://hods.asdc.asi.it/TAP	ivo://asdc.tap.asdc.tap		CAPABILITY	TABLES	JOIN	SYNC	ASYN	NOUPLOAD	ASDC TAP Servi
http://la2-tap.oats.inaf.it:8080/epntap	ivo://la2.inaf.it/la2rafit-nas-adu		CAPABILITY	TABLES	NOJOIN	SYNC	ASYN	UPLOAD	INAF-IAPS RDB
https://tao.asvo.org.au/taotap	ivo://swinburne.it.swinburne-tao		CAPABILITY	TABLES	NOJOIN	NOSYN	NOASYN	NOUPLOAD	Theoretical Astr
http://cdpp-epntap.cesr.fr/_system_/tap/	ivo://cdpp/amda.cdpp-amda		CAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	CDPP AMDA Da
http://machotap.asvo.ncl.org.au/macho-tap/	ivo://hcl.org.au/hcl.nclorgau-tap		NOCAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	MACHO TAP
http://wiggletap.asvo.ncl.org.au/wigglez-tap	ivo://hcl.org.au/hcl.nclorgau-tap		NOCAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	WigglerZ Final De
http://hipastap.asvo.ncl.org.au/hipass-tap/	ivo://hcl.org.au/hcl.nclorgau-tap		NOCAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	HIPASS TAP
http://cas123-zone1.ast.cam.ac.uk/2dFGR	ivo://uk.ac.cam.uk/camast-object_c		NOCAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	2dF Galaxy Red
http://heasarc.gsfc.nasa.gov/xamir/vo/tap	ivo://hisa.hesa.heasarc-xamir		CAPABILITY	TABLES	JOIN	SYNC	ASYN	UPLOAD	HEASARC Xami
http://data.csiro.au/prdavo/TAP	ivo://au.csiro.au/prdvo-atnf_gulbar		CAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	ATNF Publishing
http://simbed.u-strasbg.fr/80/simbed/sim-tap	ivo://cda.simbed.simbed		CAPABILITY	TABLES	JOIN	SYNC	ASYN	UPLOAD	SIMBAD TAP qu
http://tapvizier.u-strasbg.fr/TAPVizieR/tap	ivo://cda.vizier.vizier		CAPABILITY	TABLES	JOIN	SYNC	ASYN	UPLOAD	TAP VizieR quer
http://vo.ree.ac.jp/skynode/dotap/akari	ivo://vo/ree.ac.jp/skynode/dotap/akari		CAPABILITY	TABLES	NOJOIN	NOSYN	NOASYN	NOUPLOAD	AKARI Far-infrar
http://www.sao.ru/dsa-cats/TAP	ivo://sao.ru/dsa-cats/saoru-wsdb		NOCAPABILITY	NOTABLES	NOJOIN	SYNC	ASYN	NOUPLOAD	Special Astrophy
http://gavo.sp.de/tap	ivo://tap.gavo.org/epgvoorg-tap		CAPABILITY	TABLES	JOIN	SYNC	ASYN	UPLOAD	AIP DaCHS TAP



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Prospects

- **Scheduled**

- Uploading position lists
- Uploading job results
- Support of extended functions by the query editor
 - Aggregation (count, min, max...)
 - ADQL functions.
- Better error handling
- Lot of minor changes making together the interface more comprehensive



- **Thinking about a better use of the meta data**

- Better representation of joined table sets.
- Extended use of the meta data
 - plain text meta data
 - Units
 - UCDs

- **Thinking about persistence for the query results**

- User sessions
- Connecting VOSpace?



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