

# Data Discovery Using the Virtual Observatory Registry

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## What's this about?

The Virtual Observatory Registry (VO Registry) is a database for metadata, a place which provides lots of metadata on astronomical “resources” – essentially data services and the like. Its function is to help the astronomer (or a program on her behalf) locate services relevant to her research; as an example, we will look for V magnitudes and redshifts of quasars.

There are many ways to access registry data – a fairly powerful one is the Web Interface to the Relational Registry (WIRR for short) at <http://dc.g-vo.org/WIRR>. To actually speak to the VO services discovered, clients speaking the service’s protocols are still required. In this tutorial, [TOPCAT](#) plays that role.

**Software:** a web browser of your choice, [TOPCAT](#)

## 1 Querying the Registry

- ▷ **1** Open a **web browser** with <http://dc.g-vo.org/WIRR>. Make sure that JavaScript is enabled or at least grant the originating page execute privileges for JavaScript. Our web page provides a sidebar, a search field (top) and an info box which is also used to display the query results (bottom). Try to get familiar with the search form by playing a little bit around. Change the search criteria (e.g. from the free text to a waveband search), and add or remove one or several constraint lines to the search form. Click the **Run Query** button to send your query to the database.
- ▷ **2** Now translate “data with V magnitudes and redshifts of quasars” into WIRR’s criteria. The topical constraint (“quasar”) we cover with a full text match (“Text Fields match...”).

- ▷ 3 Add a new constraint line (the + button; the “data” part of our constrain means catalog, and that means we’re looking for catalog services. In WIRR, that’s “Service Capability is Cone Search” (note that depending on what you’re planning, it might actually be smarter to look for TAP services, but using these is a bit more involved.
- ▷ 4 The physical constraints (existence of magnitudes and redshifts) are a bit trickier. In the VO, physics is described by **Unified Content Descriptors** (UCDs). Of course, you don’t have to know the UCDs for redshifts and V band magnitudes by heart. Instead, make the [UCD Resolver](#) find the appropriate UCDs for you. On the resolver page, type “redshift” into the “Column description” field. Clicking the **Go** button will provide the correct string “src.redshift”. Repeat the game by typing something like “V band magnitude” into the text field. The desired UCD is called “phot.mag;em.opt.V”.



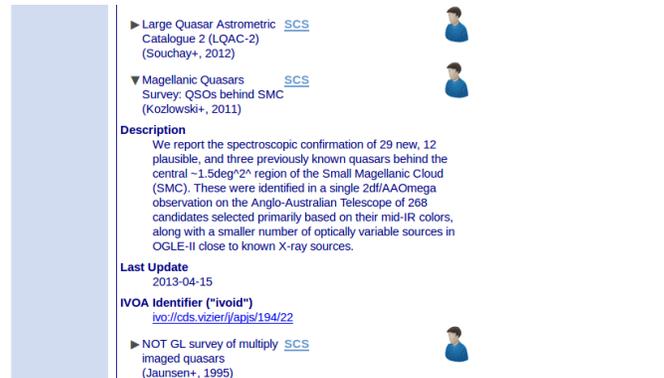
The screenshot shows a search form with the following fields and values:

|                    |       |                   |   |      |
|--------------------|-------|-------------------|---|------|
| Text Fields        | match | quasar            | - | Info |
| Service Capability | is    | Cone Search       | - | Info |
| Column UCD         | like  | src.redshift      | - | Info |
| Column UCD         | like  | phot.mag;em.opt.V | - | Info |

Below the search form, there is a “+” button, a “Show 20 items per page” dropdown, a “Skip the first 0 items” dropdown, and a “Run Query” button with a star icon.

## 2 Using the Results

- ▷ 5 Click the **Run Query** button. All matching resources are displayed (in alphabetical order) in the box below the search form. The results show up in a tabular layout with resource title, the capabilities (i.e., things you can talk to), and a contact info button. Click on the arrow in the beginning of each row to get more detailed information about a resource.



▶ Large Quasar Astrometric [SCS](#)  
 Catalogue 2 (LQAC-2)  
 (Souhay+, 2012)

▼ Magellanic Quasars [SCS](#)  
 Survey: QSOs behind SMC  
 (Kozłowski+, 2011)

**Description**  
 We report the spectroscopic confirmation of 29 new, 12 plausible, and three previously known quasars behind the central  $-1.5\text{deg}^2$  region of the Small Magellanic Cloud (SMC). These were identified in a single Zdf/AACOmega observation on the Anglo-Australian Telescope of 268 candidates selected primarily based on their mid-IR colors, along with a smaller number of optically variable sources in OGLE-II close to known X-ray sources.

**Last Update**  
 2013-04-15

**IVOA Identifier ("ivoid")**  
<ivo://cds.vizier/japs/194/22>

▶ NOT GL survey of multiply [SCS](#)  
 imaged quasars  
 (Jaunsen+, 1995)

- ▷ **6** Now start [TOPCAT](#).
- ▷ **7** On the bottom of the page, you find the [Connect to SAMP hub](#) button – hit it.
- ▷ **8** TOPCAT will ask you whether the connection should be allowed – this is because in principle, whoever can access ports on your machine, can try to connect to your SAMP Hub. Therefore, only allow Hub access if you just initiated something that would cause a Transfer to TOPCAT.
- ▷ **9** After WIRR has its SAMP connection, the text on the SAMP button changes to [Tabular services](#).
- ▷ **10** Try to send the resource list to TOPCAT by clicking on **Tabular services**. A warning shows up saying that TOPCAT has received the list successfully but could not make use of it. To get rid of this issue, select [VO](#) → [Cone Search](#) in TOPCAT's menu. In the window that then comes up, make sure [Accept Resource Lists](#) is checked.
- ▷ **11** Send the resource list again – it will turn up in TOPCAT's Cone Search window.
- ▷ **12** In that Cone Search window, you can now enter the name of your favorite quasar (use 3C273 if you have no favourite quasar), hit [Resolve](#), enter a small search radius and then query each service in turn by double-clicking it (hint: the needle icon in the top left corner keeps the window open between queries). Services that give results add tables.

Of course, you can use the resulting services in other ways you fancy, too – one thing that doesn't work in this way is querying *all* of the matched services at once. For Cone Searches, that's somewhat difficult, as the different tables have vastly different structures – joining them will be made possible by a thing called source data model; for images and spectra, joining results is somewhat easier, so many clients – like Aladin or Splat – support cross-



server queries. TOPCAT, however, does not at this point. If you want to see how to do multi-service queries yourself, check out our little pyVO showcase at <http://docs.g-vo.org/pyvo.pdf>