

## The CDS Hub

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**Abstract.** The status of the CDS services is described. In particular, new features developed in the context of the Virtual Observatory and using IVOA-discussed standards have been included in the public version of the services, e.g., filter capabilities using Unified Content Descriptors (UCDs) in VizieR and Aladin, customized hierarchical data tree using the IDHA data model, contour plots and colour composition in Aladin, and others. Aladin has also been made easy to interface with Java plug-ins, as shown with VOPlot, the table data visualizer developed by VO-India in collaboration with CDS, which is also interfaced with VizieR.

## 1. Introduction

CDS is one of the major players of the International Virtual Observatory (VO) endeavour, and its services are important building blocks of the VO. VizieR and Aladin are respectively prototypes of federation and integration of heterogeneous resources. Several recent developments of the CDS services have been implemented for the scientific demonstrations of the VO projects, in particular of the European Astrophysical Virtual Observatory (AVO). They take full advantage of the new interoperability standards discussed in the frame of the International Virtual Observatory Alliance, and allow also for testing the evolution of these standards.

## 2. SIMBAD

SIMBAD<sup>1</sup> provides reference data for more than 3,150,000 astronomical objects (end December 2003). SIMBAD is continuously updated from catalogues and published literature and increases by 100,000 to 200,000 new objects and 5,000 new references every year. Recent updates include the list of observations of the ISO satellite and links to the variable star data base of the American Association of Variable Star Observers. A long term action is under way, for the proper cross-identification of radio catalogues, taking into account source spectral properties. The help of G. Patrel (LEDA), J. MacConnel (STScI), W. Osborn (Central Michigan University) and B. Skiff for the improvement of data on galaxies, Carbon stars, globular cluster and open cluster stars respectively is also gratefully acknowledged.

SIMBAD is undergoing its fourth major software upgrade, from a proprietary database system to the freeware PostgreSQL system, which will insure a better long-term maintainability. SIMBAD has been a pioneer of interoperability, with the early release of SIMBAD name resolver which is now widely used, together with the NED one, by observatory archives and the ADS to translate an object name into its position or a bibliographic list. A VOTable output will soon be released in order to improve its interoperability in the VO context.

## 3. VizieR

VizieR<sup>2</sup> provides access and query facilities to about 4,000 catalogues and tables published in articles. This number increases by about 300 new catalogues every year. New large catalogues include the UCAC2, 2MASS all-sky release and DENIS second release. Logs of ground- and space-based observatories are also included and regularly updated (e.g. recently ESO, XMM). Several catalogues and mission logs provide access to images, spectra and time series, either located locally in Strasbourg or distributed by remote observatory data services.

VizieR provides several output formats which allow a great flexibility in the query result usage: XML and Tab Separated Value output can be re-injected into another query. VizieR is fully integrated in the VO world: it provides a VOTable output, and metadata visibility is improved by the possibility of displaying the Unified Content Descriptors (UCDs) associated to every column in a table. In addition, the relevance and usability of new possible definitions of UCDs (Derriere et al. 2004) are actively being tested on VizieR data. Taking advantage of VOTable output and of the international VO collaboration, one VizieR output is a catalogue column visualization with the VOPlot tool (Kulkarni, Kembhavi & Kale 2004), developed by VO-India in collaboration with CDS, which can be used as an applet. The implementation of very large catalogues on a PC cluster is also studied (Ochsenbein et al. 2004).

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<sup>1</sup><http://simbad.u-strasbg.fr/Simbad>

<sup>2</sup><http://vizier.u-strasbg.fr/>

#### 4. Aladin

Aladin<sup>3</sup> evolution in the last years (Boch, Bonnarel & Fernique 2004) has been strongly linked to the development of VO prototypes, in particular for the AVO project, and has also taken advantage of the *Images Distribuées Hétérogènes en Astronomie* (IDHA) project. The visualization of multispectral images has been improved, with implementation of colour composition and contour plots; filters allow to select and compute derived values from catalogue data for display, possibly using UCDS - for example proper motions or colour indices from actual photometry. Astrometric recalibration is also possible. New data sets have been added in the local Aladin image database, e.g. 2MASS and additional colours from DSS and MAMA digitization. All Aladin operations can be driven by script commands, enabling automatized processing.

In the VO context, Aladin is fully compatible, as client and server, with the Simple Image Access protocol. A view of the IDHA data model allows users to visualize a hierarchical data tree (Allen et al. 2004), with a browser giving access to appropriate metadata at each level of the tree. The software has been adapted to allow for easy interaction of VOTable and FITS compliant external JAVA applications, with a first application in the AVO January 2003 demonstration (Quinn et al. 2004) to the Spectral Energy Distribution tool developed by ESO and the Astronomy Catalogue Extractor developed by AstroGrid (running SExtractor). The first application in the Aladin public version is the plug-in of VOPlot.

#### 5. Web Services at CDS

Several key CDS services have been made available as Web Services<sup>4</sup> (Schaaff 2004): name resolver (including SIMBAD and VizieR names), VizieR access, astronomical coordinates translation, UCD resolver and access to the UCD list, GLU tag resolution. Additional services will be made available in the future when needed.

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<sup>3</sup><http://aladin.u-strasbg.fr/aladin.gml>

<sup>4</sup><http://cdsweb.u-strasbg.fr/cdsws.gml>

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