

# ivo ADQL UDFs in the Pipeline

GEFÖRDERT VOM



Bundesministerium  
für Bildung  
und Forschung

Markus Demleitner

*msdemlei@ari.uni-heidelberg.de*



- Reminder: What this is about
- Two UDFs for UDF catalogue 1.1
- Six UDFs for UDF catalogue 1.2



# ADQL User Defined Functions

TAP operators can add functionality to their ADQL engines by providing extra functions. Their names should start with a provider-specific prefix, as in:

```
select top 1 gavo_to_mjd('2023-10-18T15:57')  
from tap_schema.tables  
[=60235.664583]
```

When multiple operators provide the same functionality, they should converge on a common name and use the `ivo_` prefix.

The “Catalogue of ADQL User Defined Functions”, now in Version 1.0 (Juaristi Campillo and Demleitner 2021) lists these `ivo_` UDFs.

# Towards Version 1.1

Version 1.1 of the UDF cat is currently proposed (see <http://ivoa.net/documents/>). There are two new UDFs in there:

```
ivo_epoch_prop_pos(ra, dec, parallax, pmra, pmdec,  
radial_velocity, ref_epoch, out_epoch) -> POINT
```

and

```
ivo_histogram(val, lower, upper, nbins) -> INTEGER[]
```

Please review and post to the DAL list if you have thoughts about this.

# Towards Version 1.2

There are already several functions slated for version 1.2. Please chime in if you think they should be defined differently.

# ivo\_normal\_random

```
ivo_normal_random(mu REAL, sigma REAL) -> REAL
```

The function returns a random number drawn from a normal distribution with mean  $\mu$  and width  $\sigma$ .

# ivo\_simbadpoint

```
ivo_simbadpoint(identifier TEXT) -> POINT
```

gavo\_simbadpoint queries simbad for an identifier and returns the corresponding point. Note that identifier can only be a literal, i.e., as simple string rather than a column name.

```
e.g., ivo_simbadpoint('GJ 699')  
-> POINT(269.452076958619, 4.69336496657667)
```

# **ivo\_to\_jd, ivo\_to\_mjd**

```
ivo_to_jd(d TIMESTAMP) -> DOUBLE PRECISION
```

```
ivo_to_mjd(d TIMESTAMP) -> DOUBLE PRECISION
```

The functions converts database timestamps to (modified) julian dates. This is naive; no corrections for timezones, let alone time scales or the like are done. You can thus not expect this to be good to second-precision unless you are careful in the construction of the timestamp.

This is so you can do date computations even if the table schema (regrettably) has timestamps.

# ivo\_transform

```
ivo_transform(from_sys TEXT, to_sys TEXT, geo GEOMETRY) ->  
GEOMETRY
```

The function transforms ADQL geometries between various reference systems. `geo` can be a `POINT`, a `CIRCLE`, or a `POLYGON`, and the function will return a geometry of the same type. `From_sys` and `to_sys` must be literal strings. Reference frame names are case-sensitive and must be taken from the IVOA reframe vocabulary.



# ivo\_epoch\_prop

```
ivo_epoch_prop(ra DOUBLE PRECISION, dec DOUBLE PRECISION,  
    parallax DOUBLE PRECISION, pmra DOUBLE PRECISION,  
    pmdec DOUBLE PRECISION, radial_velocity DOUBLE PRECISION,  
    ref_epoch DOUBLE PRECISION, out_epoch DOUBLE PRECISION)  
-> DOUBLE PRECISION[6]
```

Returns a 6-vector of (ra, dec, parallax, pmra, pmdec, rv) at out\_epoch for these quantities at ref\_epoch. Units on input and output are degrees for ra and dec, mas for parallax, mas/yr for pmra and pmdec, and km/s for the radial velocity. ref\_epoch and out\_epoch are given in Julian years. parallax, pmra, pmdec, and radial\_velocity may be None and will enter the computations as 0 then, except in the case of parallax, which will be some small value.

# Your Turn!

Feedback on all of these is welcome on the DAL list (or perhaps as a bug on <https://github.com/ivoa-std/udf-catalogue>).

If you have useful UDFs in your TAP service and want to promote it to ivo\_: Talk to me; perhaps I'll be your second implementation!

Thanks!