

International Virtual Observatory Alliance (IVOA) Newcomers Introduction

IVOA interop, October 2022

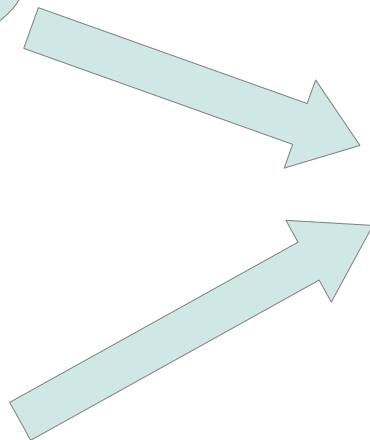
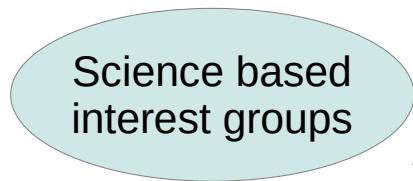
Hendrik Heinl, Dave Morris

ESCAPE - The European Science Cluster of Astronomy & Particle Physics ESFRI Research Infrastructures has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement n° 824064.



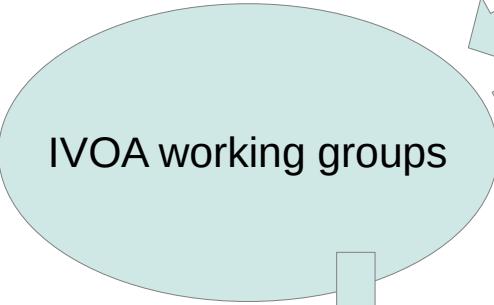


Everyone invited to develop science use cases



Science priorities committee

Scientists from IVOA members and major astronomy projects



Request For Comment (RFC) document



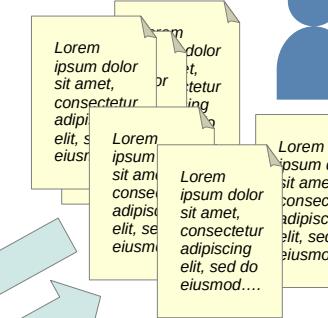
Everyone invited to comment



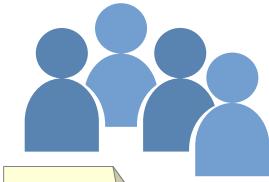
Anyone can raise issues



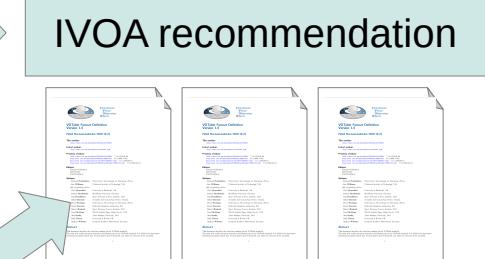
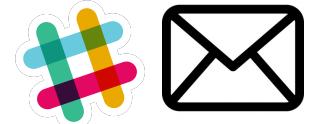
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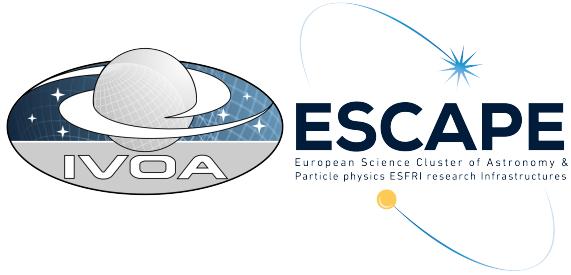


Working group discussions



Everyone invited to discuss





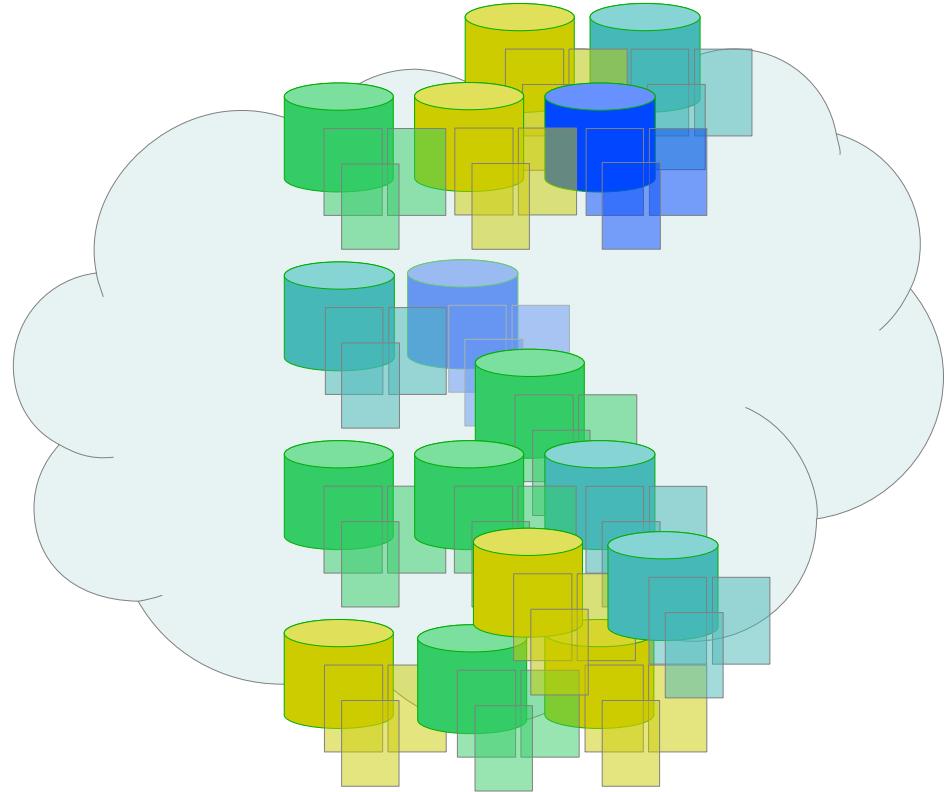
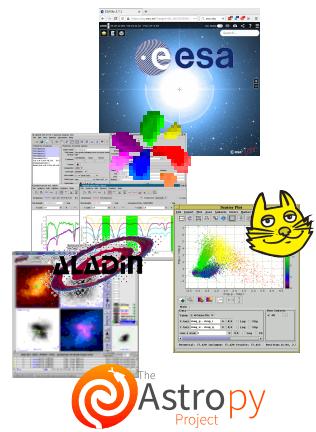
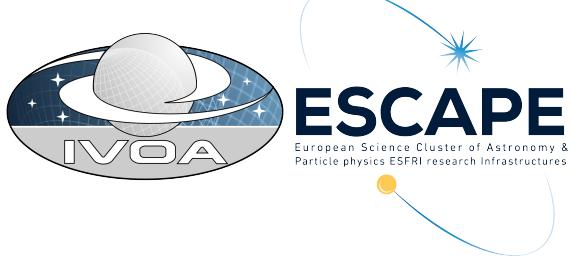
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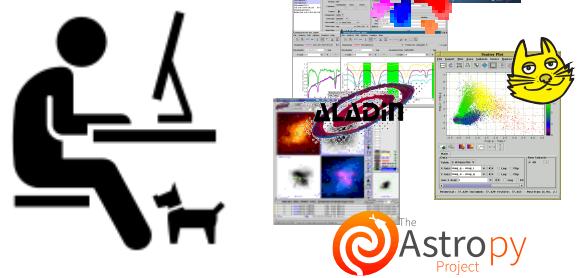
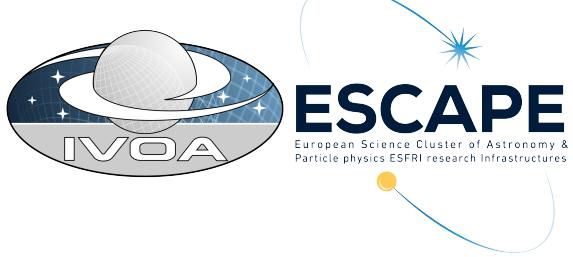
The Virtual Observatory

Data from all over the world in the cloud

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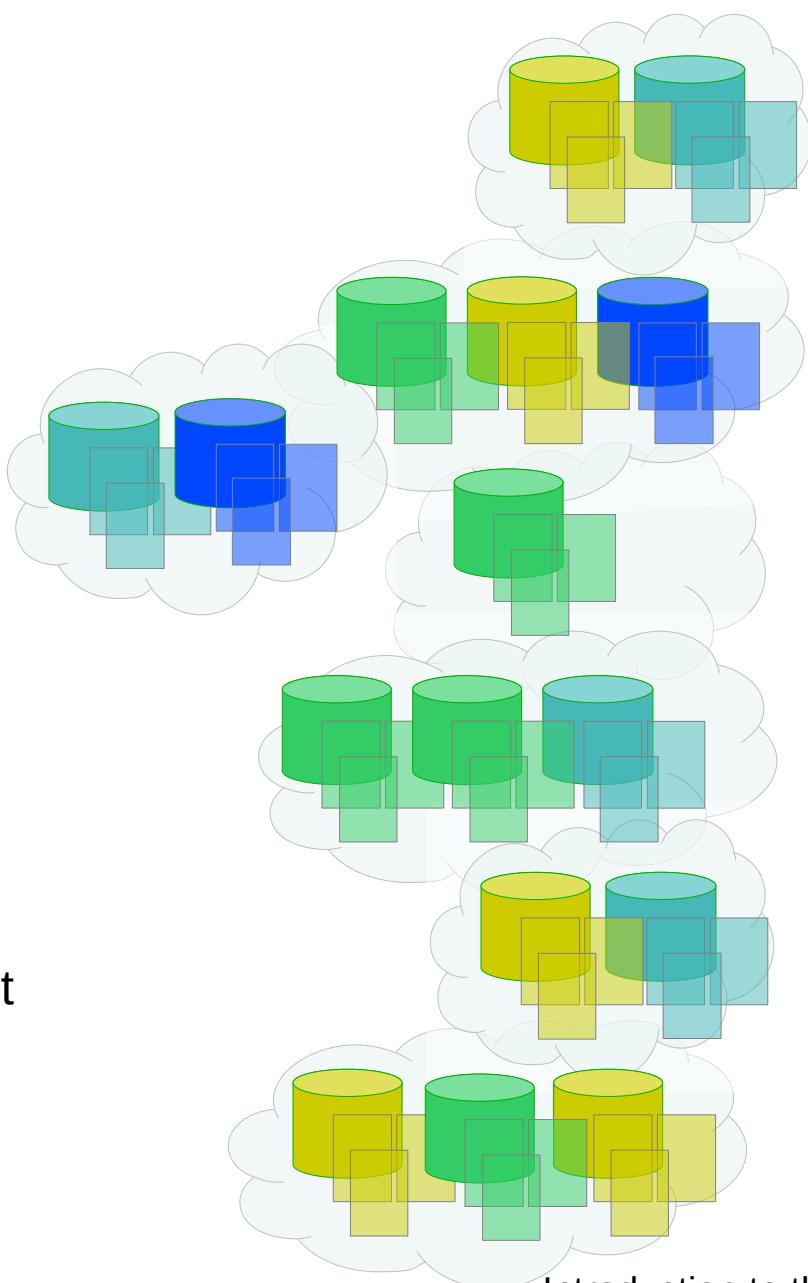


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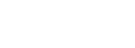
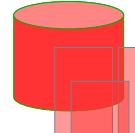


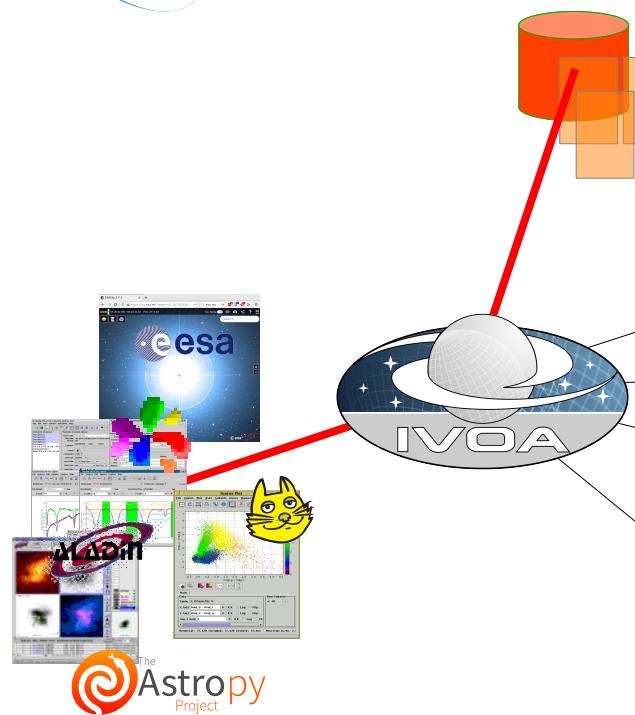
Lots of individual services each playing their part
But ... how do you know where everything is ?

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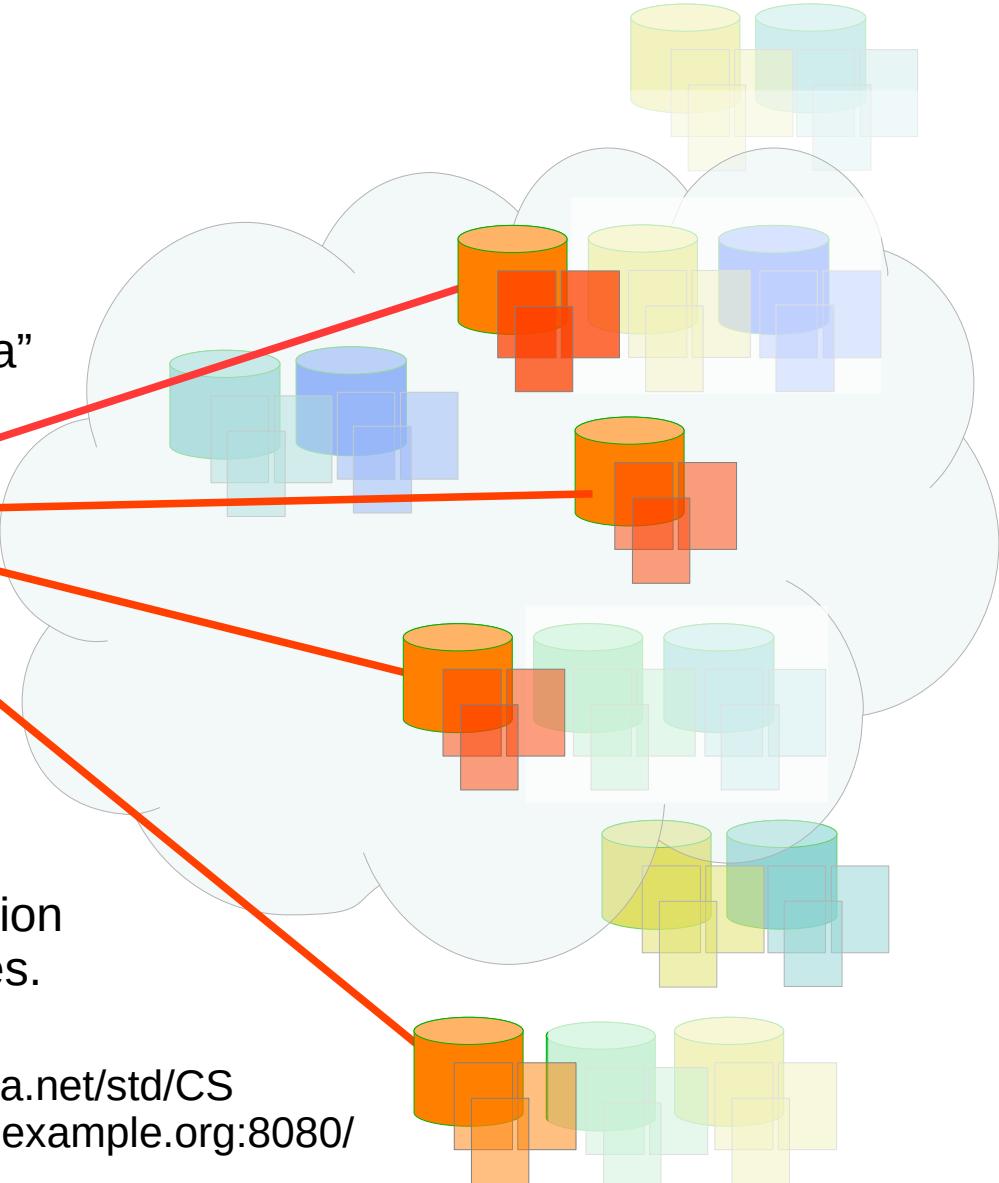
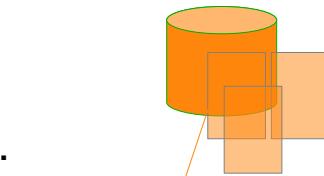
The registry is the initial contact point for interactions with IVOA services

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



The Astropy
Project

Search for:
“Services with neutrino data”



capability ivo://ivoa.net/std/CS
endpoint http://cs.example.org:8080/



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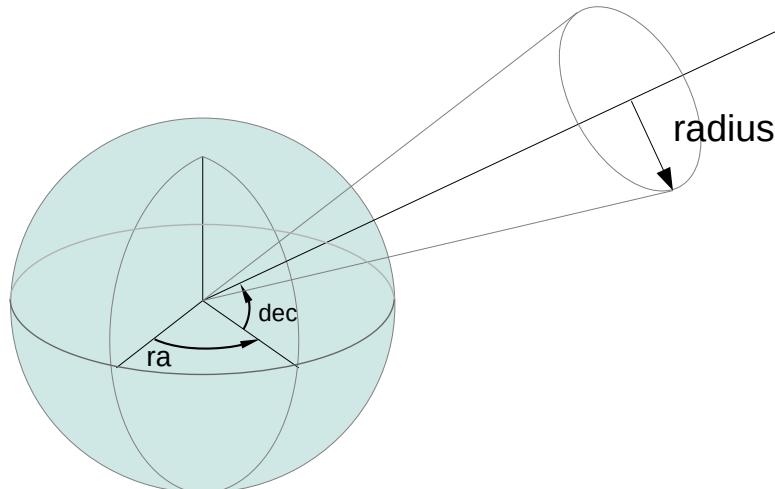
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Simple Cone Search

One of the earliest services
defined by the IVOA

RA = 170° (deg)
DEC = 25° (deg)
SR = 30° (deg)

Version 1.0 adopted as an
IVOA recommendation in 2006



<https://ivoa.net/documents/latest/ConeSearch.html>

Simple Cone Search

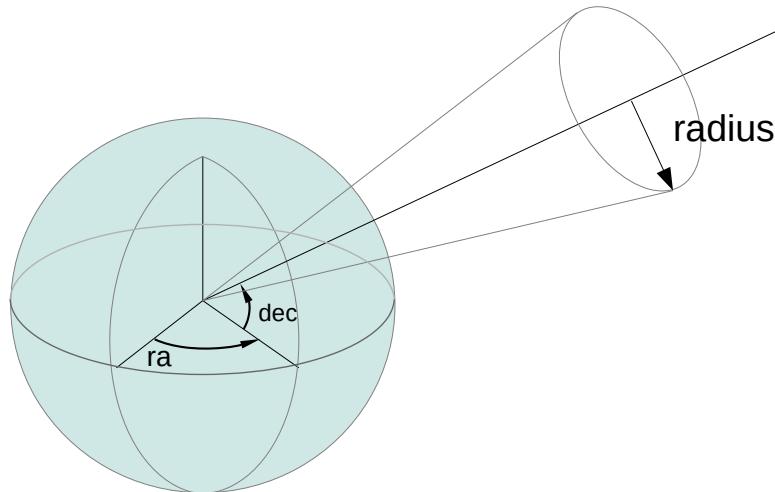
Simple HTTP GET request

`https://ivoa.example.net/cone?RA=170&DEC=25&SR=30`

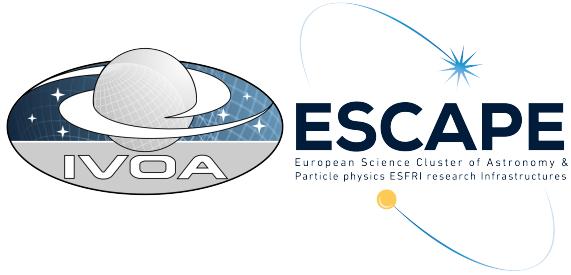
RA = 170° (deg)

DEC = 25° (deg)

SR = 30° (deg)



<https://ivoa.net/documents/latest/ConeSearch.html>



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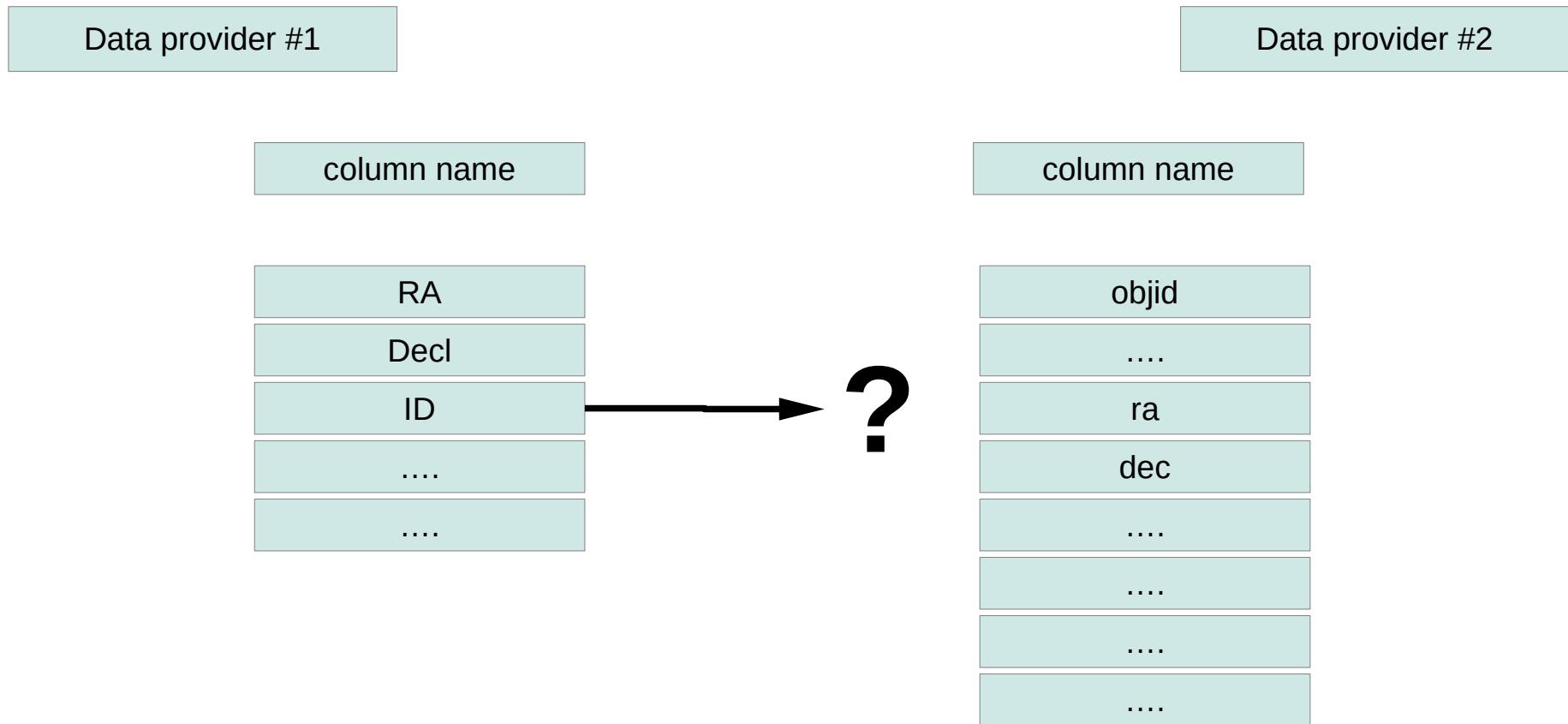


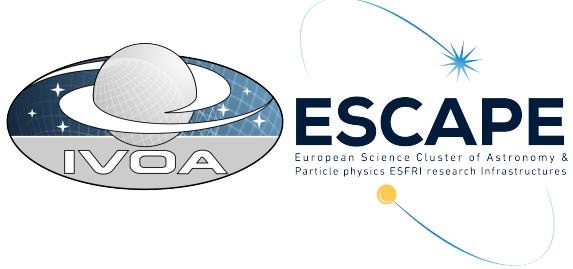
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Unified Content Descriptors (UCD)

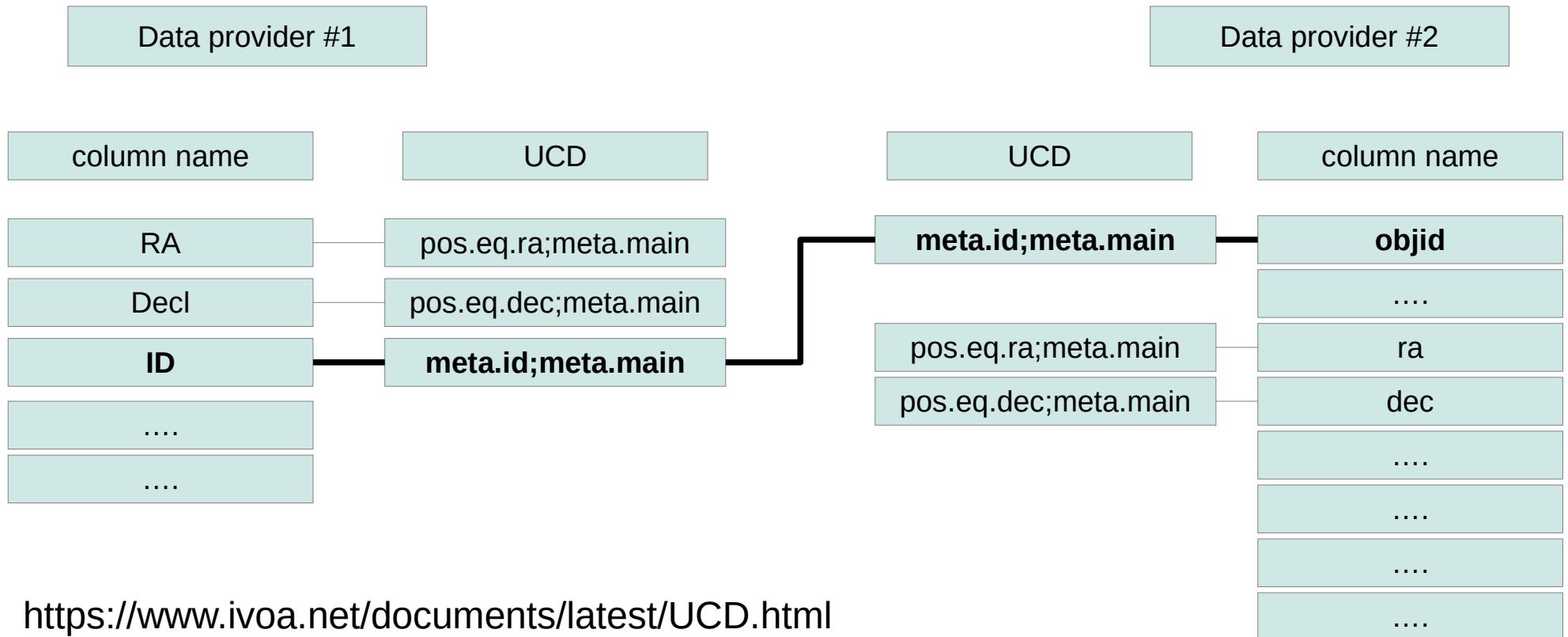
Different data providers have a different table structures



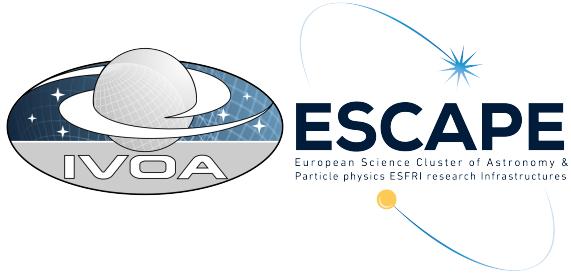


Unified Content Descriptors (UCD)

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



<https://www.ivoa.net/documents/latest/UCD.html>



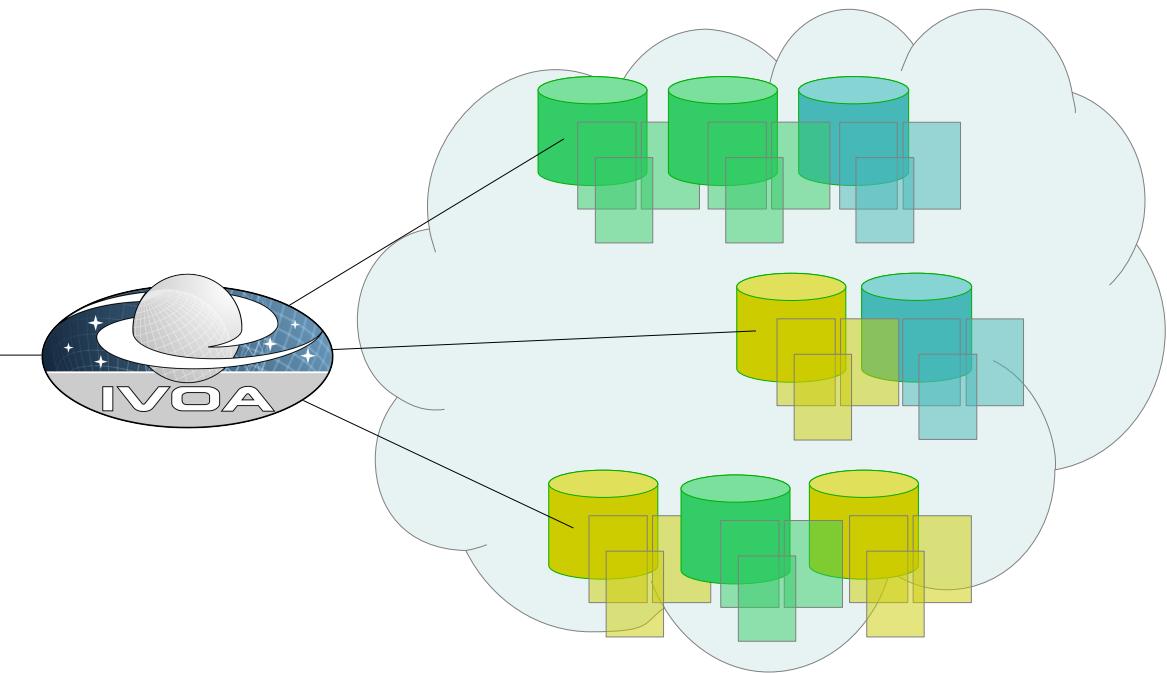
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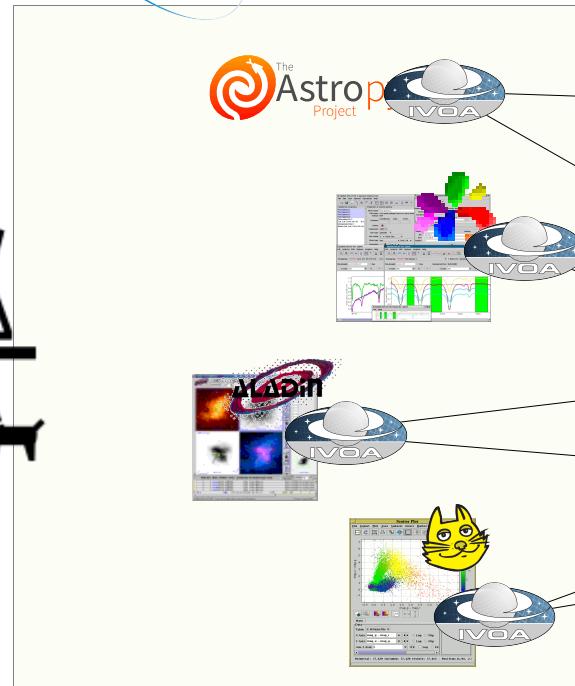


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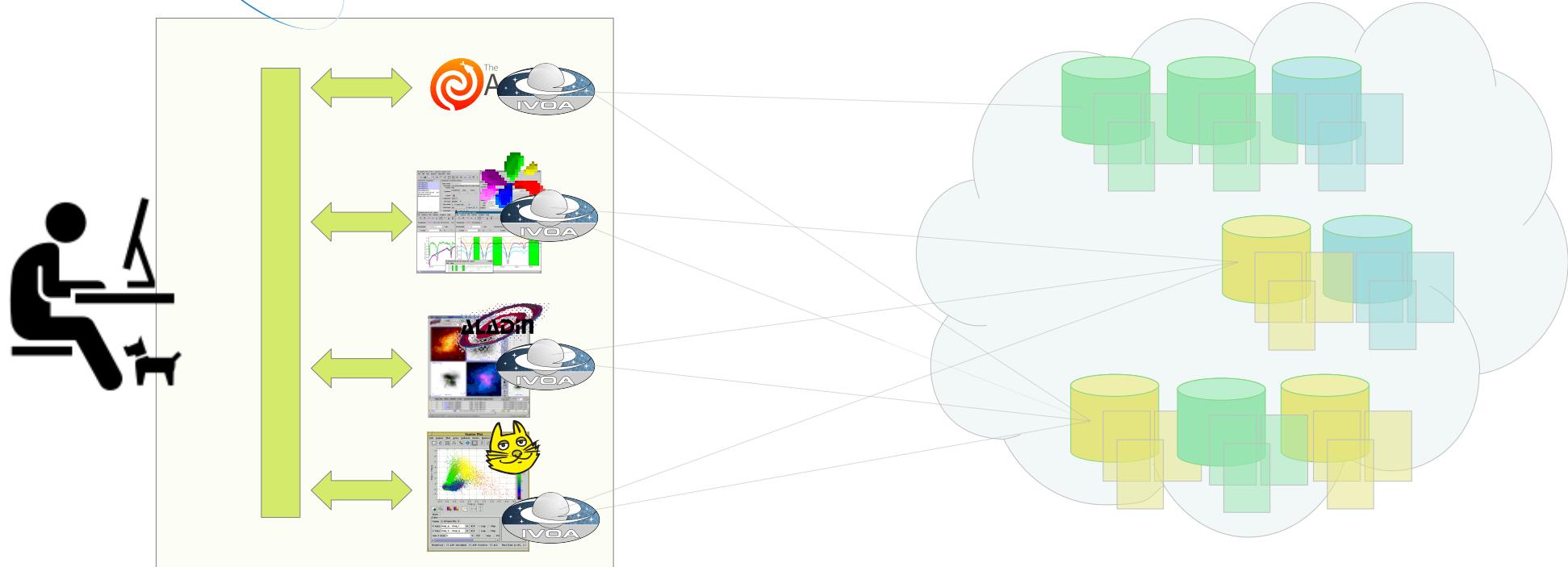
The Virtual Observatory

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



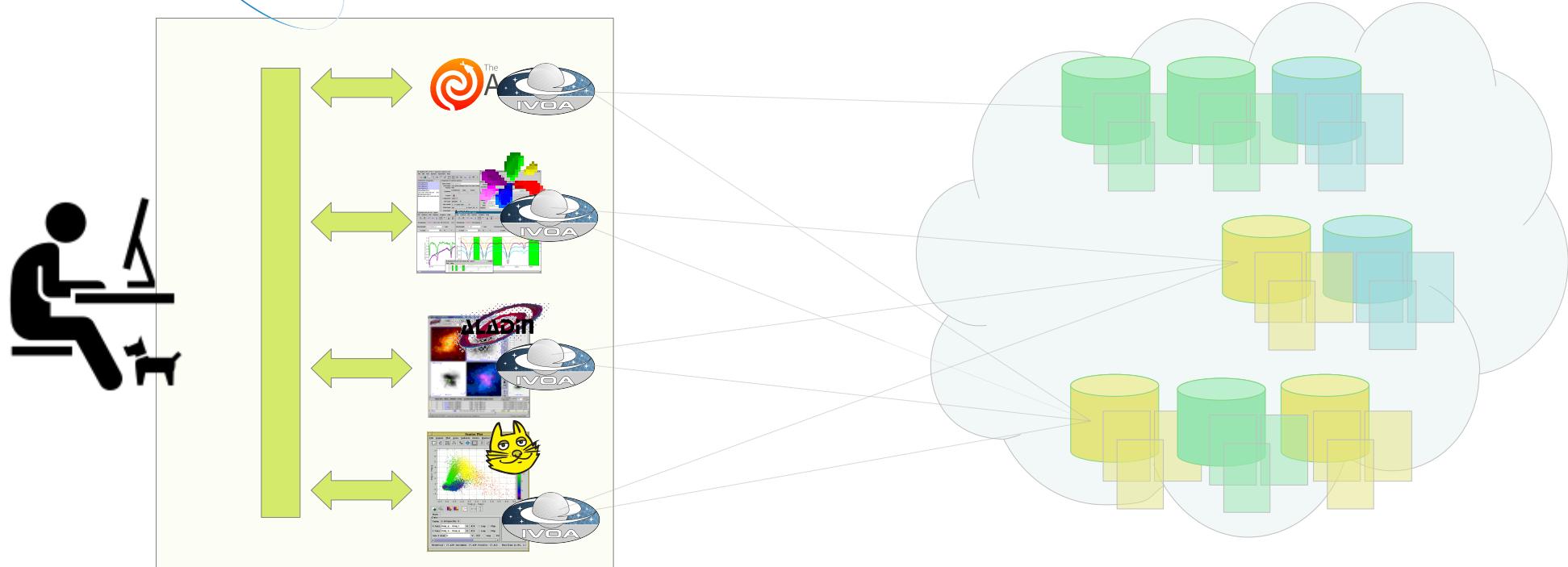
SAMP is a message bus within your local computer

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

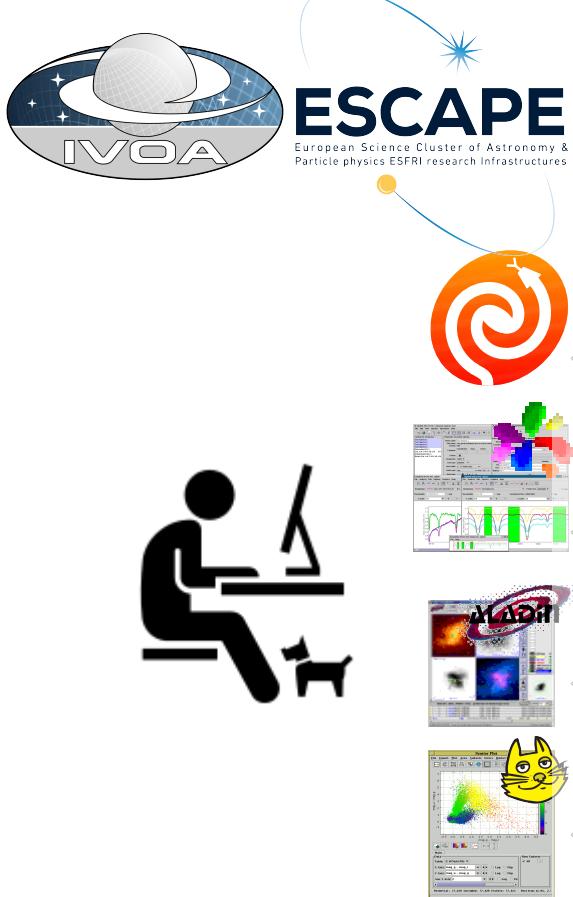
Send to Aladin:

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

Or broadcast to all listeners

Send to all:

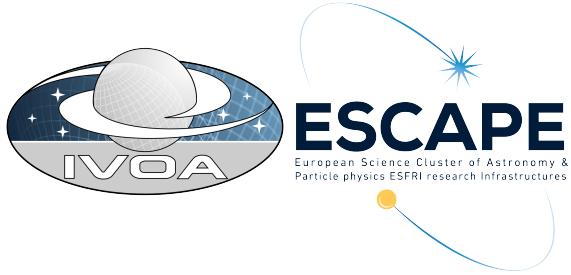
`coord.pointAt.sky <ra,dec>`



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



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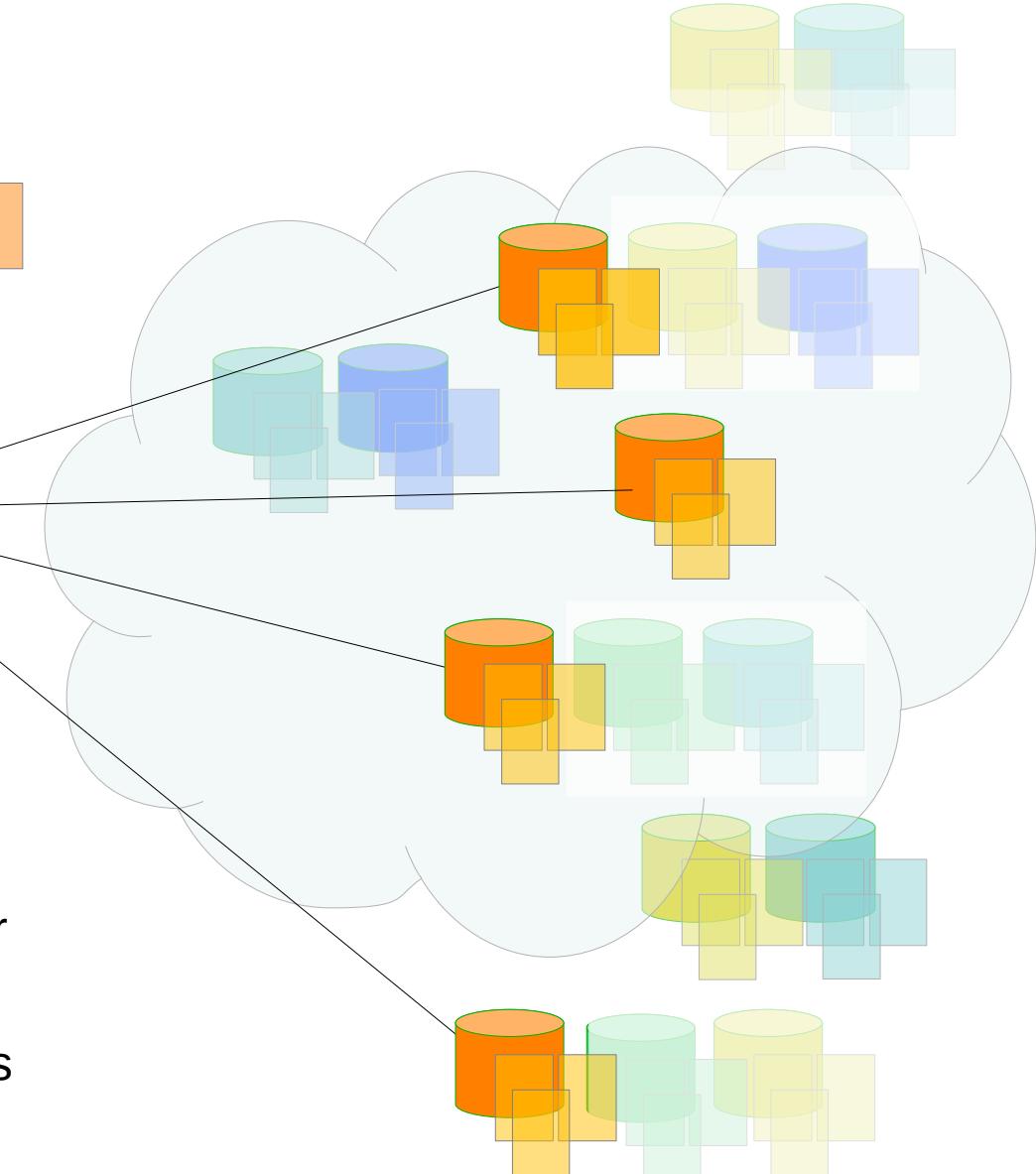
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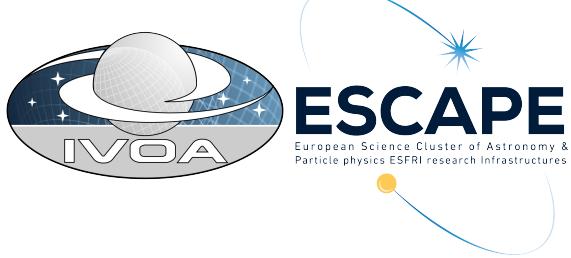


Search for:
“Services with neutrino data”



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



Search for:
“Services with neutrino data”



Data providers publish metadata about their services and the data they contain

Client applications can use standard terms to help the user discover the data they need

Registry Resource Record :

Service capabilities

TAP, ObsTap, ConeSearch, SIAP, SSAP

Collection metadata

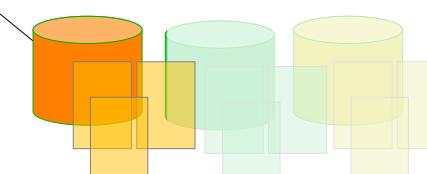
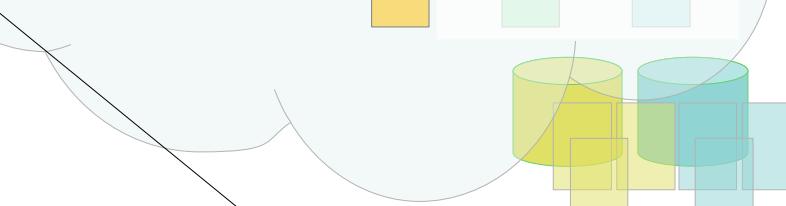
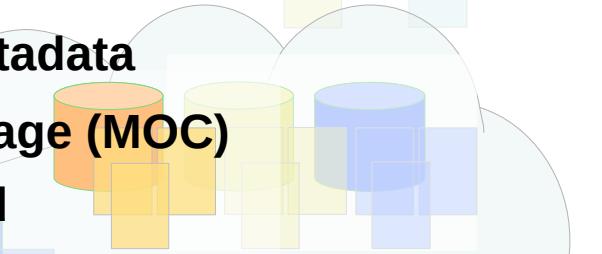
Sky coverage (MOC)

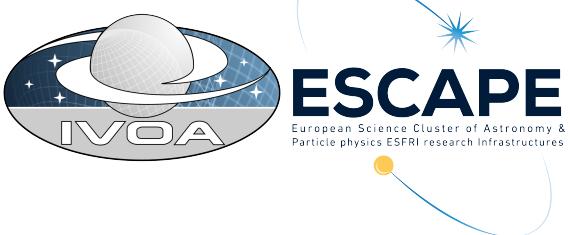
Waveband

Infra-red, optical, ultra-violet, xray

Database catalogs

Table and column metadata





Registry Resource Record :

Service capabilities

TAP, ObsTap, ConeSearch, SIAP, SSAP

Collection metadata

Sky coverage (MOC)

Waveband

Infra-red, optical, ultra-violet, xray

Database catalogs

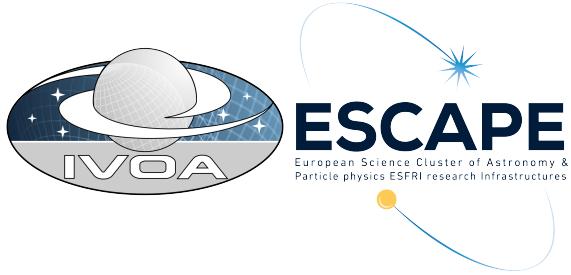
Table and column metadata

For more details on how to publish data:

<https://wiki.ivoa.net/twiki/bin/view/IVOA/PublishingInTheVO>

The service standards define what metadata
is required for each type of service





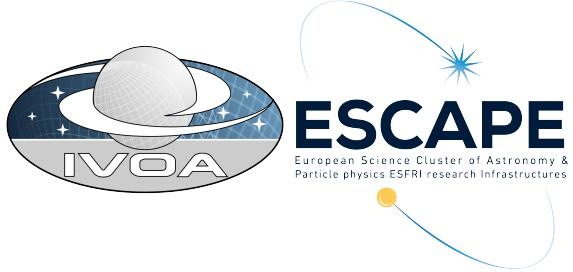
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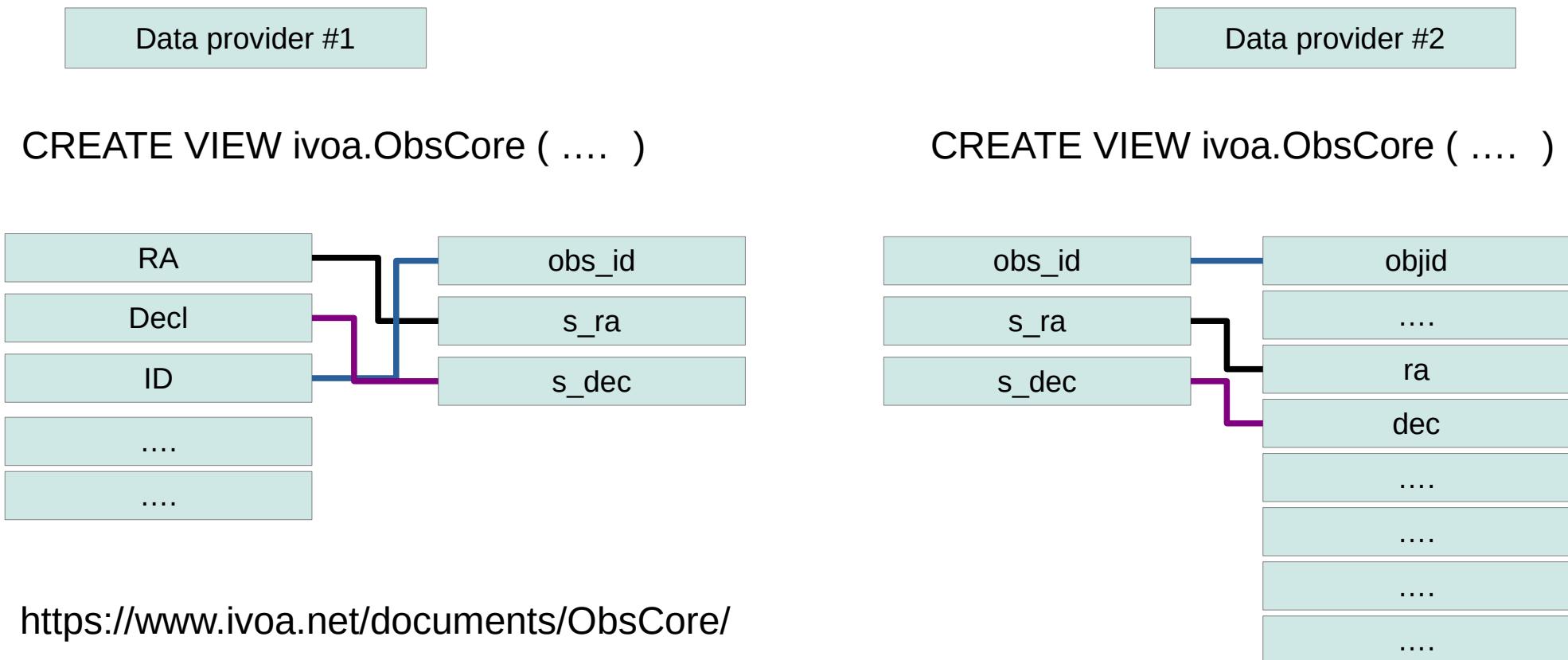


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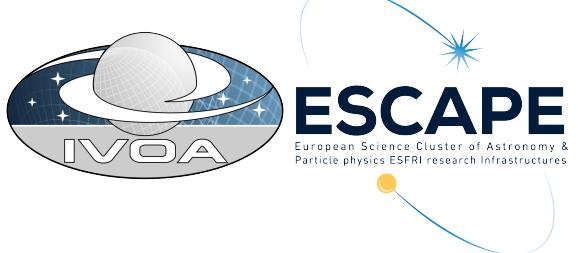
Observation Data Model Core Components

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



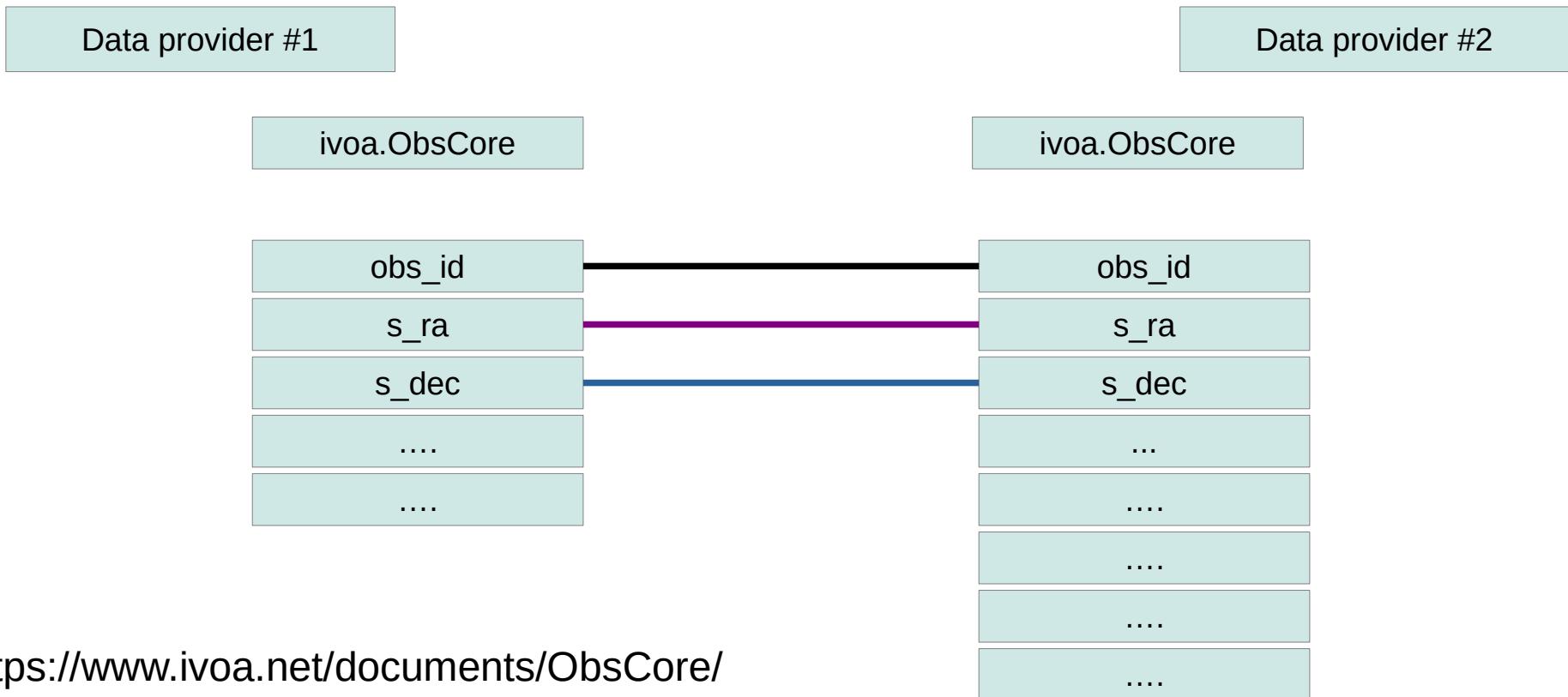
<https://www.ivoa.net/documents/ObsCore/>





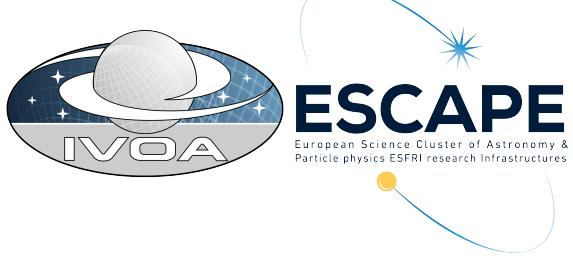
Observation Data Model Core Components

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

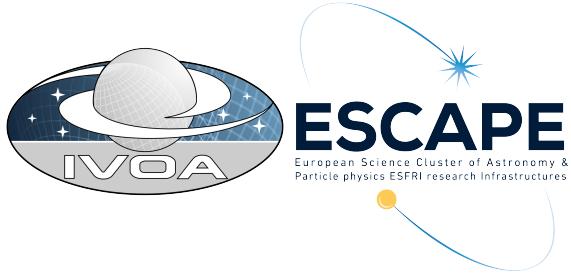
Data provider #1

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'
```

A diagram illustrating the flow of a query. On the left, a box labeled "Data provider #1" contains the text "ivoa.ObsCore". A grey arrow points from this box to a larger box labeled "ivoa.ObsCore" on top, which contains a SQL query. From the bottom of this central box, another grey arrow points to the right, leading to a box labeled "Data provider #2". Inside "Data provider #2", there is a vertical list of columns: "obs_id", "s_ra", "s_dec", and three ellipsis ("...") entries.

Data provider #2



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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

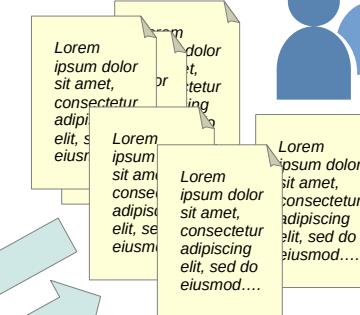
Science priorities
committee



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

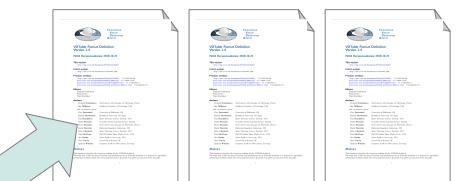
ObjVisSAP ObsLocTAP

TIMESYS Multi-order Coverage (MOC)

Hierarchical Progressive Surveys (HiPS)

Request For Comment
(RFC) document

IVOA recommendation



Everyone invited
to comment

Anyone can
raise issues

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