Euro-VO framework and future AIDA directions

Background

- The astronomical Virtual Observatory aims at interoperability between distributed, heterogeneous digital repositories, and integration of data from different sources
- Science driven
- *The Virtual Observatory concept:*
  - *Seamless and transparent query of data centres*
  - *New analysis and visualisation tools*
  - *A standard structure for data centres to publish their data and services*

The International Virtual Observatory Alliance

Round the clock from top: Italy, India, Canada, Spain, Armenia, China, Euro-VO, France; Germany, Hungary, Japan, Korea, USA, Brazil, Russia, UK, Australia

- National projects, very different because of the national context
- Since the beginning an international endeavour: the projects formed the International Virtual Observatory Alliance, in particular to oversee the definition of discipline specific interoperability standards

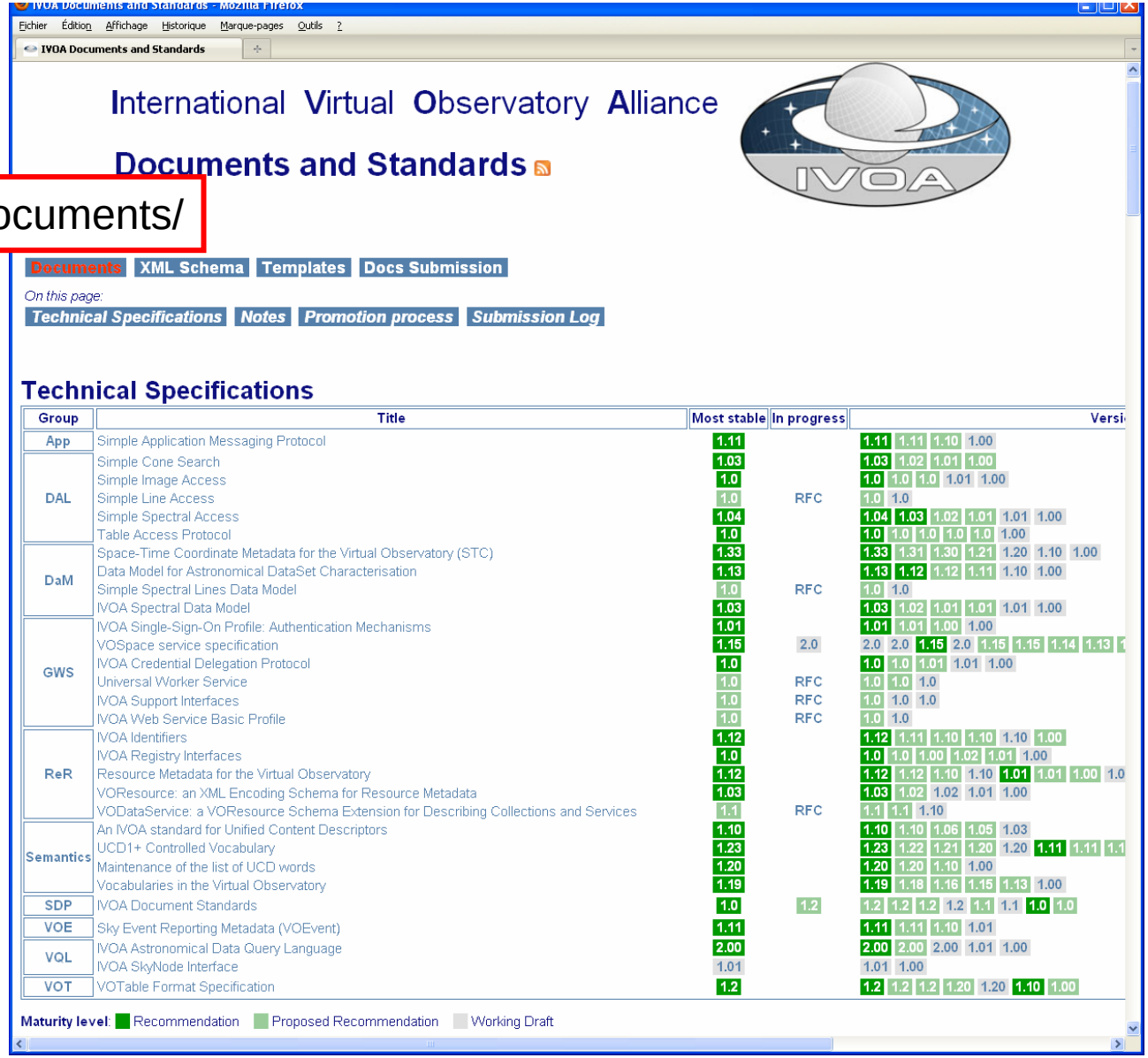
Audience

- Heterogeneous, distributed *'data' services*: archives of observations, value-added data bases, tools, bibliographic data (including e-journals), simulation data
- VO: An 'interoperability layer' to be implemented by service providers
- Most information freely accessible (sometimes after a proprietary period)
- *Users* are the whole astronomical community, and also education, amateur astronomers, public
- Ultimate impact in the scientific field: all astronomers, wherever they are, are given access to the best data and tools

IVOA Working Groups

- Standardization process adapted from W3C
- Working Groups
  - Grid & Web Services (assesses usage of Grid technologies)
  - Resource registry
  - Data modelling
  - Query language
  - Data Access layer
  - Semantics
  - VOTable
  - VOEvent
- Interest Groups: Applications; Theory; Data Curation & Preservation
- Mailing lists for all WGs and IGs, open to subscription
- IVOA face-to-face meeting twice a year

http://www.ivoa.net/Documents/



IVOA Documents and Standards - Mozilla Firefox

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IVOA Documents and Standards

International Virtual Observatory Alliance

Documents and Standards

Documents | XML Schema | Templates | Docs Submission

On this page:

Technical Specifications | Notes | Promotion process | Submission Log

Technical Specifications

Group	Title	Most stable	In progress	Versi
App	Simple Application Messaging Protocol	1.11		1.11 1.11 1.10 1.00
DAL	Simple Cone Search	1.03		1.03 1.02 1.01 1.00
	Simple Image Access	1.0		1.0 1.0 1.0 1.01 1.00
	Simple Line Access	1.0	RFC	1.0 1.0
	Simple Spectral Access	1.04		1.04 1.03 1.02 1.01 1.01 1.00
	Table Access Protocol	1.0		1.0 1.0 1.0 1.0 1.0 1.00
DaM	Space-Time Coordinate Metadata for the Virtual Observatory (STC)	1.33		1.33 1.31 1.30 1.21 1.20 1.10 1.00
	Data Model for Astronomical DataSet Characterisation	1.13		1.13 1.12 1.12 1.11 1.10 1.00
	Simple Spectral Lines Data Model	1.0	RFC	1.0 1.0
	IVOA Spectral Data Model	1.03		1.03 1.02 1.01 1.01 1.01 1.00
GWS	IVOA Single-Sign-On Profile: Authentication Mechanisms	1.01		1.01 1.01 1.00 1.00
	VOSpace service specification	1.15	2.0	2.0 2.0 1.15 2.0 1.15 1.15 1.14 1.13 1
	IVOA Credential Delegation Protocol	1.0		1.0 1.0 1.01 1.01 1.00
	Universal Worker Service	1.0	RFC	1.0 1.0 1.0
	IVOA Support Interfaces	1.0	RFC	1.0 1.0 1.0
	IVOA Web Service Basic Profile	1.0	RFC	1.0 1.0
ReR	IVOA Identifiers	1.12		1.12 1.11 1.10 1.10 1.10 1.00
	IVOA Registry Interfaces	1.0		1.0 1.0 1.00 1.02 1.01 1.00
	Resource Metadata for the Virtual Observatory	1.12		1.12 1.12 1.10 1.10 1.01 1.01 1.00 1.0
	VOResource: an XML Encoding Schema for Resource Metadata	1.03		1.03 1.02 1.02 1.01 1.00
	VODataService: a VOResource Schema Extension for Describing Collections and Services	1.1	RFC	1.1 1.1 1.10
Semantics	An IVOA standard for Unified Content Descriptors	1.10		1.10 1.10 1.06 1.05 1.03
	UCD1+ Controlled Vocabulary	1.23		1.23 1.22 1.21 1.20 1.20 1.11 1.11 1.1
	Maintenance of the list of UCD words	1.20		1.20 1.20 1.10 1.00
	Vocabularies in the Virtual Observatory	1.19		1.19 1.18 1.16 1.15 1.13 1.00
SDP	IVOA Document Standards	1.0	1.2	1.2 1.2 1.2 1.2 1.1 1.1 1.0 1.0
VOE	Sky Event Reporting Metadata (VOEvent)	1.11		1.11 1.11 1.10 1.01
VQL	IVOA Astronomical Data Query Language	2.00		2.00 2.00 2.00 1.01 1.00
	IVOA SkyNode Interface	1.01		1.01 1.00
VOT	VOTable Format Specification	1.2		1.2 1.2 1.2 1.20 1.20 1.10 1.00

Maturity level: Recommendation | Proposed Recommendation | Working Draft

Links with the existing environment

- Links are sought when possible, e.g
  - The registry is OAI-PMH compliant
  - It is based on Dublin core information, with disciplinary extensions
  - SKOS standard for vocabularies
- Some developments can be reused by others, e.g. Registry, VOTable (huge XML tables), …

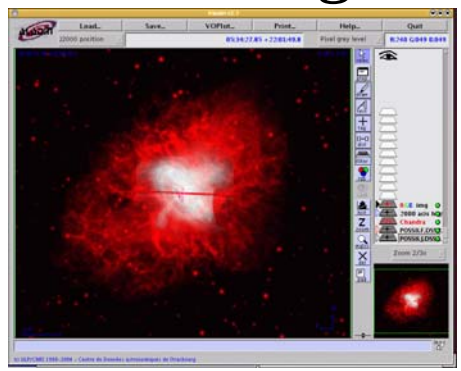
Deployment and feedback

- Incremental deployment by data centres
- Currently ~130 data providers in the registry, some providing many resources
- Feedback from implementation:
  - IVOA WG and mailing lists,
  - tutorials organised for data providers (Euro-VO)
  - national VO projects talk to their communities
- ALSO outreach to/feedback from scientists through VO Days, Schools, national projects

Impact (1)

- Major scientific objectives
  - *Long term observations of variable natural phenomena*
  - *A large number of objects, complex interactions, many scales*
- Observations with different techniques, at different scales (ground- and space-based observatories, large surveys)

  Multi-wavelength observations make a significant and increasing fraction of publications

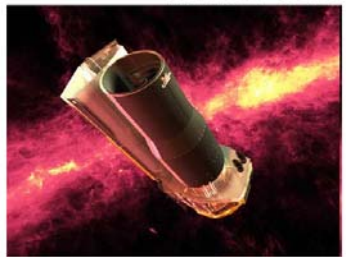


Impact (2)

VLT

XMM

SPITZER



Also: small and medium size ground-based telescope

- Optimize the science return of large ground- and space based instruments and of large surveys
- Significant increase in productivity by providing easy access to data

Impact (3)

- A huge diversity of repositories:
  - large services provided by international agencies, with archives of the large ground-based and space instruments
  - large systematic surveys of the sky, results of large simulations
  - generalist data bases and services
  - smaller contributions of scientific teams which share their expertise
- The VO development has been a strong incentive, especially on smaller teams, but not only, to develop access to their data and knwoledge

Lessons learnt (1)

- Standards development
  - Global, international view essential from the start to build a single, world-wide interoperable system
  - Pragmatic approach: best effort alliance, voluntary contributions, bottom-up approach, has proven to be very efficient
  - Put together scientists, data providers and IT specialists to get a useful and useable system

Lessons learnt (2)

- The definition of the ‘proper’ (‘usable’ and ‘useful’) standards is a huge task, which works when the proper people from the community are mobilized (archive providers, data centre staff) – ‘enough’ complexity to start with, not too much to remain useable by implementers and understandable by astronomers: a delicate balance
- Take into account feedback from implementation by data centres and usage by scientists

Future developments

- Currently transition to operations
- R&D/evolution of standards must continue (feedback from implemantation and usage by sceintists, scintific and technical evolution, progressive inclusion of more complexity)
- Sustainability of the VO teams an issue , to ensure continuity of expertise on the standards and their subsequent developments
- Outreach to the scientific community is essential at this phase
- Extension of interoperability to other disciplines