

Architecture of the AVO Prototype

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Rationale

The Astrophysical Virtual Observatory (AVO) prototype addresses some key problems of modern Astronomy. For instance, the challenge of browsing huge sets of observations in multiple wavebands, where the data are distributed between several data centres. Furthermore, we tackle the problem of triggering demanding remote computation on grid nodes in a way that minimizes the impact of the network bottleneck. And, of course, results need to be collected and structured, analyzed and displayed.

AVO Prototype Components

The AVO prototype is an extensible toolset and its Java client has got three components:

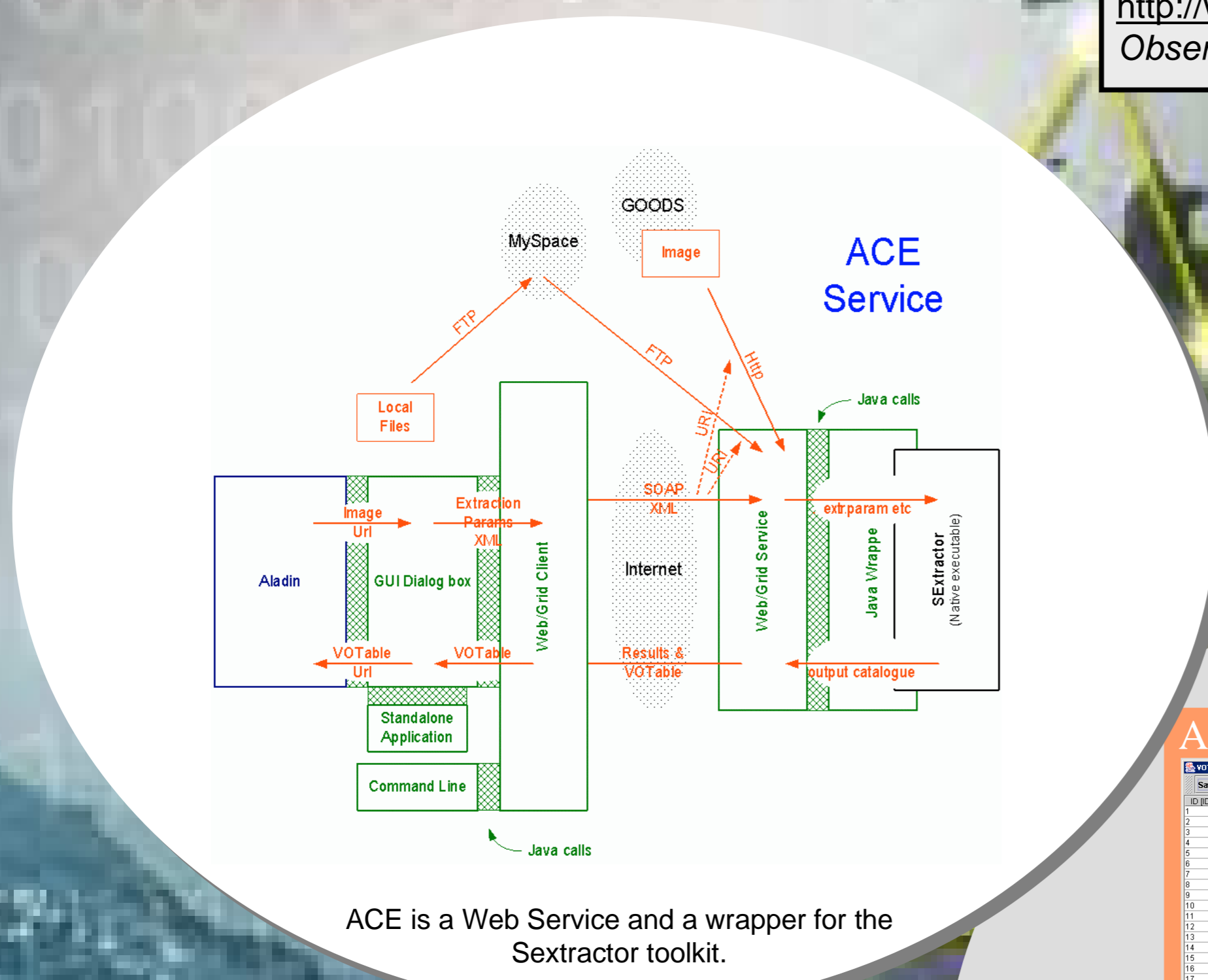
1. Aladin type of interface for meta data discovery and visualization
2. Astronomy Catalogue Extractor (ACE)
3. Spectral Energy Distribution (SED) utility (very recently an additional plugin called VOPlot was provided by VO India)

The software components were developed at CDS in Strasbourg, by the Astrogrid consortium and by ESO respectively. The three modules exchange information in VOTable format - a dialect of XML for Astronomy - and use Unified Content Descriptors (UCDs). UCDs are meta data, i.e. keywords, with a defined meaning across applications and data sets. From a VO point of view UCD tagged data wrapped in VOTable format are a major innovation.

VOTable format is also used to encode a hierarchical representation of the available on-line data which is displayed in a new meta data browser. For details visit <http://www.euro-vo.org/intranet/> or see the poster *Organization of Data in Virtual Observatories* by M.G. Allen et al.

Scientific Scenarios

Please visit us at the IVOA booth to see a live demo.



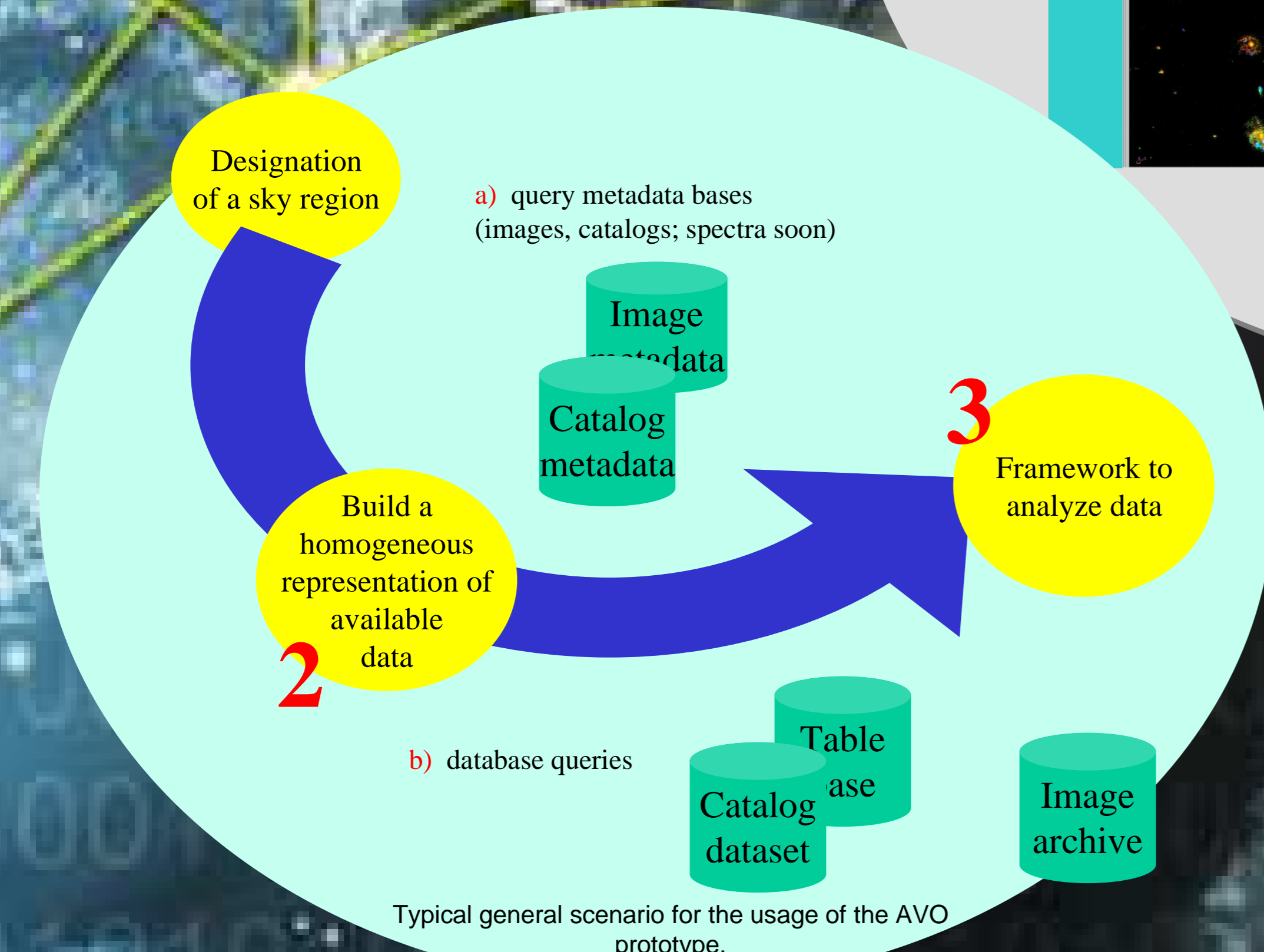
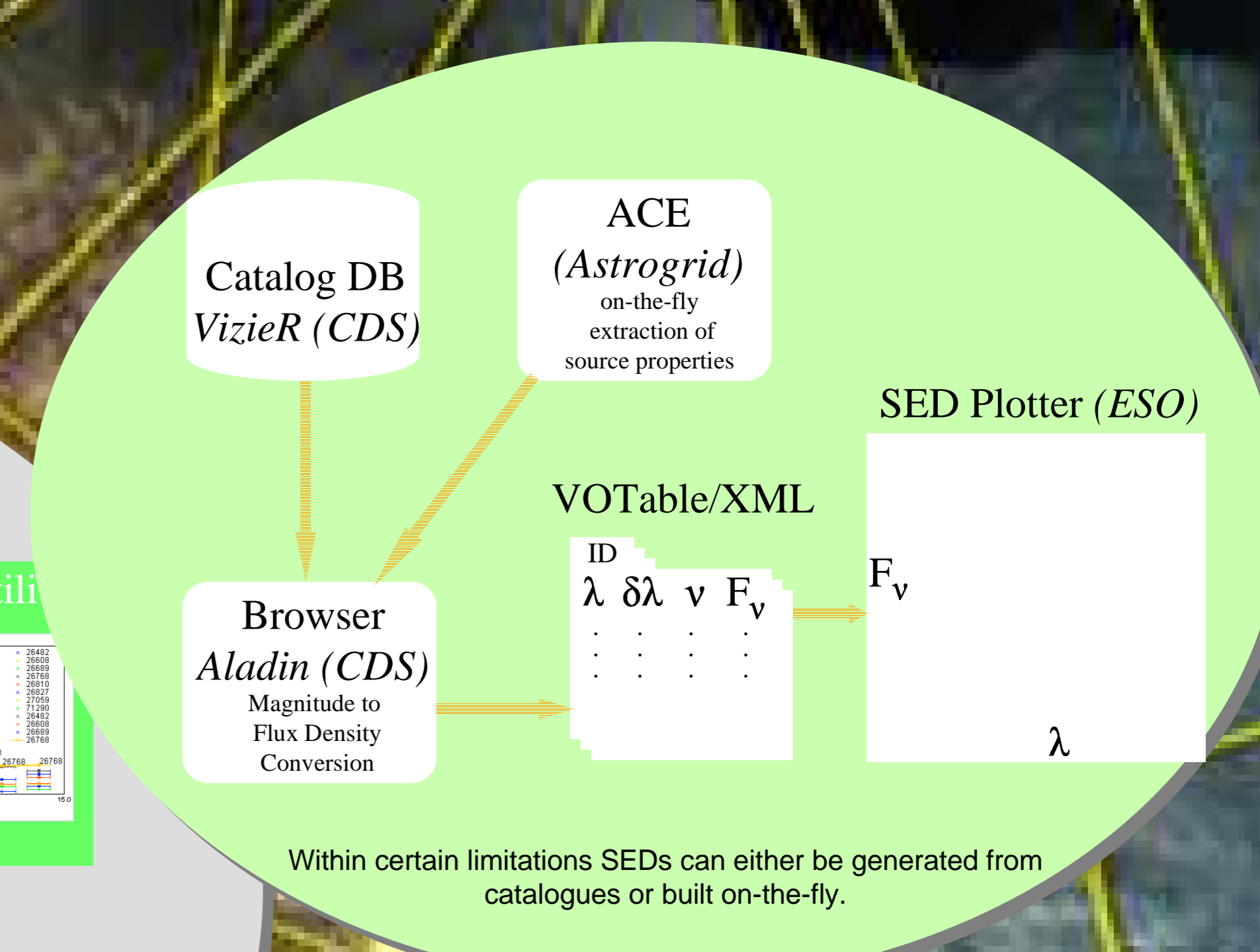
Astronomy Catalogue Extractor (ACE)

Spectral Energy Distribution Utility

Aladin Type of Interface

Evaluation Copies & Docu

<http://www.euro-vo.org/twiki/bin/view/Avo/SwgDownload>



VOTable

The VOTable specification is a proposed standard to represent data and meta data in Astronomy. Although backward compatible to FITS binary tables its scope is much wider and the format far more versatile. Currently there exists a DTD as well as a Schema format definition for this XML document type (<http://www.ivoa.net/twiki/bin/view/IVOA/IvoaVOTable>).

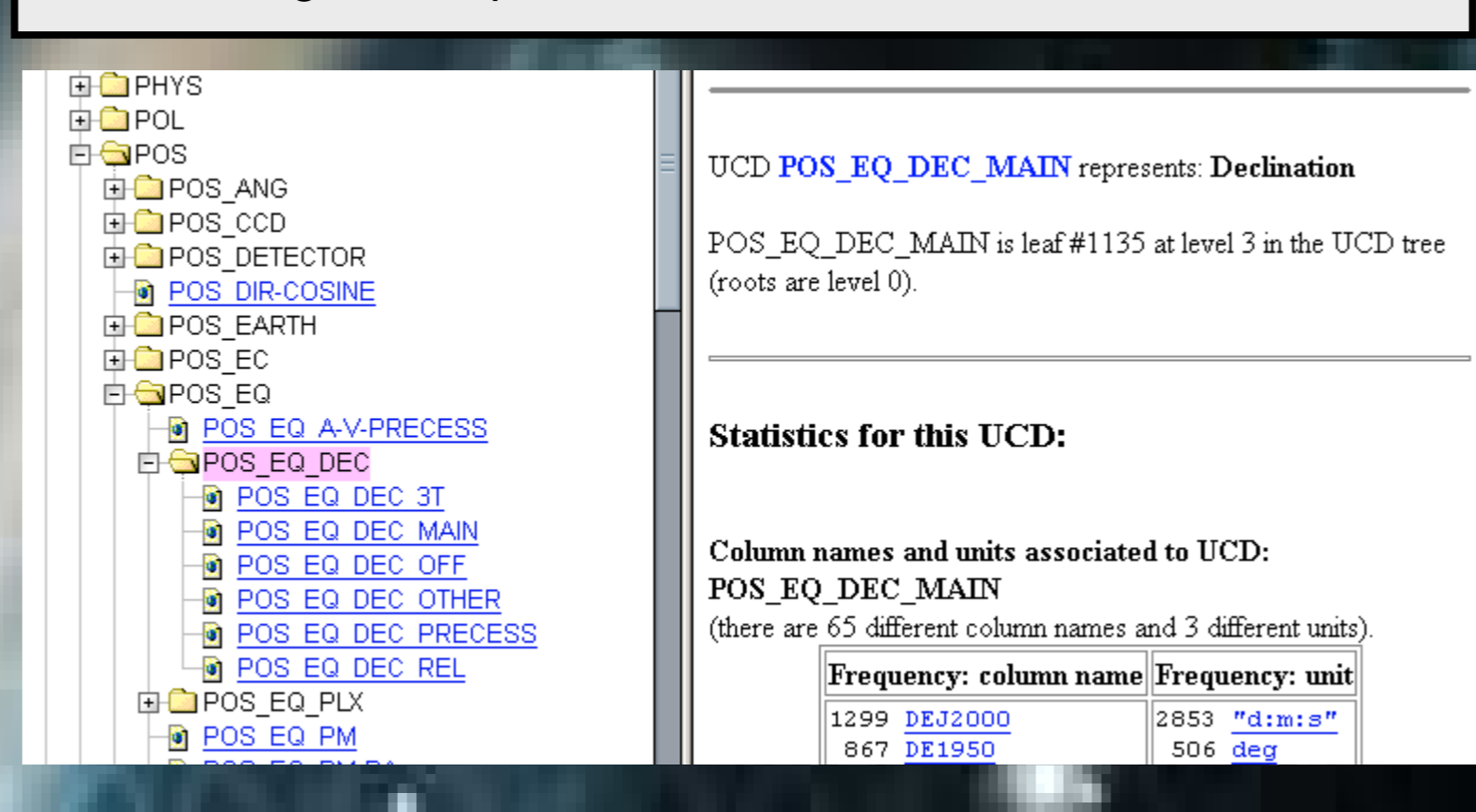
Below is a snippet of a VOTable document. This particular one describes some SEDs.

```
<?xml version="1.0" encoding="UTF-8" ?>
<VOTABLE xmlns:cd="http://www.ivoa.net/2001/XMLSchema-instance"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="http://vizier.u-strasbg.fr/xml/VOTable.xsd"
null
<DESCRIPTION>*** Astrophysical Virtual Observatory - Spectral Energy Distribution Utility V0.8
Dump of SEDs in VOTable format generated on Mon Jul 07 18:52:49 CEST 2003 In case of
problems contact twiki@euro-vo.org ***</DESCRIPTION>
<RESOURCE name="112934/ubvvt"
- <TABLE ID="68604">
<FIELD arraysize="*" name="_OID" type="hidden" ucd="ID_NUMBER" />
<FIELD datatype="float" name="frequency" precision="E5" ucd="OBS_FREQUENCY"
unit="Hz" />
<FIELD datatype="float" name="delta frequency" precision="E5" ucd="INST_FILTER_FWHM"
unit="Hz" />
<FIELD datatype="float" name="flux" precision="E5" ucd="PHOT_FLUX_DENSITY"
unit="Jy" />
<FIELD datatype="float" name="error on flux" precision="E5" ucd="ERROR" unit="Jy" />
<DATA>
- <TABLEDATA>
- <TR>
<TD>Aladin-27989400</TD>
<TD>6.4735008E14</TD>
```

UCD

Uniform Content Descriptors (UCDs) are meta data to describe astronomical parameters. UCDs are arranged in a hierarchical tree and were 1st used at CDS in Strasbourg. UCDs and extensions thereof will form the basis of a meta data structure to express meaning in astronomical terms in a system independent way (<http://www.ivoa.net/twiki/bin/view/IVOA/IvoaUCD>).

Below listing shows part of the UCD tree.



Glossary

ACE	Astronomy Catalogue Extractor
ACIS	Advanced CCD Imaging Spectrometer
ACS	Advanced Camera for Surveys
AVO	Astrophysical Virtual Observatory
EIS	ESO Imaging Survey
ESA	European Space Agency
ESO	European Southern Observatory
GOODS	Great Observatories Origins Deep Survey
HDF-N	Hubble Deep Field North
HFF	Hubble Flanking Fields
HST	Hubble Space Telescope
ISAAC	VLT Infrared Spectrometer And Array Camera
MERLIN	Multi-Element Radio Linked Interferometer Network
MPG	Max Planck Gesellschaft
NASA	National Aeronautics and Space Administration
NRAO	National Radio Astronomy Observatory
SED	Spectral Energy Distribution
SOAP	Simple Object Access Protocol
UCD	Unified Content Descriptor
UMAN	University of Manchester
VOTable	Proposed XML Format for Astronomical Tables
WFI	Wide Field Imager
VLA	Very Large Array
VLT	ESO's Very Large Telescope Observatory

Credits

The Astrophysical Virtual Observatory was selected for funding by the 5th Framework Programme of the European Community for research, technological development and demonstration activities, contract HPRI-CT-2001-50030.