

# Conference summary

# A view of the present status of VO (1)

- One of the very few truly global endeavours of astronomy, IAU is a natural place to assess the VO project status and to present it to the community
- IAU time scale is basically 3 years so the Special Session gives a good view of the evolution since Sydney one-day Joint Discussion, devoted to discuss what was expected from VO in the different scientific domains of astronomy, plus many posters presenting projects

## A view of the present status of VO (2)

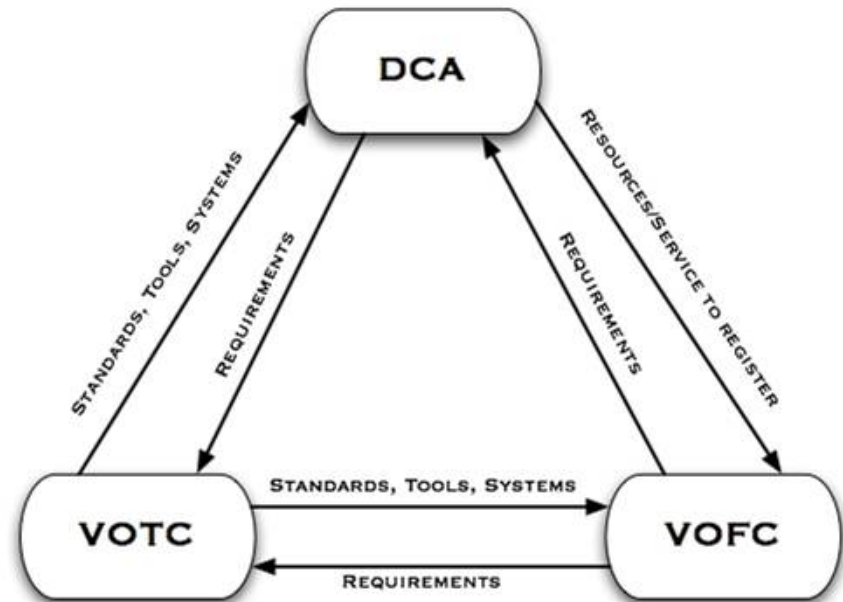
This three day symposium gives a good overview of the present status of VO:

- the different communities (astronomy, solar physics) are working on VO;
- national communities are organizing themselves;
- still technical development and technical challenges;
- implementation by data centres has begun – a strong incentive to make data public!
- yes, there is new data available, and there are already VO-enabled tools available to do *your* research – and more will come

This summary is built from ideas and words gathered in the presentations, organized in several views

- View from VO projects/IVOA
- View from data centres and service providers
- View from users

DCA: Data Centre Alliance  
VOTC: Technology Centre  
VOFC: Facility Centre



# Seen from VO projects/IVOA (1)

- VO projects talk to two communities
  - Data and service providers
  - Science users
- VO standards have to be useful and usable to convince the data providers to uptake the VO framework – a thin layer on top of their services
- Support the two communities, get the feedback from implementation and usage, and take it into account

# Seen from VO projects/IVOA (2)

- Nice examples of the diversity of VO projects – based on national data holdings, technical and scientific expertise... and the wishes of the funding agencies
- IVOA work is to continue to provide a common framework to this increasingly diverse community of service providers, and to adjust to the evolution towards an increased role for data centres
- Interoperability between tools, collaboration between projects, are already producing innovative and useful tools (e.g., atomic and molecular line catalogues used in spectral tools)

# Seen from VO projects/IVOA (3)

- The VO is science driven and must remain so
- It has to take the best advantage from IT developments
- Lots of interdisciplinary work with the IT community (e.g., ontologies, mediation tools, image processing), but this requires time and effort and we have to build win-win collaborations (good research and test beds for the IT community, aiming at developing operational, sustainable solutions for the VO)
- R&D is required (in particular to make sure that our specific needs are taken into account in IT developments), but when it comes to implementation, we can only use stable operational solutions – adoption of new technologies not too early, not too late – a proper balance between risk and sustainability



# Seen from VO projects/IVOA (4)

- VO is a grid of data and services and many aspects do not require usage of the GRID techniques but some do  
Use of the computational GRID is relevant in particular for massive data analysis, creation and storage of “Virtual Data” – simulated data, theoretical data ...  
A growing community of Grid astronomers (including operational service)  
Bridge between the VO and the Grid  
Single Sign-on is one important issue  
Interoperability between Globus and EGEE is another one
- Well suited with the agencies (at least, Brussels’) trends to develop “Knowledge infrastructure”

# Seen from data and service providers (1)

- There is a user community! So it is worth joining the VO
- VO is not dictating how to manage the archive – a thin VO layer on top, translating local parameters to standard ones, although some archives may decide to implement deeper changes
- More data centres, more diversity
- More open archives, improved science interfaces – valuable by itself
- New facilities see themselves in the VO context
- Archives of older data opened with science usage in mind by several national projects

## Seen from data and service providers (2)

- Some large organizations are moving towards provision of ‘science ready’ data and enhanced data archives, even for complex data such as interferometry, and improve data management – this is a positive effect of VO
- Smaller teams are willing to provide specific data and services to the VO (ANCHORS/full processing of Chandra/XMM)
- New kinds of services, in particular emergence of theoretical services, providing modelling results, matching models and observations, but also software suites, data analysis tools and algorithms, specific services dedicated to help to study well defined science questions, and full data analysis and research environments

## Seen from data and service providers (3)

- There is a cost in producing quality data archives and services and in maintaining them (and a smaller overhead in making them VO compliant)
- ‘Data centres’ have to be sufficiently funded
- We need good scientists in the VO game: a career path is needed to keep the best people and to properly reward them (‘data scientists’)
- Community support needed – an endless fight in Committees

## Seen from data and service providers (4)

- Quality is a must and a community concern
- Innovative ways of providing science-ready data (through instrument teams and key program PIs) is really worth exploring but a quality assessment is required
- Who is in charge of quality?  
IVOA is not willing nor able to be the quality police  
National projects have certainly a role to play

# Seen from data and service providers (5)

- One has to understand which metadata are required from data pipelines to use data properly (origin, limits, strengths, errors, systematics,...), not only for the dissemination of data products, but also for data analysis, complex queries, quality control – data standards as well as interoperability standards (extension of IVOA work?)

How to compare surveys (catalogues, images,...) properly is another aspect of interoperability

- Similar problem for theoretical services: proper metadata have to be defined, allowing one to use models adequately
- ‘Private’ publication is a risk, quality assessment required

# Seen from users (1)

- There are users and different usages
  - Multi-wavelength, multi-instrument astronomy – integration of heterogeneous data
  - Comparison between modelling and observations
  - Data analysis
  - Statistical analysis “high fidelity statistics”
  - Search for diamonds in haystacks
  - ...
- All communities are concerned (from users of large surveys to the ‘(not so) old-fashioned stellar spectroscopy’ !)

## Seen from users (2)

- Widely used tools have already benefited from the VO developments, so people may use the VO without being aware of it
- Diversity of science needs >> diversity of VO portals
- In each discipline, community help to compare tools and propose evolutions, and to propose new tools – the VO projects will not write all the tools!



## Seen from users (3)

- Not necessarily end-to-end VO-enabled science – although this can be the case sometimes, but VO-enabled data and tools can be used in different stages of one research program
- Astronomers skills and knowledge still needed, and a critical eye on results
- Projects should aim at providing easy-to-use tools when possible
- There will also be usages requiring authorisation (Grid-type usage, storage of intermediate results, ...)
- Workflow management (simple, complex)
- “publication” of data analysis path

## Seen from users (4)

- How to help users (in particular for advanced usage of tools)?
  - A real role for national projects (help-desk, Euro-VO Facility Centre)
  - A good model: NVO Summer Schools and research grants
  - Also important to target students in astronomy courses

“Is this the same VO that was presented a few weeks ago at the Paris Observatory”

Yes, it is

Not really starting from scratch: there is a past, there are lessons to be learnt, there are already data and service providers and the community is already accustomed to use on-line resources

Change in scale

We have to build a sustainable framework for science usage with many actors

- Because the VO will be often hidden in the infrastructure and not apparent in tools, I think that most users will not acknowledge usage in their publications
- Service usage statistics
- VO will be in the everyday work of astronomers – as has happens for the internet and the bibliographic network

See you in Rio for an update three years from now, and a better view of the post-2010 perspectives