Architecture of the IVOA

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ESAC Science Data Centre

ASTERICS DADI Technology Forum 1
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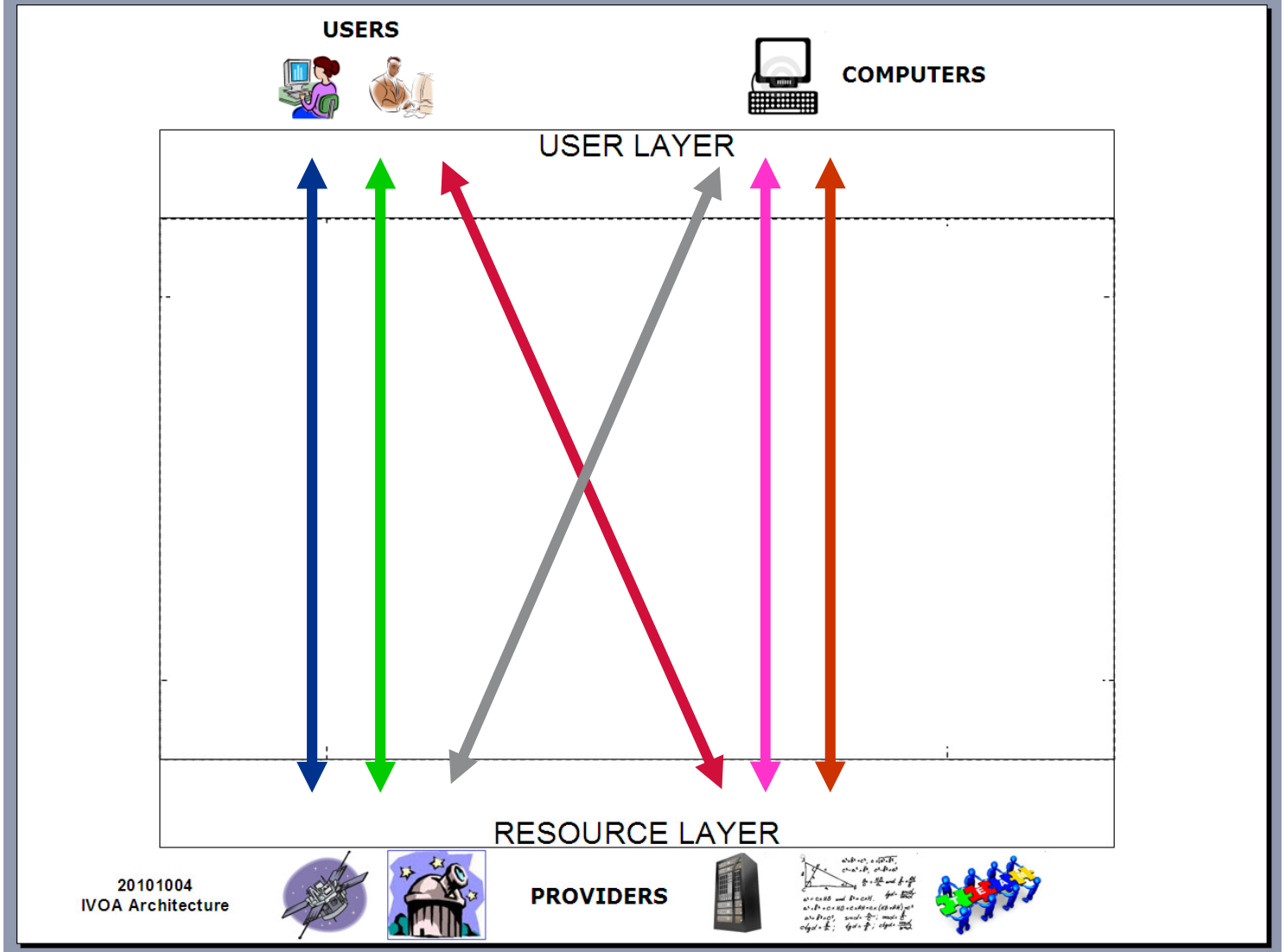
Usual Access to Astronomical Data and Services



For each Archive and for each Service :

1. Some common format (FITS)
2. Dedicated Data Model
3. Dedicated access interface

No real inter operability between services

IVOA Architecture

International
Virtual
Observatory
Alliance

IVOA Architecture

Version 1.0

IVOA Note 2010-11-23

This version:
Version 1.0- 23rd of November 2010

Latest versions:

Previous version(s):

Editors
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Author(s):
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and the IVOA Technical Coordination Group (tcg@ivoa.net):

Abstract

This note describes the technical architecture of the IVOA. The description is decomposed into three levels. Level 0 is a general, high level summary of the IVOA Architecture. Level 1 provides more details about components and functionalities, still without being overly technical. Finally, Level 2 displays how the IVOA standards fit into the IVOA Architecture.

IVOA Architecture, v1.0, 23/10/2010

1. http://tinyurl.com/ivoa-arch

Endorsed by the IVOA Exec

Still valid as of today

1. Some evolution with some new standards

Objective of the IVOA Architecture is to be "understandable" by many people

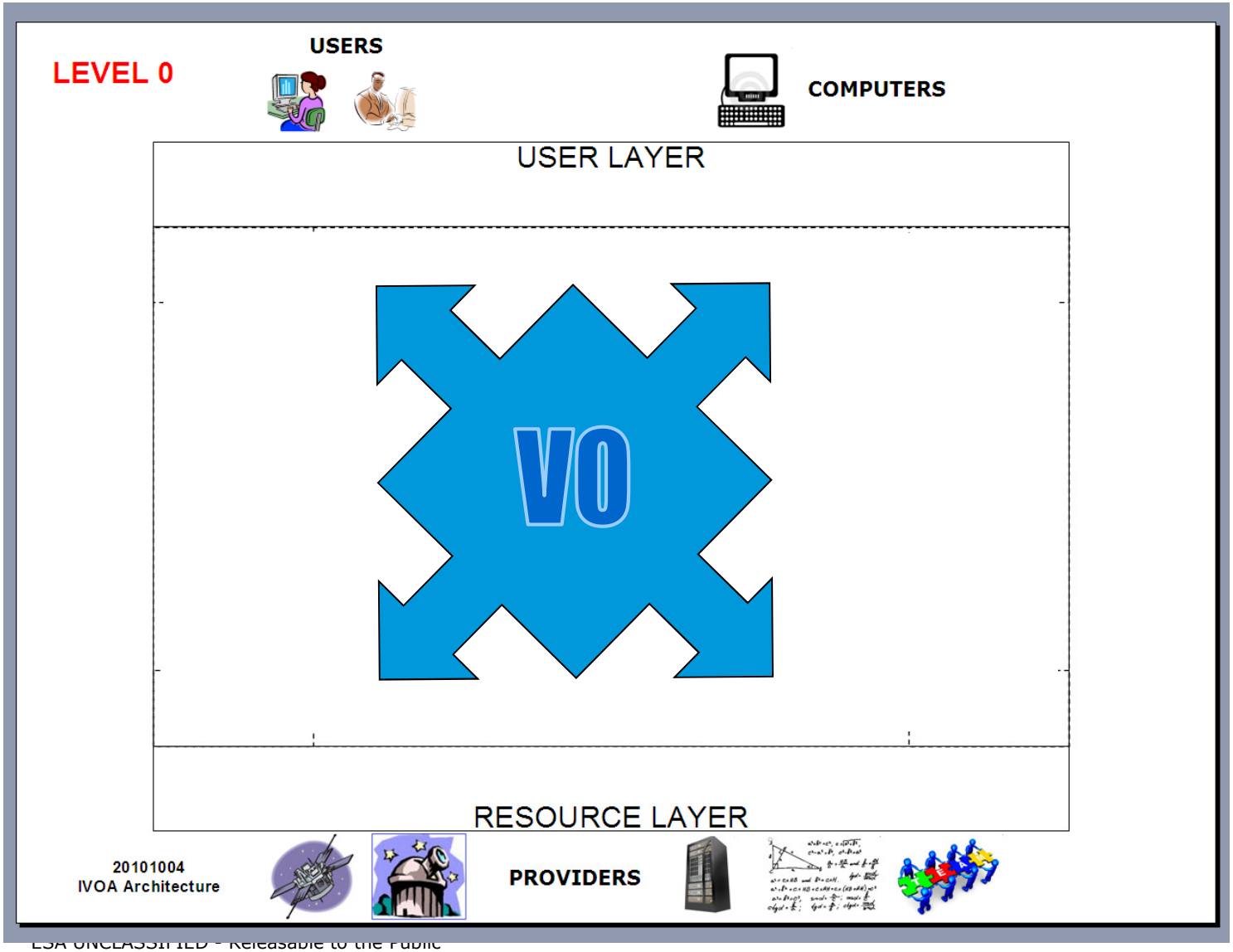
IVOA Architecture

2 views required

1. (level 0 and level 1) view for "public" consumption
    a. Global, generic, minimize VO jargon
    b. Readable by all, not too technical

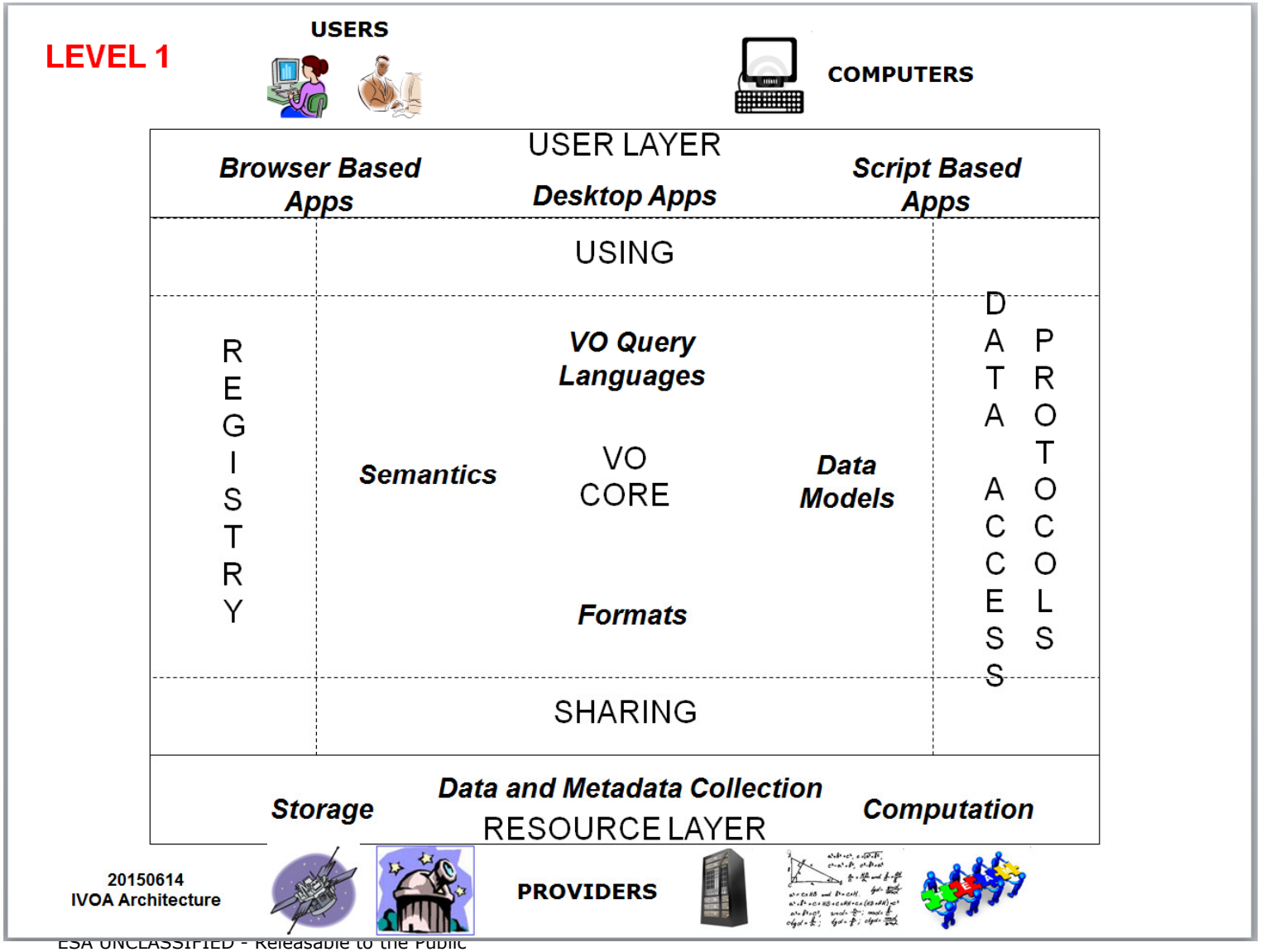
2. (level 2) view for IVOA and VO developers' needs
    a. Extension of (level 1)
    b. More detailed, all IVOA standards mentioned
    c. Clear connections and inter-dependency between IVOA standards
    d. Shows what is need to implement VO services
        – As a Data Centre, an Application developer, a Service Provider, …
        – What building blocks are required to fulfill a science case

IVOA Architecture – Level 0



- Hide specificities of each Archive and each Service to offer a common framework for access and usage
- Yellow Page of Services
- Inter Operability between services

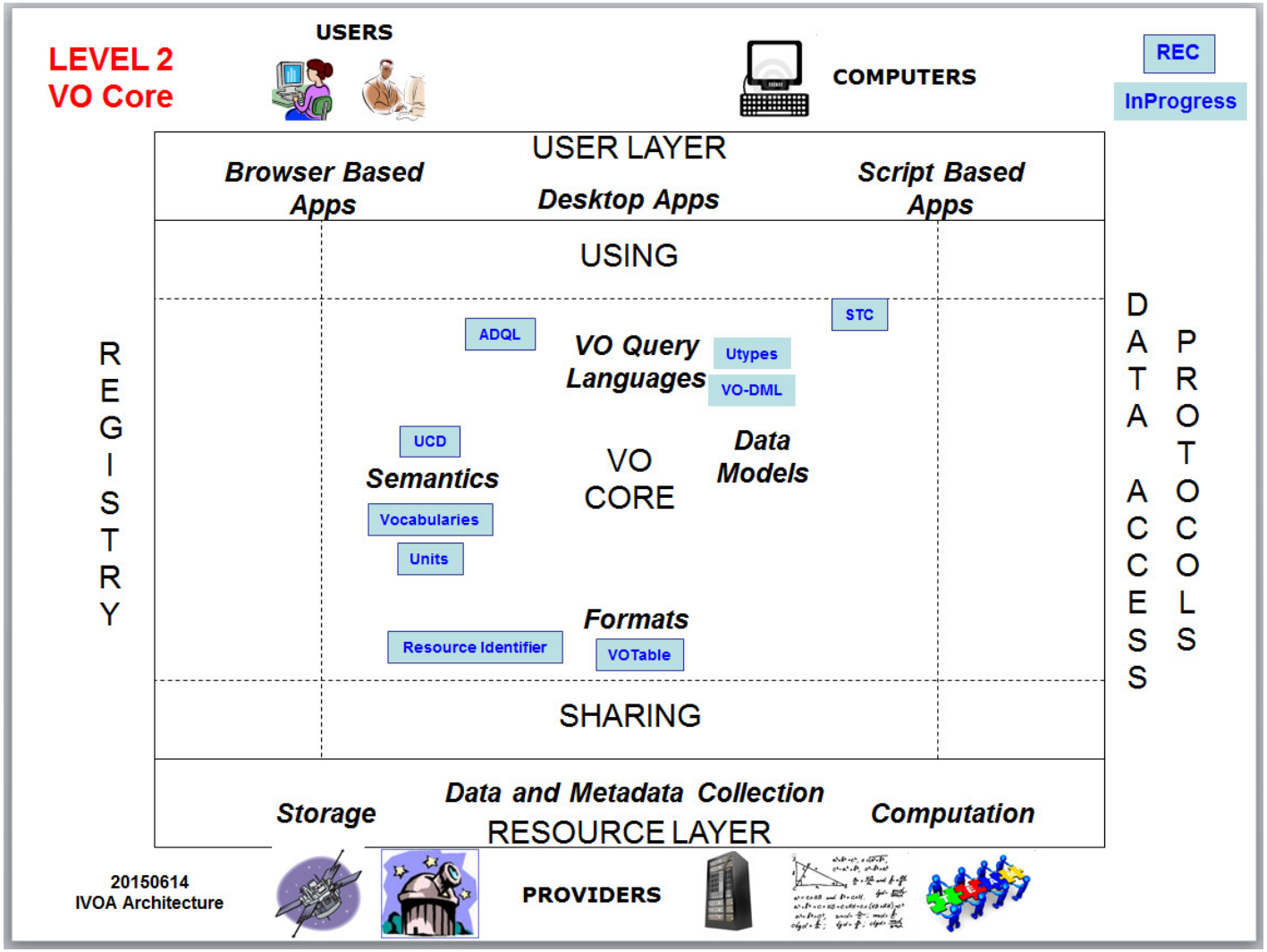
IVOA Architecture – Level 1



Describes the VO "ecosystem" according to various building blocks

1. VO Core
2. Registry
3. Using
4. Sharing
5. Data Access

IVOA Architecture – Level 2
VO Core standards



Underlying building blocks for other standards

VOTable (1st IVOA standard and most used)

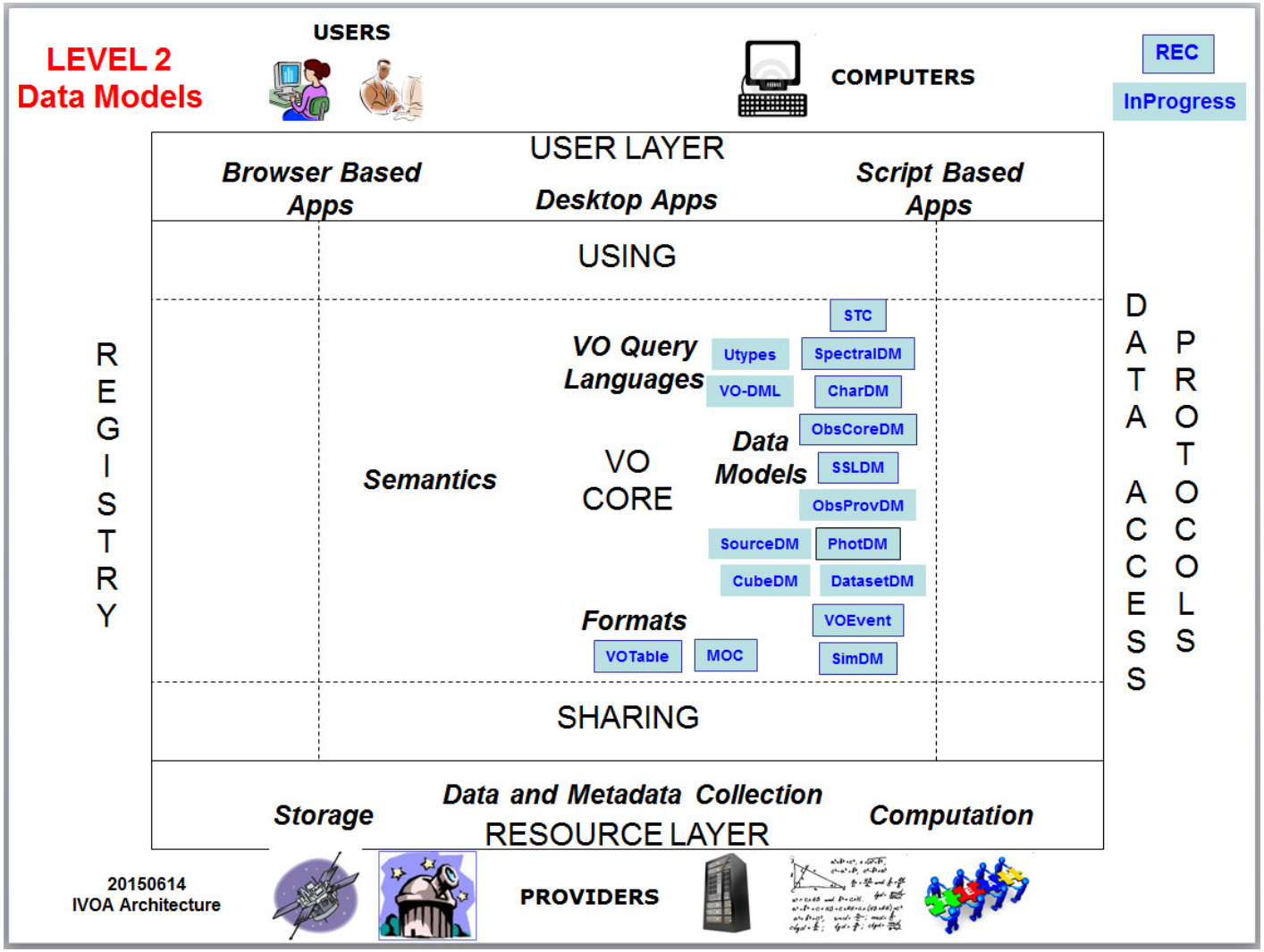
Astronomical Data Query Language (SQL for astronomy)

STC (Space Time Coordinate) system

Units for astronomy

Utypes for Data Model

IVOA Architecture – Level 2
Data Model standards



Core DM

1. STC, Utypes, CharDM

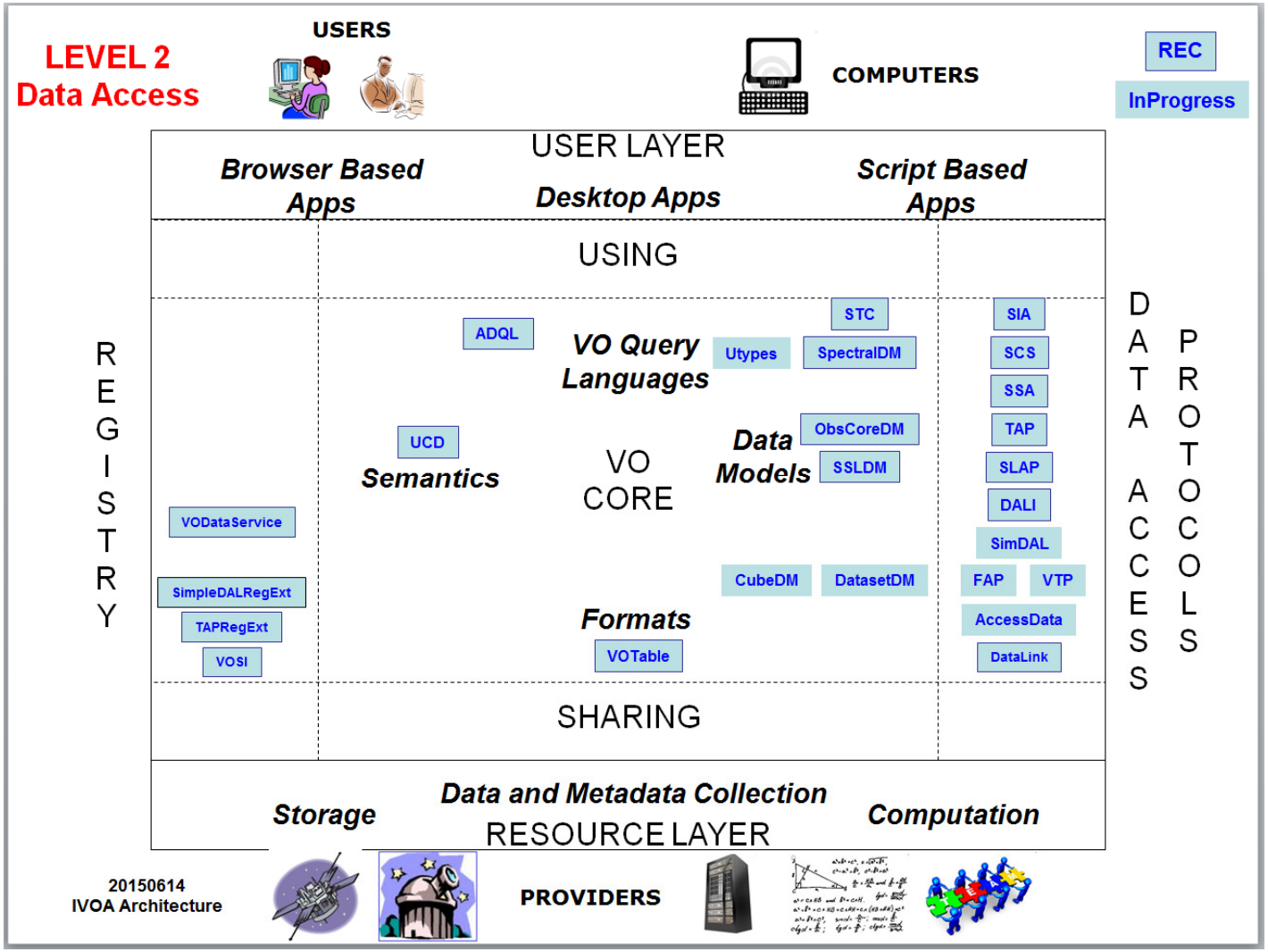
Type Specific DM

1. ObsCoreDM
2. SpectralDM
3. SSLDM
4. PhotDM
5. CubeDM
6. DatasetDM
7. SourceDM
8. SimDM

TAP/ADQL +DM

1. Power and abstraction to access any data

IVOA Architecture – Level 2
Data Access standards



Simple Access Protocols

1. Cone Search (SCS)
2. Images (SIA)
3. Spectra (SSAP)
4. Spectral Line (SLAP)

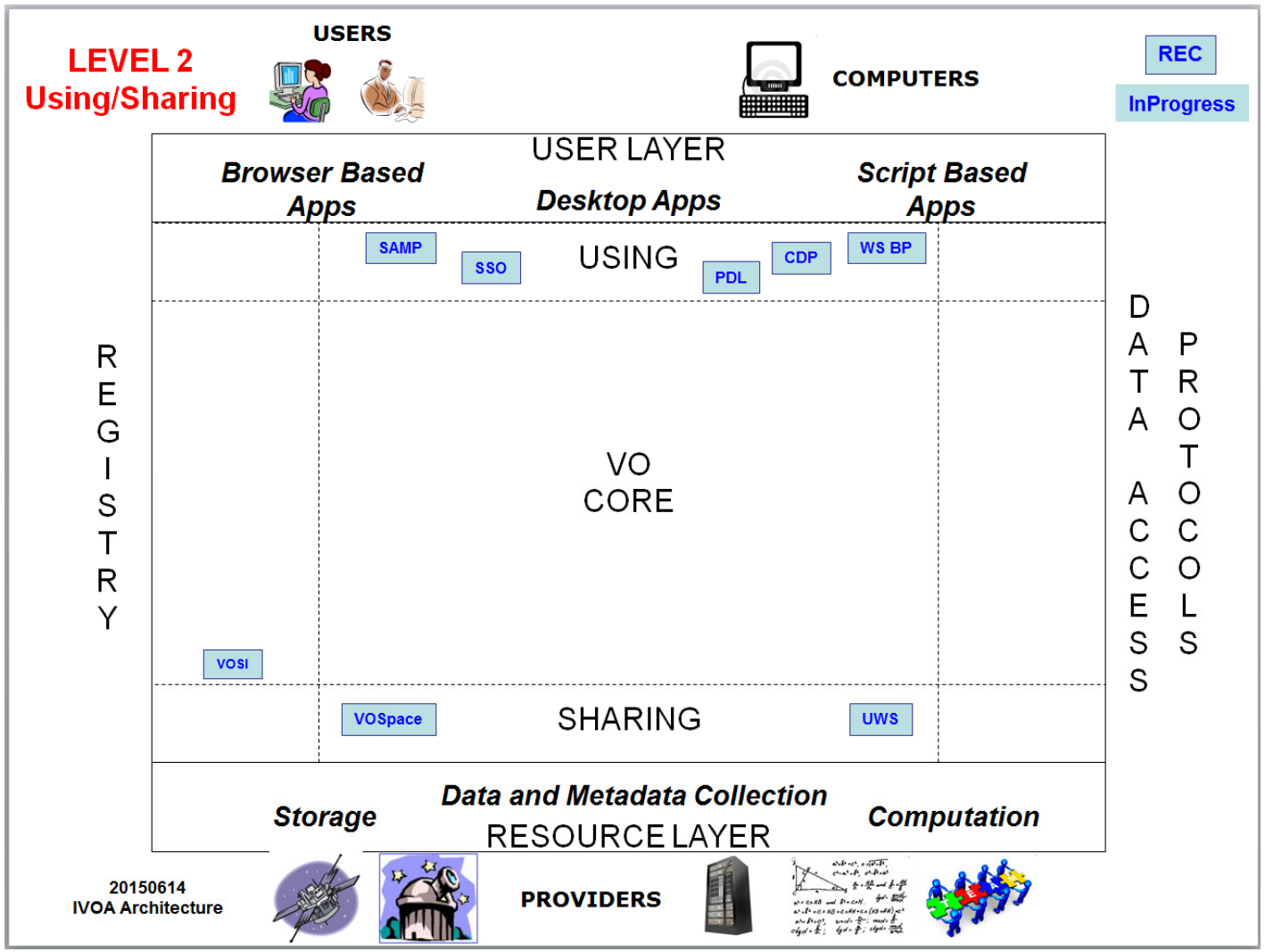
Table Access Protocol (TAP)

1. More powerful
2. Table upload
3. Sync/async query

More fine grained access

1. DALI, Datalink, AccessData

IVOA Architecture – Level 2
Using and Sharing standards



SAMP

1. Widely used
2. Enable interconnectivity between apps

User Authentication

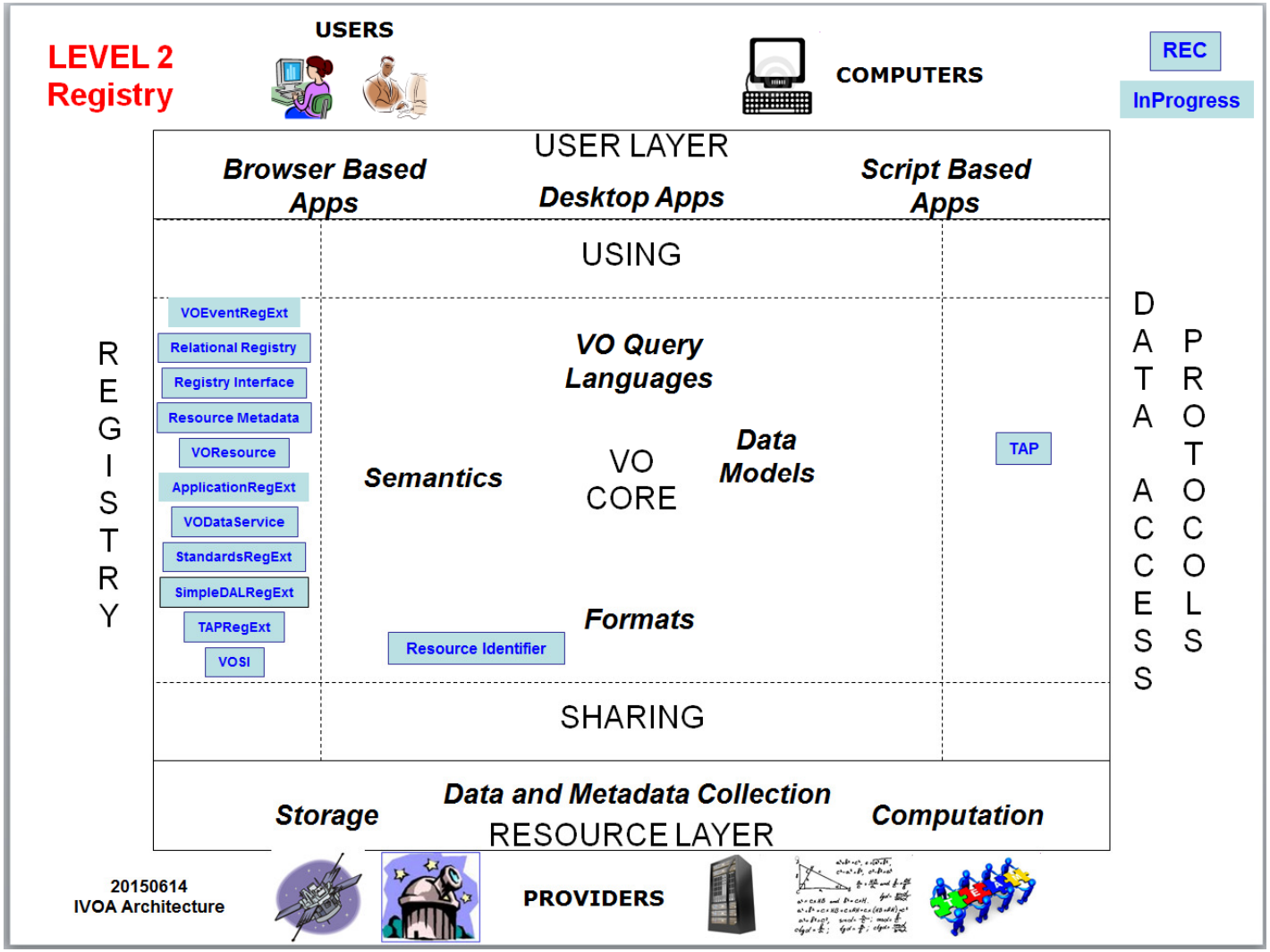
1. Single Sign On
2. Credential Delegation Protocol

VOSpace for VO virtual storage

UWS - Universal Worker Service

VO Support Interface

IVOA Architecture – Level 2
Registry standards

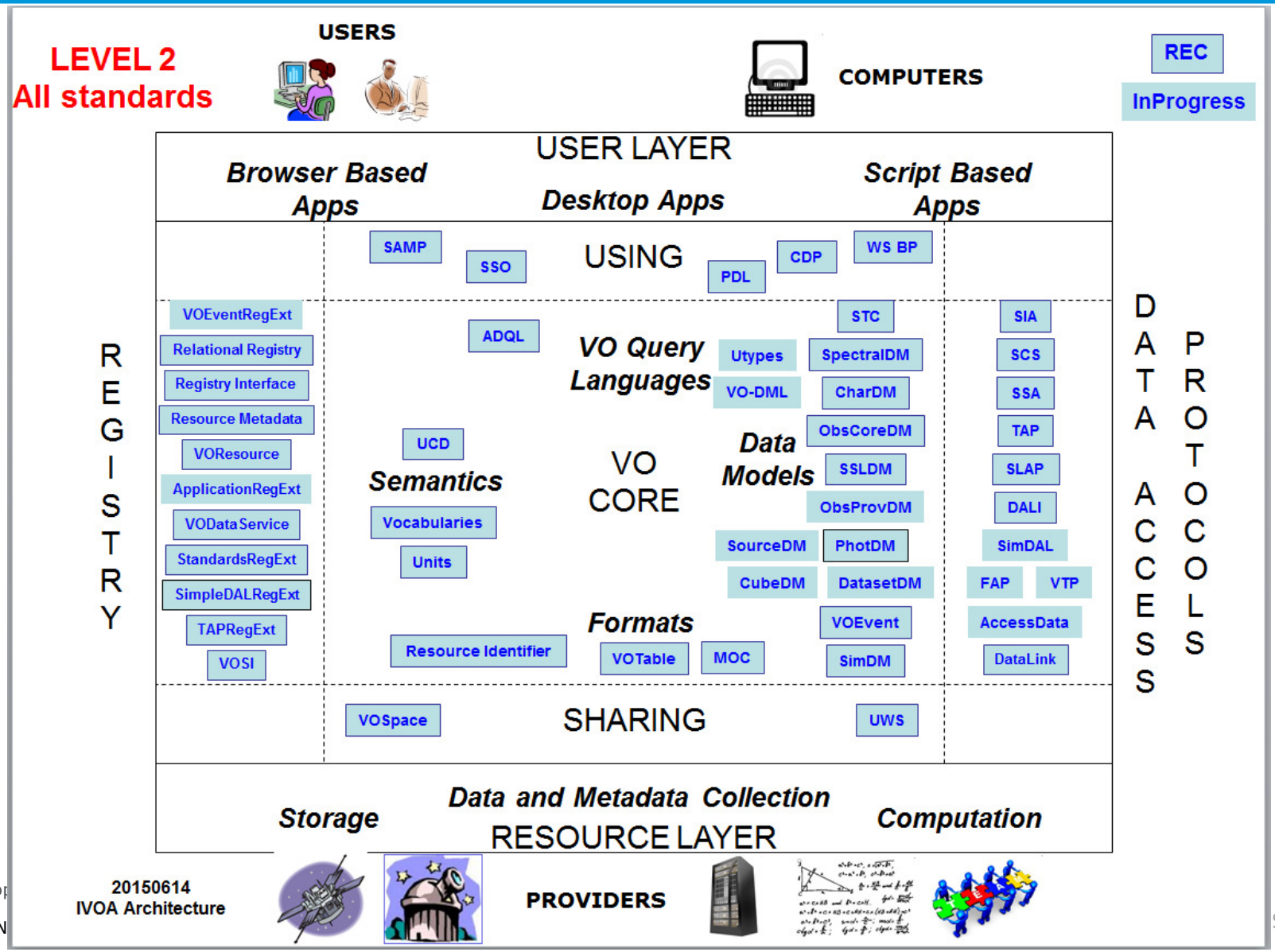


VO yellow page service

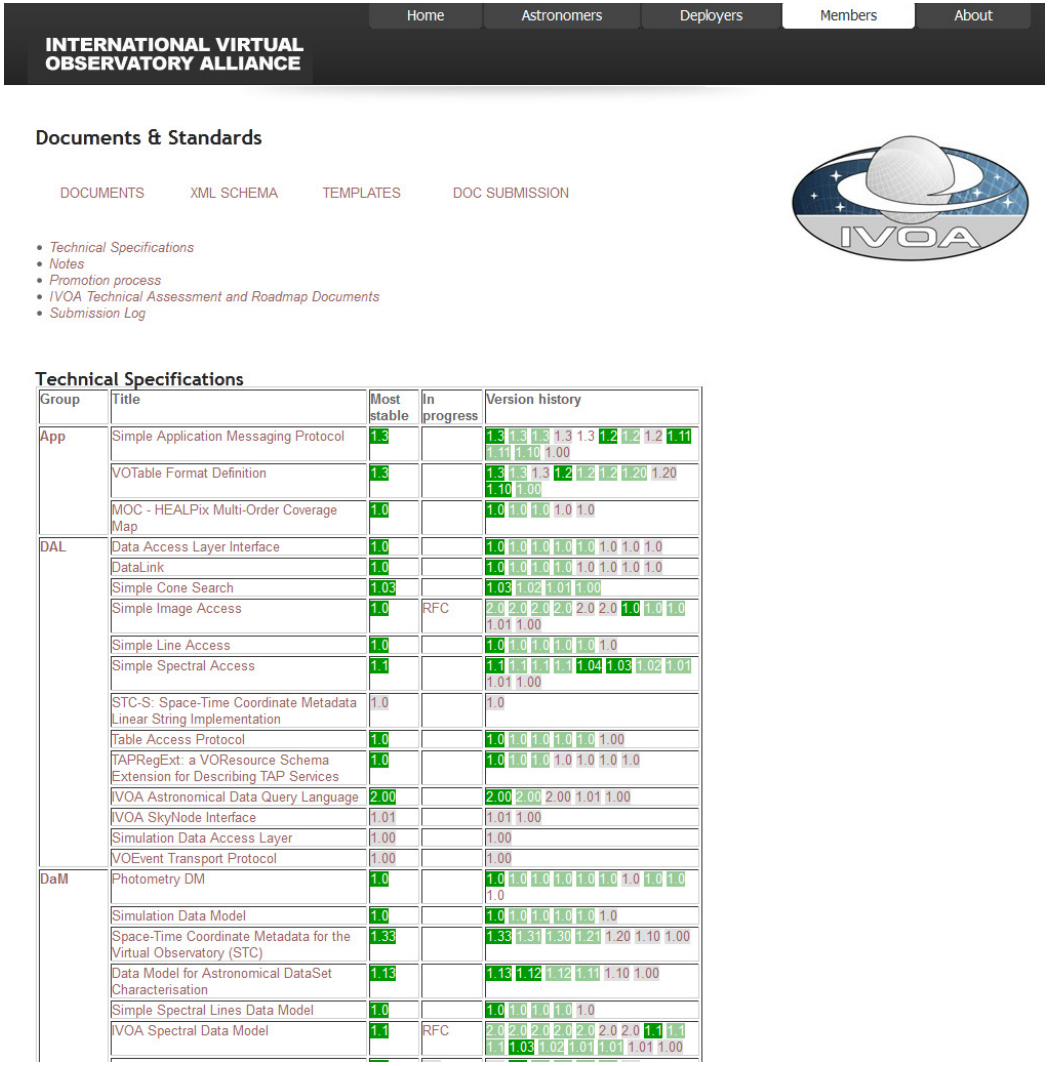
1. Publishing registries
2. Full searchable registries
3. Harvesting registries

Description of all types of VO resources

IVOA Architecture – Level 2
All standards



IVOA Standards Documents



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INTERNATIONAL VIRTUAL OBSERVATORY ALLIANCE

Documents & Standards

DOCUMENTS XML SCHEMA TEMPLATES DOC SUBMISSION

- *Technical Specifications*
- *Notes*
- *Promotion process*
- *IVOA Technical Assessment and Roadmap Documents*
- *Submission Log*

Technical Specifications

Group	Title	Most stable	In progress	Version history
App	Simple Application Messaging Protocol	1.3		1.3 1.3 1.3 1.3 1.3 1.2 1.2 1.2 1.11 1.11 1.10 1.00
	VOTable Format Definition	1.3		1.3 1.3 1.3 1.2 1.2 1.2 1.20 1.20 1.10 1.00
	MOC - HEALPix Multi-Order Coverage Map	1.0		1.0 1.0 1.0 1.0 1.0
DAL	Data Access Layer Interface	1.0		1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
	DataLink	1.0		1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
	Simple Cone Search	1.03		1.03 1.02 1.01 1.00
	Simple Image Access	1.0	RFC	2.0 2.0 2.0 2.0 2.0 2.0 1.0 1.0 1.0 1.01 1.00
	Simple Line Access	1.0		1.0 1.0 1.0 1.0 1.0 1.0
	Simple Spectral Access	1.1		1.1 1.1 1.1 1.1 1.04 1.03 1.02 1.01 1.01 1.00
	STC-S: Space-Time Coordinate Metadata Linear String Implementation	1.0		1.0
	Table Access Protocol	1.0		1.0 1.0 1.0 1.0 1.0 1.00
	TAPRegExt: a VOResource Schema Extension for Describing TAP Services	1.0		1.0 1.0 1.0 1.0 1.0 1.0 1.0
	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
	Simulation Data Access Layer	1.00		1.00
	VOEvent Transport Protocol	1.00		1.00
DaM	Photometry DM	1.0		1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
	Simulation Data Model	1.0		1.0 1.0 1.0 1.0 1.0 1.0
	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		1.0 1.0 1.0 1.0 1.0
	IVOA Spectral Data Model	1.1	RFC	2.0 2.0 2.0 2.0 2.0 2.0 2.0 1.1 1.1 1.1 1.03 1.02 1.01 1.01 1.01 1.00

All IVOA standards documents are at: http://www.ivoa.net/documents/

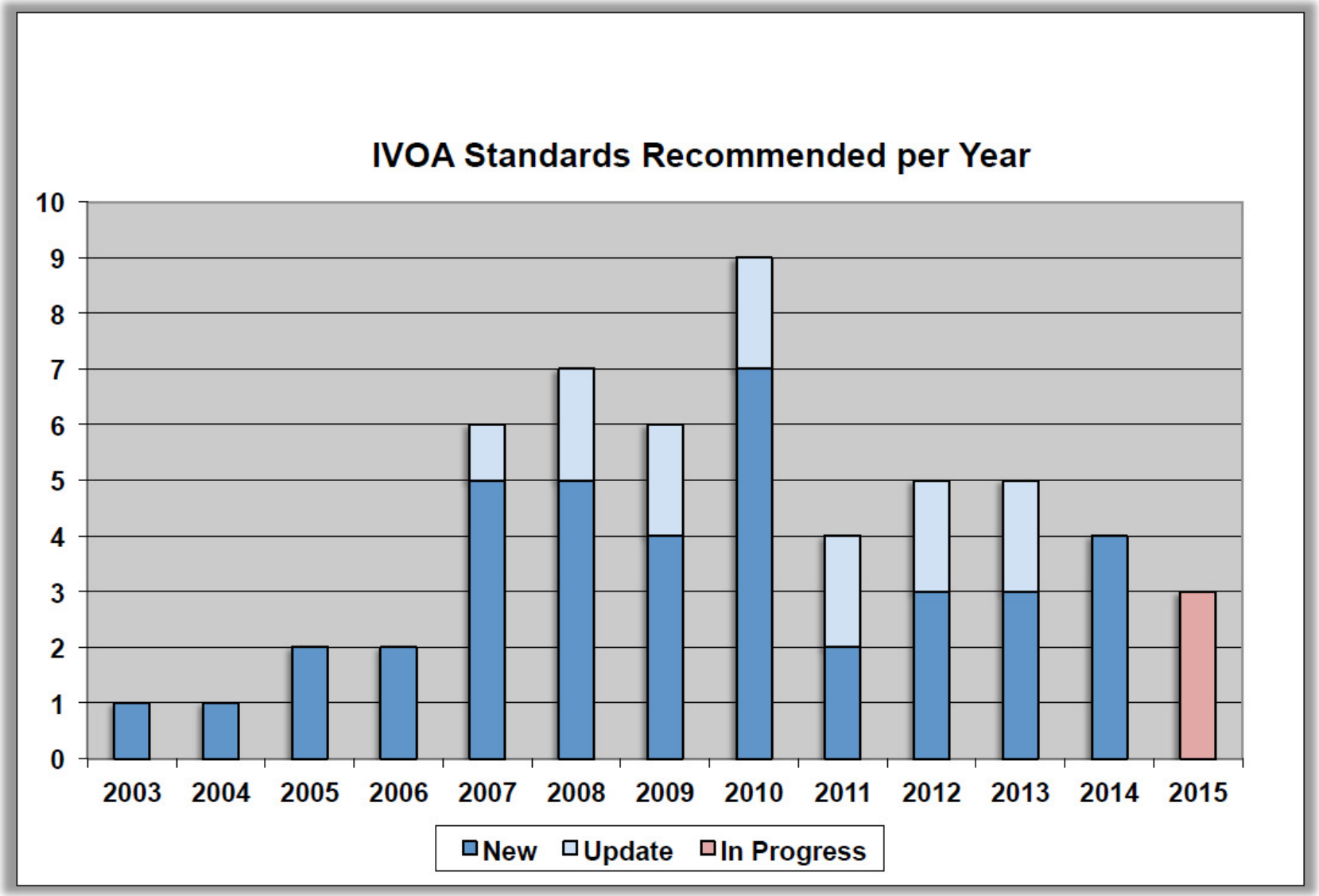
IVOA Standards Roadmap set by TCG, twice a year

1. http://tinyurl.com/ivoa-roadmap

Some new standards being defined

Some standards being updated based on implementation feedback

IVOA Standards through time



Chri

IVOA Technical Coordination Group

Members

	Chair	Vice-Chair
TCG	Matthew Graham	Pat Dowler
Working Groups		
Applications	Pierre Fernique	Tom Donaldson
Data Access Layer	François Bonnarel	Marco Molinaro
Data Model	Mark Cresitello-Dittmar	Laurent Michel
Grid and Web Sevices	Brian Major	Giuliano Taffoni
Registry	Markus Demleitner	Theresa Dower
Semantics	Mireille Louys	Alberto Accomazzi
Interest Groups		
Data Curation & Preservation	Françoise Genova	n/a
Education	Massimo Ramella	Sudhanshu Barway
Knowledge Discovery in Databases	George Djorgovski	n/a
Operations	Tom McGlynn	Mark Taylor
Theory	Franck Le Petit	Carlos Rodrigo
Time Domain	John Swinbank	Mike Fitzpatrick
IVOA Committees		
Exec	Christophe Arviset	Enrique Solano
Standard and Processes	Francoise Genova	n/a
Science Priorities	Mark Allen	n/a
Inactive Working Groups		
VOTable	Dormant	
VO Query Language	Merged with DAL in May 2010	
VOEvent	Tranformed into Time Domain IG in Oct 2012	

Each WG is in charge to define IVOA standards

Each IG engages discussion within the IVOA on areas that could potentially (but not necessarily) become a standard

TCG role

1. Assures technical coordination amongst WGs / IGs
2. Liaison with IVOA Exec Committee
3. Technical review role for each standard proposed, checking consistency with other standards

Science Priorities for IVOA

1. IVOA standards to be driven by science priories, defined by IVOA Committee on Science Priorities

2. Multi-dimensional Data
    a. Radio astronomy, Integral Field Spectroscopy, high energy, polarization, simulation, data mining datasets, …
    b. ObsCoreDM 1.1, SIA 2.0 & 2.1, AccessData 1.0, Dataset DM 1.0 and CubeDM 1.0

3. Time Domain Astronomy
    a. Time series, light curves, transient event reports, …

4. Potential new ones being defined
    a. Big data ? Bring the software and the processing to the data ? …

VO standards are spreading…

1. In the astronomy community mainly but also in other disciplines (eg Planetary Science, …)

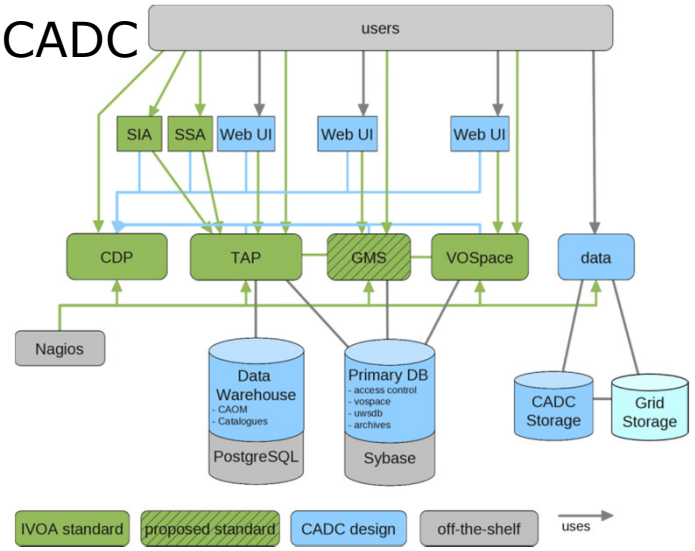
2. More and more VO Apps, with increased interoperability functionalities
    a. Aladin, Topcat, SPLAT-VO, VOSpec, …
    b. 4 applications sessions at the last Interop meeting in Sesto!

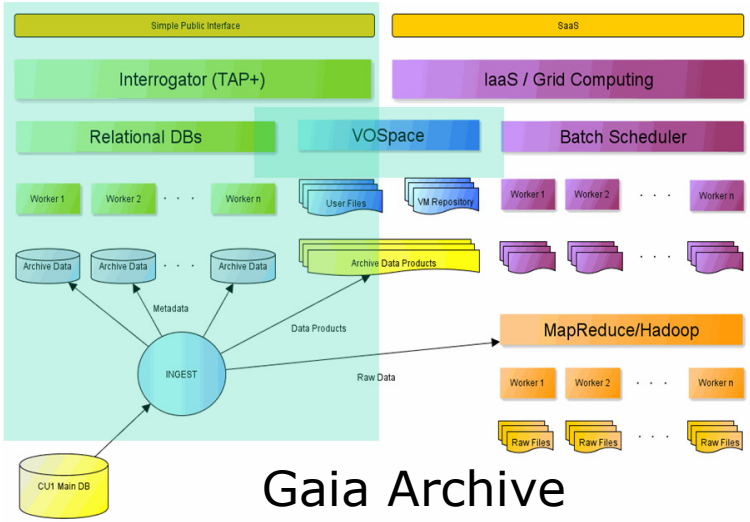
3. VO services built on top of existing data services
    a. Most of current SCS, SIAP, TAP, SSAP data services

4. VO built-in as part of archive infrastructure
    a. CADC, Gaia Archive, Euclid, …

Example of VO built in Archives

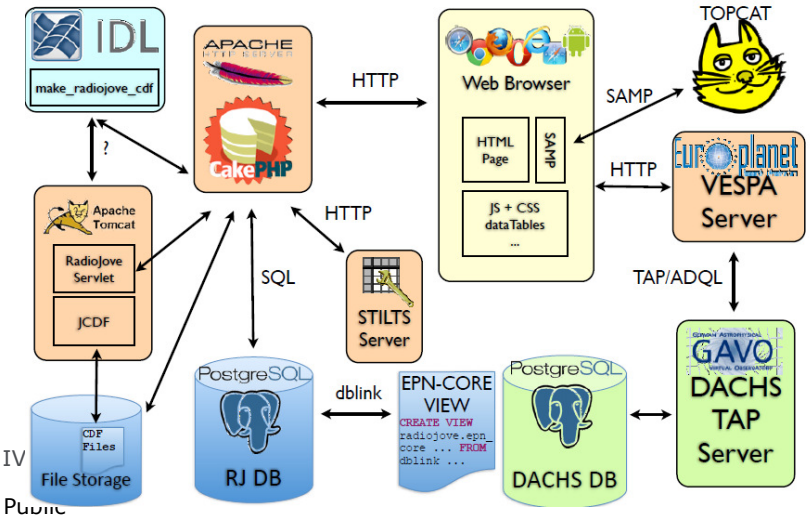
CADC





Gaia Archive

Radio-Jove Archive Architecture



Improving the VO "ecosystem"

1. The VO is operational
    a. Need for reliable systems and services
    b. Need for compliancy to ensure interoperability

2. Creation of an IVOA Operations IG aiming at improving the VO ecosystem
    a. VO Services monitoring (availability, compliancy, …)
    b. IVOA Registry cleaning
    c. Request for implementations, validators

3. Discussions starting to improve the IVOA standards process
    a. Be more flexible and responsive

IVOA "Messages"

1. *"The VO is not a magic solution to all astronomy data management challenges but it can bring useful solutions to some of them"*
    a. Interoperability amongst datasets
        - And VO science applications will be the key
    b. IVOA Standards to help building archives
    c. Need to address "bring and run code next to the data"

2. *"If one wants to take something out of the IVOA, one needs to bring something in"*
    a. Need to convince big projects to participate to standards development so they can better fit their needs
    b. And IVOA needs to go faster so we can meet projects deadlines