Scientific council : The TAPVizieR service

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The context

The TAPVizieR services provides a **new** method to search for data in the VizieR database.

Why a new service ?

- VizieR is a component of the Virtual Observatory
  $\rightarrow$ implementation of the standards : ADQL/TAP

- ADQL gives new capabilities to search for data in a VizieR table

To take advantage of **ADQL**

⚠ *VizieR can't extract data from table with constraints computed with combined columns!*

Example : to find records of tables with a color defined by the difference between 2 columns (Bmag-Vmag)

The benefits of **SQL**

- SQL can execute operations between columns
- SQL contains functions : *average, min, max,* $\sqrt{col}$*, ... (PostgreSQL : sine, cosine...)*
- SQL can join tables

Example : *querying a table with a color constraint*

```
SELECT  table.RA2000, table.DE2000, table.Bmag, table.Vmag
FROM    table
WHERE   Bmag-Vmag<1
```

To take advantage of **ADQL**

- **ADQL** : a SQL extension for astronomy

- a set of objects and functions : distance, geometries
  (point, circle, polygon, box)

Example : *the Tycho catalog around Vega*

```
SELECT ra_icrs_, de_icrs_
FROM   tyc2
WHERE  1=CONTAINS(
           POINT('ICRS',tyc2.RA_ICRS_,tyc2.DE_ICRS_) ,
           CIRCLE('ICRS', 279.23, 38.78, 2.))
```

To take advantage of **TAP**

The TAP service

TAP is a HTTP protocol to execute a remote **ADQL** Query

- the META data provided by the service contains a standardized description of the database
- TAP can be used in synchronous or asynchronous mode

A standard of the IVOA

- **TAP** services are already availale in CADC, GAVO ..
- external software like **Topcat** operates on TAP service
- TAP can be used by external software to link different databases

The VizieR implementation

Managing the VizieR volumetry

- **METAdata** : $\sim$10.000 catalogs, $\sim$20.000 tables and $\sim$300.000 columns

- **Large catalogs** : 2MASS($\sim$400G), GSC2.3($\sim$1T), ...

$\Rightarrow$ **Implementation :**   a new dedicated database ($\sim$3.5Tb)
                                  a new 2D index **H3C** based on the standard HEALPix.

To manage the heterogeneous coordinates systems

- Coordinate system, equinox, epoch depends of the catalog

- VizieR computes positions, taking into account equinox, epoch and **proper motions**

$\Rightarrow$ **Implementation :**   requires homogeneous positions $\Rightarrow$ add positions in ICRS
                                  for every table.

Giving an easier access

- ADQL is not yet known by all astronomers
  ⇒ simplify the usage of the service with generated ADQL from a simple form

- take advantage of the VizieR METAdata (more detailed than TAP METAdata) to select the appropriate tables and columns

Conclusion

Beneficial impact of implementation

- an experience with big database and replication (PostgreSQL) $\sim 3.5\,Tb$
- a new index **H3C** based on **HEALPix**
- a web interface which can be used for teaching

Commissioning schedule

- Today : available locally only
- Soon : available for the external VO community
  followed by the annoucement to the astronomical community