

VO Tools and Services

Using VO now

- **VO Tools**
 - VO-enabled existing tools & new tools
 - Prototypes & proof of concept test tools
- **Services**
 - VO-enabled with 'translation layer'
 - New services
- **Applications Infrastructure**
 - Make tools accessible
 - Build your own customized system from VO components

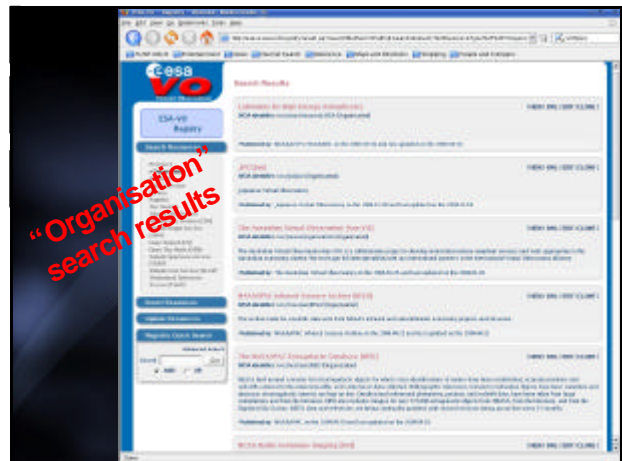
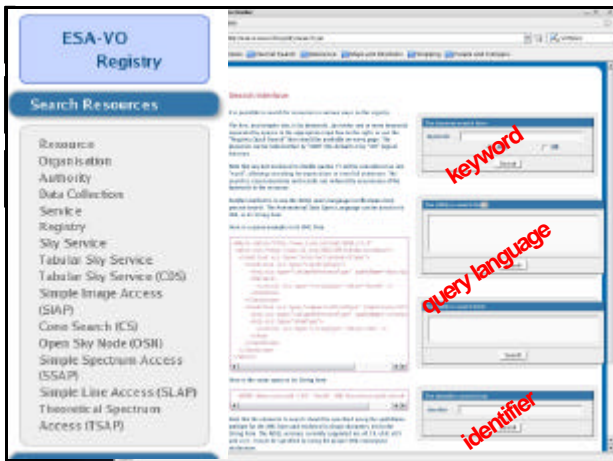
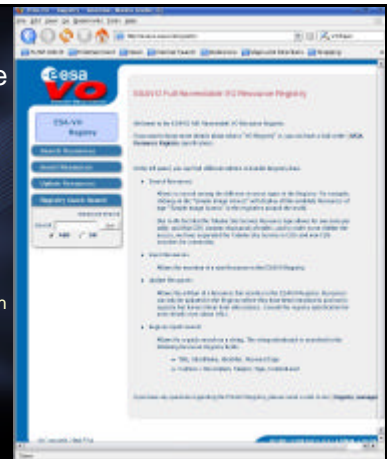
A tour of some of the VO tools available now

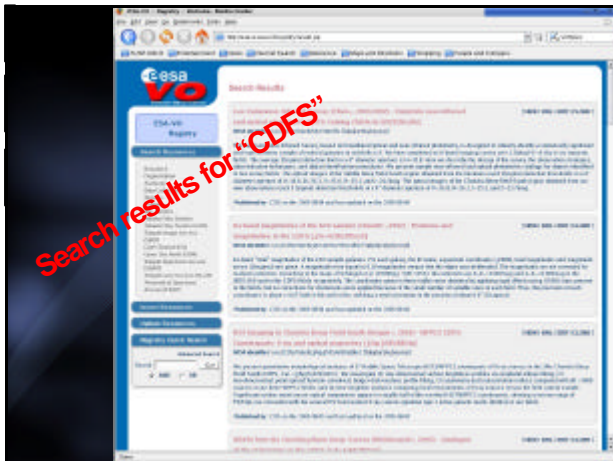
- representative and by no means complete!

Finding information in the VO

Registries are here

- multiple interfaces
 - human readable
 - machine readable
- simple/advanced search





Using registries

- **Description of resources**
 - resource type
 - limited info on how to “use” a resource
- **Applications**
 - use registries to find information & services
 - establish interfaces to services
 - e.g.
 - identify resources in registry which return images/spectra
 - query each resource images and spectra for a given coordinate position
 - select and use information in application

Examples

CDS Aladin: combines registry discovery with other access methods

Examples

NVO Datascope:

- web page interface
- updates as services respond
- direct launch into tools available

Visual Browsing and Capabilities of tools using VO available data

- **Images**
 - Display
 - Cutouts
- **Catalogs**
 - Visualisation
 - Filtering
 - X-matching
- **Spectra**
 - display
 - line-lists
 - combination across archives

AVO prototype based on CDS Aladin

Catalogues

- Manipulation
- X-match
- Visualization
- Direct link to:

CDS Aladin

Image Cutout Tool

AVO prototype based on CDS Aladin

Image Cutout Services

Cutouts generated remotely

e.g. SWIRE cutout service

Simple Spectrum Access Services

Image / Spectrum / Catalog interoperability

STScI Specview & AVO prototype

Multi-archive spectra

- SSA servers
- Registry
- Unit interop.
- emerging conventions and standards

ESA VOSpec

Line lists integrated into the tool

STScI Specview

Line lists from a Service

ESA VOSpec & Spectral Line Access Protocol (SLAP) Service

Latest version

Latest version

VisIVO : Visualization tools

Grid based data:

- Isosurfaces
- Volume rendering

Point like data:

- Pixels
- Scalar quantities with colours
- Scalar quantities with variable size and shape glyphs

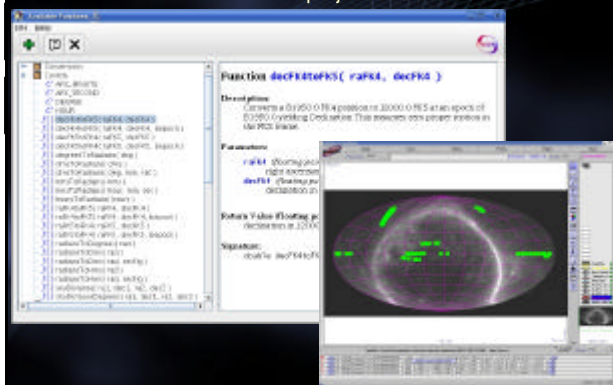
INAF, CINEA : visivo.cineca.it

Tabular data - interactive tools
- interoperability

VOPlot

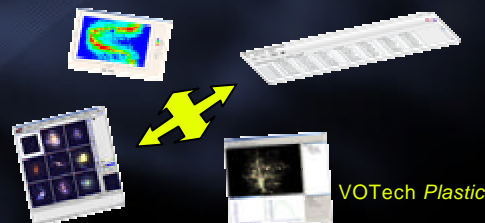
Topcat

- Astronomy functionality
 - coordinate units and projections

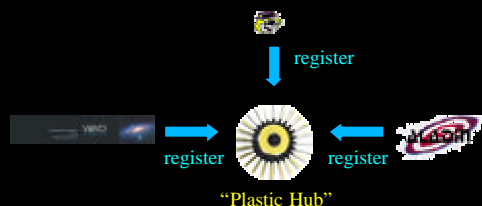


Interoperability of tools

- Formats for files, standards/protocols for accessing service... but also *interaction between tools*



Architecture: publish-subscribe



Plasticizing your apps: scripting

You can also use Plastic to visualise data directly from your favourite scripting environment (Python in this case)

- Obtain the URL of the hub's xml-rpc server
- Register your application


```
- id = s.plastic.hub.registerNoCallback("myapp")
```
- Send messages to other apps:


```
- responses = s.plastic.hub.request(id, message, args)
```

Using Services

- Through web interfaces
 - traditional services adopting VO standards
 - translation layers on existing services
 - new 'built for VO' service
- By calling from your own programs, tools or services
 - power of your familiar computing environment alongside VO services
 - Scripting, Pipelines, Workflows...

...see next talk

- VizieR example - multiple interfaces

Web page interface



Direct URL calls
- parametrized
- unix *CDSclient*

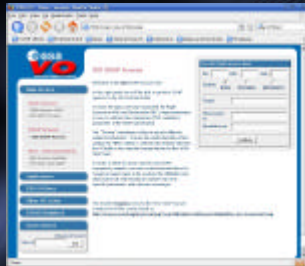
VO interfaces:
TABULAR SKY SERVICE
SKYNODE ...in devel.

output incl. VOTable, FITS, csv,...

- SIMBAD example - name resolving web

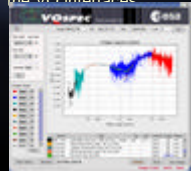
- **ESAVO** example - access to ISO, XMM

Web page interface



VO interfaces:

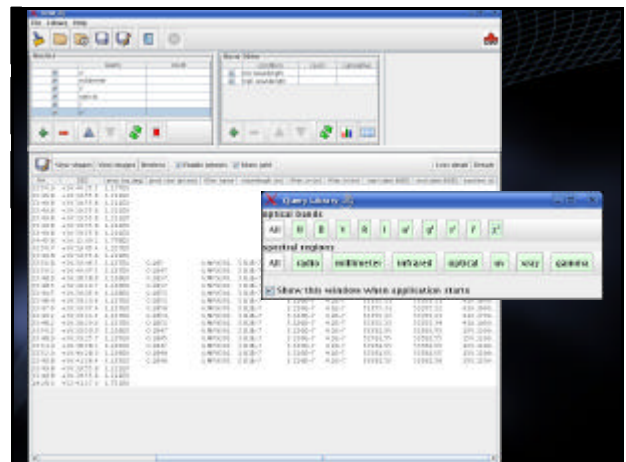
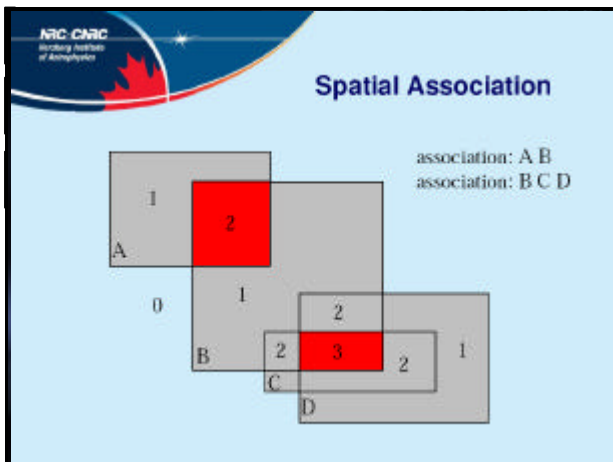
- Simple Image Access
- Simple Spectral Access
- ...standards in devel
- VOSpec - a tool using the VO interfaces



CVO 'OCTET' Tool

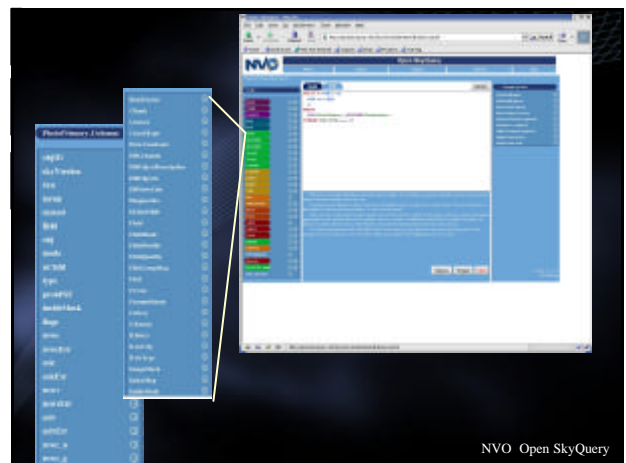
• Different approach to target based queries:

- search for spatial associations in various wavebands
- e.g. 'all regions where there is IR, Radio and V-band coverage'
- **order of constraints is relevant**
- **download data to desktop or VO tools**

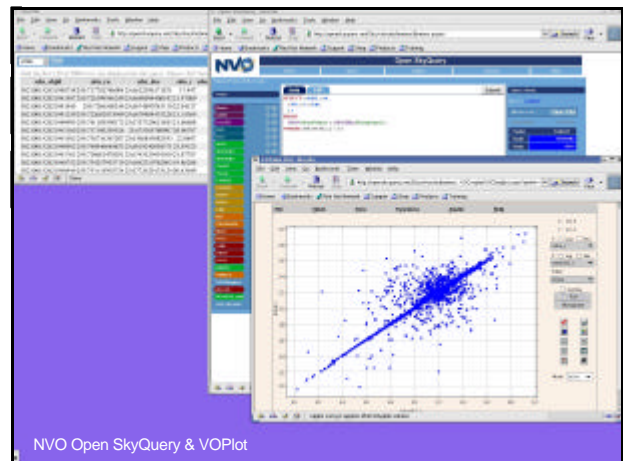
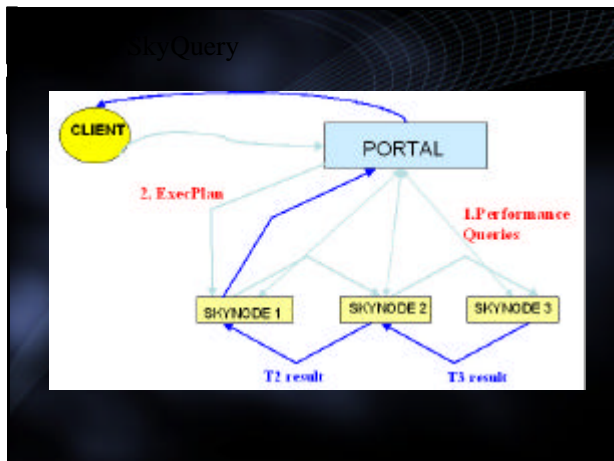


NVO Services

- Registry Interface
- Datascope
- Catalog coverage maps
- Open SkyQuery
- WESIX
- VOEventNet
- Mosaics
- WCS fixer



NVO Open SkyQuery



- ## Cross Matching
- Common theme in VO science cases
 - big – small
 - local – distributed data
 - simple positional – complex constraints
 - Implemented
 - in TOOLS
 - and as SERVICES
 - Use depends on purpose, but landscape changing quickly

- ## Scripting and 'Workflows'
- Link VO services together for specific tasks
 - Much like we do now but calling distributed VO programs, services and data storage
 - Some specific-built systems do this already
 - Python and Perl examples have been demonstrated
 - AstroGrid speciality – experience in testing many systems – See AstroGrid lecture (Walton)

- ## Legacy Software
- IRAF, AIPS, MIDAS etc.
 - Strong desire to work with VO
 - Implemented examples:
 - WCSFixer – A web enabled IRAF plate solver
 - ParseITongue scripting of AIPS pipelines (AstroGrid)
 - Various *SExtractor* services
 - Much more work needed here

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- ## IVOA Applications Interest Group
- Announcements of new tools
 - Discussion on VO tools
 - Suggestions for enhancements
 - Feedback to IVOA working groups on standards etc.
 - www.ivoa.net - Community - Applications

Working list of applications – add your own!

| Applications (Please add new links by editing this page) | |
|--|---|
| VOIC List of Tools and Software | VOIC National Virtual Observatory |
| IMOS 2008 | Data browsing Service |
| VOIC | Provide Visualization Systems |
| VOICable VOPlot | A tool for visualizing astronomical data |
| VOICAD | Simple Operations on Catalogues And Tables |
| STL/STL | Command-line tools to tackle VOICAD manipulation |
| Traverse | A viewer for hierarchical structures |
| VOICable VOTool | A VOICable Visualization and Editing Tool |
| VOIC Nuclei | Image and Catalogue tool |
| VOICable Image | Multi-dimensional visualization of data from VOICable |
| VOICable VOICam | A tool to handle VO compliant spectra through VOICAP |
| VOICED | A tool for building Spectral Energy distributions |
| VOICable WebPlot | A VOICable implementation: Application Launcher, Image Explorer, Table Explorer, Image Explorer, Image Explorer |
| VOIC | A Simulation Interface to the Virtual Observatory |
| VOICable Visualization Tools | VOICable Project Data Query |
| VOICable VOICable Table | VOICable Project |
| VOICable VOICable | VOICable Filter for OpenOffice Calc |
| VOICable VOICable | VOICable Synchronizer for VOICable to HTML |
| VOICable VOICable | Special Analysis Tool |
| VOICable VOICable | Auto-Configurable Database Generator |
| VOICable VOICable | VOICable Catalogue Database Test |

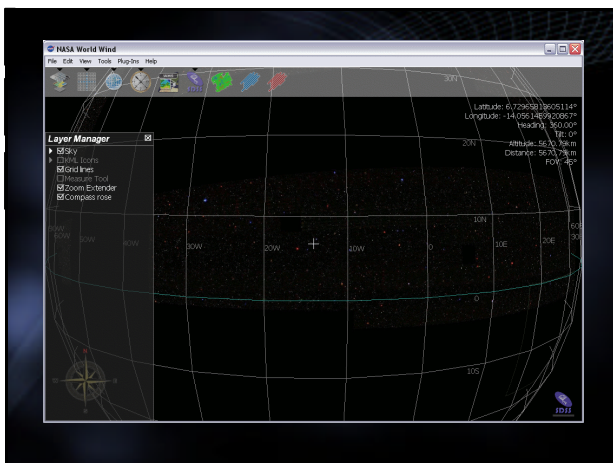
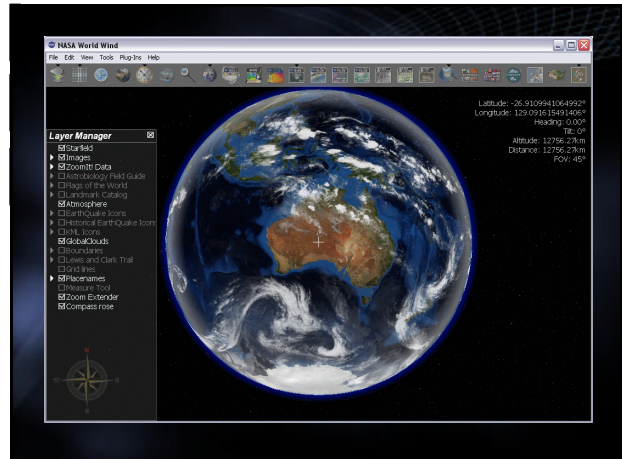
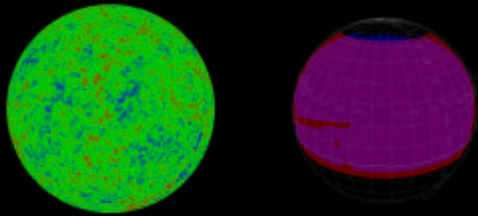
| Applications Infrastructure | |
|-----------------------------|---|
| VOICable VOICable | Client-side software for the VOICable and language independent, uniform access to VOICable services |
| VOICable VOICable | Common Resource Administration (CRA) A technology and toolkit for VOICable enabling legacy applications by publishing them as web-services. |

| Libraries and Frameworks | |
|--------------------------|--|
| VOICable VOICable | Java VOICable parser |
| VOICable VOICable | Java VOICable parser |
| VOICable VOICable | Search Tables infrastructure Library - Generic Java Table Handling for Astronomy |
| VOICable VOICable | VOICable parser |
| VOICable VOICable | VOICable parser based on XSL |

Plans

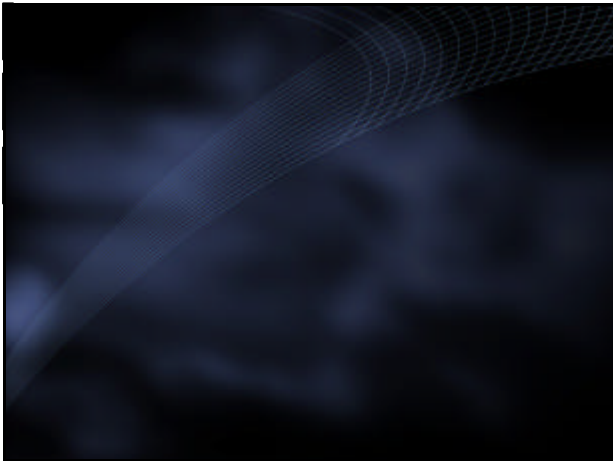
- **Very large cross-match**
 - infrastructure to develop intelligent cross-match (uncertainties, PSFs etc.)
- **Astronomical interoperability**
 - Photometric systems, resolutions, apertures e.g. to make SEDs
- **IRAF/IDL/AIPs access in VO**
 - early developments/studies in progress
- **Workflows and Grid capabilities**
 - First steps are promising

- **Google-Earth style browsing**
 - GESTALT Project (NVO, Univ. Pitt, NOAO)
 - SDSS DR4, WMAP + other data available
 - VO interop – coming (hopefully)



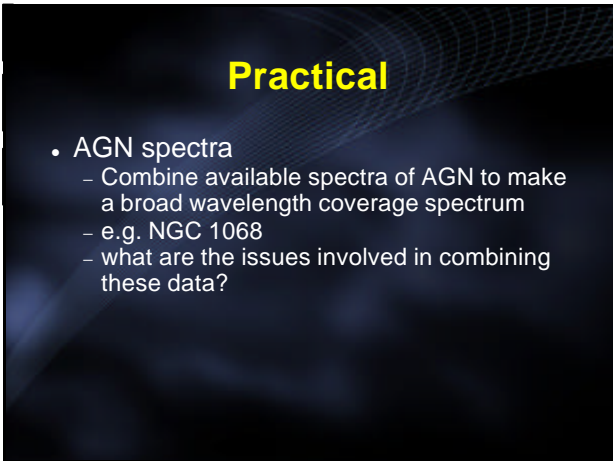
Summary

- **VO tools are ready for doing science**
 - Varying levels of stability and maturity
- **VO services are rapidly coming online**
 - Data centres implementing translation layers
 - Specialized services uptake of VO standards



Practical

- CDFS Type 2 QSO follow-up
 - This area of the sky has been the subject of intense study with many papers with catalogues published
 - Are any of the QSO candidate sources in these catalogues?
 - e.g high-z catalogues? IR catalogues?
 - Are any spectra available for these (or other CDFS sources) in the VO?
 - make cutouts of the interesting cases



Practical

- AGN spectra
 - Combine available spectra of AGN to make a broad wavelength coverage spectrum
 - e.g. NGC 1068
 - what are the issues involved in combining these data?



Practical

- Play with WorldWind for astronomy data
 - How could information from the VO be incorporated in this interface?
- Try data mining tools for the GOODS catalogues – see the weka tool that works with PLASTIC