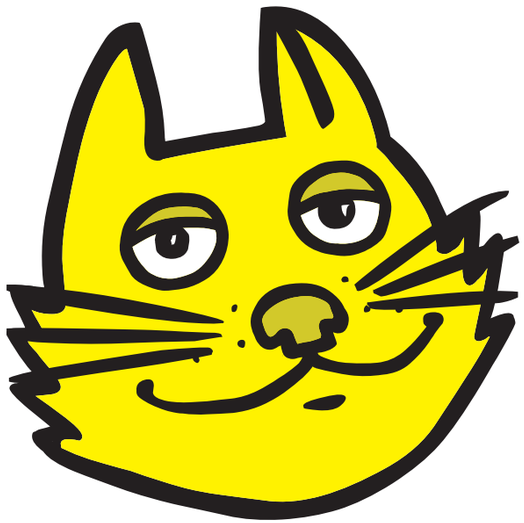
TOPCAT/STILTS Updates



Mark Taylor (University of Bristol)

IVOA Interop
Bologna

10 May 2023

$Id: tcupdates.tex,v 1.11 2023/05/09 20:51:54 mbt Exp $

Outline

TOPCAT v4.8-8, STILTS v3.4-8, released April 2023

- ADQL 2.1
- DataLink 1.1
- Plot Axes
- Other ...

ADQL

Powered by VOLLT — thanks Grégory Mantelet

- Using beta version with ADQL 2.1 support (commit `8b88a44` on branch `adql2.1`)

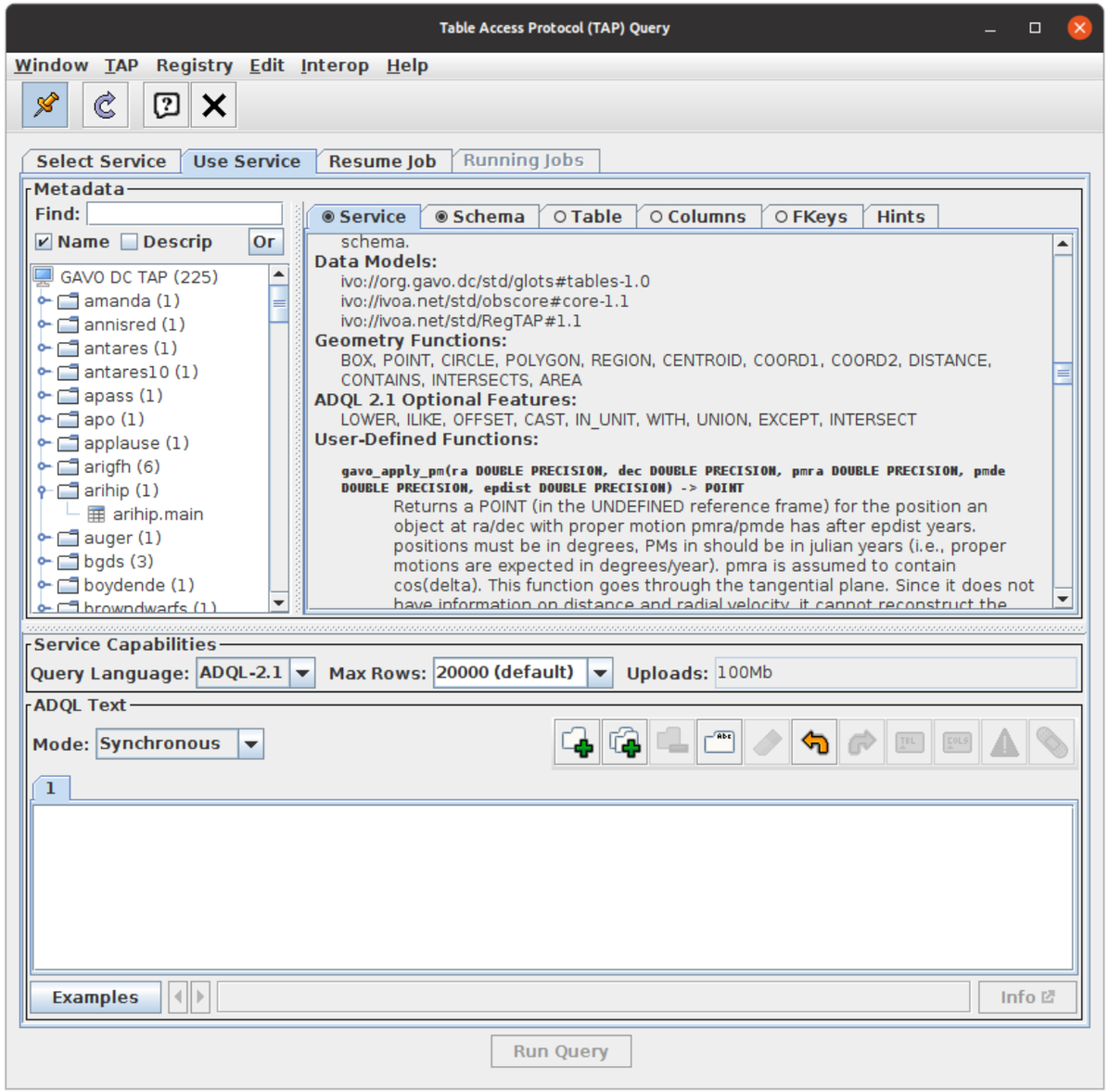
TOPCAT reads `/capabilities` document (TAPRegExt)

- Detects support for:
  - ADQL 2.1 (else 2.0 default)
  - optional ADQL features (geometry, CTEs, Sets, unit conversion, ...)
  - User Defined Functions, including argument syntax
- Reports details in **Service** tab
- Feeds information to parser for syntax checking in ADQL entry panel
- Adjusts **Examples** menu ADQL
- Updates **Hints** tab content

If service is ADQL 2.1, you can select instead ADQL 2.0 in Capabilities Panel

- Not generally useful ...
- ... except for ADQL geeks, syntax declaration checking etc

ADQL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bgds (3)
boydende (1)
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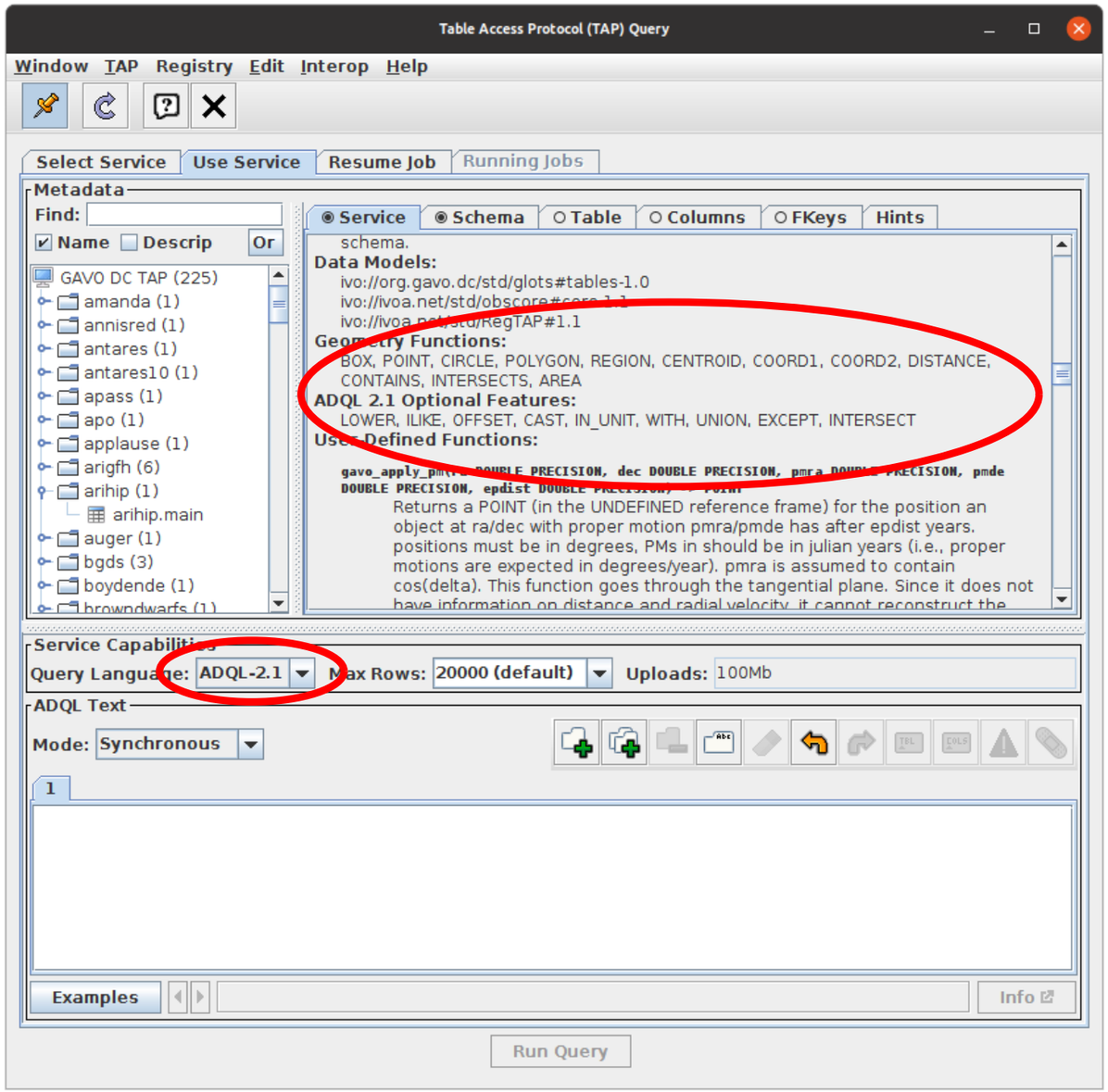
Hints
schema.
Data Models:
ivo://org.gavo.dc/std/glots#tables-1.0
ivo://ivoa.net/std/obscore#core-1.1
ivo://ivoa.net/std/RegTAP#1.1
Geometry Functions:
BOX, POINT, CIRCLE, POLYGON, REGION, CENTROID, COORD1, COORD2, DISTANCE,
CONTAINS, INTERSECTS, AREA
ADQL 2.1 Optional Features:
LOWER, ILIKE, OFFSET, CAST, IN_UNIT, WITH, UNION, EXCEPT, INTERSECT
User-Defined Functions:
gavo_apply_pm(ra DOUBLE PRECISION, dec DOUBLE PRECISION, pmra DOUBLE PRECISION, pmde
DOUBLE PRECISION, epdist DOUBLE PRECISION) -> POINT
Returns a POINT (in the UNDEFINED reference frame) for the position an
object at ra/dec with proper motion pmra/pmde has after epdist years.
positions must be in degrees, PMs in should be in julian years (i.e., proper
motions are expected in degrees/year). pmra is assumed to contain
cos(delta). This function goes through the tangential plane. Since it does not
Service Capabilities
Query Language: ADQL-2.1
Max Rows: 20000 (default)
Uploads: 100Mb
ADQL Text
Mode: Synchronous
1
Examples
Info
Run Query

ADQL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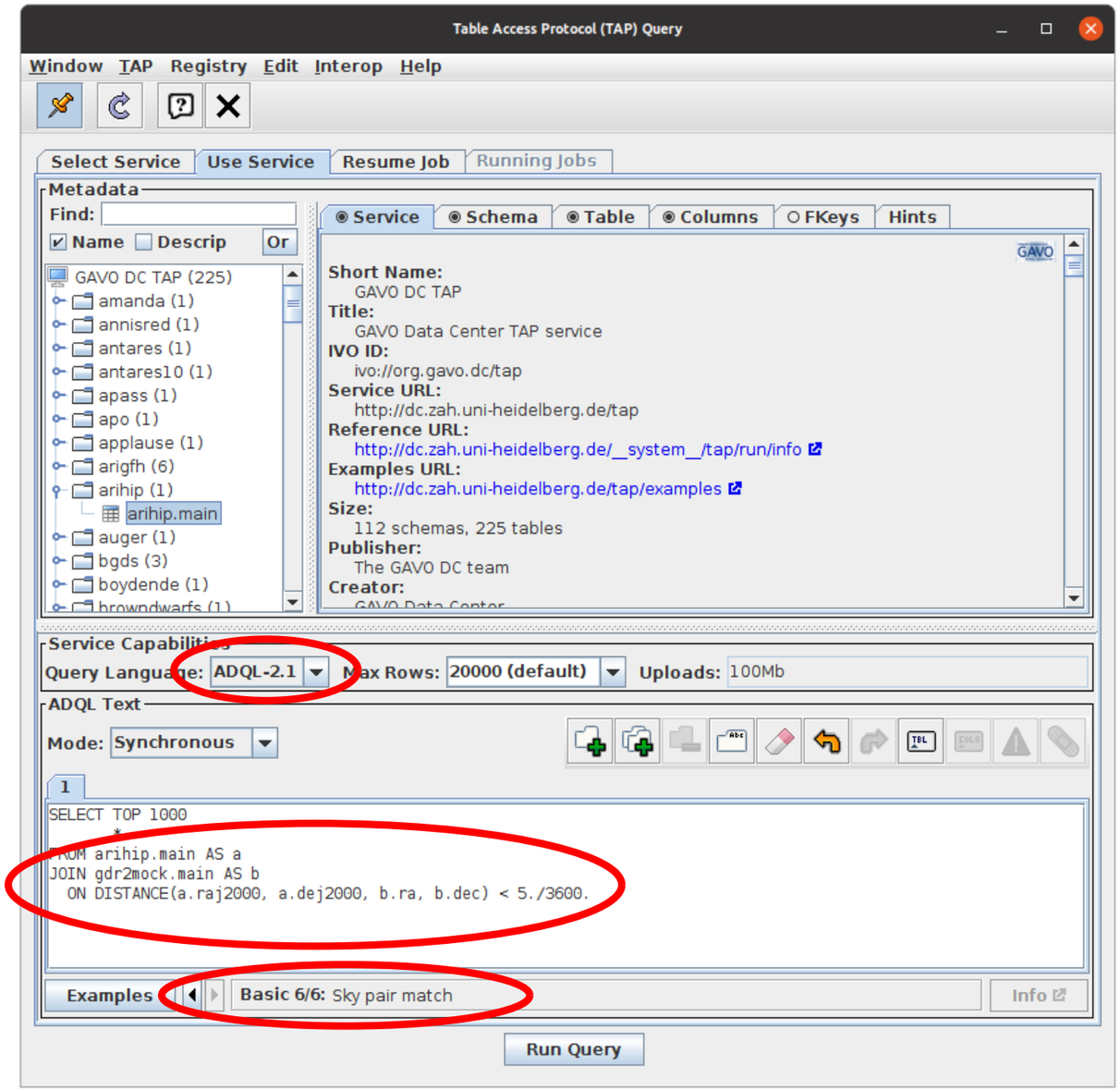
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GAVO DC TAP
Title:
GAVO Data Center TAP service
IVO ID:
ivo://org.gavo.dc/tap
Service URL:
http://dc.zah.uni-heidelberg.de/tap
Reference URL:
http://dc.zah.uni-heidelberg.de/__system__/tap/run/info
Examples URL:
http://dc.zah.uni-heidelberg.de/tap/examples
Size:
112 schemas, 225 tables
Publisher:
The GAVO DC team
Creator:
Service Capabilities
Query Language: ADQL-2.1
Max Rows: 20000 (default)
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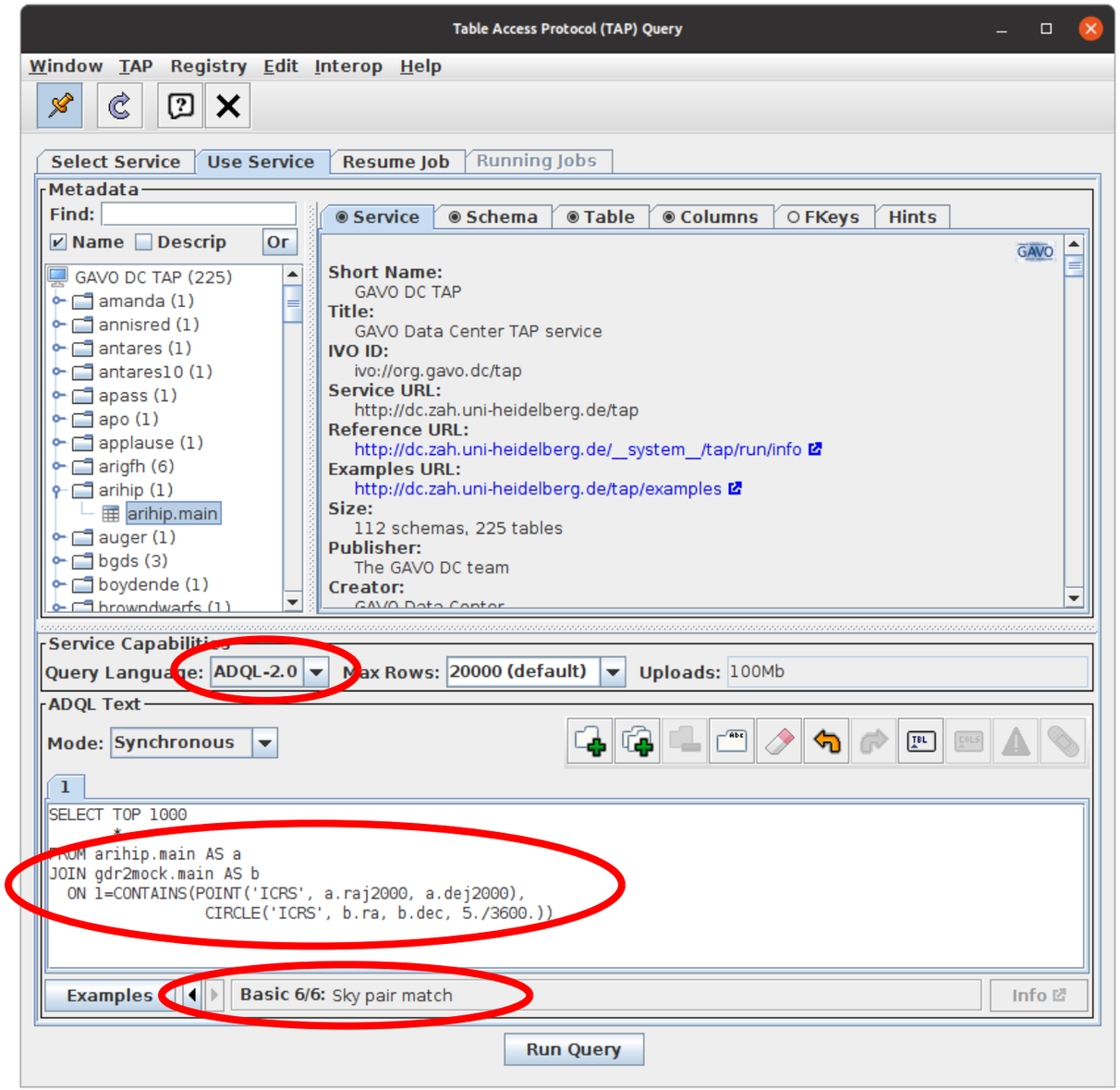
ADQL Text
Mode: Synchronous
1
SELECT TOP 1000
*
FROM arihip.main AS a
JOIN gdr2mock.main AS b
ON DISTANCE(a.raj2000, a.dej2000, b.ra, b.dec) < 5./3600.
Examples
Basic 6/6: Sky pair match
Info
Run Query

ADQL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ADQL Text
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1
SELECT TOP 1000
*
FROM arihip.main AS a
JOIN gdr2mock.main AS b
ON 1=CONTAINS(POINT('ICRS', a.raj2000, a.dej2000),
CIRCLE('ICRS', b.ra, b.dec, 5./3600.))
Examples
Basic 6/6: Sky pair match
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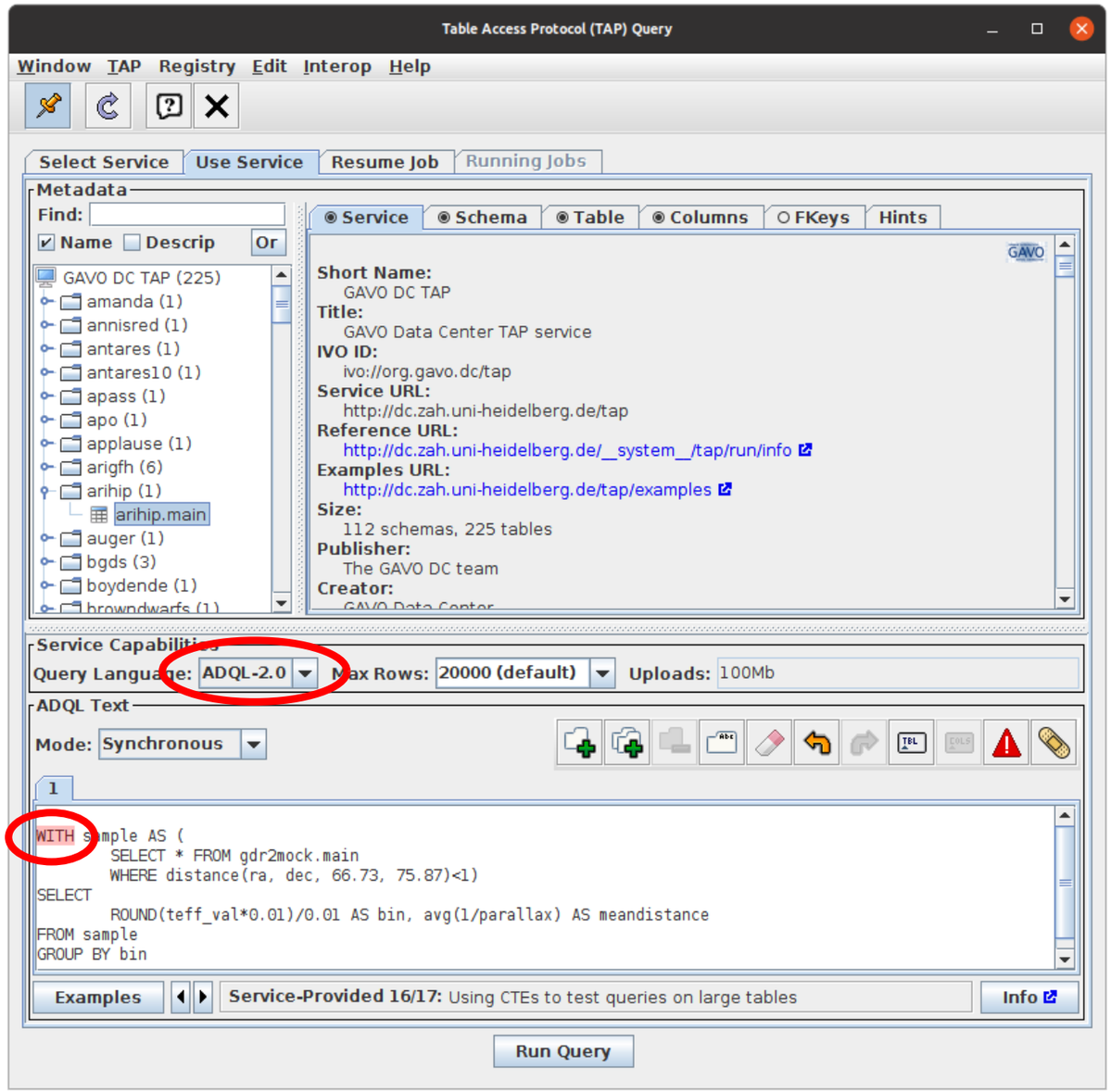
ADQL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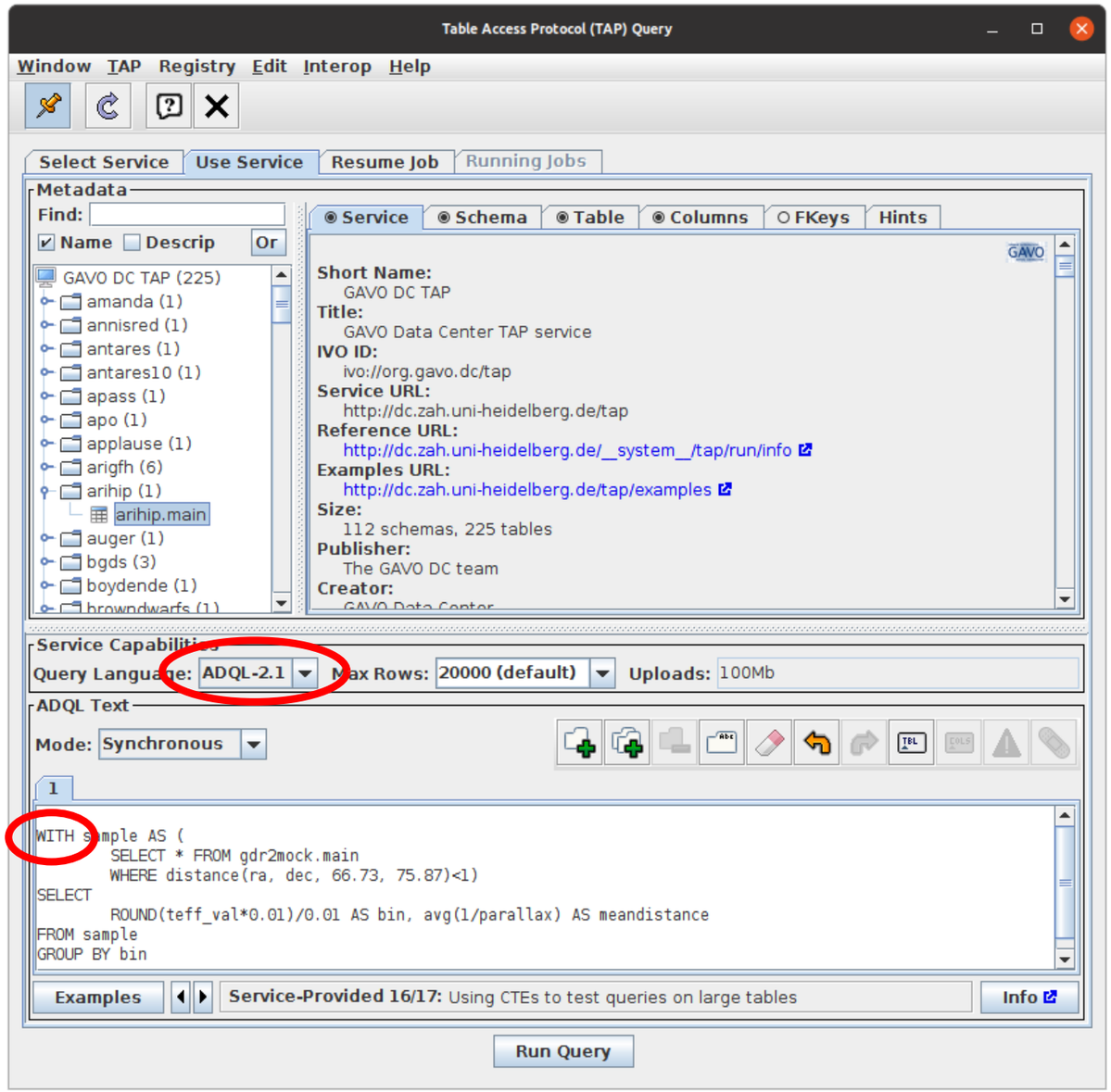
WITH sample AS (
SELECT * FROM gdr2mock.main
WHERE distance(ra, dec, 66.73, 75.87)<1)
SELECT
ROUND(teff_val*0.01)/0.01 AS bin, avg(1/parallax) AS meandistance
FROM sample
GROUP BY bin
Examples
Service-Provided 16/17: Using CTEs to test queries on large tables
Info
Run Query

ADQL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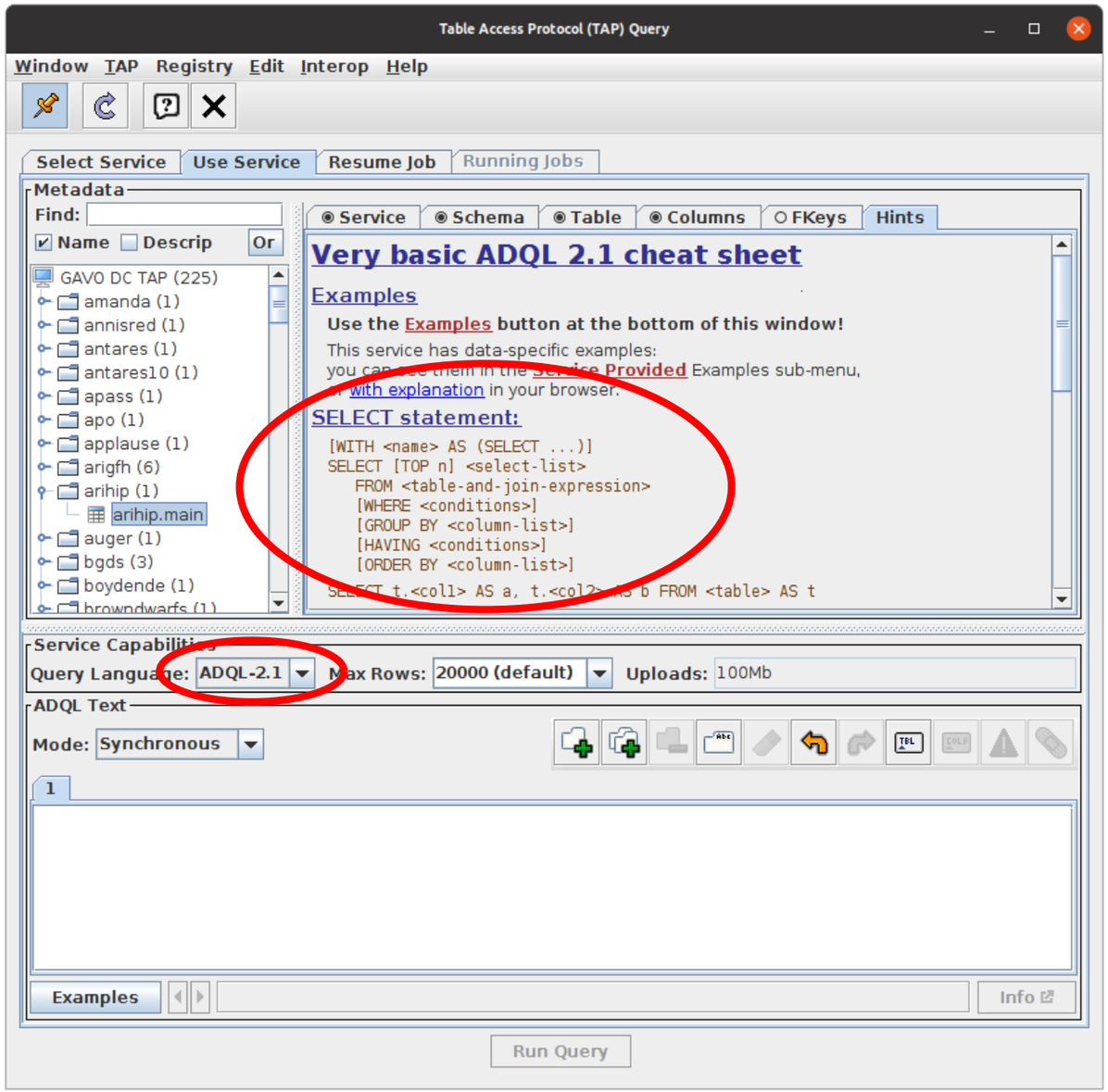
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Very basic ADQL 2.1 cheat sheet
Examples
Use the Examples button at the bottom of this window!
This service has data-specific examples:
with explanation in your browser.
SELECT statement:
[WITH <name> AS (SELECT ...)]
SELECT [TOP n] <select-list>
FROM <table-and-join-expression>
[WHERE <conditions>]
[GROUP BY <column-list>]
[HAVING <conditions>]
[ORDER BY <column-list>]
Service Capabilities
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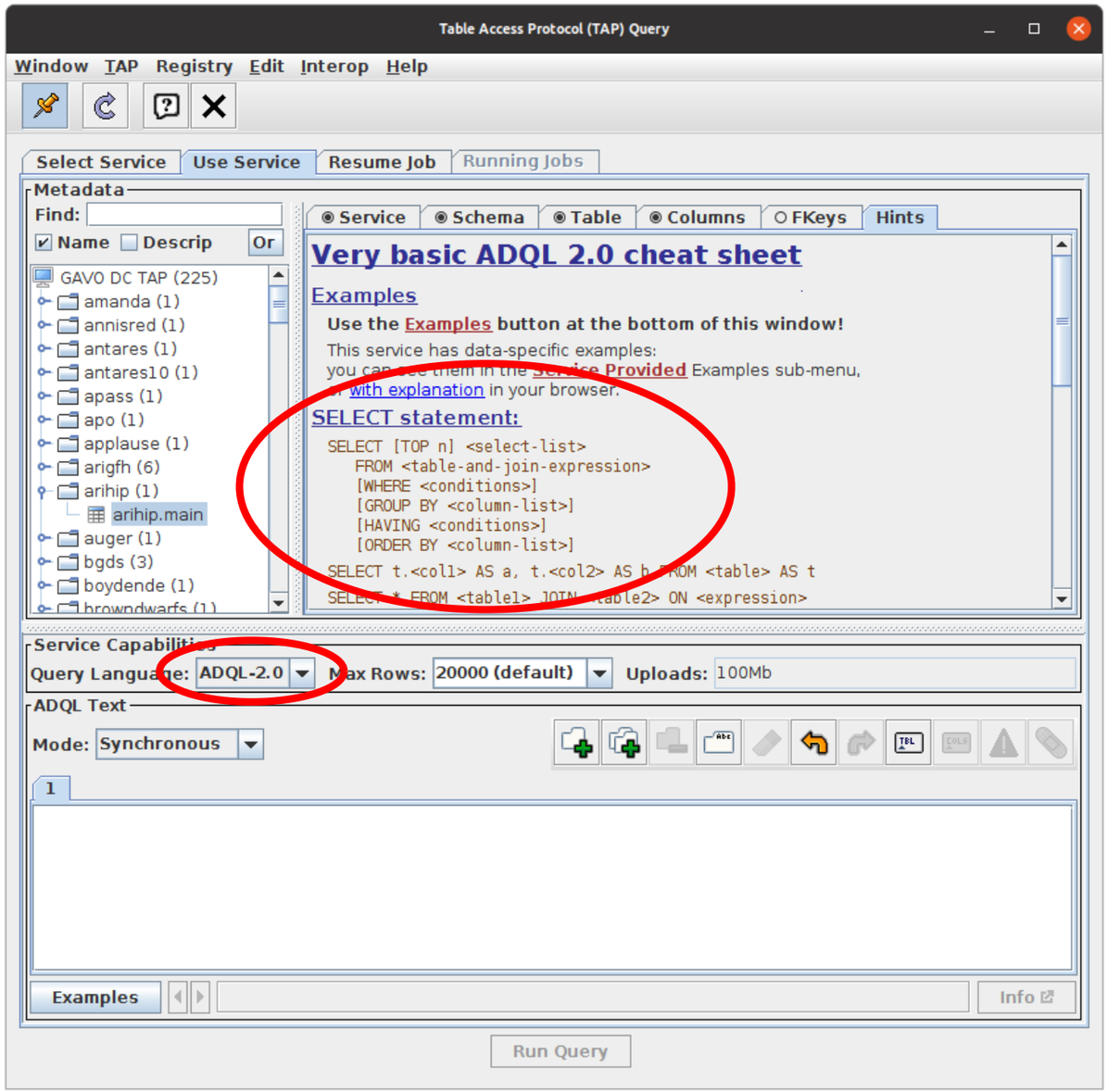
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[HAVING <conditions>]
[ORDER BY <column-list>]
SELECT t.<col1> AS a, t.<col2> AS b FROM <table> AS t
Service Capabilities
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ADQL

Users

- Probably won't notice this change in behaviour
- Hopefully it will just help them to do the right thing
  (and not get confused because syntax is different for different services)

Service Providers

- Implement ADQL 2.1 if you can
- Make sure your VOSI `capabilities` document declares optional features etc (TAPRegExt)
- Remember: `DISTANCE(ra1,dec1,ra2,dec2)<dist` is preferred crossmatch/cone condition

DataLink

TOPCAT and DataLink 1.1

- New metadata used to improve guesses about DL result handling
  - `content_qualifier` helps to decide on default action for link target
  - `local_semantics` helps to predict user link choice based on last choice

VOTable I/O

- Service Descriptor PARAMs `contentType` and `exampleURL` now preserved on round trip I/O

STILTS `datalinklint`

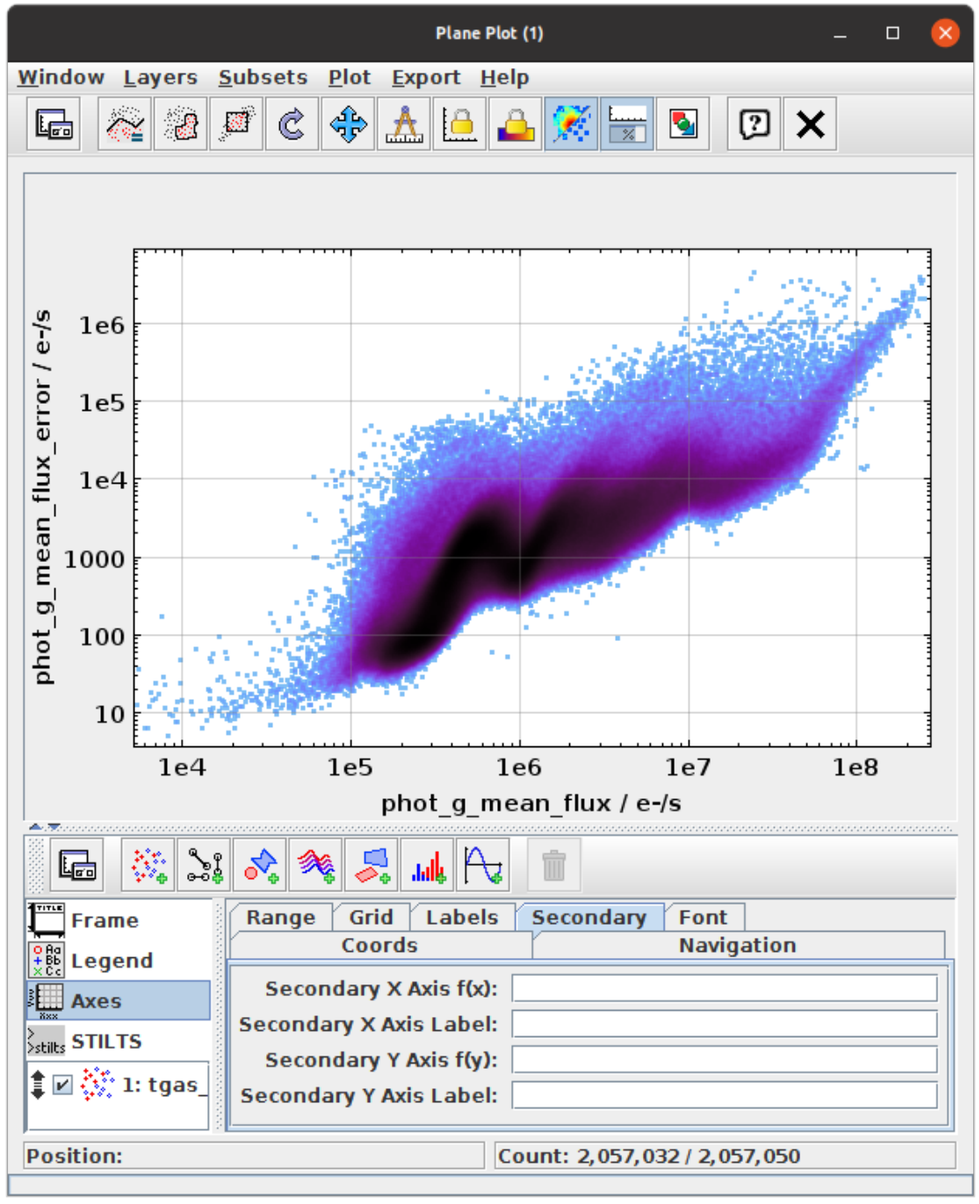
- Validates DataLink links-response tables
- Can now check DataLink 1.0 or (PR-20230413) 1.1
- 1.1-specific checks:
  - Required standardID INFO
  - Contiguous rows for same ID
  - Content of columns `content_qualifier`, `link_auth`, `link_authorized`
  - Recommended name/DESCRIPTION metadata for (especially multiple) service descriptors
- Version determination:
  - Has parameter `version` = `"1.0"` or `"1.1"`, effectively defaults to 1.1
  - Currently no way to determine from links response table what version it's supposed to be — see DL Issue #96
- Checks on semantics terms now check online vocabularies if necessary (e.g. `https://www.ivoa.net/rdf/datalink/core/`)
- Does/should anybody validate links response tables routinely?

Plot Axes

Several (overdue) improvements in plot axis drawing

- Tick marks on all four axes by default
- "Secondary axes" possible — different scales on top/bottom or left/right axes (defined algebraically)
- Variable transparency on grid lines
- Minor tick marks not so crowded

  $\rightarrow$ plots a bit less ugly
- Applies to **Plane** and **Time** plots



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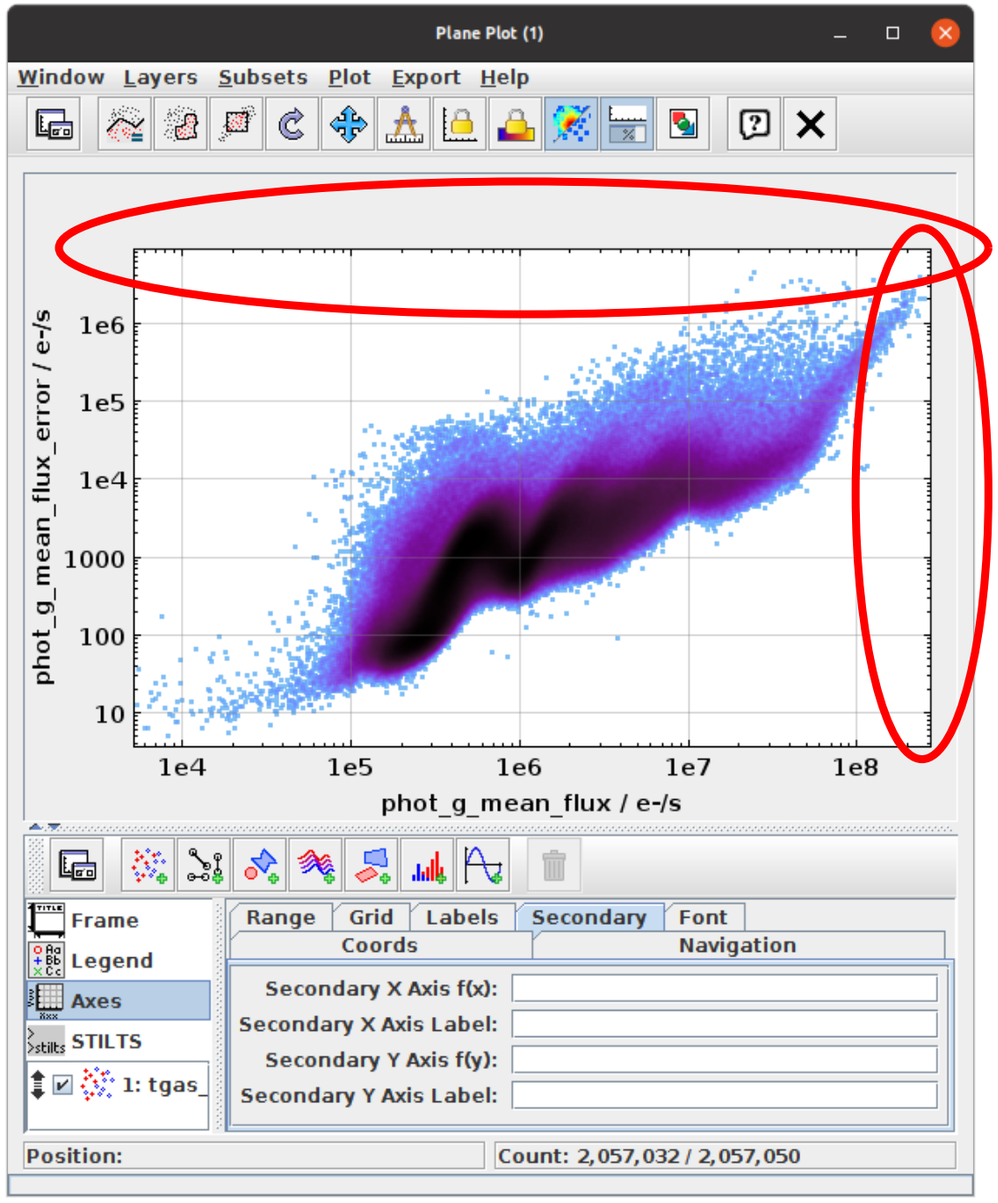

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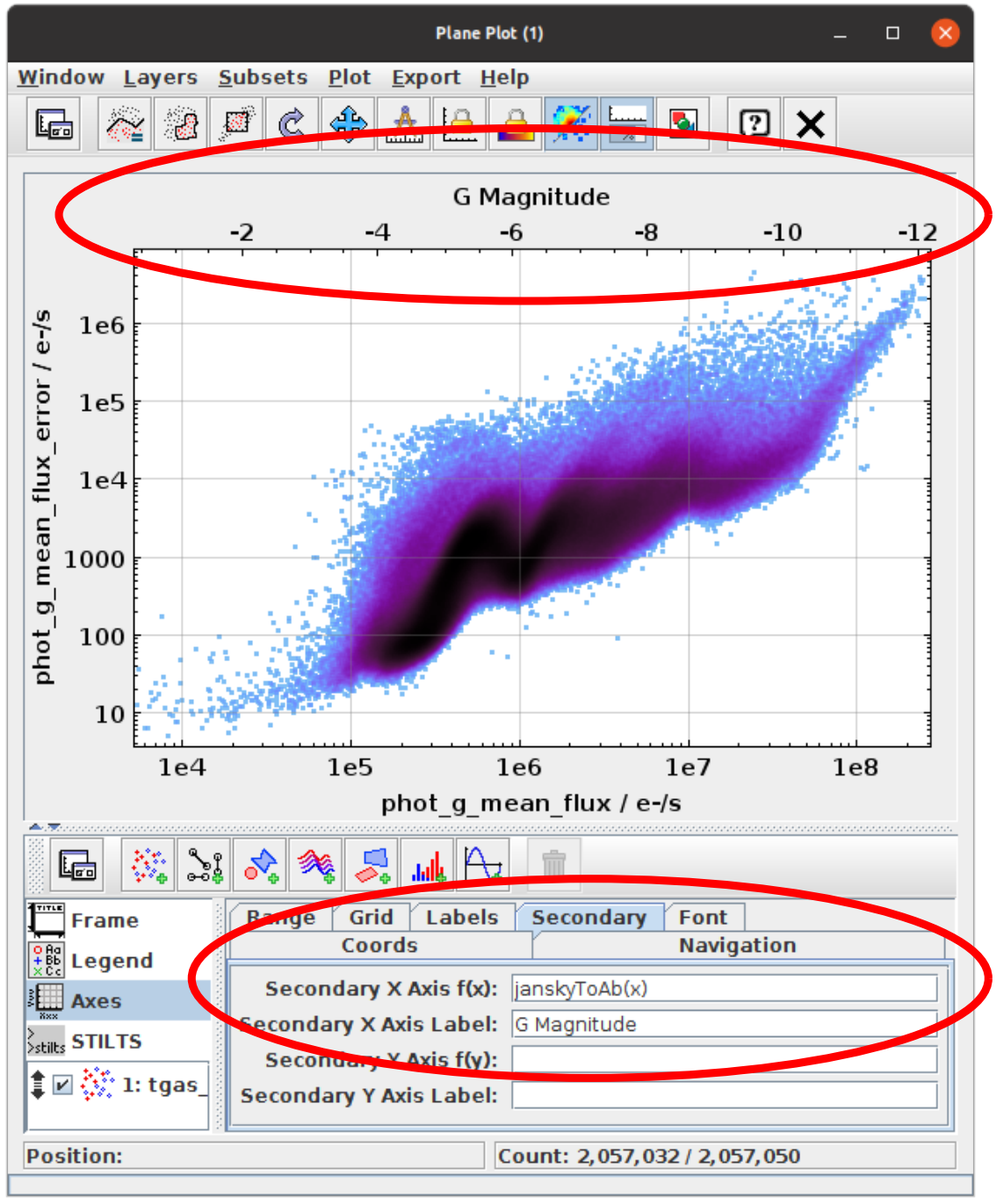

Miscellaneous

Various other minor enhancements, bugfixes, workarounds

- Can draw ellipse shapes for graphical subset selection on Sky plot
- New function `inSkyEllipse(ra0, dec0, raCenter, decCenter, rA, rB, posAng)`
- Hierarchical Service-Provided Example menus in TAP window
- UCD validation updated to UCDList v1.5 (thanks to Grégory Mantelet Ucidy library)
- Recognised "smoc" as well as "moc" in xtypes
- ECSV reader performance improved, especially for Gaia DR3 bulk download files
- JDBC reader now reads array values from RDBMS
- Bug fixes, performance enhancements, ...

See the web pages for more detail

http://www.starlink.ac.uk/topcat/

http://www.starlink.ac.uk/stilts/