



# The IVOA Architecture

Christophe Arviset (ESA/ESAC)

Head of the Science Archives and Computer Engineering Unit

Science Operations Department

Chair of the IVOA Technical Coordination Group

Forum VO-PDC, Paris, 21<sup>st</sup> November 2011



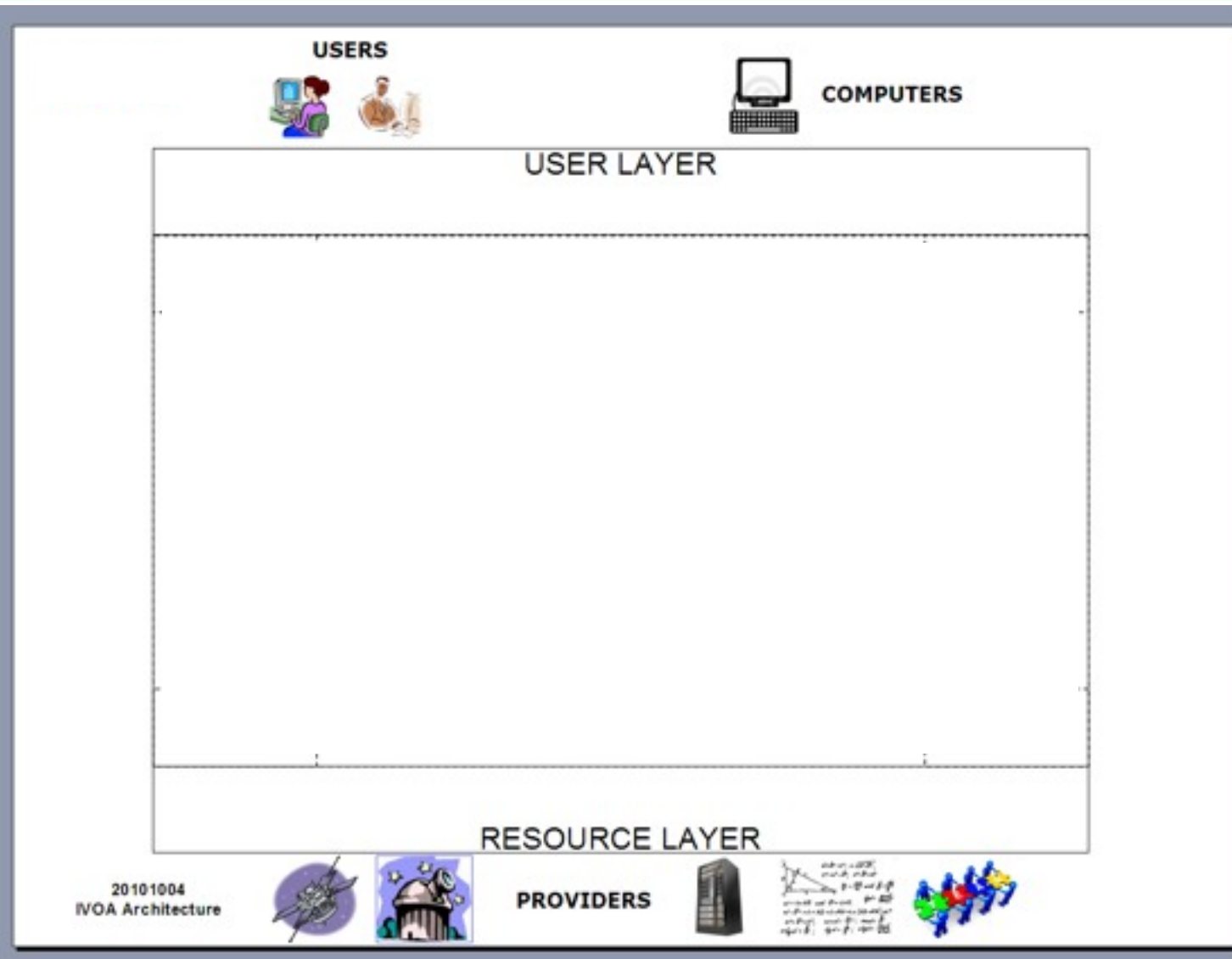


## 2 views required

- (level 0 and level 1) view for “public” consumption
  - Global, generic, minimize VO jargon
  - Readable by all, not too technical
  
- (level 2) view for IVOA and VO developers' needs
  - Extension of (level 1)
  - More detailed, all IVOA standards mentioned
  - Clear connections and inter-dependency between IVOA standards
  - 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



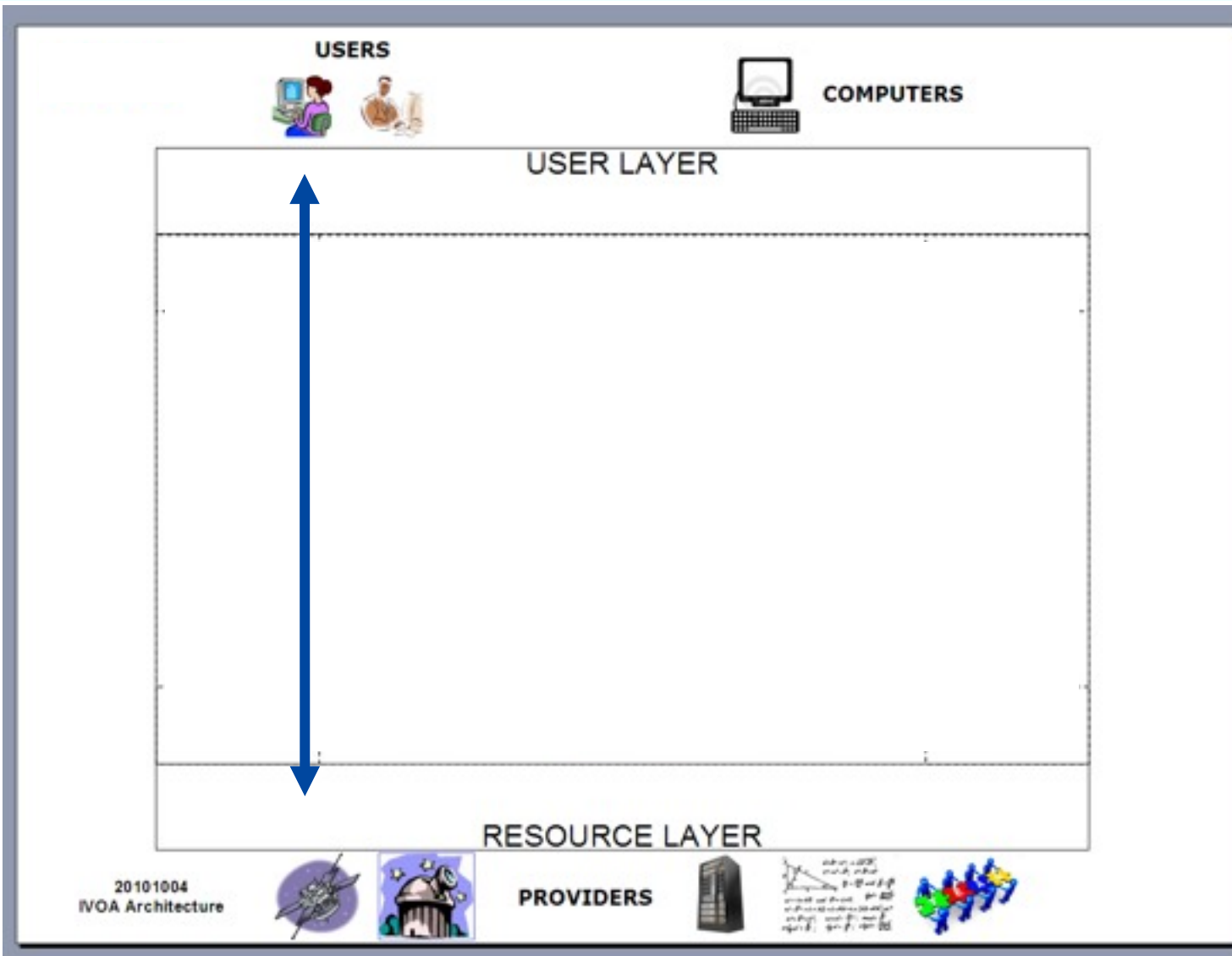
# Access to Astronomical Data and Services



- For each Archive and for each Service
  - Some common format (FITS)
  - Dedicated Data Model
  - Dedicated access interface
- No real interoperability between services



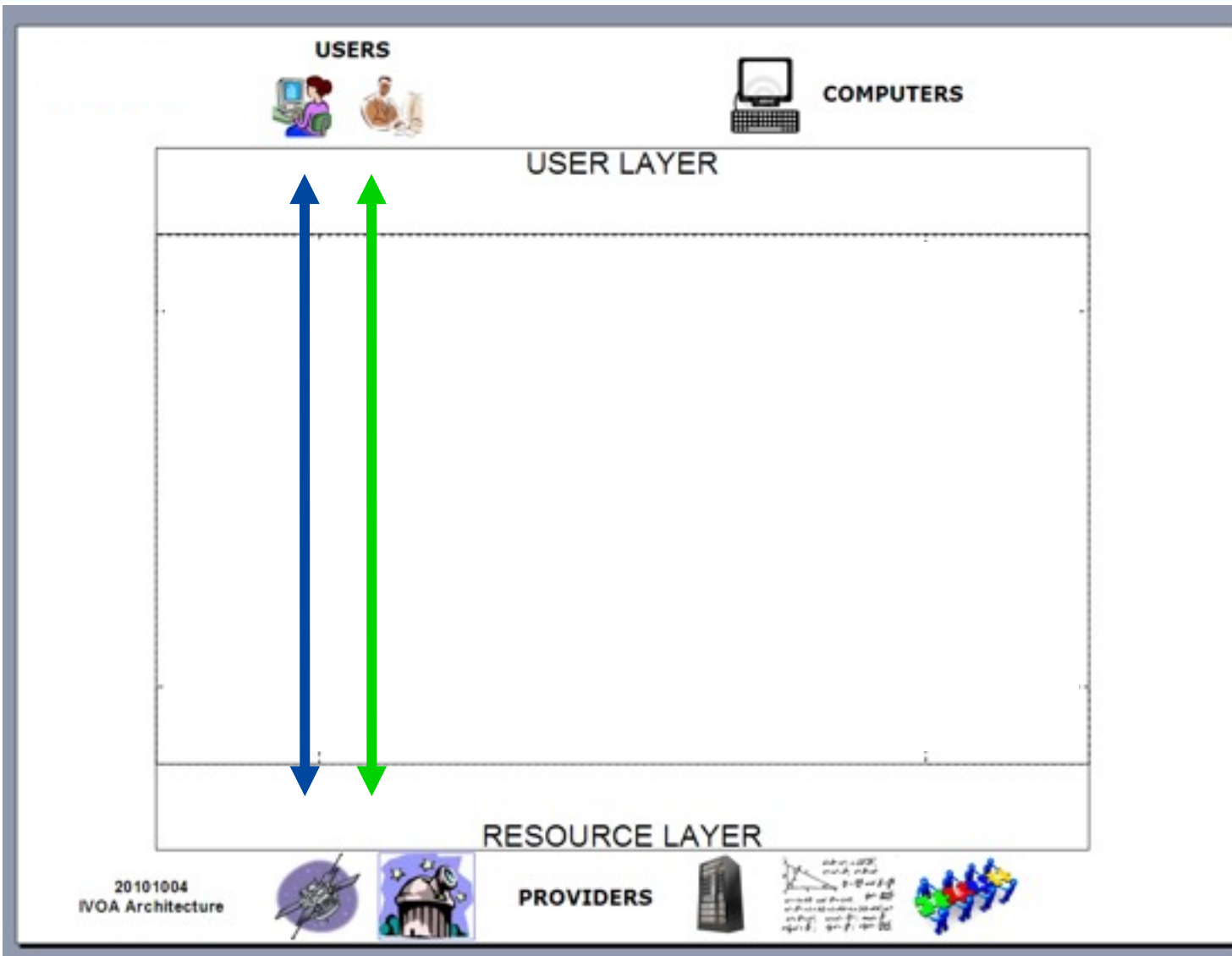
# Access to Astronomical Data and Services



- For each Archive and for each Service
  - Some common format (FITS)
  - Dedicated Data Model
  - Dedicated access interface
- No real interoperability between services



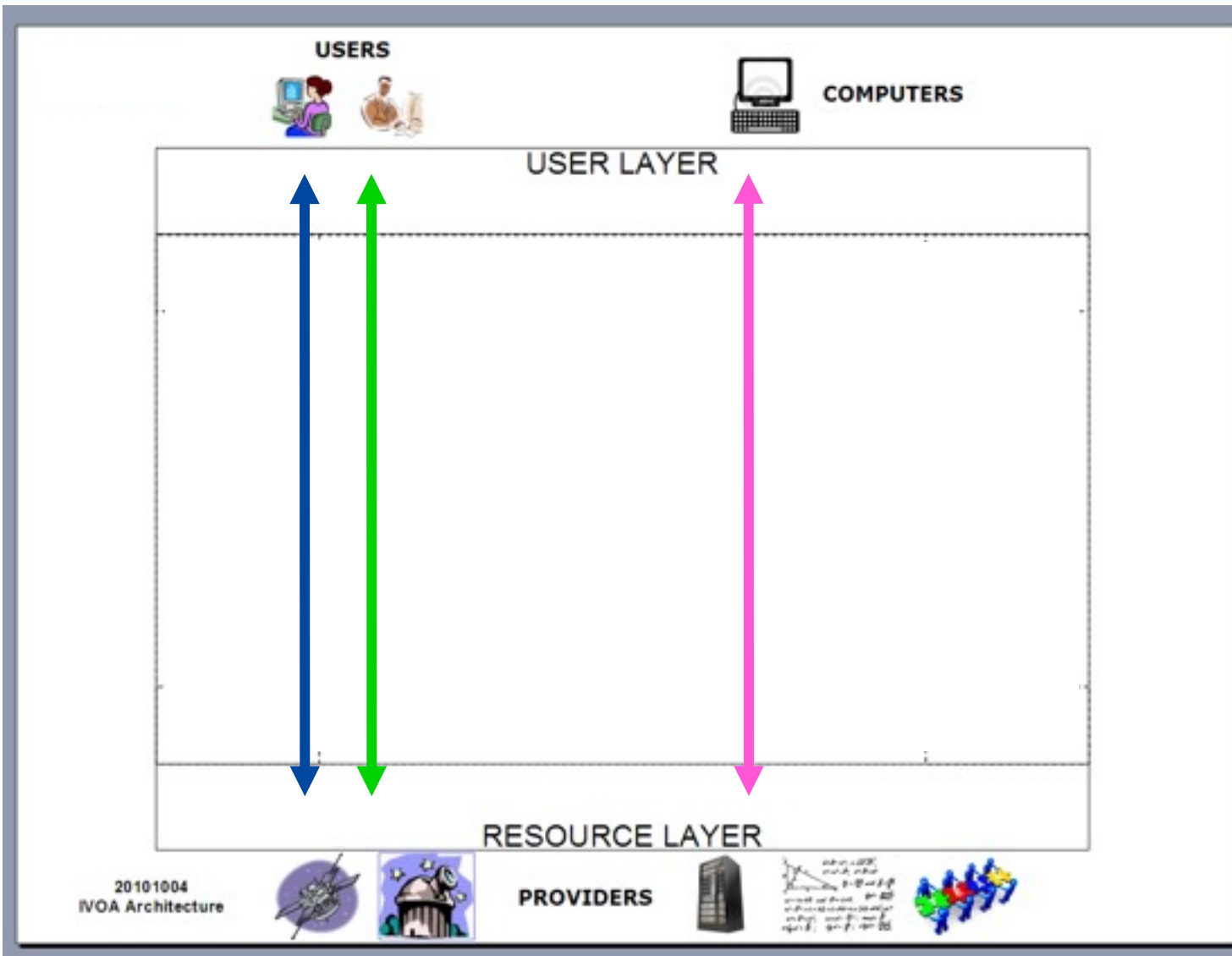
# Access to Astronomical Data and Services



- For each Archive and for each Service
  - Some common format (FITS)
  - Dedicated Data Model
  - Dedicated access interface
- No real interoperability between services



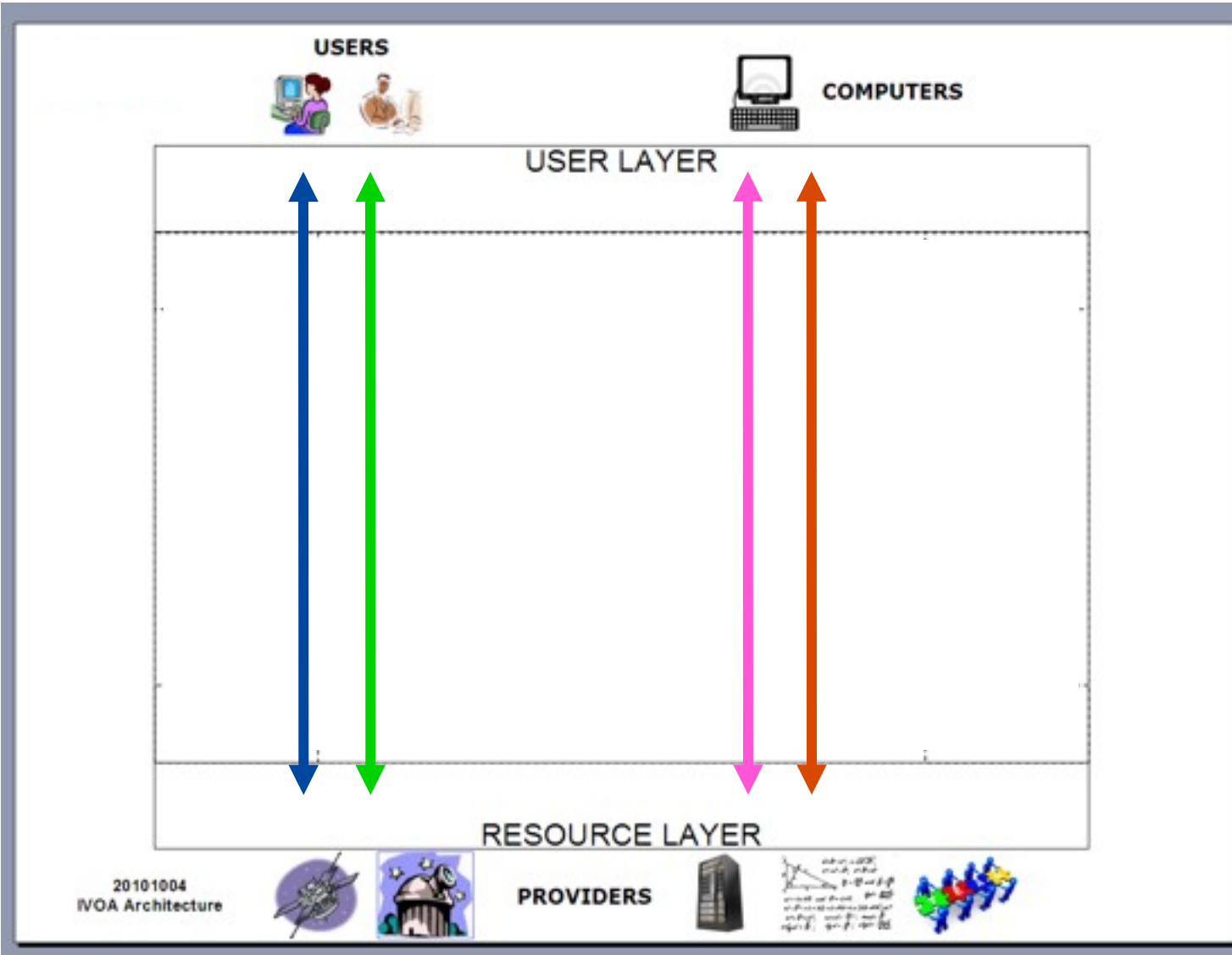
# Access to Astronomical Data and Services



- For each Archive and for each Service
  - Some common format (FITS)
  - Dedicated Data Model
  - Dedicated access interface
- No real interoperability between services

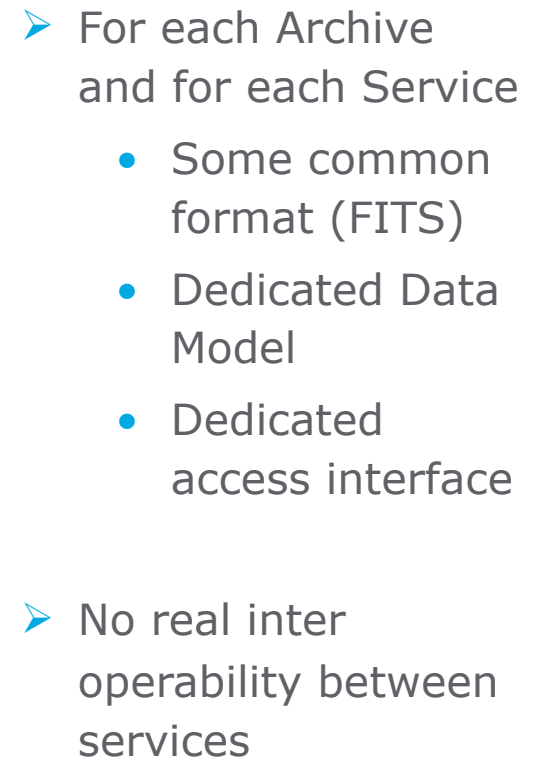


# Access to Astronomical Data and Services



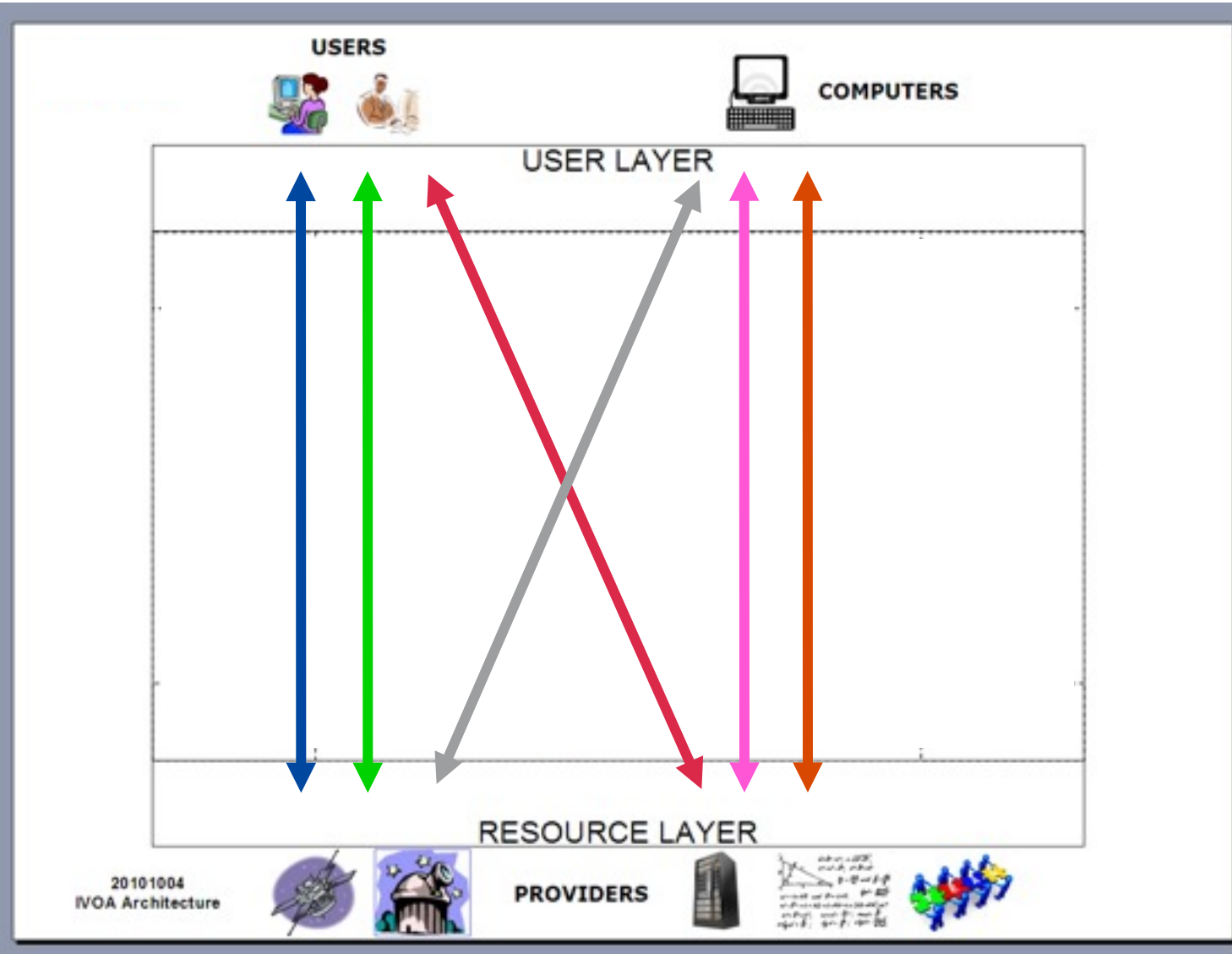
- For each Archive and for each Service
  - Some common format (FITS)
  - Dedicated Data Model
  - Dedicated access interface
- No real interoperability between services







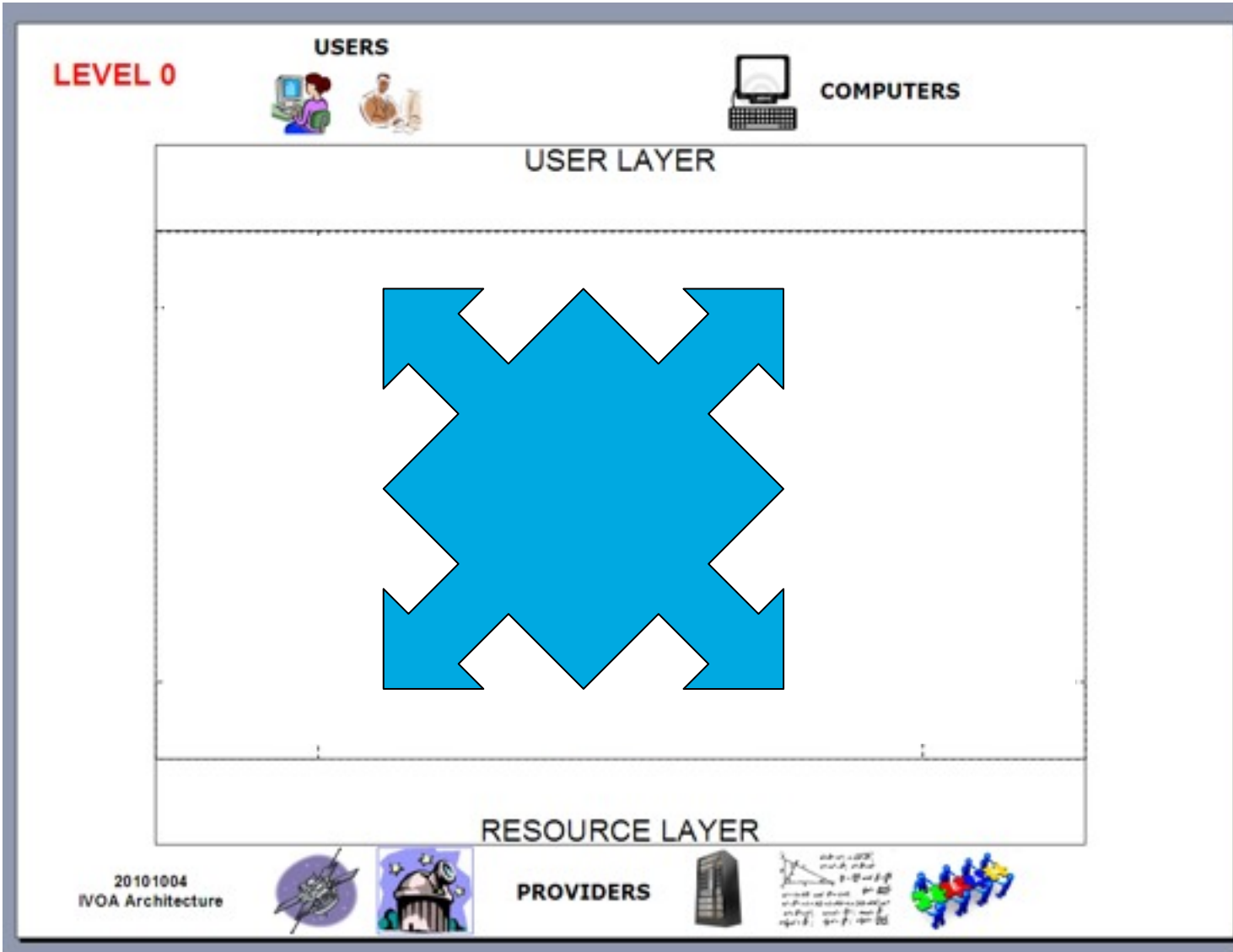
# Access to Astronomical Data and Services



- For each Archive and for each Service
  - Some common format (FITS)
  - Dedicated Data Model
  - Dedicated access interface
- No real interoperability between services

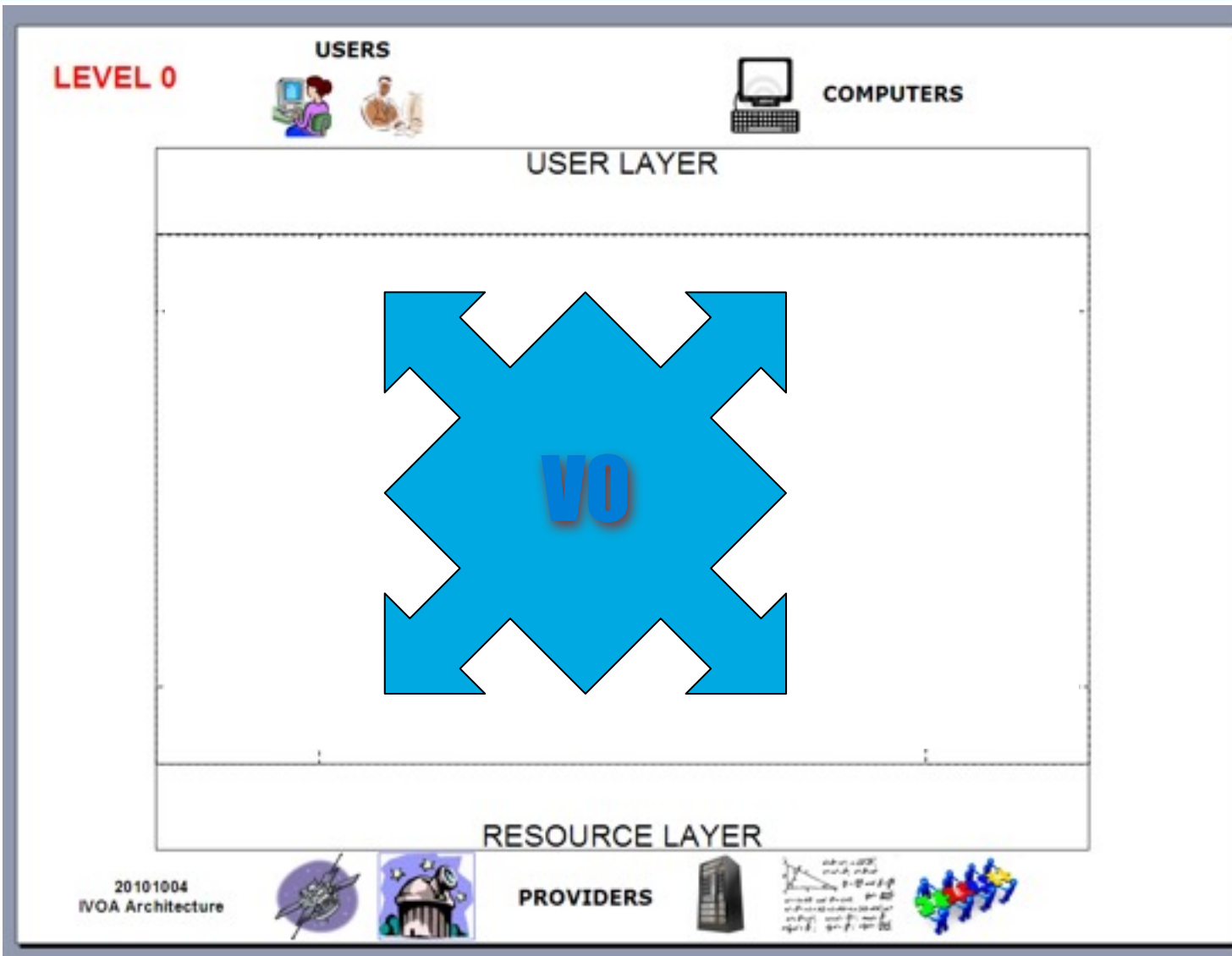


# IVOA Architecture – Level 0





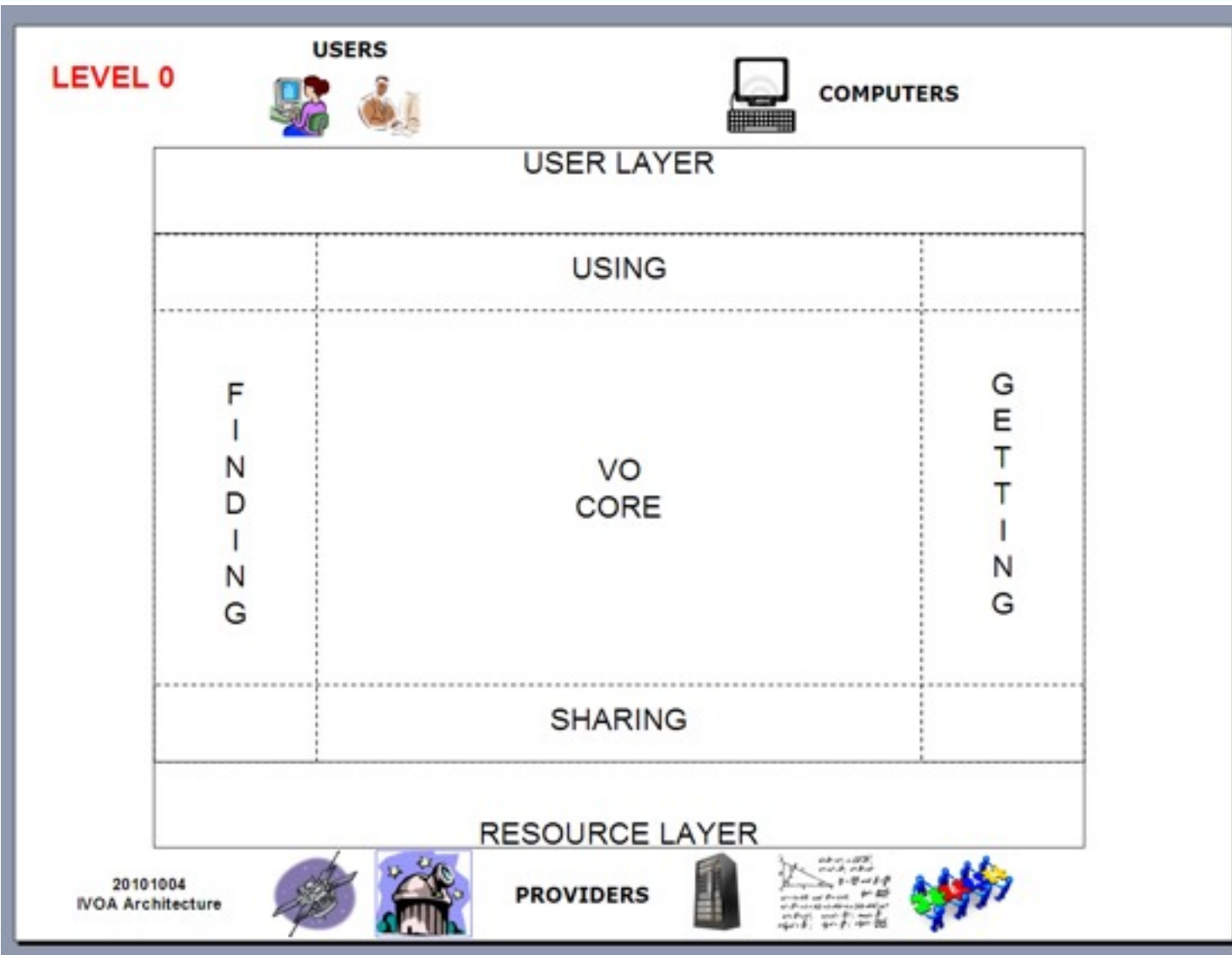
# IVOA Architecture – Level 0



- 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



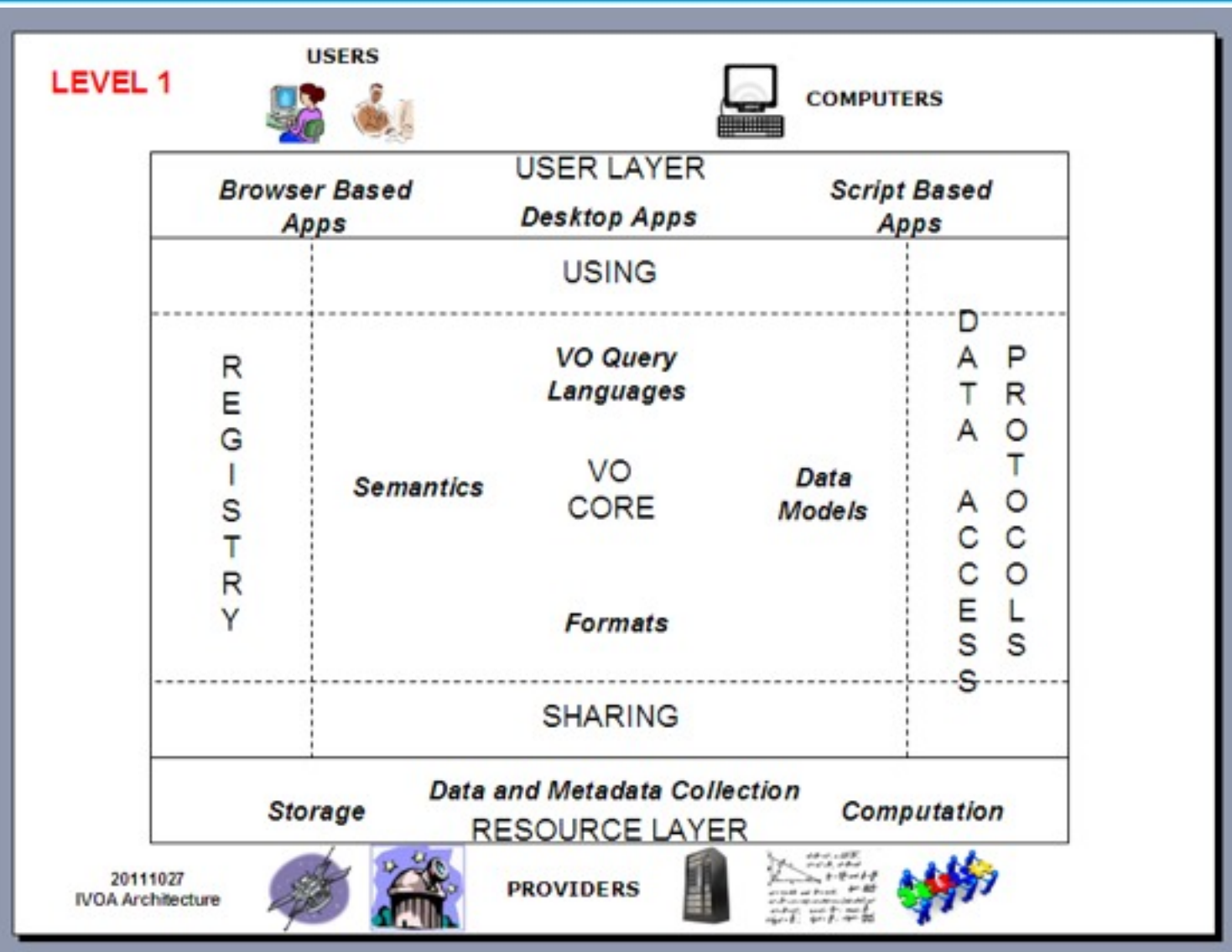
# IVOA Architecture – Level 0



- 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



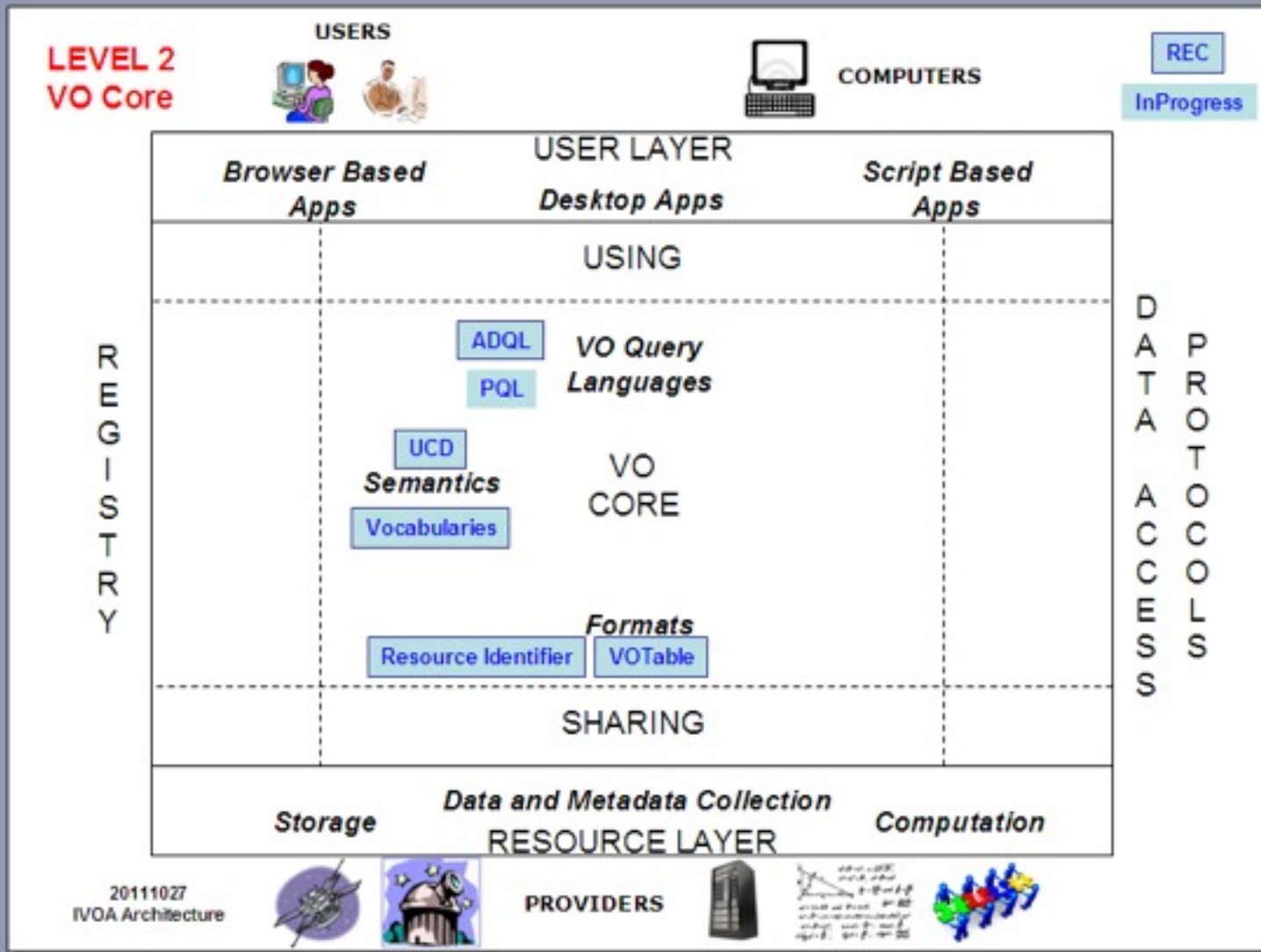
# IVOA Architecture – Level 1





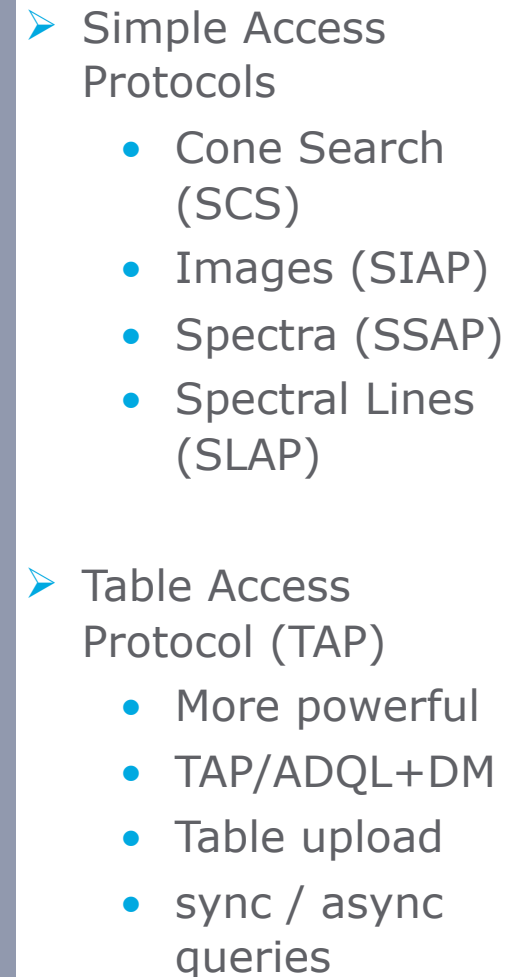
# IVOA Architecture – Level 2

## VO Core Protocols



- Underlying building blocks for other standards
- VOTable
  - 1<sup>st</sup> IVOA std and most used
- Unified Content Descriptor (UCD)
- Astronomical Data Query Language (ADQL)

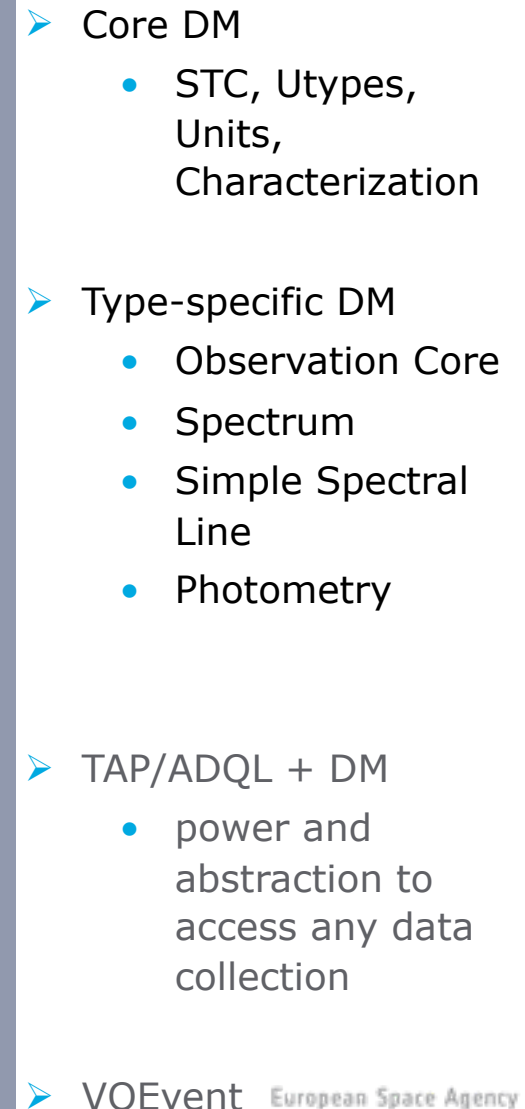






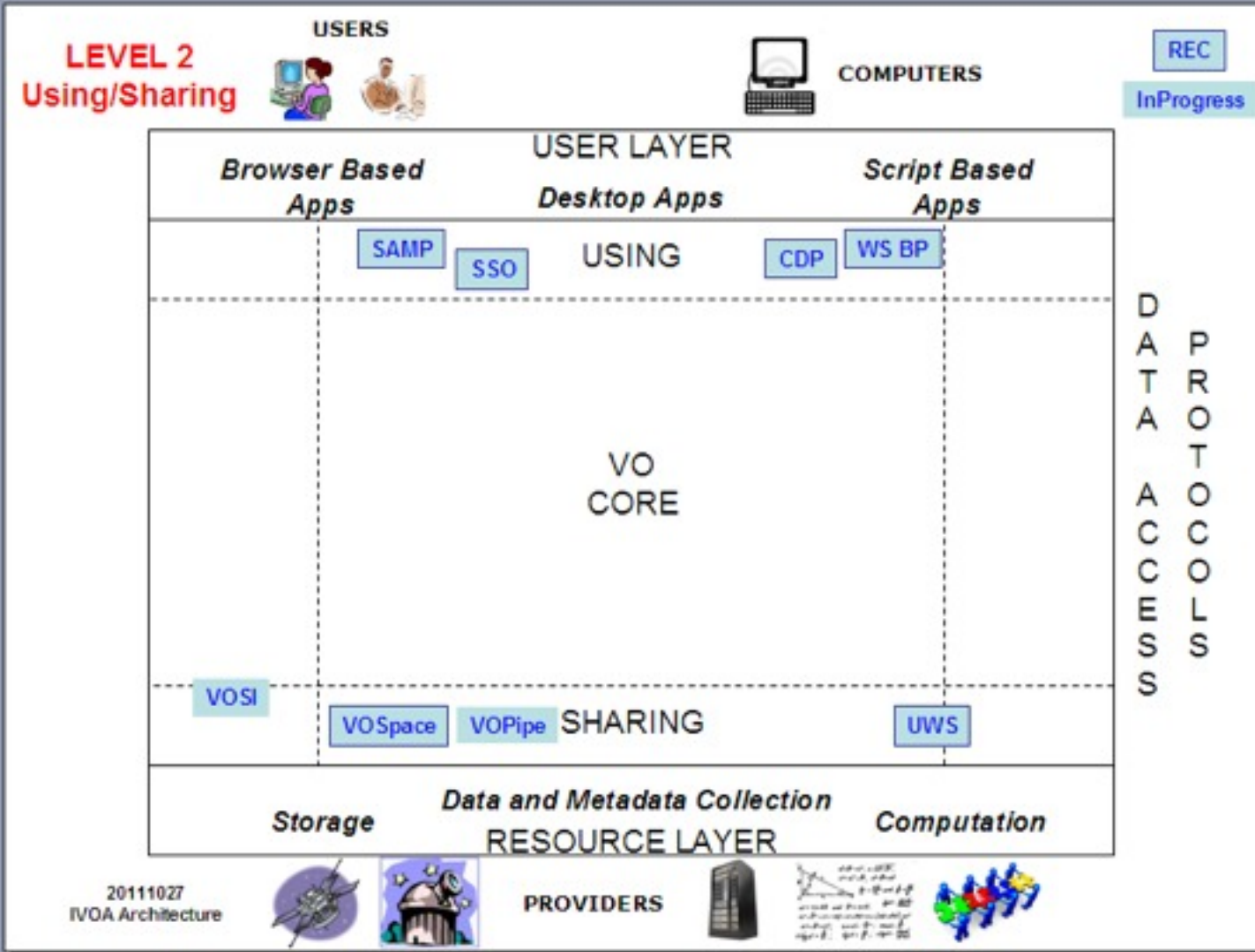








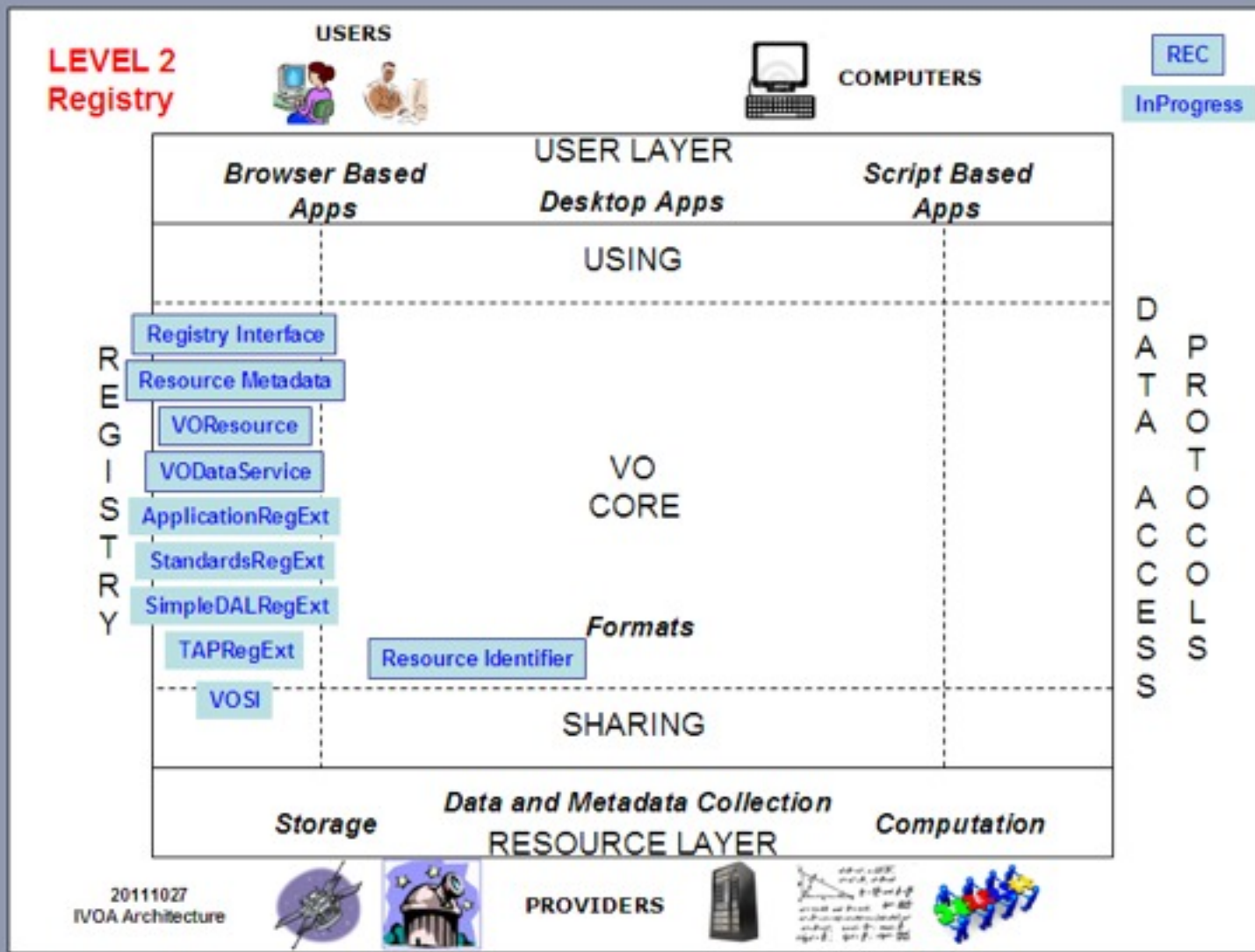
# IVOA Architecture – Level 2 Using and Sharing



- SAMP enabling inter connectivity between VO applications
- Single Sign On / Credential Delegation Protocol for user authentication
- VOspace for VO virtual storage
- Others for VO data processing workflows



# IVOA Architecture – Level 2 Registry



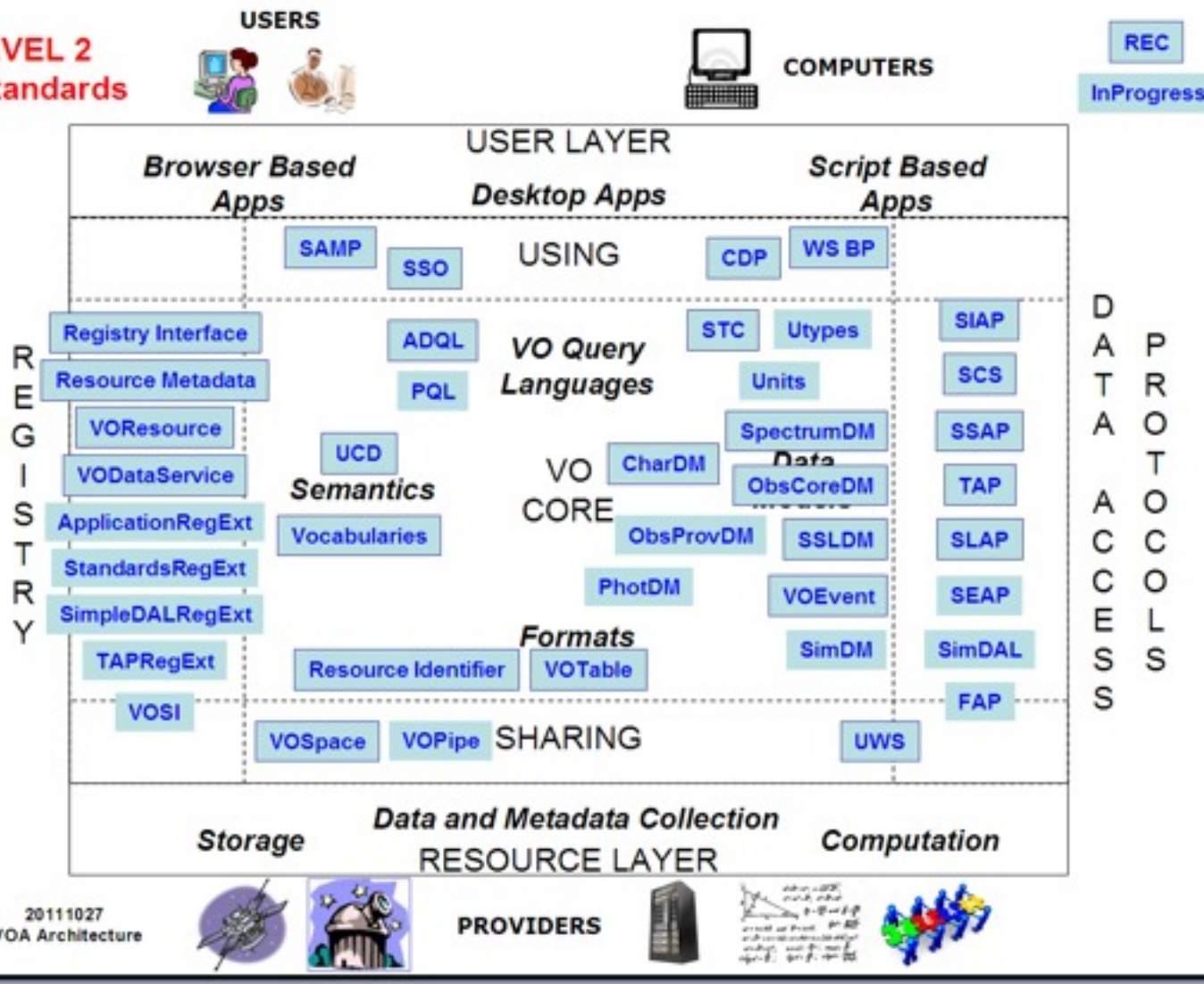
- VO Yellow Page service
- Find VO Resources of different kinds
- Publishing Registries
- Full Searchable Registries
- Harvesting Registries



# IVOA Architecture – Level 2



**LEVEL 2**  
All standards



- All standards represent building blocks to be used depending of type of VO services
- Data & metadata VO Publishing
- VO Applications consuming VO services
- Processing and storage VO workflows

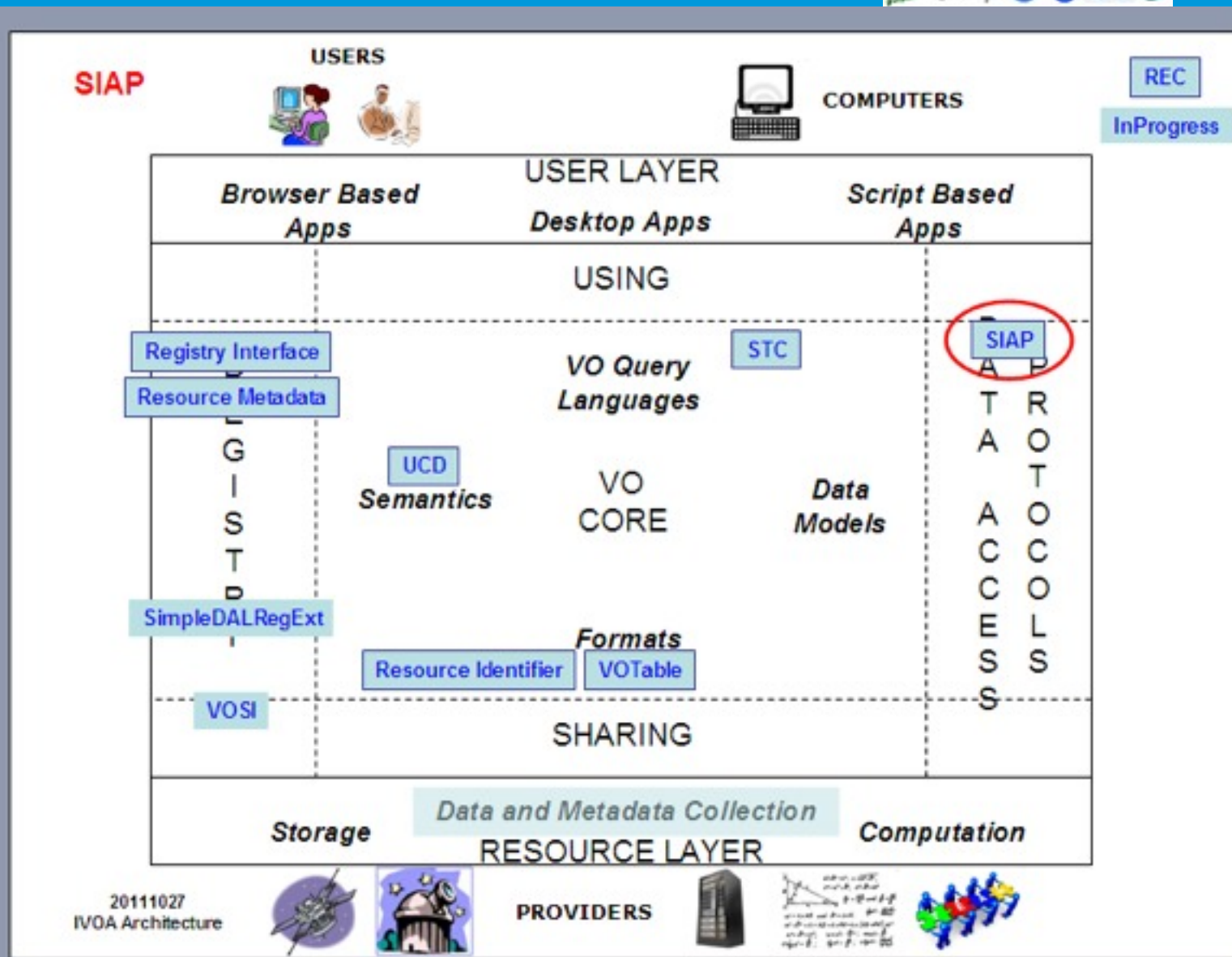




# **Examples of IVOA Architecture Diagram for some specific IVOA standards and their use in applications & tools**

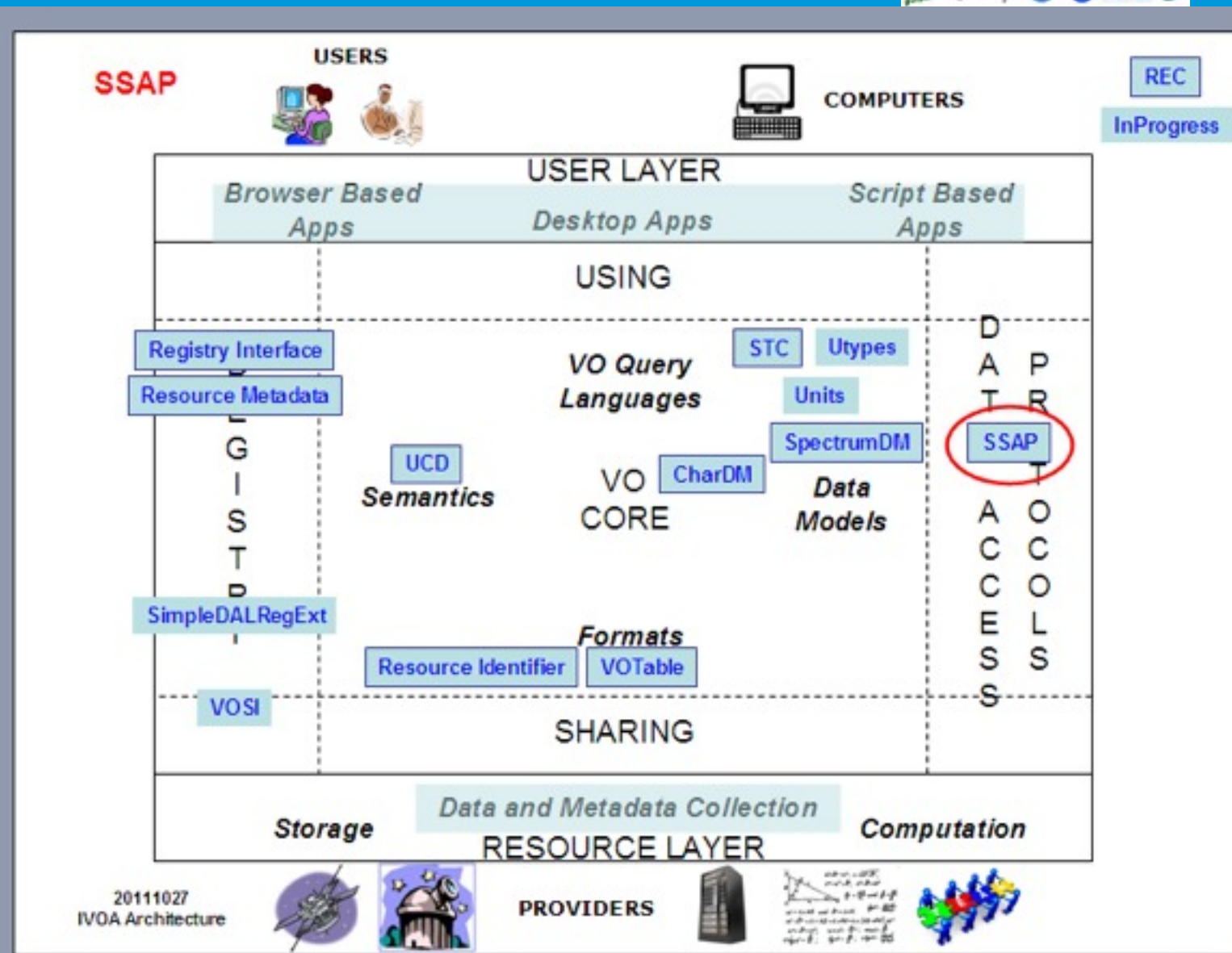


# SIAP : Simple Image Access Protocol



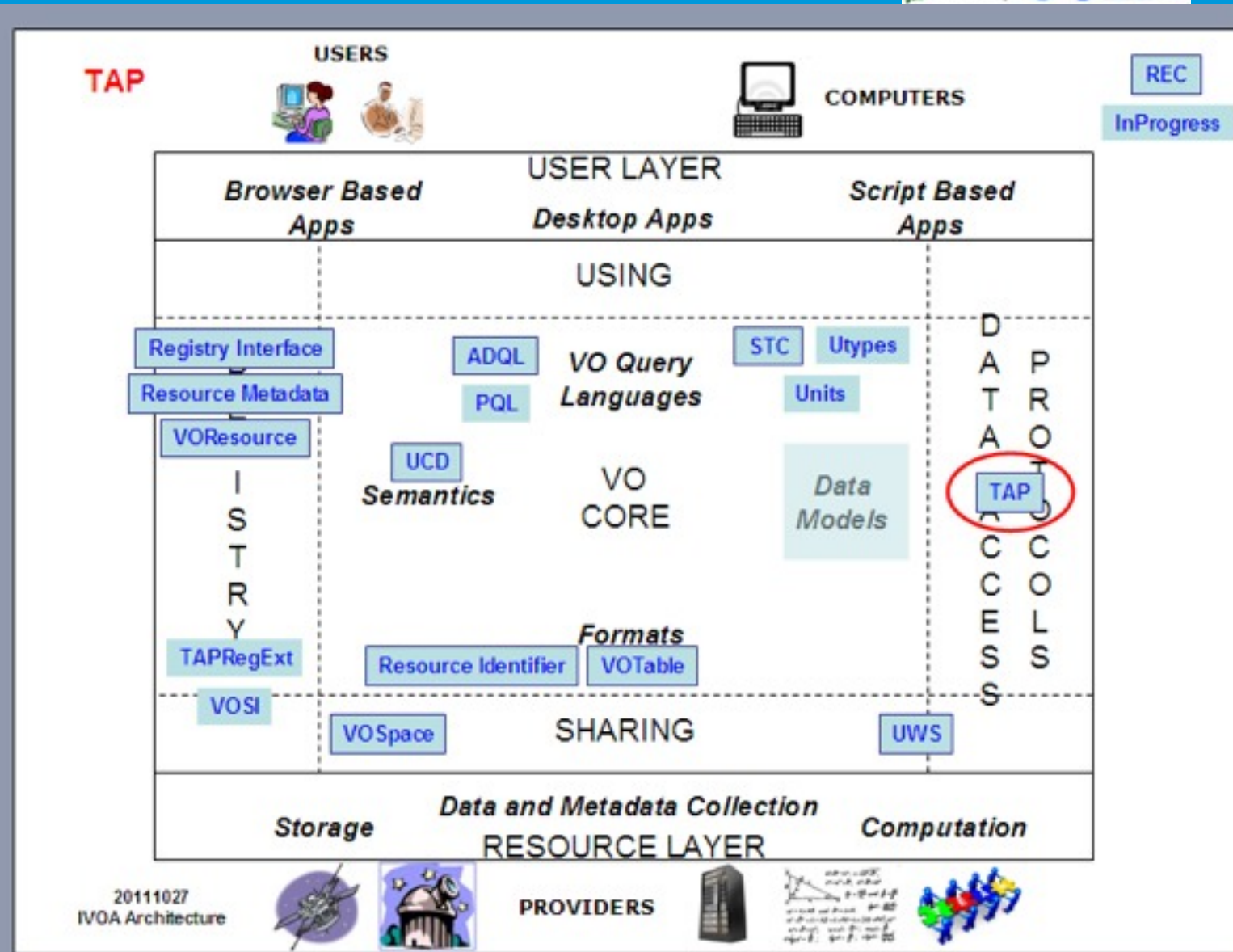


# SSAP and SpectrumDM



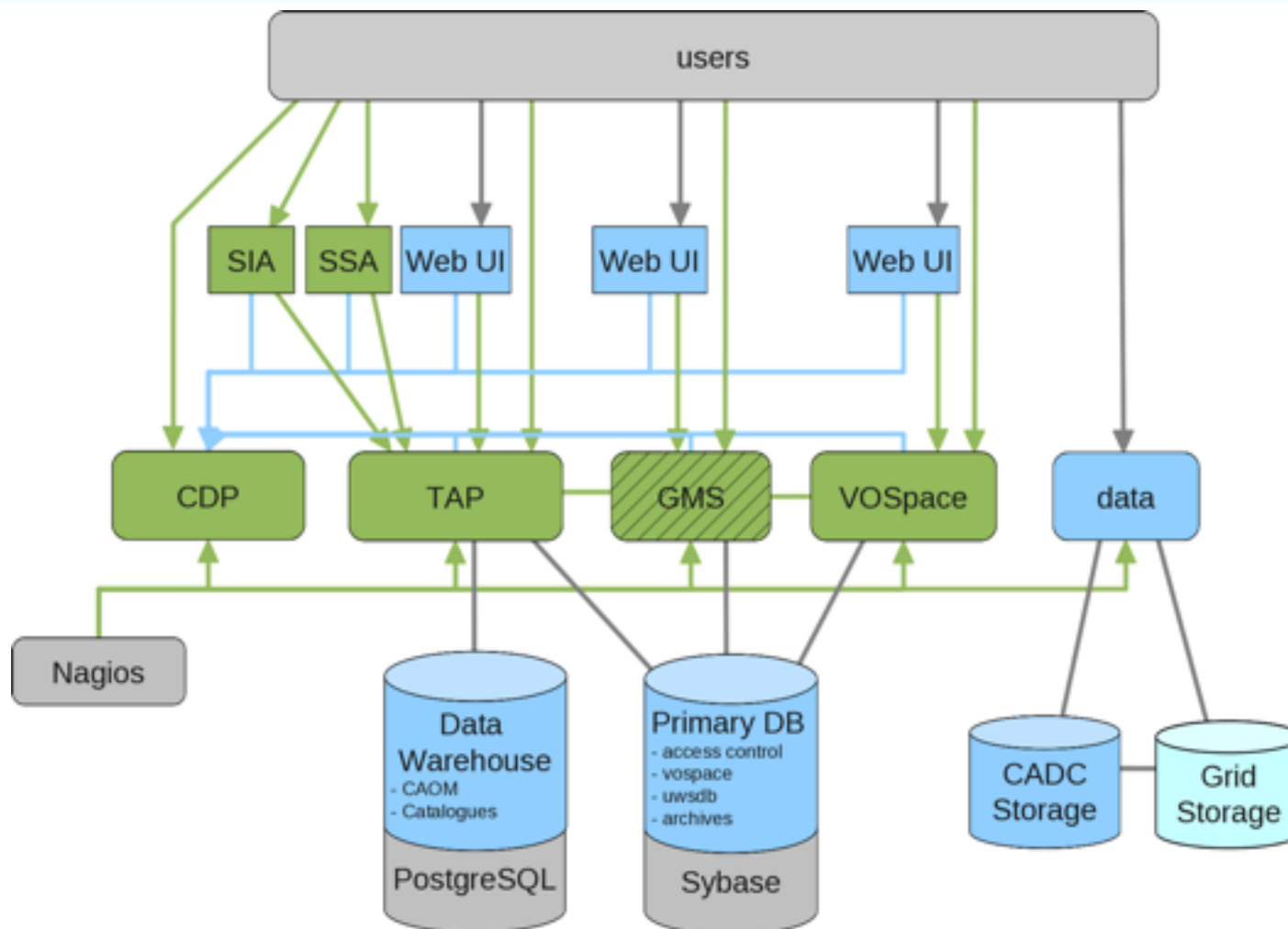


# TAP – Table Access Protocol





# CADC : a VO compliant infrastructure









# SIMBAD: TAP Service (TEST)



[GDS](#) · [Simbad](#) · [VizieV](#) · [Aladin](#) · [Catalogues](#) · [Nomenclatures](#) · [Biblio](#) · [Tutorial](#) · [Developer's corner](#)

» TAP Service

[Login](#) [Preferences](#) [Register](#)

ADQL help

- [Simbad tables](#)
- [ADQL cheat sheet](#)

Query examples

Execution options

Job name

Format

Max records

☒ Batch mode

☒ Check before start

Upload (0)

Name	File/URL
Add table	

Note: to use an uploaded table in the query, you must prefix its name with "TAP\_UPLOAD" (i.e. `tap_upload.whatever`).

Batch queries

Other TAP resources

SERVICE DESCRIPTION

TAP is an IVOA protocol which describes a way to query data tables of a service. Queries are by default written in ADQL and results are returned by default in VOTable. For more information about TAP see <http://www.ivoa.net/Documents/TAP/> and <http://www.ivoa.net/Documents/latest/ADQL.html> for ADQL.

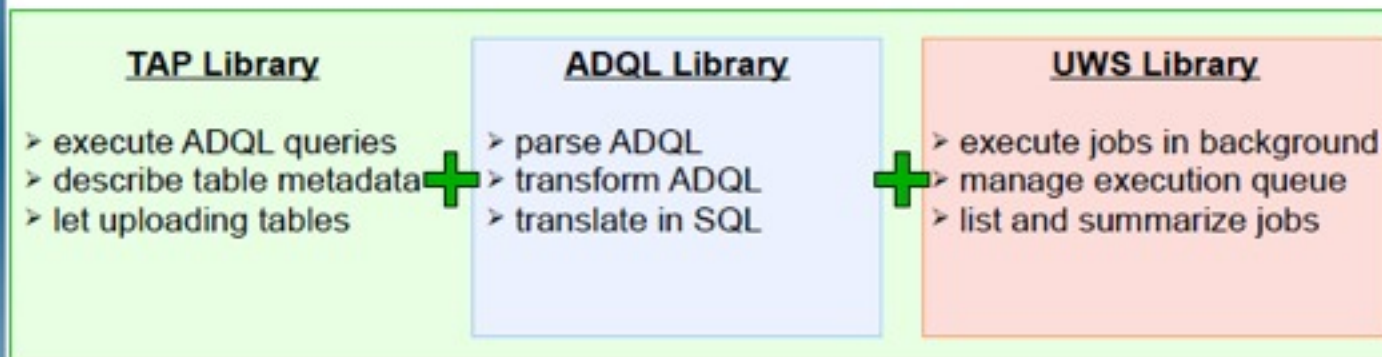
**NOTE:** *This service is still in progress !*

EXECUTE A QUERY

```
-- Display basic data about objects contained in a given circle and whose mag B < 9.0.
SELECT basic.OBJID,
       RA,
       DEC,
       main_id AS "Main identifier",
       res_subtype AS "SubtypeReference",
       sbref AS "SBReferences",
       plx_value AS "Parallax",
       rvz_radvel AS "Radial velocity",
       galdis_majorax,
       galdis_minorax,
       galdis_angle AS "Galaxy ellipse angle"
FROM basic JOIN Tsim ON sbref = sid
WHERE filter = 'B'
      AND flux < 9.0
      AND CONTAINS(POINT('J2000', RA, DEC), CIRCLE('J2000', 10, 5, 1)) = 1
ORDER BY "Main identifier";
```

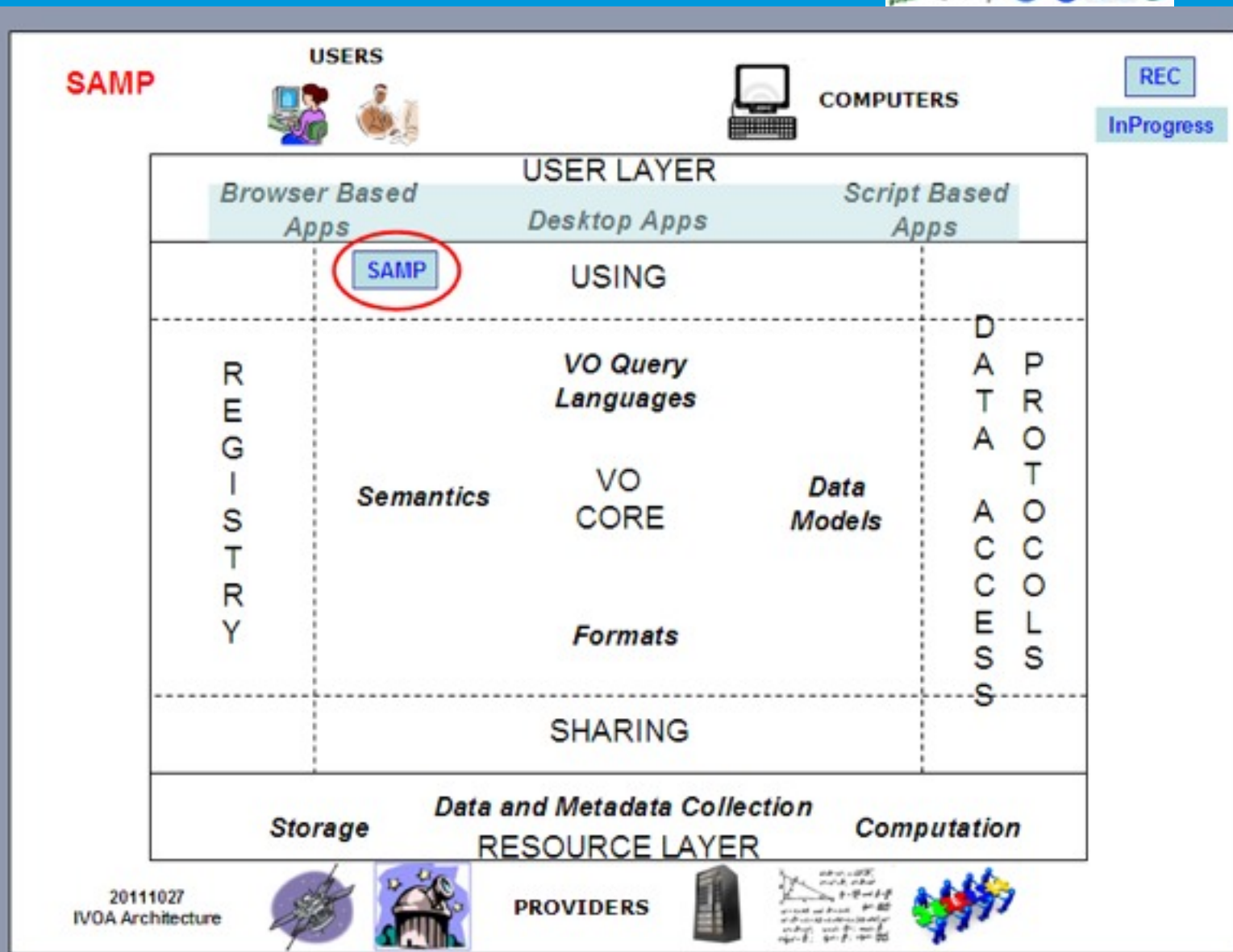
@ULPVCNRS - Centre de Données astronomiques de Strasbourg

## TAP Usage in Sim



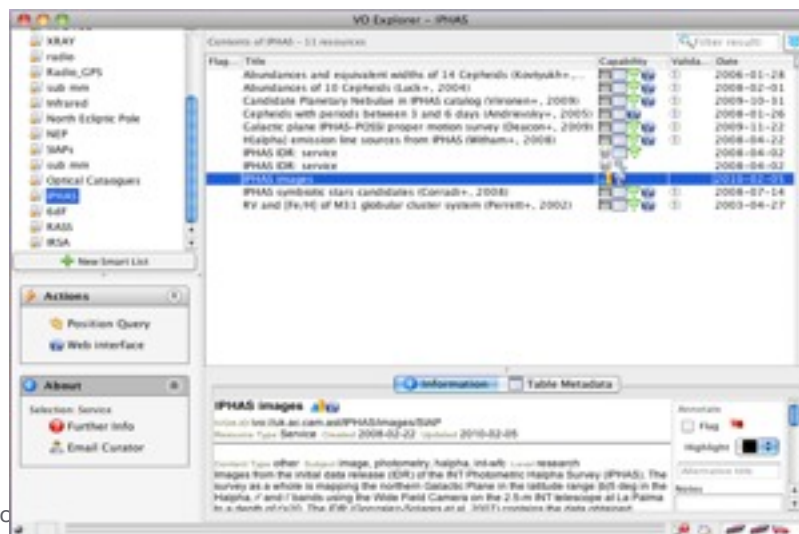
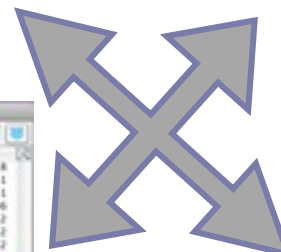


# SAMP and applications interoperability





# VO applications interoperability through SAMP





# SAMP used in other discipline: Soho Science Archive and Aladin



SOHO Science Archive v1.6

File View Windows Actions Tools Help

Search Observations EIT #1 P = X

Observations

[ 69,871 Results ] Page 1 of 1,398 Page Size: 10

Instrument	Detector	Observation Type	Begin Date
EIT	EIT	SYNOPTIC FULL SUN	00:13:37 16/01/1996
EIT	EIT	SYNOPTIC FULL SUN	00:29:05 16/01/1996
EIT	EIT	SYNOPTIC FULL SUN	00:52:45 16/01/1996
EIT	EIT	SYNOPTIC FULL SUN	13:54:59 16/01/1996
EIT	EIT	SYNOPTIC FULL SUN	16:34:09 18/01/1996
EIT	EIT	SYNOPTIC FULL SUN	17:49:26 19/01/1996
EIT	EIT	SYNOPTIC FULL SUN	18:41:02 19/01/1996
EIT	EIT	SYNOPTIC FULL SUN	21:19:38 19/01/1996
EIT	EIT	SYNOPTIC FULL SUN	21:31:26 19/01/1996
EIT	EIT	SYNOPTIC FULL SUN	21:38:47 19/01/1996
EIT	EIT	SYNOPTIC FULL SUN	16:29:59 20/01/1996
EIT	EIT	SYNOPTIC FULL SUN	17:05:58 20/01/1996
EIT	EIT	SYNOPTIC FULL SUN	17:44:09 20/01/1996
EIT	EIT	SYNOPTIC FULL SUN	18:15:58 20/01/1996
EIT	EIT	SYNOPTIC FULL SUN	18:54:32 20/01/1996
EIT	EIT	SYNOPTIC FULL SUN	19:48:45 21/01/1996

Log Console

posuna has logged in at 1:52:00 PM

Details

Eit Obs Details [1169870]

Id: 1169870

Instrument: EIT

Observatory: SOHO

Detector: EIT

Obs Type: SYNOPTIC FULL SUN

Object: Full Sun/Full Disk

Objective: SYNOPTIC FULL SUN

Proc Level: L2 file

Begin Date: 07:29:33 06/05/1996

End Date: 07:29:40 06/05/1996

File Name: eit19960506.072933

File Format: FITS

File Size: 2108160 bytes

Wave Range: 171 Angstrom

Obs Name: 171\_5SEC.000

Obs Mode: Backside

Fov Position: 0.00,0.00 arcsec

Fov Angle: -0.31 degrees

Fov Size: [1024][1024] arcsec

Spatial Res: 2.629 arcsec

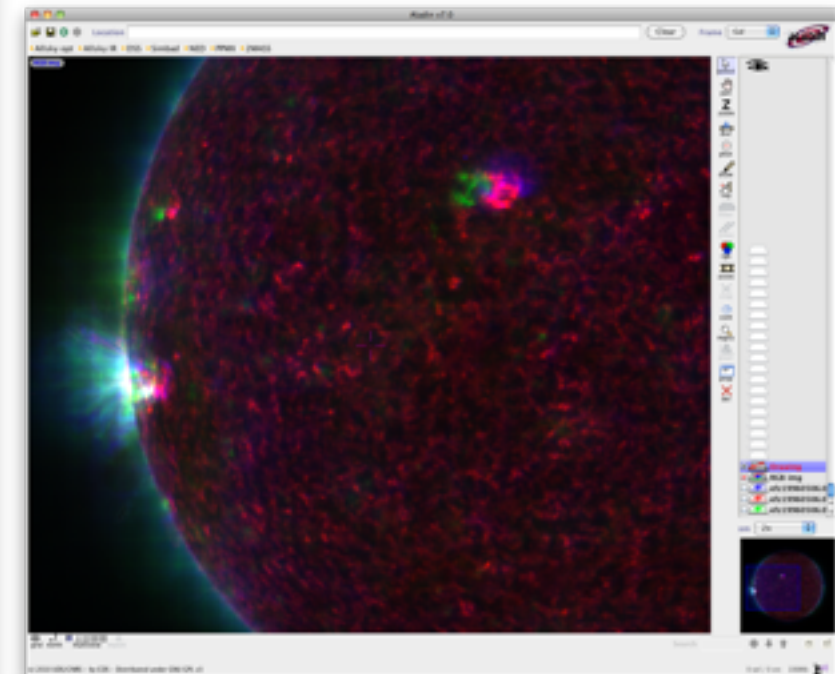
Exp Count: 1

Exp Time: 7.100 seconds

Origin: Rocket Science

Wave List: N/A Angstrom

19960506\_0729\_40171\_0024.jpg



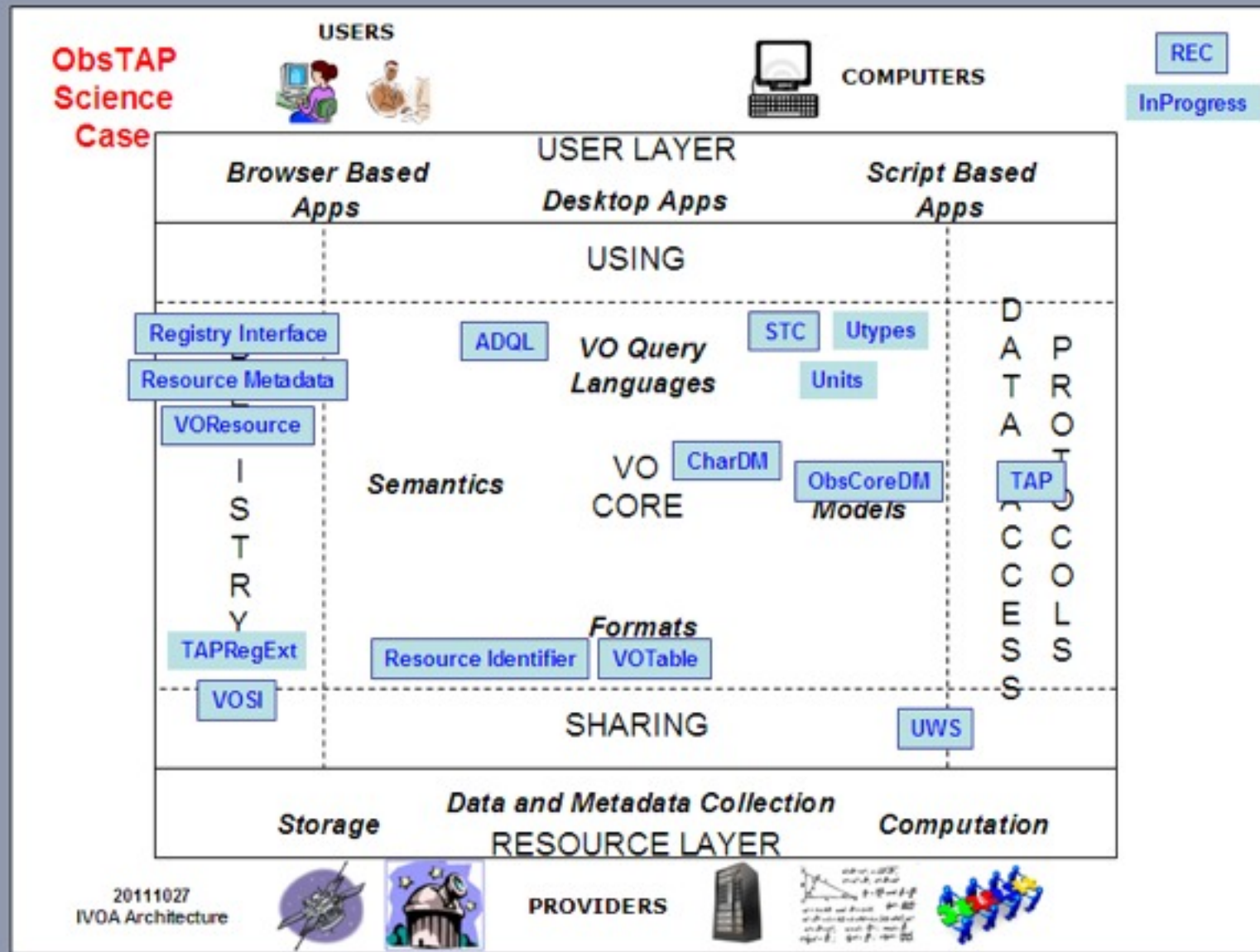




# Examples of IVOA Architecture Diagram for IVOA Science Cases

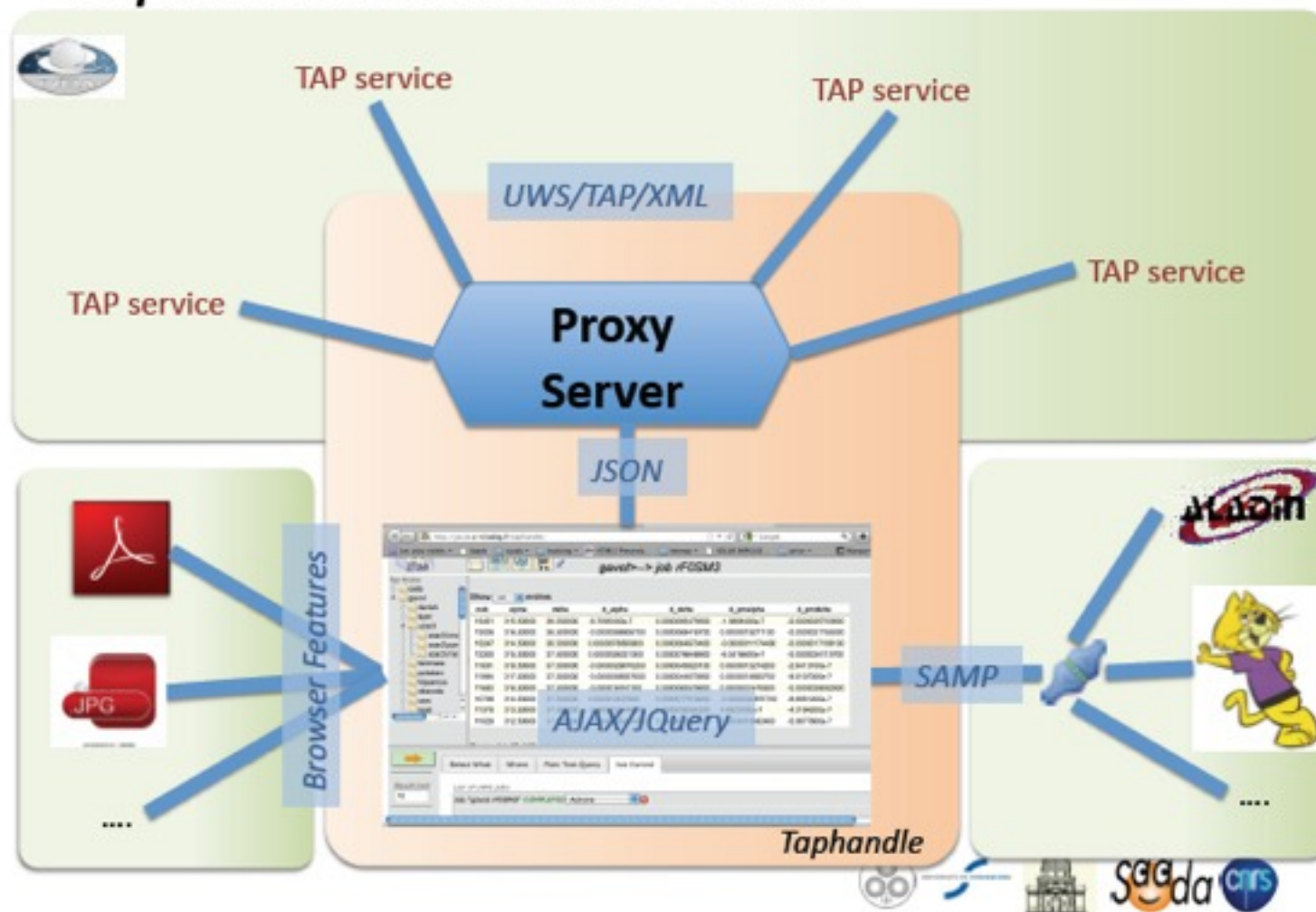


# ObsTAP Science Case



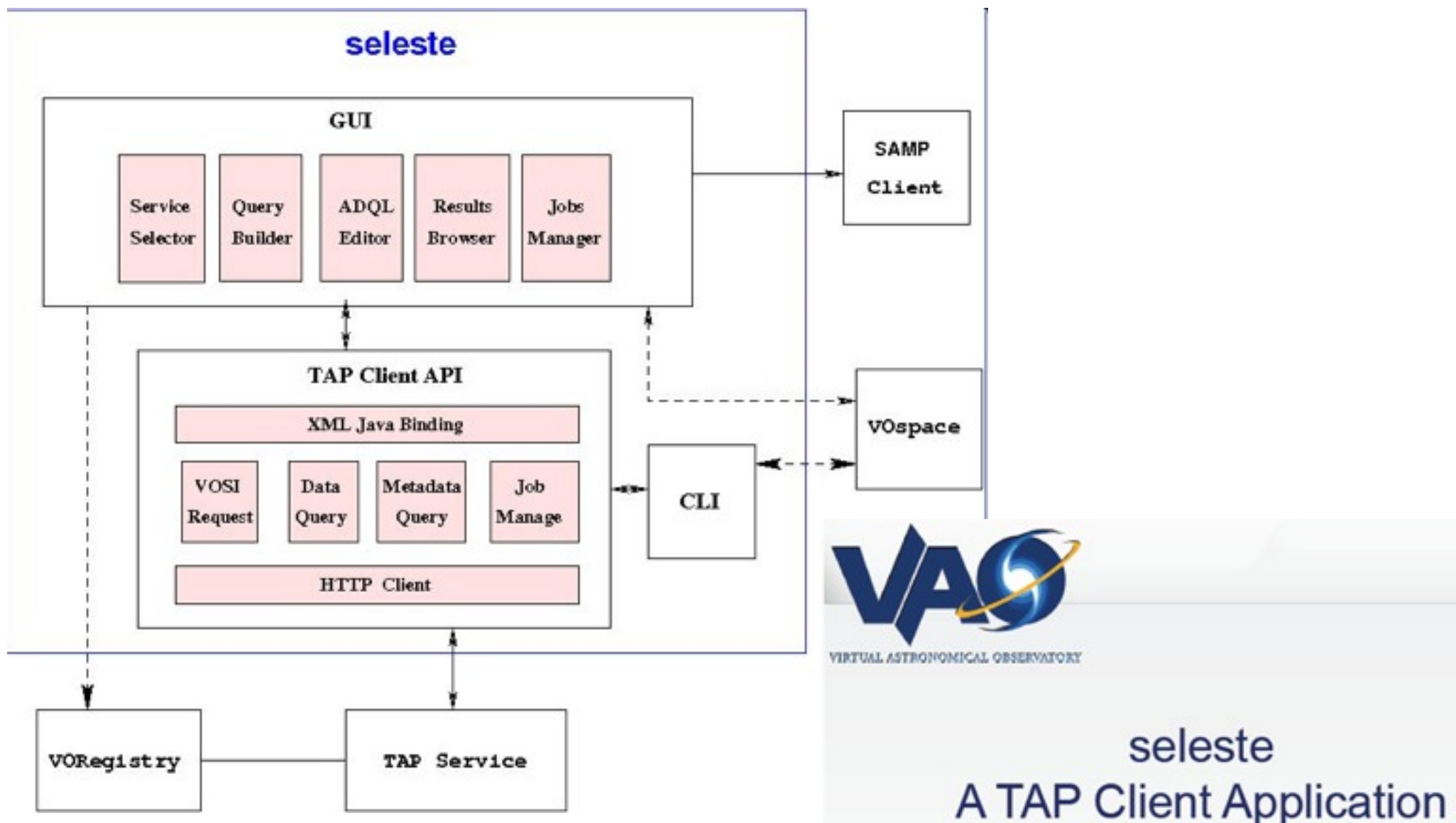


## Taphandle Architecture



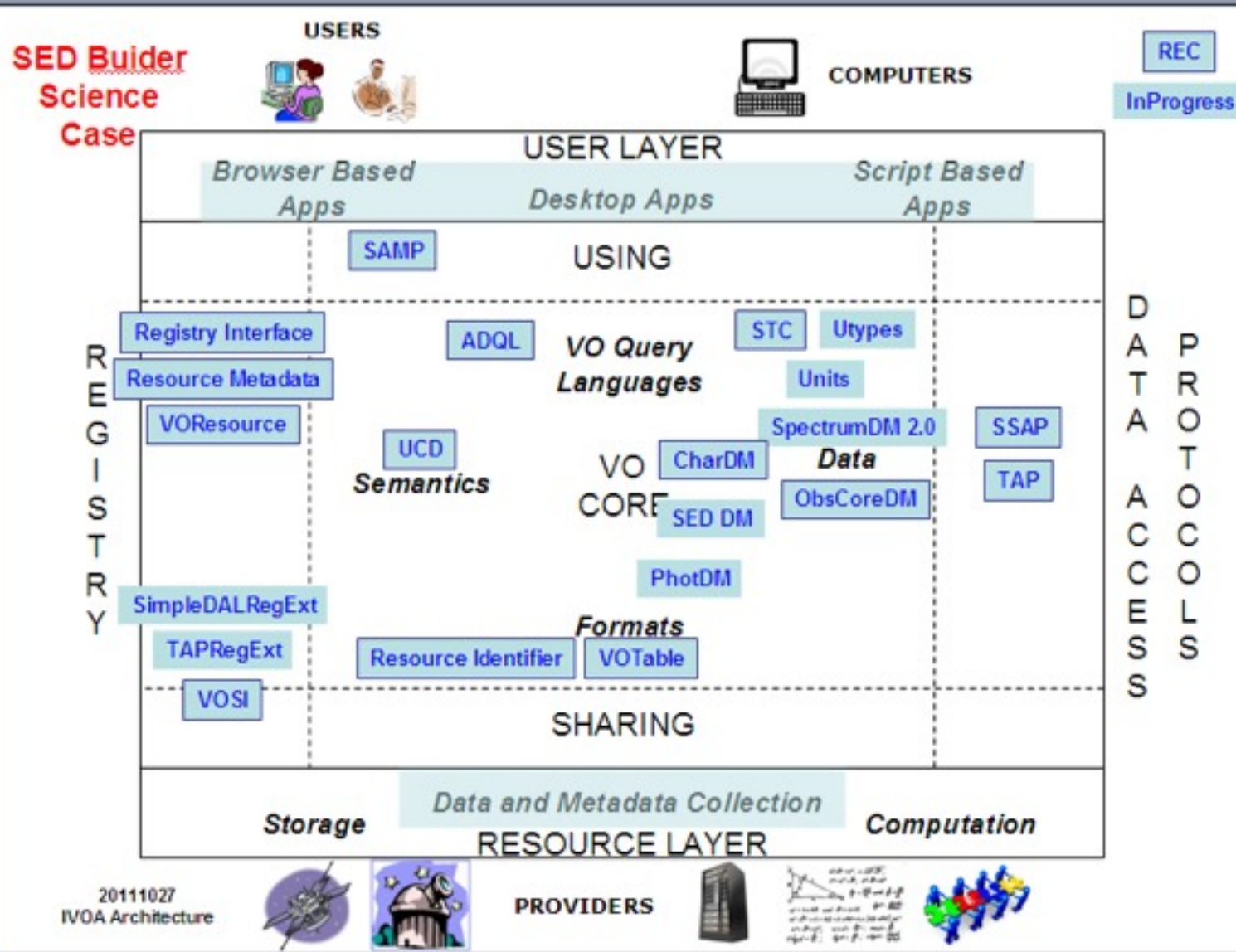


# seleste : VAO TAP Client Application



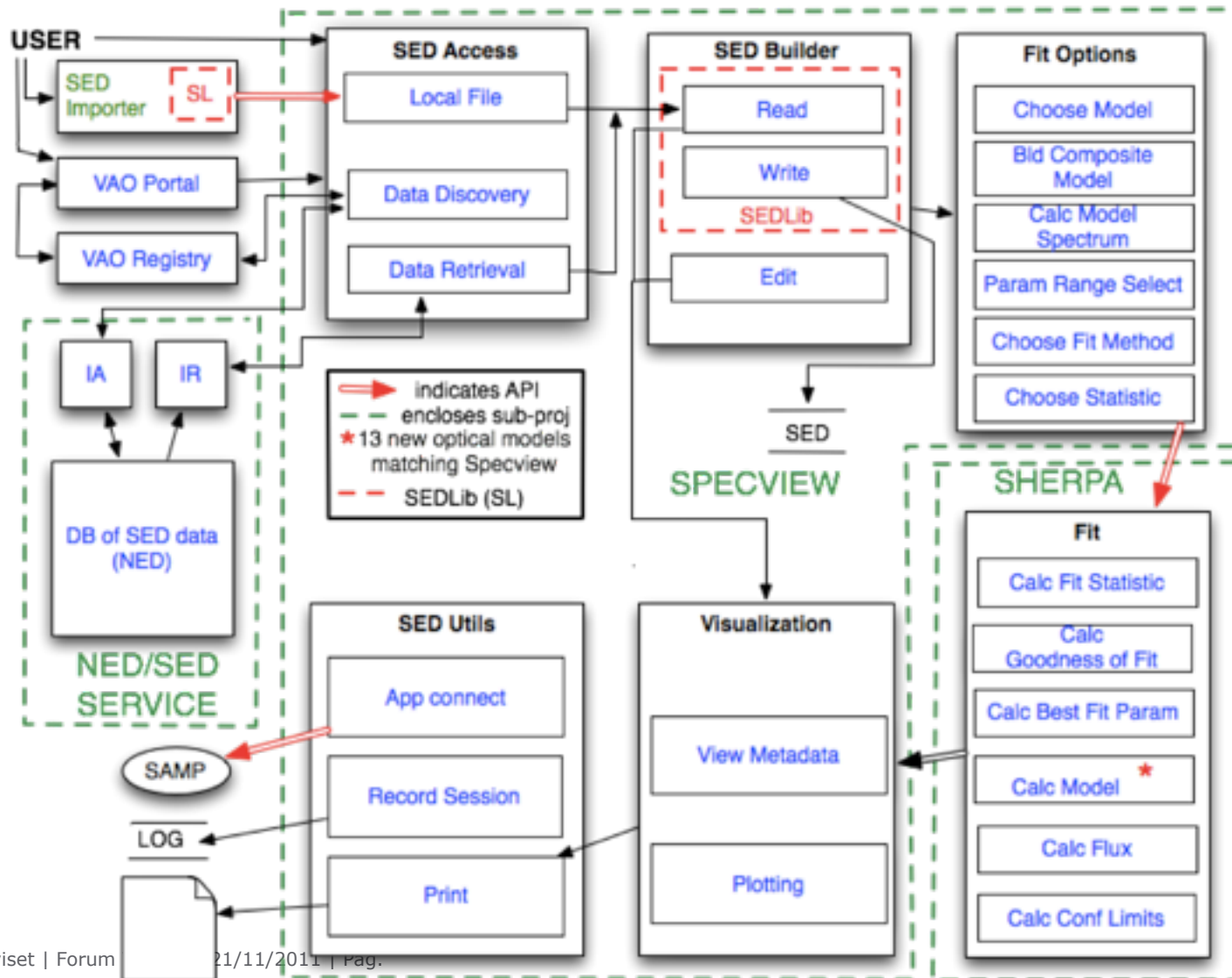


# SED builder Science Case



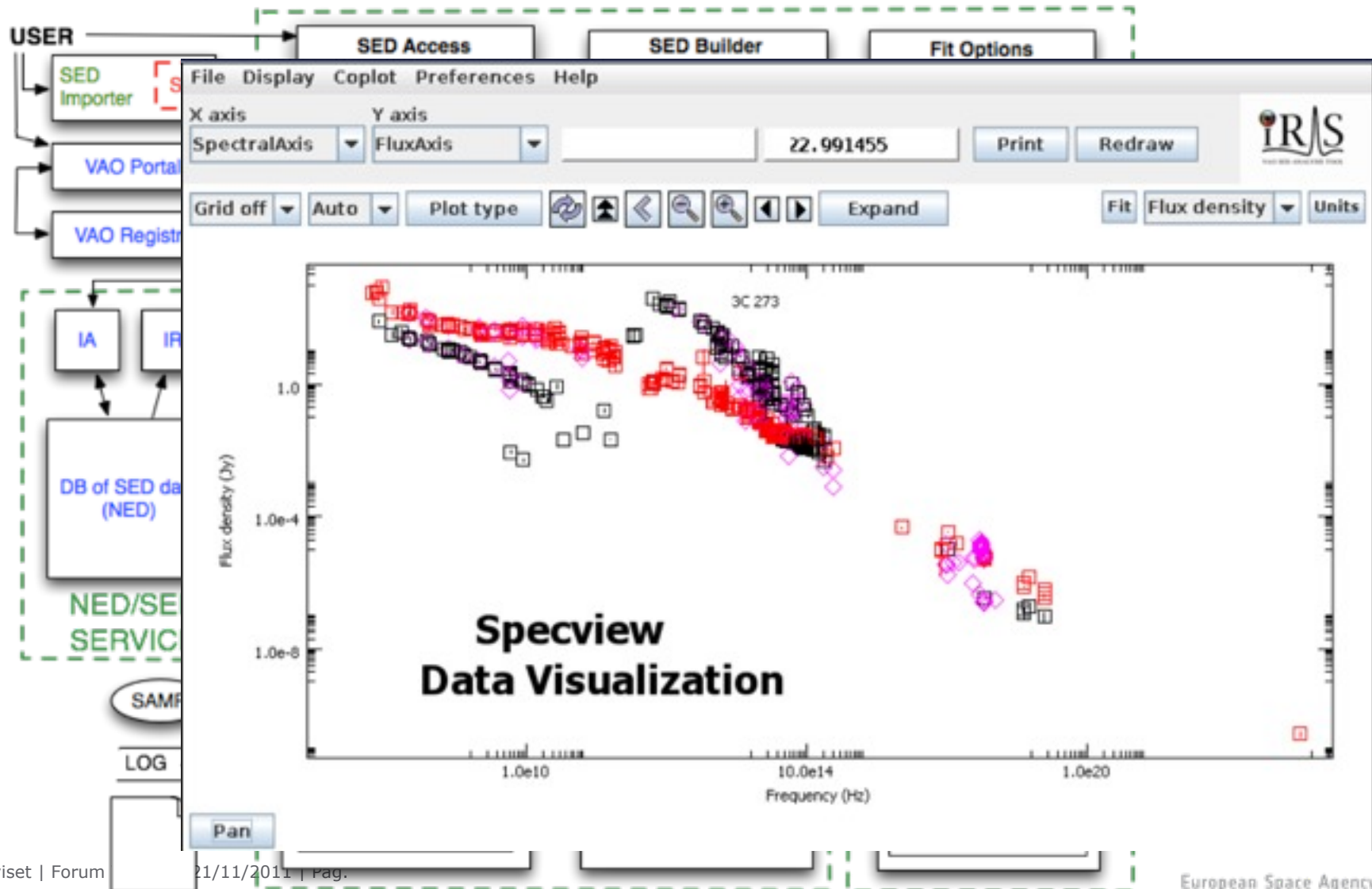


# IRIS : VAO SED Builder





# IRIS : VAO SED Builder

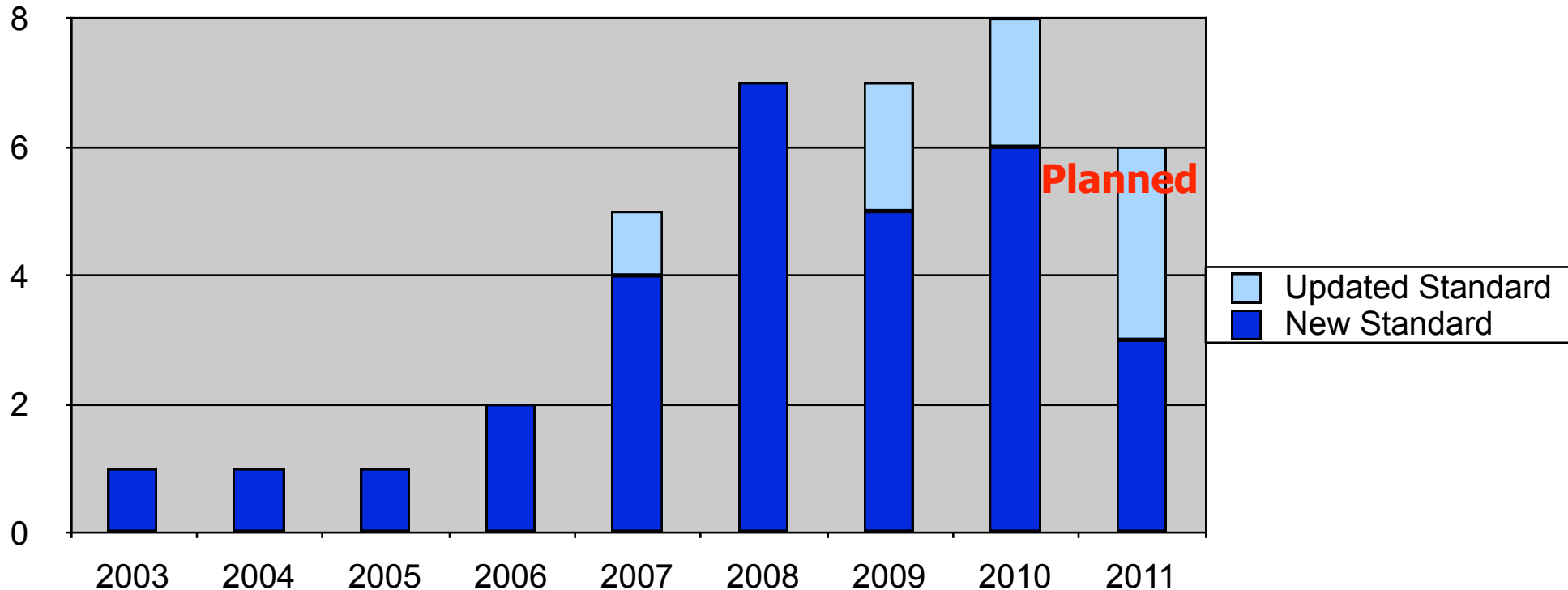




# IVOA standards release through time



IVOA Standards issued per year



30 endorsed standards  
<http://www.ivoa.net/Documents/>



# Reference and acknowledgements



- The IVOA Architecture (Oct 2010)
  - <http://www.ivoa.net/Documents/Notes/IVOAArchitecture/>
- Stable since 1<sup>st</sup> version (Oct. 2010)
- Update foreseen in 2012
- Thanks to all the people who have participated to the definition and the writing of IVOA standards
- Thanks to all the people who are developing VO services and applications



*International  
Virtual  
Observatory  
Alliance*

## IVOA Architecture

### Version 1.0

**IVOA Note 2010-11-23**

#### **This version:**

Version 1.0- 23<sup>rd</sup> of November 2010

#### **Latest versions:**

#### **Previous version(s):**

#### **Editors**

Christophe Arviset

#### **Author(s):**

Christophe Arviset, Severin Gaudet  
and the IVOA Technical Coordination Group ([tcg@ivoa.net](mailto:tcg@ivoa.net)):