



## The Virtual Observatory

The involvement of the Observatory to this SO is mainly supported by the CDS but with key participations from the Galaxy team and the SSC-XMM. This leads to a fruitful collaborative environment for the development of interoperability standards and VO tools.

### The CDS and the VO

The CDS has been a precursor of the VO in many respects, and it has been one of the major actors of the VO since the emergence of the concept in 1999-2000:

- It has a major role in the activities of the International Virtual Observatory Alliance (IVOA), participating actively in the Executive and Working/Interest Group leadership, in the definition of interoperability standards, and in the re-definition of the IVOA architecture which took place in 2010. CDS staff participated in the definition of 13 of the 35 standards which, in July 2011, are IVOA recommendations or on the recommendation path, in the domains of Applications, Data Access Layer, Data Models, Grid and Web Services, Semantics, VOTable, and on the standardisation process itself. VOTable, the first VO standard adopted in March 2002 (before the start of IVOA), was initially a collaboration between CDS and the US National Virtual Observatory project.
- CDS services are important building blocks of the Virtual Observatory, Aladin as VO portal, seamlessly interacting with other VO-enabled tools such as TOPCAT, SIMBAD as a reference for astronomical objects, and VizieR for catalogues. Seen from the CDS, the VO is not virtual at all, as shown in the Figure 19, which demonstrates the very significant increase of the usage of VizieR through VO-enabled tools (principally TOPCAT).

### VizieR usage in log scale

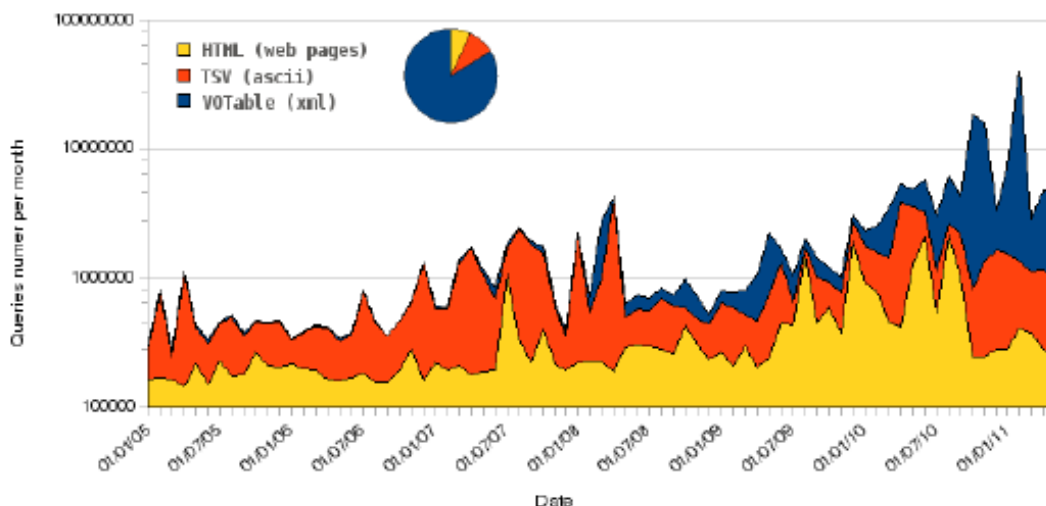


Figure 19: Usage of VizieR through the VO: The significant and increasing usage from the VO appears in blue, which shows output in the VO format VOTable.

- CDS has a leadership role at the European and national level on VO development and the creation of a community of data centres.
  - o At the national level, CDS has been the cornerstone of the *Action Spécifique Observatoires Virtuel France* since its creation in 2004. It has disseminated knowledge about the VO among the other French



laboratories, and is now at the forefront for dissemination in the scientific community (a complex task since it is difficult to find the most efficient way to reach the community).

- At the European level, the CDS had been at the origin of the first international Working Group on Interoperability (an OPTICON Working Group), which has been superseded by the IVOA in 2002. It has participated in all the successive European projects of Framework Programmes 5, 6 and 7 which have contributed to build the European implementation of the VO, Euro-VO, and has led the three last ones, EuroVO-DCA, EuroVO-AIDA and EuroVO-ICE.

### *Other participations*

The publication of theoretical products in the VO, obtained by simulation or modelling, brings up difficulties that are different from the observational datasets. This is the reason for the creation of a Theory Working Group since the beginning of the *Action Spécifique Observatoires Virtuel France* in 2004. It had been led since then by H. Wozniak, who has also been leading the IVOA Theory Interest Group for the period 2008–2012, and participated in the EuroVO-DCA Theory Expert Group (see PREV-83). This strong involvement in the development of specific VO standards for simulated data, such as the Simulation Data Model, leads the ANR Lidau project (D. Aubert, P. Ocvirk) to make an early implementation of these standards. It is important to maintain such a strong participation in the Theoretical VO since the numerical simulation activities will be developed in the future (see scientific project report).

As described in the SSC-XMM report (see Page 40), the SAADA tool developed by L. Michel, can easily build complex databases from collections of interconnected files. It integrates natively many of the VO concepts and standards. SAADA evolution is regularly reported during the IVOA Interoperability meetings.