

TAP and ADQL

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Table Access Protocol (TAP) ...

- is a **web service protocol** providing access to collections of tabular data (“tablesets”)
- accepts queries against a tableset and responds to a query by generating an output table
- supports various query languages
 - ▶ support for **ADQL** (Astronomical Data Query Language) is mandatory
- is available via **TOPCAT** (besides various other services like Vizier or cone search)
 - ▶ TOPCAT’s TAP client enables you to access astronomical tables at remote data centres all over the world

Astronomical Data Query Language (ADQL)

- based on **SQL** (Structured Query Language)
- consists of a subset of the SQL grammar extended for astronomical needs
 - ▶ e.g. support for geometrical functions
- basic query syntax:

```
SELECT [ TOP <#rows> ] <column name #1> <column name #2> ...  
FROM <table name>  
[ WHERE <conditions> ]  
[ GROUP BY <columns> ]  
[ ORDER BY <columns> ]
```

- ▶ squared brackets above mean: **optional**
- ▶ to select all columns of a table, the * symbol can be used, e.g.

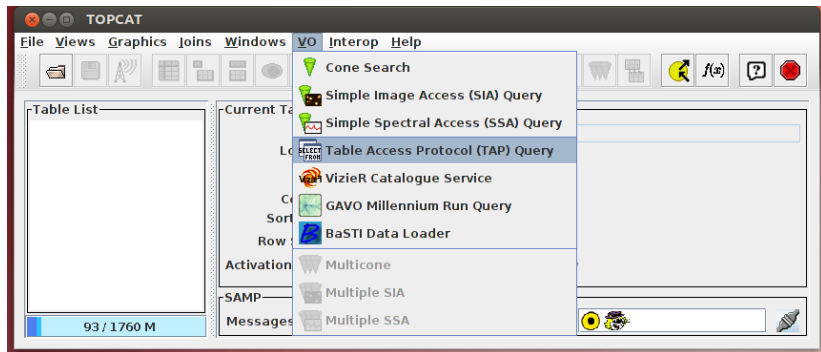
```
SELECT * FROM mytable
```

- an application like **TOPCAT** which “speaks” TAP
- a **data centre** providing one or several tablesets of interest
- a **query** formulated in ADQL



TAP/ADQL – Let's Start Cooking...

- access TAP via TOPCAT



- ▶ click on “VO” → “Table Access Protocol (TAP) Query”

TAP/ADQL – Let's Start Cooking...

- search the registry for TAP services
 - ▶ click on **“Submit Query”** (you can leave the **“Keywords”** line blank)

Table Access Protocol (TAP) Query

File Deletion Columns Registry Interop Help

Select Service Enter Query Resume Job Running Jobs

Available TAP Services

Registry: <http://registry.astrogrid.org/astrogrid-registry/services/Registry>

Keywords: And

Match Fields: Short Name Title Subjects ID Publisher De

Accept Resource Lists Cancel Query Submit Query

Short Name	Title
FIRST	FIRST Survey Catalogue (03Apr11 Version)
GAVO DC TAP	GAVO data center TAP service
GLIMPSE	GLIMPSE (Galactic Legacy Infrared Mid-Plane Survey Extraordinaire)
IRAS	Infrared Astronomical Satellite Archive (IRAS)

TAP Parameters

TAP URL: http://dc.zah.uni-heidelberg.de/_system_/tap/run/tap Enter Query

- ▶ click on **“Enter Query”**

TAP/ADQL – Let's Start Cooking...

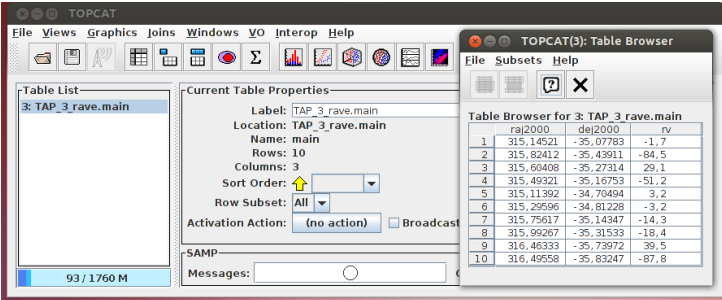
- select a table, e.g. **“rave.main”** (spectroscopic radial velocities of 50000 stars in the Milky-Way Southern hemisphere)
 - ▶ column information is displayed
- enter your ADQL query in the **“ADQL Text”** box, e.g.

```
SELECT [ TOP 10 ] raj2000, dej2000, rv FROM rave.main
```

- ▶ hint: clicking button **“Examples”** provides several example queries

TAP/ADQL – Your Meal Is Being Served...

- query output: table with three columns (right ascension, declination, radial velocity) and ten rows (the first ten rows of our input table)



The screenshot shows the TOPCAT software interface. The main window displays the 'Table List' with '3: TAP_3_rave.main' selected. The 'Current Table Properties' panel shows details for this table: Label: TAP_3_rave.main, Location: TAP_3_rave.main, Name: main, Rows: 10, Columns: 3, Sort Order: (up arrow), Row Subset: All, and Activation Action: (no action). A 'Table Browser' window is open, displaying the first 10 rows of data for '3: TAP_3_rave.main' with columns 'ra|2000', 'de|2000', and 'rv'.

	ra 2000	de 2000	rv
1	315,14521	-35,07783	-1,7
2	315,82412	-35,43911	-84,5
3	315,60408	-35,27314	29,1
4	315,49321	-35,16753	-51,2
5	315,11392	-34,70494	3,2
6	315,29596	-34,81228	-3,2
7	315,75617	-35,14347	-14,3
8	315,99267	-35,31533	-18,4
9	316,46333	-35,73972	39,5
10	316,49558	-35,83247	-87,8

- ▶ use TOPCAT to display your data, cross-match them with other tabular data, ...

Special Devices: The ADQL Mixer

- the mixer allows you to have columns from different input tables in your output table
- technically, it's a table join
 - ▶ ADQL knows a so-called JOIN ... USING and a JOIN ... ON

```
SELECT [ TOP <setLimit> ] <columnList>  
FROM <table1>  
JOIN <table2>  
USING <columnName>
```

- ▶ `columnName` is a column which is present in `table1` and `table2`

```
SELECT [ TOP <setLimit> ] <columnList>  
FROM <table1>  
JOIN <table2>  
ON <searchCondition>
```

- ▶ `searchCondition` defines the conditions which must be satisfied to join rows from `table1` and `table2`, e.g. matching coordinates

- you will get and learn more recipes in the following by our short exercise course
- don't hesitate to ask if you get stuck or feel unsure

We hope that you'll enjoy the course...
and get inspired to satisfy your (g)astronomical delights...

-  P. Dowler et al.: Table Access Protocol – Version 1.0, IVOA Recommendation (27th of March 2010).
-  I. Ortiz et al.: IVOA Astronomical Data Query Language – Version 2.0, IVOA Recommendation (30th of October 2008).
-  M. Demleitner: GAVO web page offering a short course on ADQL and TAP, <http://docs.g-vo.org/adql/html/>.
-  M. Taylor: TOPCAT – Tool for OPerations on Catalogues And Tables, <http://www.star.bris.ac.uk/~mbt/topcat/>.