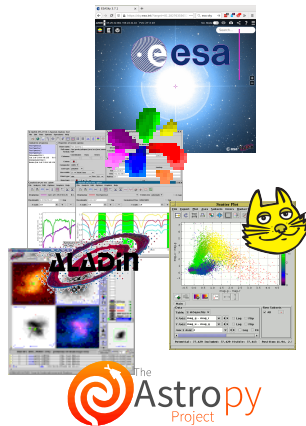
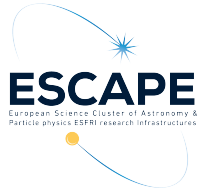


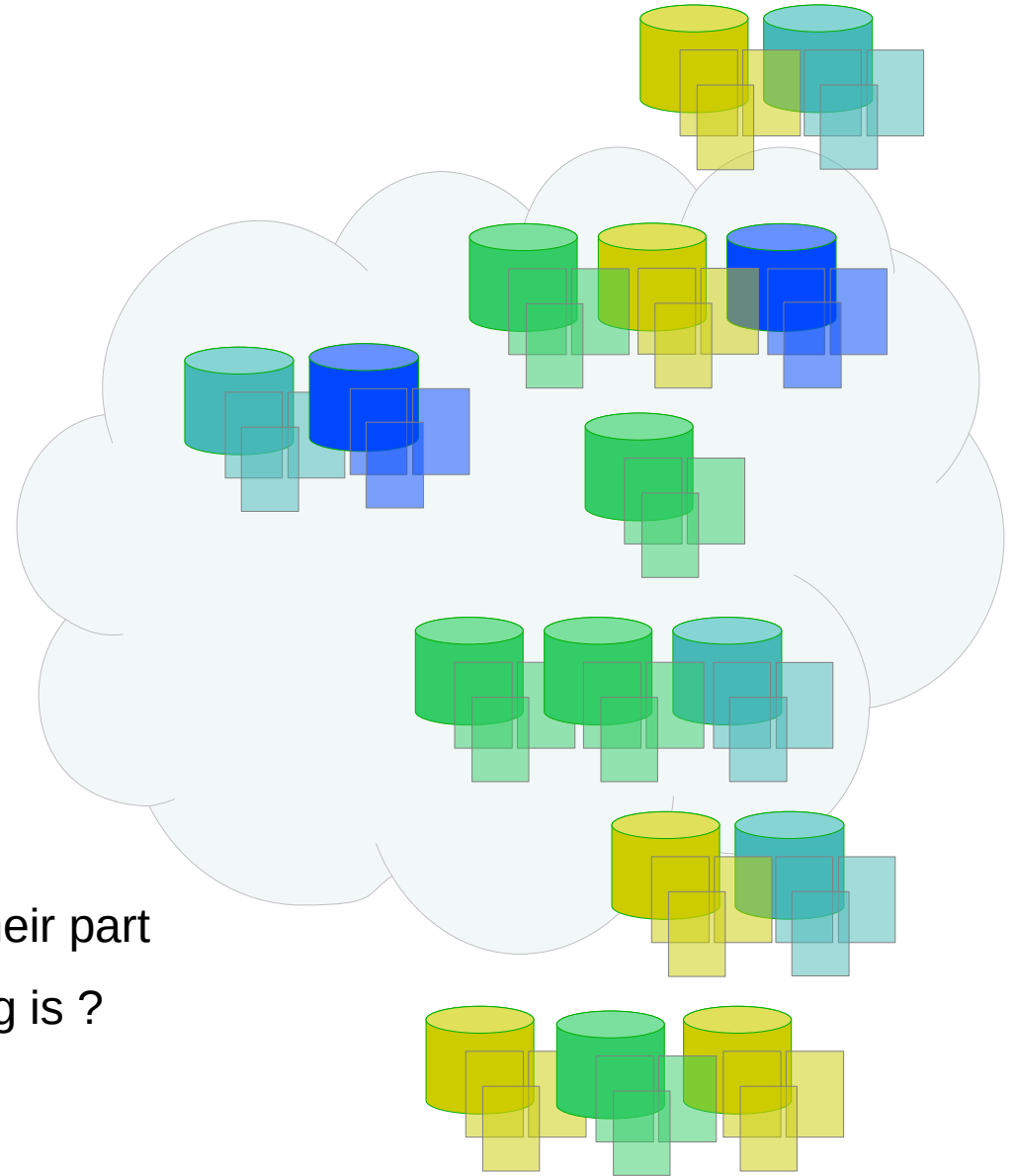
## The Virtual Observatory

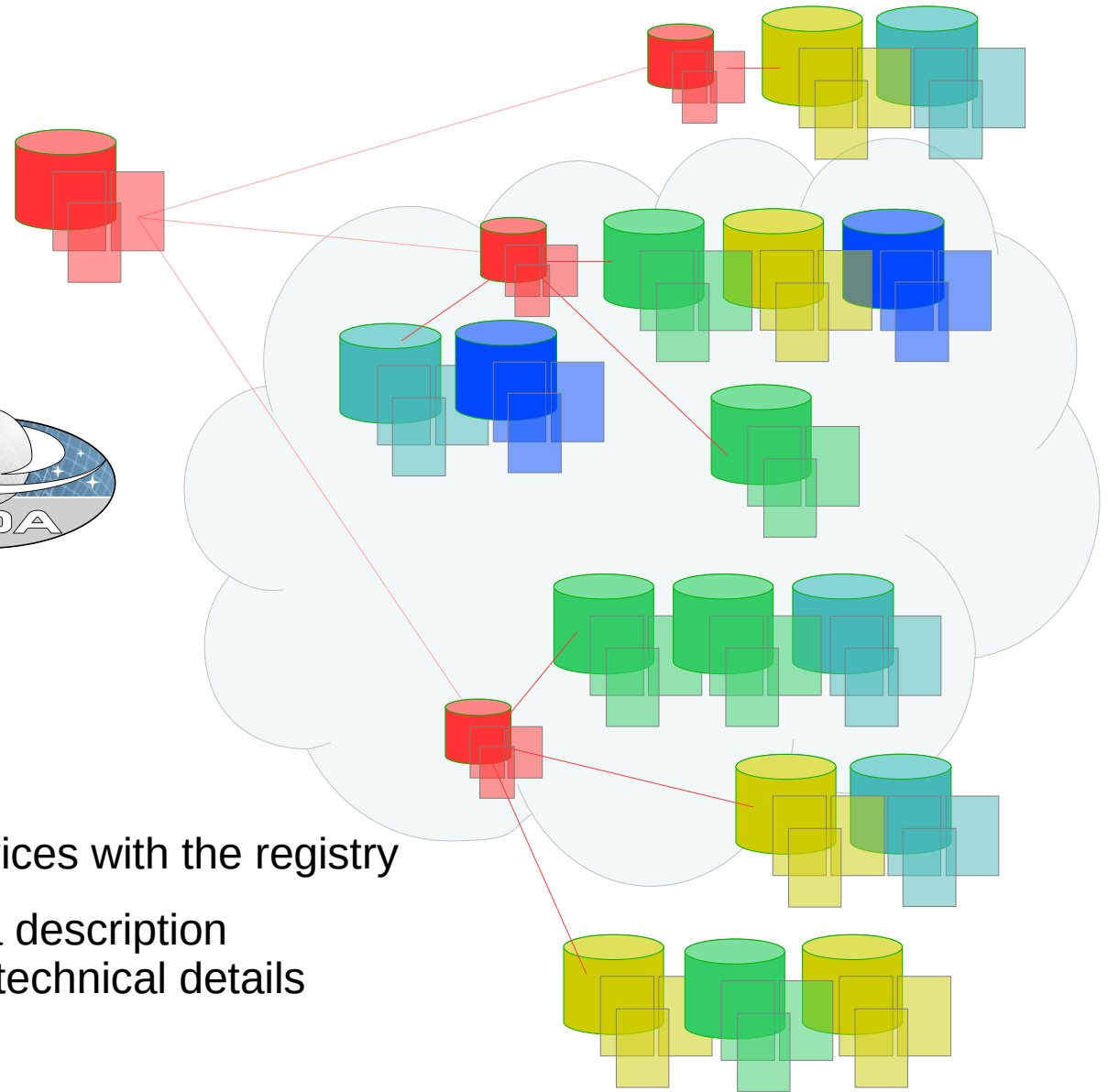
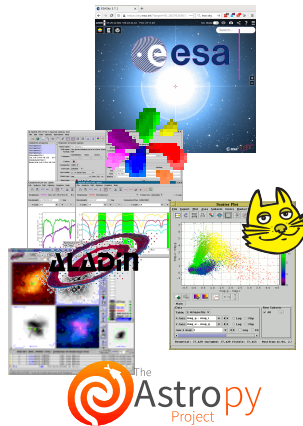
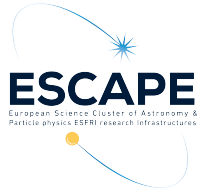
Data from all over the world .... in the cloud





Lots of individual services each playing their part  
But ... how do you know where everything is ?

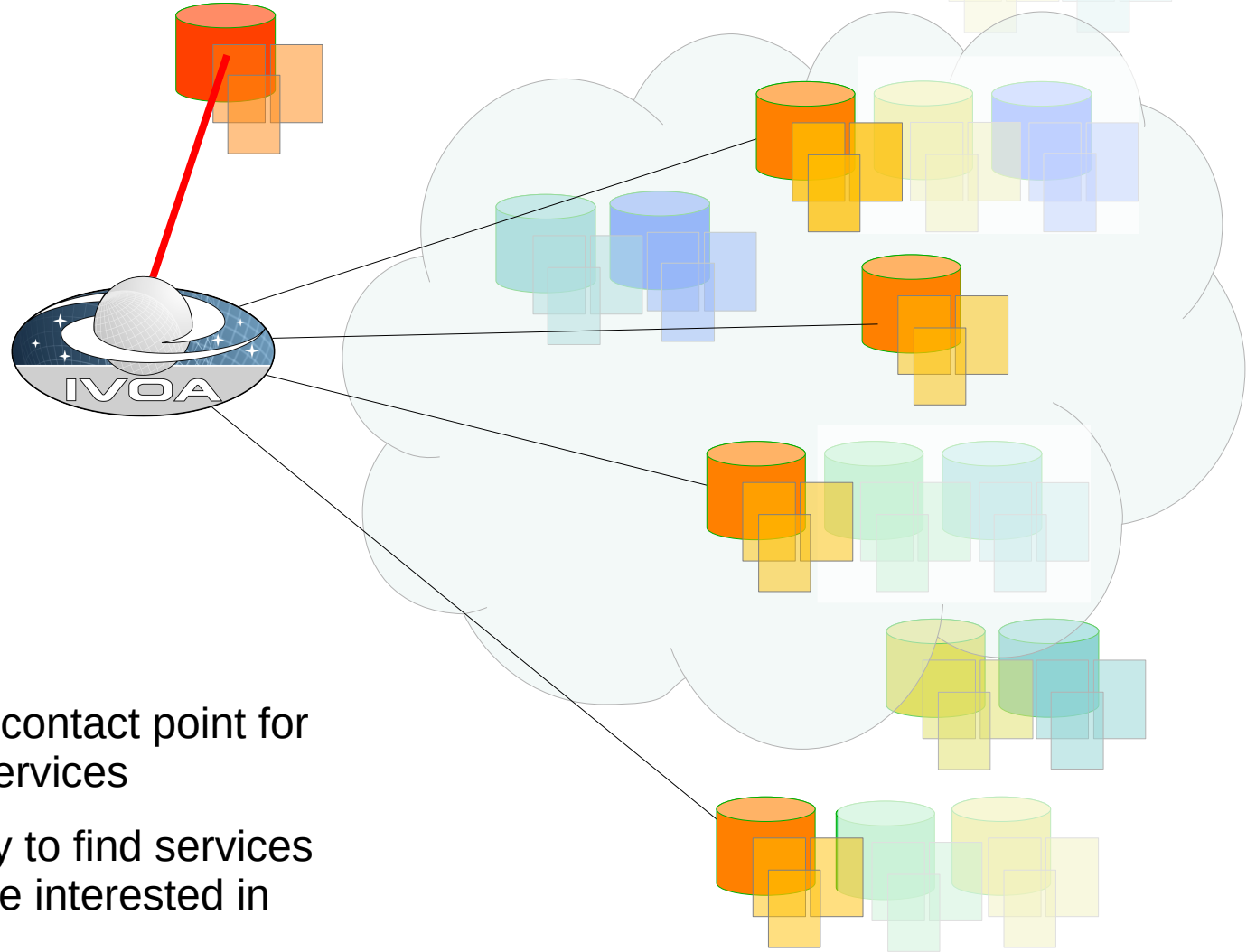
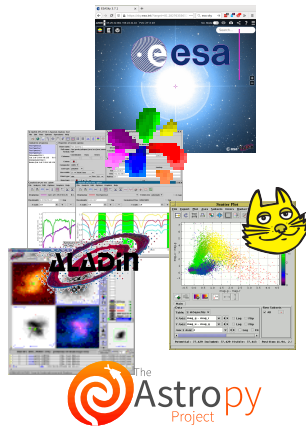
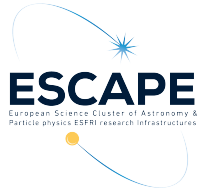




Data providers register their services with the registry

Registration metadata includes a description of the data they provide and the technical details of how to connect

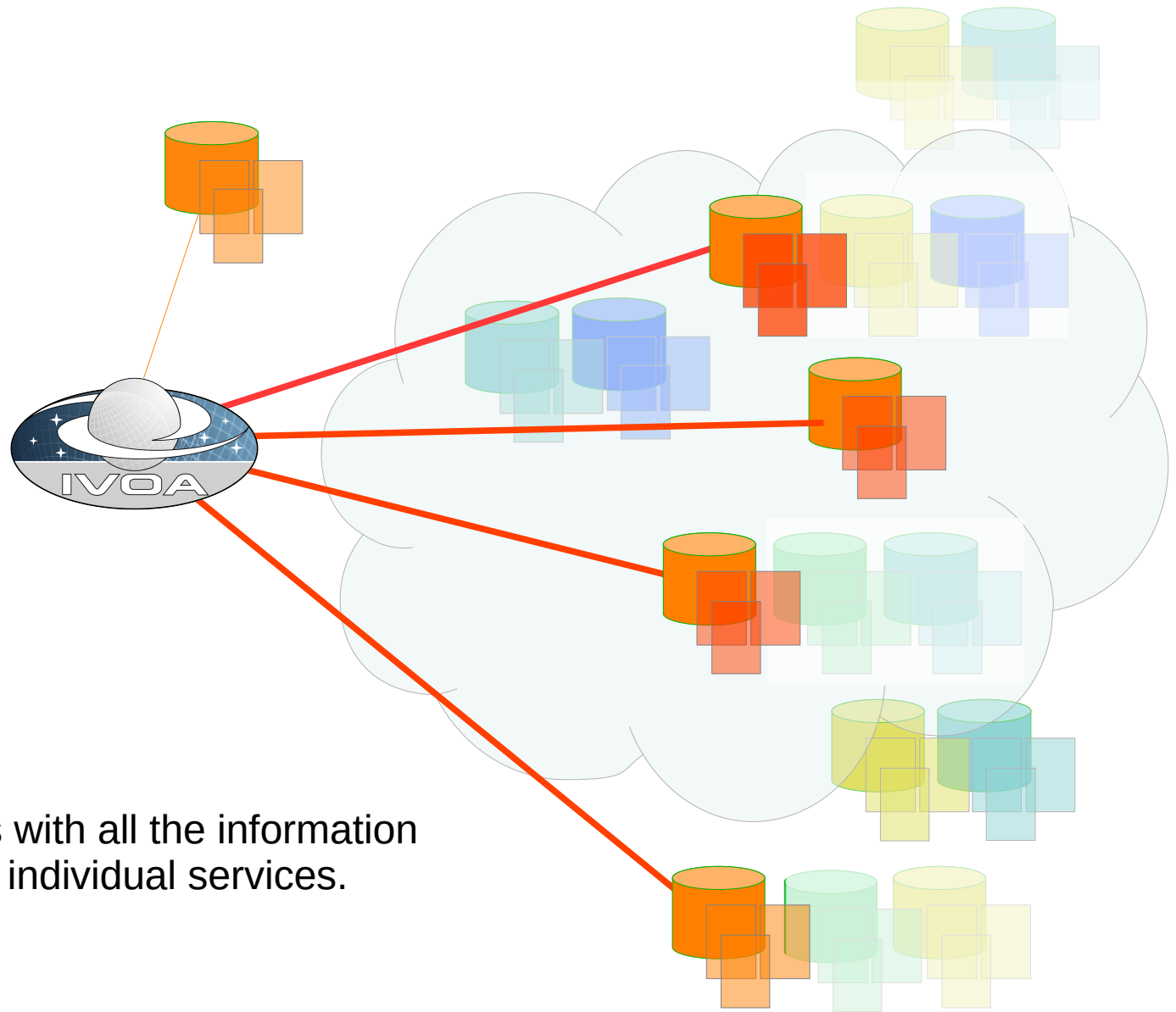
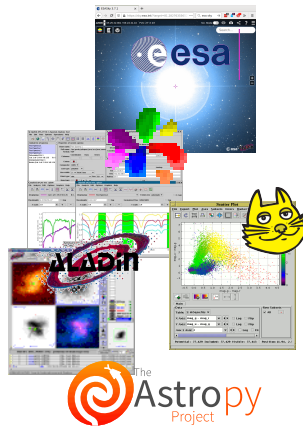
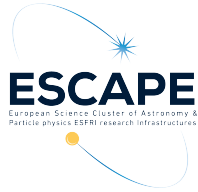




The registry is the initial contact point for interactions with IVOA services

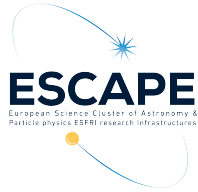
Clients query the registry to find services that contain data they are interested in





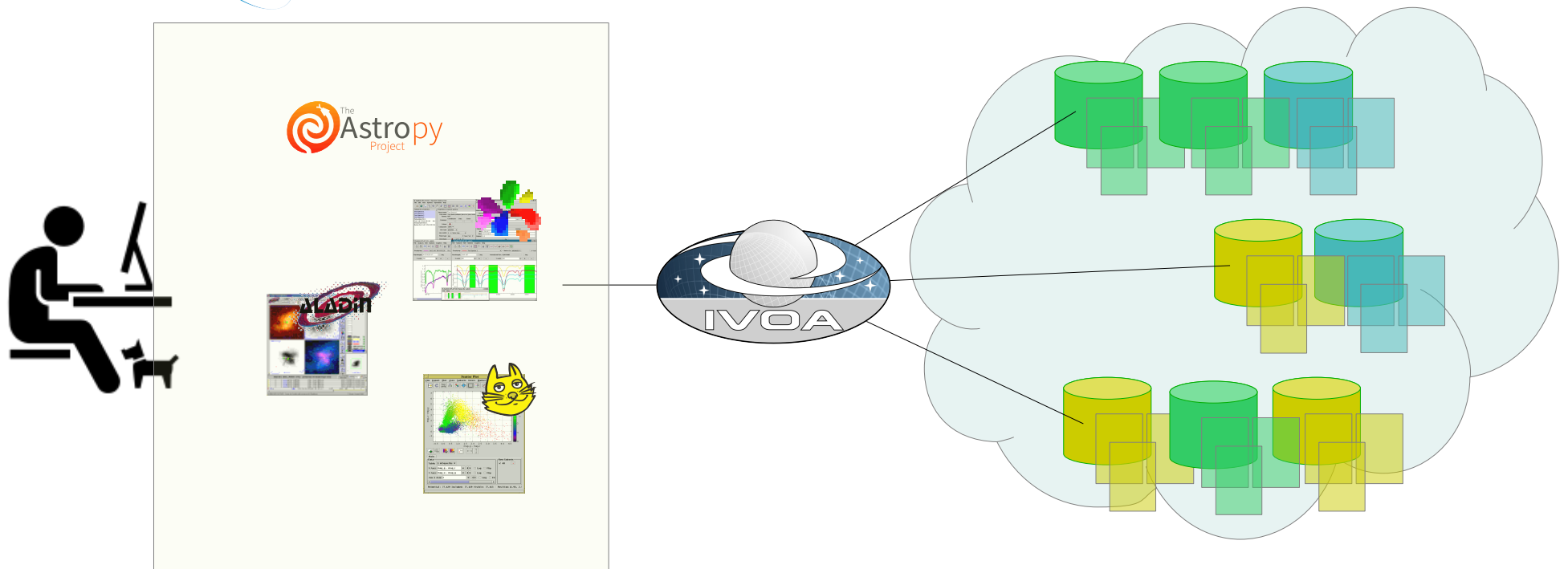
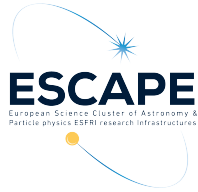
Registry provides clients with all the information they need to contact the individual services.





# Back to the main session

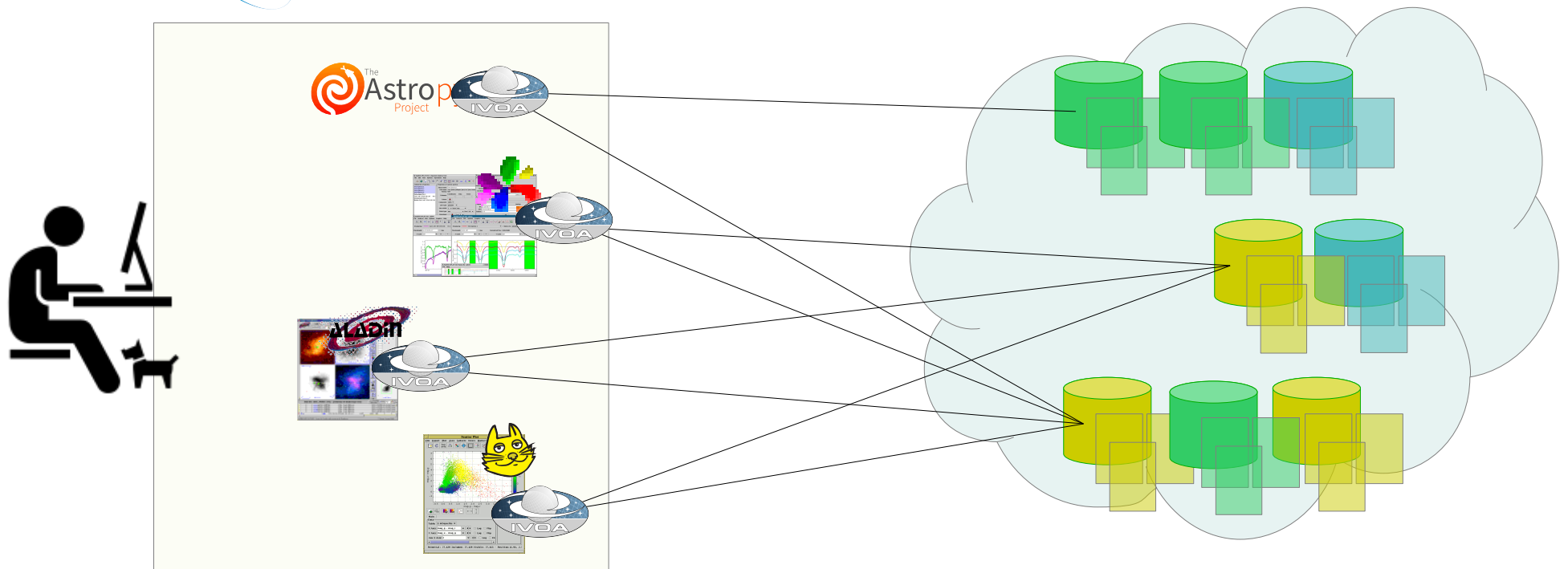
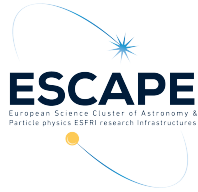




## The Virtual Observatory

All the data from the cloud .... available on your desktop



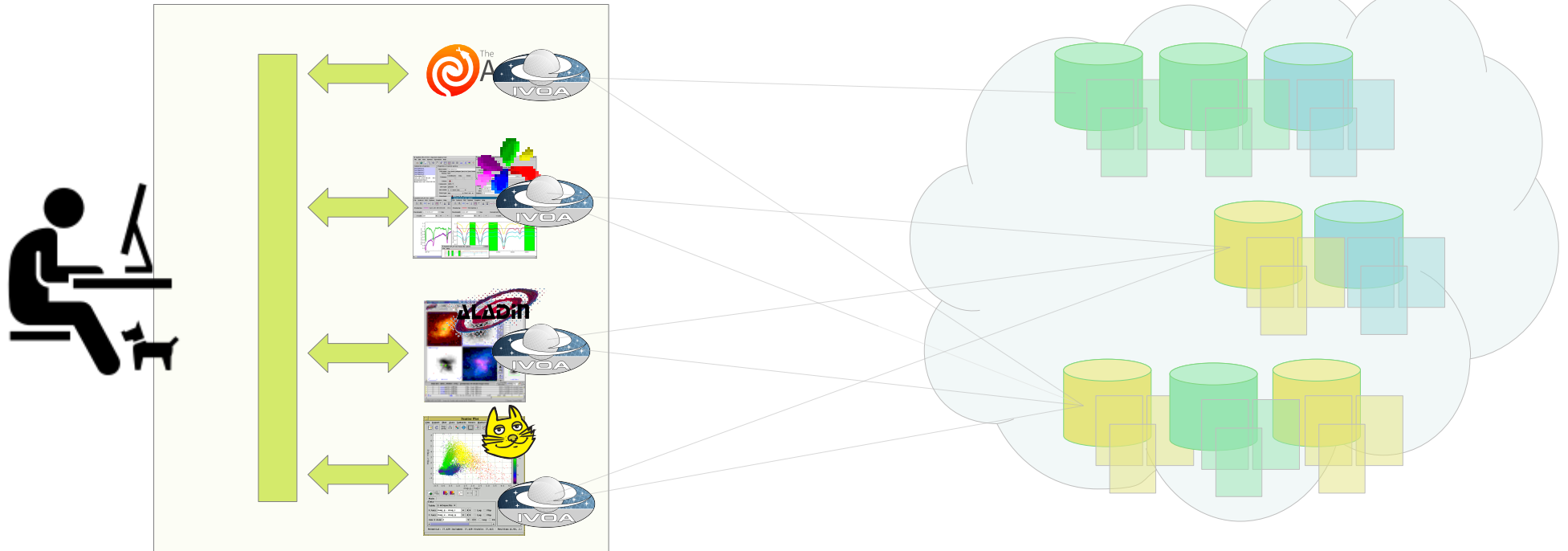
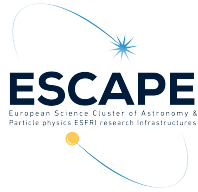


All the data from the cloud .... to each desktop app

Each application maintains its own connection to the VO







SAMP is a message bus within your local computer

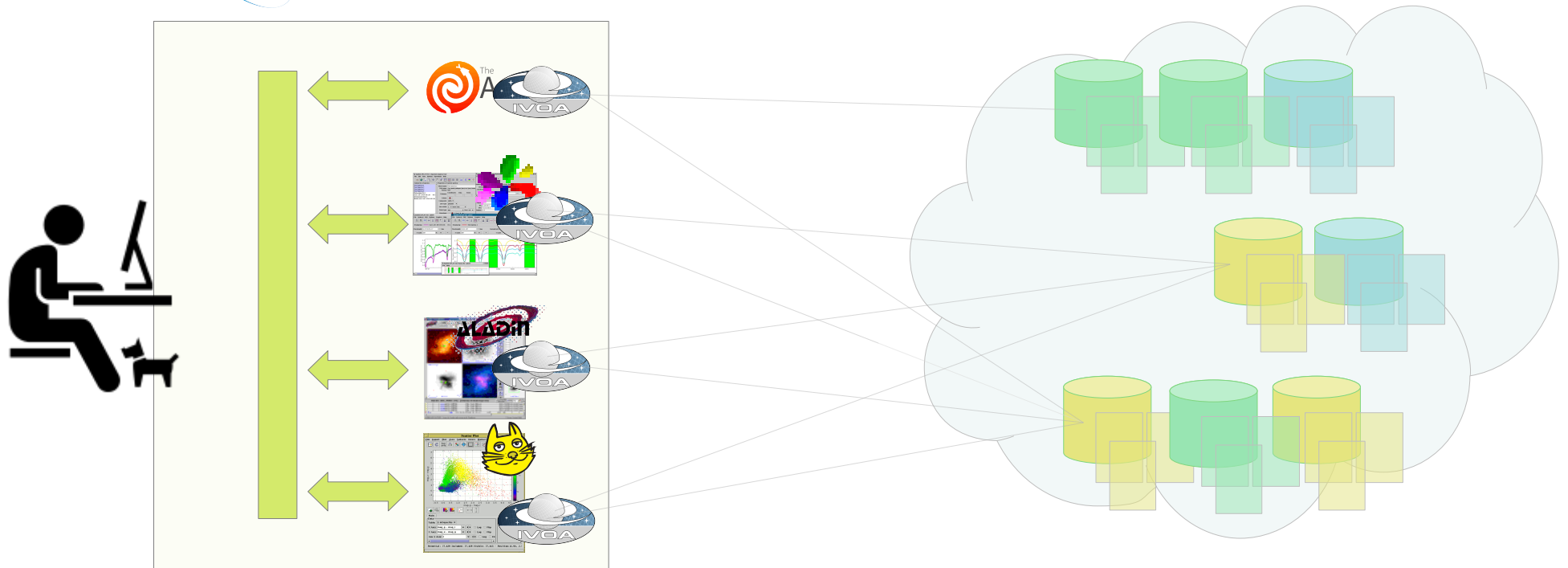
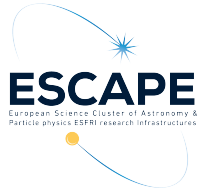
Applications can use SAMP to send messages to each other

```
table.load.votable <http://example.org/.../table.vot>
```

```
image.load.fits <http://example.org/.../image.fits>
```

```
coord.pointAt.sky <ra,dec>
```





Messages can be sent to specific applications

Send to Aladin:

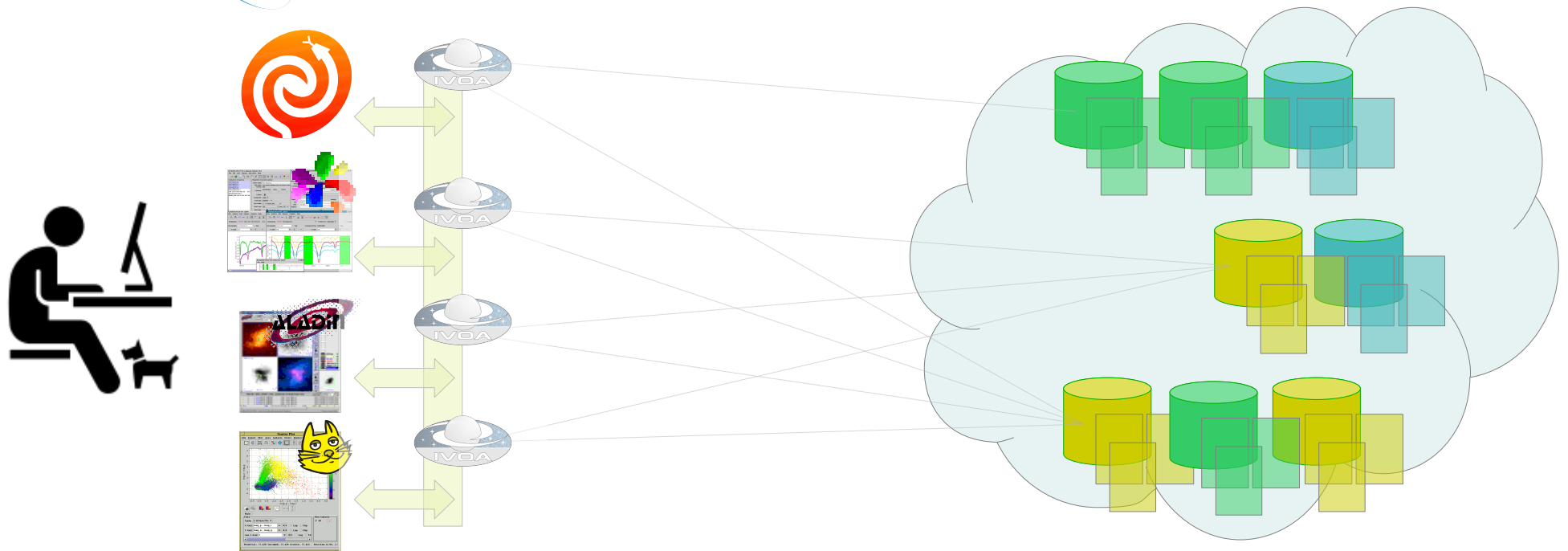
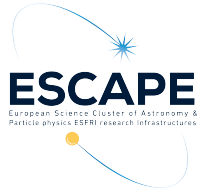
`image.load.fits <http://example.org/.../image.fits>`

Or broadcast to all listeners

Send to all:

`coord.pointAt.sky <ra,dec>`



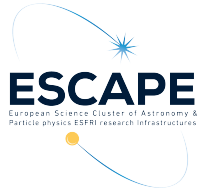


## The Virtual Observatory

If we have done our job right, all the details disappear

All the data from the cloud appears to be one big dataset accessible through your desktop





# Back to the main session



# Unified Content Descriptors (UCD)

Different data providers have a different table structures

Data provider #1

column name

RA

Decl

ID

....

....

Data provider #2

column name

objid

....

ra

dec

....

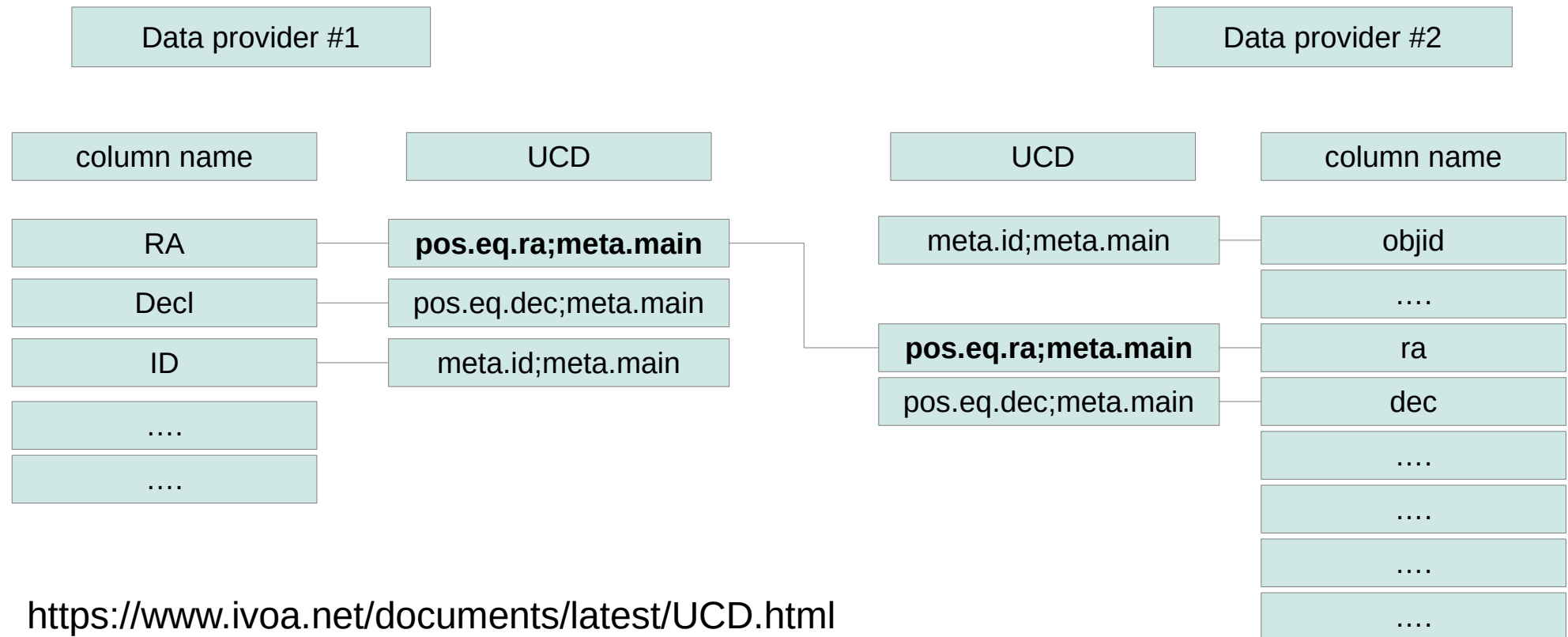
....

....

....

# Unified Content Descriptors (UCD)

TAP schema and UCDs enable **clients** to figure out the mapping

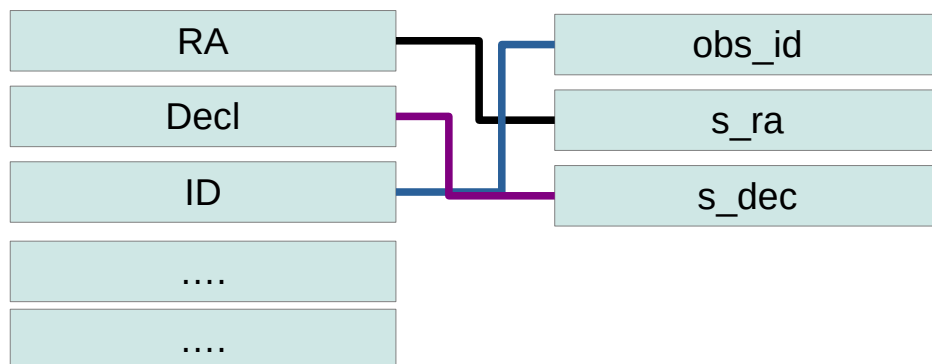


# Observation Data Model Core Components

ObsCore adds a standard view to the data in each data provider

Data provider #1

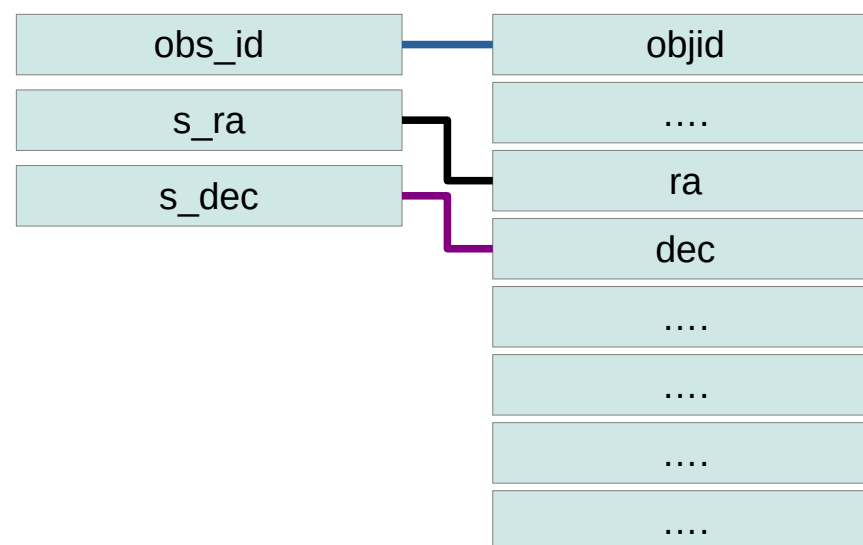
```
CREATE VIEW ivoa.ObsCore ( .... )
```



<https://www.ivoa.net/documents/ObsCore/>

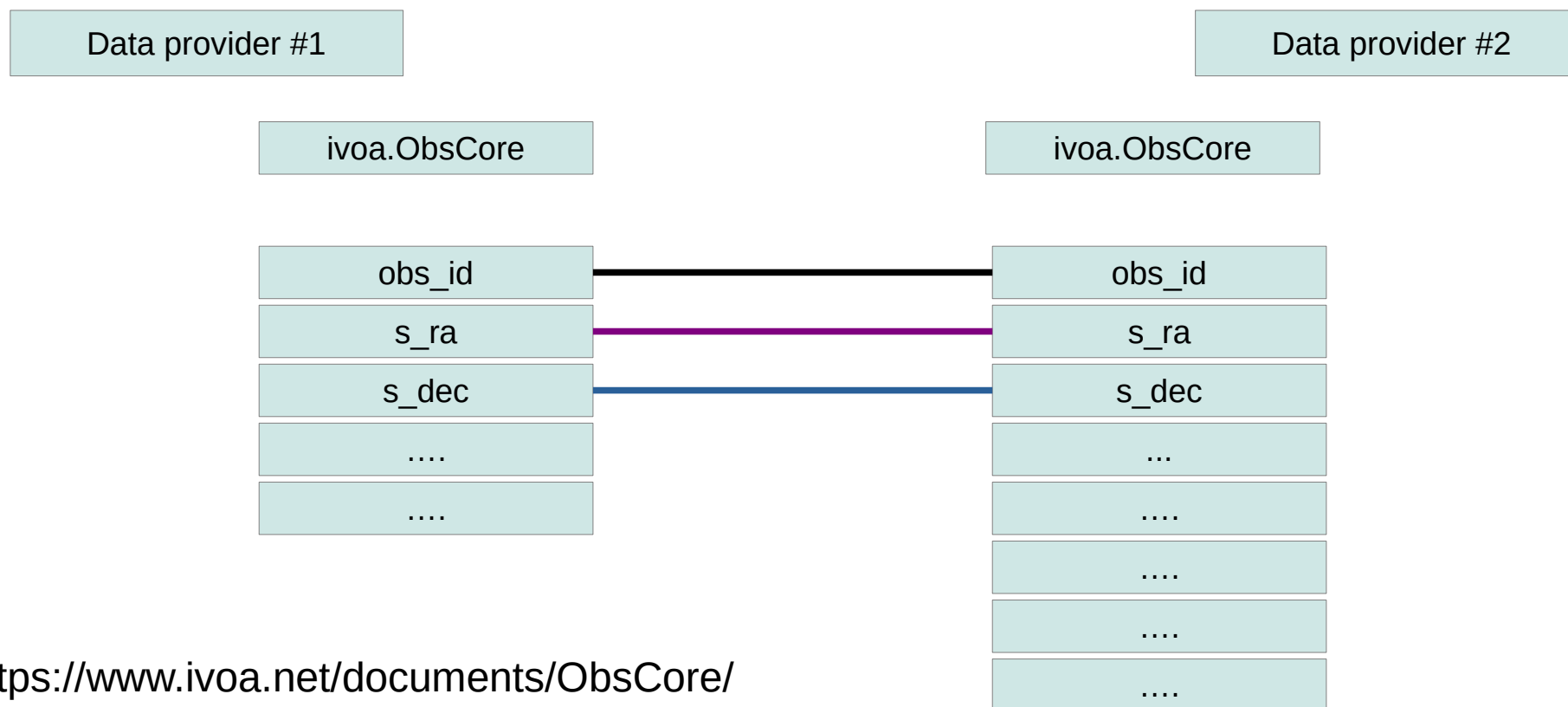
Data provider #2

```
CREATE VIEW ivoa.ObsCore ( .... )
```



# Observation Data Model Core Components

Now the public tables in **both** providers are the same



<https://www.ivoa.net/documents/ObsCore/>



# Observation Data Model Core Components

Now, the same query can be applied to **both** services

Data provider #1

Data provider #2

ivoa.ObsCore

ivoa.ObsCore

**SELECT**

**\*** obs\_id

**FROM** ivoa.obscore AS db

**JOIN** TAP\_UPLOAD.It AS mine

**ON** 1=CONTAINS (

POINT('ICRS', db.s\_ra, db.s\_dec),

CIRCLE('ICRS', mine.RA, mine.Decl, mine.Beta)

)

**AND**

db.dataproduct\_type='image'

obs\_id

s\_ra

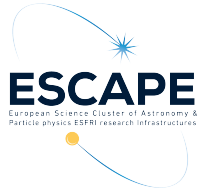
s\_dec

...

....

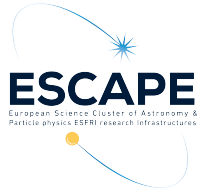
....

....



# Back to the main session





Everyone invited to develop science use cases

Science based interest groups

Scientific use cases

theory  
time-series

Science priorities for the IVOA

Science platforms

Machine learning

Multi-messenger astronomy

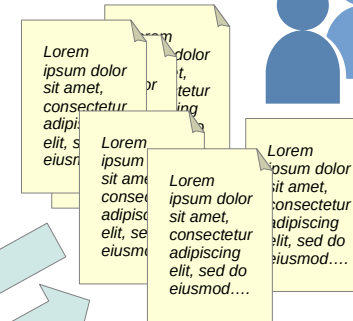
Science priorities committee



Scientists from IVOA members and major astronomy projects

IVOA working groups  
e.g. DataAccessLayer,  
Applications,  
Semantics

Working group email list



Everyone invited to discuss

New standards being developed

ObjVisSAP    ObsLocTAP

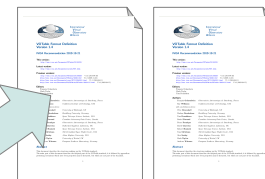
TIMESYS    Multi-order Coverage (MOC)

Hierarchical Progressive Surveys (HiPS)

Request For Comment (RFC) document



IVOA recommendation



Everyone invited to comment



Anyone can raise issues



Introduction to the VO  
IVOA interoperability  
Nov 2021

