The Virtual Observatory
and
the IVOA
The Virtual Observatory

• Emergence of the Virtual Observatory concept by 2000

• Concerns about the data avalanche, with in mind in particular very large surveys such as the SDSS, statistical analysis, search for diamonds in haystacks, …

• Based on solid grounds
The context of astronomy (1)

- Long term observations of variable natural phenomena
- A large number of objects, complex interactions, many scales
- Study of variability, evolution, statistics
- Observations with different techniques, at different scales, have to be put together (ground- and space-based observatories, large surveys)
- Optimization of the scientific return of ‘big science’ (space/ground-based)
The context of astronomy (2)

- A small community
- Few commercial constraints
- Long term partnership for defining standards to describe data and for networking of on-line resources
- Most observatories and instruments installed on telescopes are international collaborations, some are national

- Property rights
  - Data is available after a proprietary period (1 year)
  - Academic journals
    - Table of contents and abstracts freely available
    - Full content in general available after 3 years
    - Some tables immediately available through data centres
Standards and tools in astronomy

• A long pre-VO history!
• FITS
  Data from all telescopes
• SIMBAD and NED name resolvers
  Translates object names into coordinates or list of references in which the object is cited
  Used by most archive services and ADS
• Table description by the journals and VizieR: a homogeneous view of heterogeneous data – data curation, not only data collection

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Catalogue description

Catalogues, tables published in journals, lists of observations

A single description standard (physical description + contents)

Shared by data centres and journals

Information curation (authors/journals/data centres)

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Networking on-line resources: the astronomy bibliographic network

• How to code a reference:

  *bibcode* e.g. 1999A&A...351.1003G
  – Defined by NED and SIMBAD before the Internet age, because services shared data
  – Hugely used by ADS
  – Excellent partnership between journals, data centres and observatory archives

• Astronomers have been using the bibliographic network in their daily work for years now, long before agreement among publishers on DOI
Table of contents of an on-line paper
To full information about the paper and links in ADS
ADS/archives/AAS journals
From bibliography
To the original observations

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The Virtual Observatory (1)

• From networking to the astronomical Virtual Observatory (integration)

Seamless and transparent query of data centres

New analysis and visualisation tools

A standard structure for data centres to publish their data and services

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The Virtual Observatory (2)

- Two colloquia (Pasadena, Garching) in 2000
- The first projects (AstroGrid, AVO, NVO) began in 2001 (also IDHA > Characterisation DM)
- The first Interoperability Working Group was created in 2001, in the frame of the European OPTICON Network, with international participation beyond Europe from the beginning
IVOA pre-history

VOTable

F. Ochsenbein/R. Williams

(Hot) discussion in Strasbourg

Agreement in April 2002

2002 January 28th

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IVOA (1)

• Created in June 2002 by an agreement between AstroGrid, AVO, NVO
• Colloquium in Garching
• An alliance of the VO projects to define a common framework
  – High level goals
  – Roadmap and Milestones
  – Interoperability standards
• IVOA mission

To facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems and organizational structures necessary to enable the international utilization of astronomical archives as an integrated and interoperating Virtual Observatory
An International Alliance

- Rotating chair
- Each project has its own goals
- Interoperability standards are the key
  - Working groups
  - Bi-yearly international meetings
- Links with general IT standards: Astronomy group at GGF
- Science demos: relevance and applicability of the standards
International Virtual Observatory Alliance

About IVOA Papers

Members Documents

Events Forum

Contacts Community

Search

IVOA Events

previous

upcoming

AAS 207th Meeting
8-12 January 2006,
Washington, DC, USA

MOA Interoperability
14-19 May, 2006
Victoria, Canada

IAU XOM General Assembly,
Special Session 3
14-25 August, 2006
Prague, Czech Republic

MOA Interoperability
18-21 September, 2006
Moscow, Russia

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September 2006
Europe
China
India
Canada
Spain
Italy
Armenia
France
Germany
Hungary
Japan
Korea
USA
Russia
UK (AstroGrid)
Australia

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Guidelines for Participation

Version 1.00

IVOANote 2006 August 17

This version:
http://www.ivoa.net/Documents/Notes/IVOA/IVOA%20Participation-20050817.html

Latest version:
http://www.ivoa.net/Documents/Notes/IVOA%20Participation.html

Previous versions:
Based on an informal document dated 2003-07-01.
Authors:
W. J. Hinkelman and P. J. Gunn

Abstract

This document gives an overview of the goals of the International Virtual Observatory Alliance and describes guidelines for participation.

Status of This Document

This is an IVOA Note expressing suggestions from and opinions of the authors; it is intended to share best practices, possible approaches, or other perspectives on interoperability with the Virtual Observatory. It should not be referenced or
National projects

- Each project has its own goals
  - Local data
  - Local expertise
  - Funding agencies’ demands
- Very diverse in size and organization, from one single large organization to a network with ‘triggering’ funds
- Science Reference Missions/Science WG/AC
- New projects are emerging
VO standard bearer is IAU VO WG being constituted
Chair: Bob Hanisch
Alliance

Documents

Technical Specifications

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F. Genova, Interoperability meeting, Moscow, September 2006
Relations with IT

• 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
Relations with the GRID (1)

- The GRID context has been favourable to the emergence of the VO projects but also an obstacle to discipline-specific, VO-oriented actions in some cases.
- VO is a grid of data and services and many aspects do not require usage of the GRID techniques but some do.
- VO is well suited with the agencies (at least, Brussels’) trends to develop “Knowledge infrastructure”.

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Relations with the GRID (2)

- 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
  Interoperability between GRID implementations (Globus, EGEE, Naregi,…)

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VO at IAU in Prague

- IVOA Exec
- Constitution of the IAU Commission 5 WG VO
- Demo booth
- VO Special Session 3
- Also discussions during Special Session 6 on data management

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The Virtual Observatory in action: New science, new technology, and next generation facilities

IAU XXVI General Assembly, Special Session 3

Prague, August 17-18 2006

This conference will highlight scientific achievement enabled by the world-wide Virtual Observatory initiatives, review technical progress towards the VO vision, and examine the importance of the VO for future astronomical facilities.

Location and Date
The location for the conference is Prague, The Czech Republic. Our conference is a "Special Session" during the IAU General Assembly which runs through the period August 14-19 2006. Together with a related session on Astronomical Data Management, the VO special session covers 3.5 days in the period Aug 17-20.

Thursday Aug 17 pm  SPF3 - VO Science
Friday Aug 18 all day SPF3 - VO Science
Monday Aug 21 all day SPF3 - VO Science
Tuesday Aug 22 am SPF3 - VO Science
Tuesday Aug 22 pm SPF3 - Astronomical Data Management

News
The travel grant application deadline has now passed.
As of May 16th, 200 people have registered their intention to attend our conference (out of 1296 in total for the GA), and 25 people have already submitted abstracts (the deadline is June 22nd).

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F. Genova, Interoperability meeting, Moscow, September 2006
VO Science in Prague: Astronomical Data Management

A closely related "special session" (SPS6) on Astronomical Data Management follows on immediately after ours.

Information about SPS6 can be found here.

Further information

- Home
- Aims and Topics
- Call for Papers
- Key Dates
- Scientific organising Committee
- Keynote Speakers
- Proceedings
- Special Session 6 on Astronomical Data Management
- IAU General Assembly
- VO projects
VO Special Session in Prague

- An excellent overview of the present status of the VO
- In Sydney (2003): expectations and projects
- A very rapid evolution
  - Framework by IVOA, national projects
  - Implementation by data centres has begun
  - Already influences astronomers’ work environment: ‘science ready’ data, services and tools
DCA: Data Centre Alliance
VOTC: Technology Centre
VOFC: Facility Centre

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Critical points for IVOA (1)

- Implementation has begun
- We need the basic standards!
- Useful and usable standards
- We have to support take-up by data centres, gather implementation feedback, and take it into account
  - Many types of data and service providers, from large agencies to small teams
- New roles for IVOA, national projects?
  - VO compliance assessment?
  - Metadata from data pipelines, theoretical services
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Very diverse data, organized in data models, with semantics

Standard curation information (OAI/Dublin Core) + Service definitions

Several harvestable registries from different partners
Several implementations

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Critical points for IVOA (2)

• 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 – Applications and Theory Interest Group
Critical points for IVOA (3)

• Quality is a must and a community concern
• ‘Private’ publication is a risk, quality assessment required
• Who is in charge of quality?
  IVOA is not willing nor able at present to be the quality police
  National projects have certainly a role to play
Critical points for IVOA (4)

• Not only demos, there are users
  – 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’)! – need their requirements, can provide tools

• Diversity of science needs > diversity of portals
Critical points for VO (5)

• 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

• People will use VO in tools, no acknowledgement in publications, usage statistics
Changing role for IVOA

• 4 years of existence: lessons learnt
• Evolution of the context
• Projects submit proposals for next phases
• Action on the IVOA Exec:
  Assessment of goals and organization
Comments are welcome
Message to this meeting

We need the standards!