



# IVOA services

4th Rucio Community Workshop, Sept 2021

D.Morris University of Edinburgh

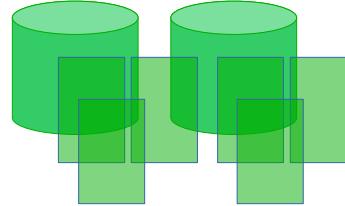




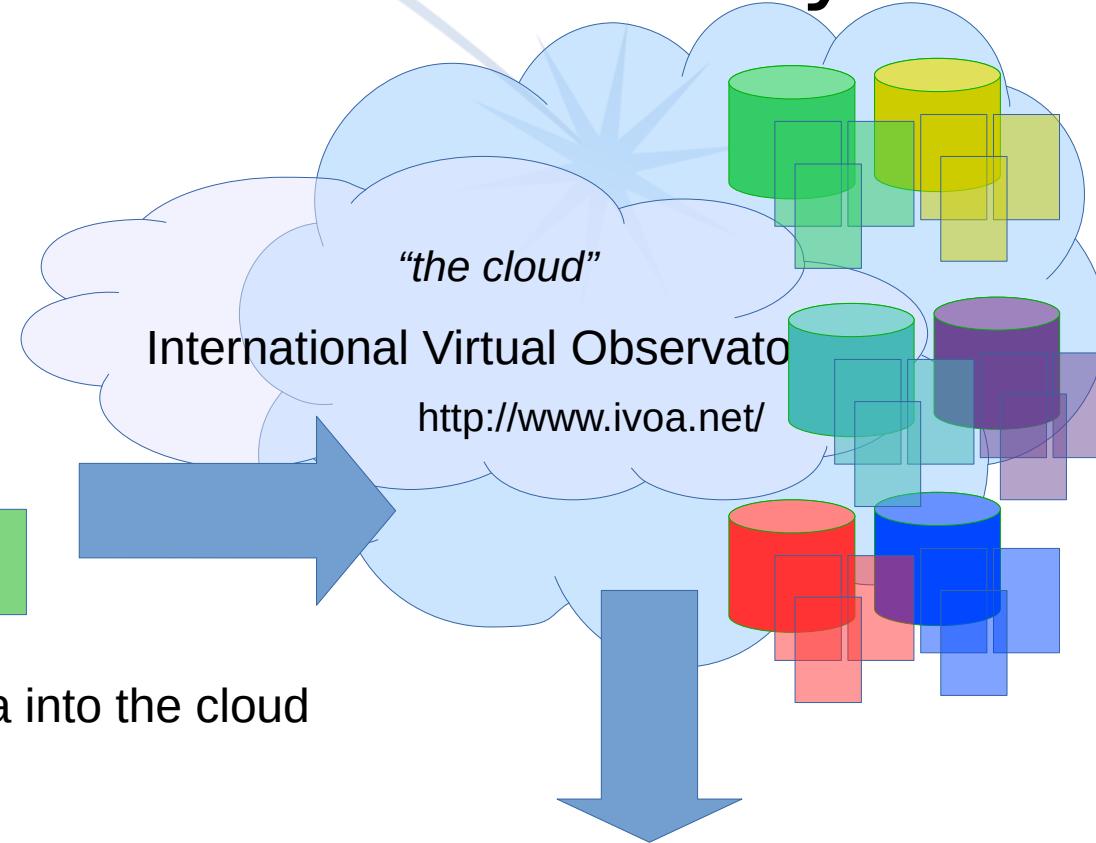
# The virtual observatory



Data providers



Publishing our data into the cloud



[our data] + [their data] => [interesting stuff]

29/09/2021

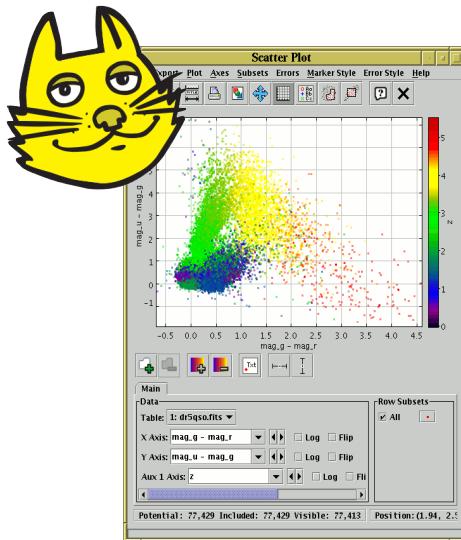


# Virtual observatory tools

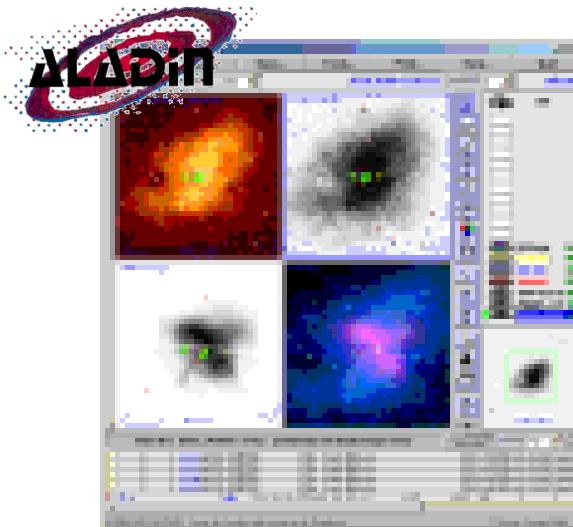


The desktop tools everyone uses :

TOPCAT



Aladin Vizier



Were not invented by the IVOA.

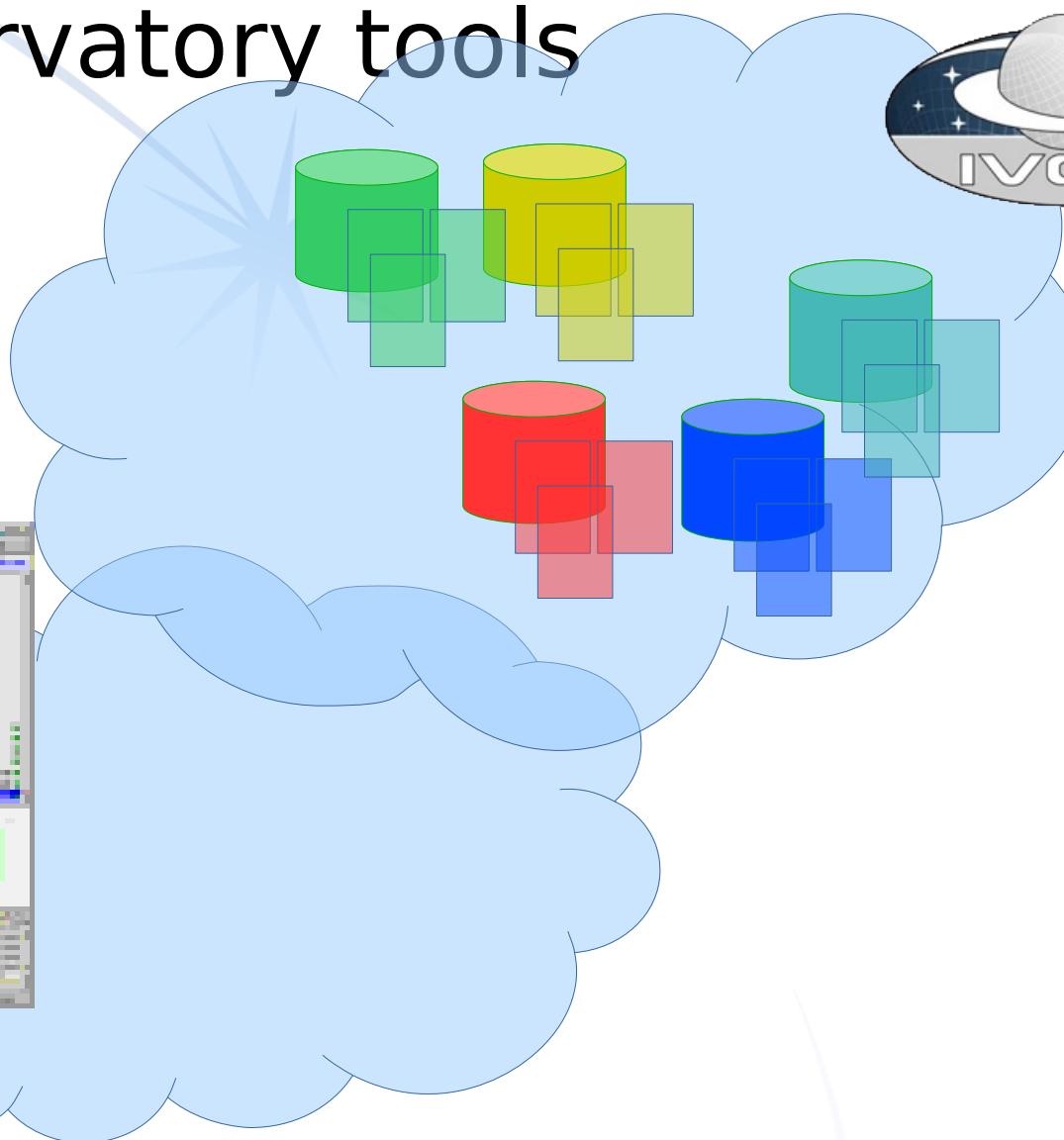
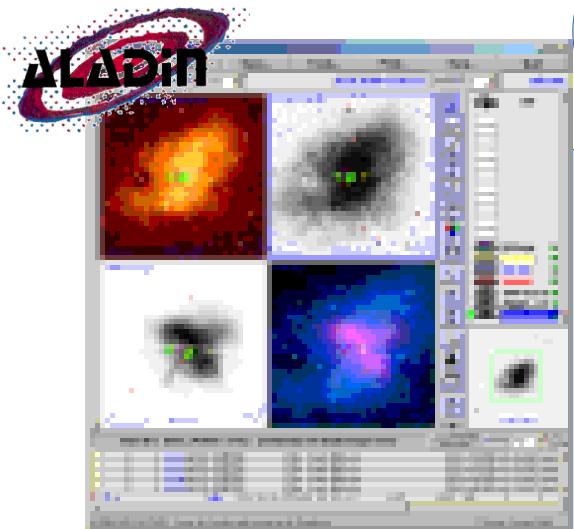
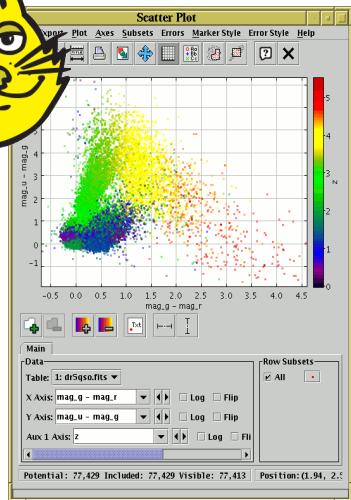
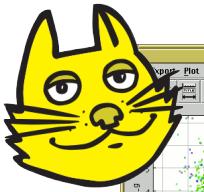
They were all established  
before the IVOA was created.



# Virtual observatory tools



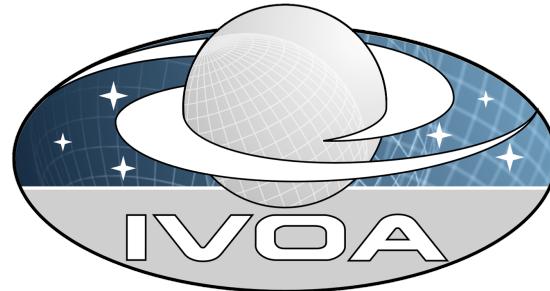
Connecting them to the VO provides access to data from around the world.



# International Virtual Observatory Alliance



## IVOA is modelled on the W3C



*“Providing a forum for members to collaborate on developing common standards for data interchange.”*

VOTable Format Definition (VOTable)

Simple Image Access Protocol (SIAP)

Table Access Protocol (TAP)

Astronomy Data Query Language (ADQL)

Hypertext Markup Language (HTML)

Extensible Markup Language (XML)

Hypertext Transfer Protocol (HTTP)

XML Path Language (XPath)





# International Virtual Observatory Alliance



IVOA is modelled on the W3C



W3C®



# International Virtual Observatory Alliance



W3C defines standards



Hypertext Markup Language (HTML)

Extensible Markup Language (XML)

Hypertext Transfer Protocol (HTTP)

XML Path Language (XPath)

Members create software, hardware, services ..



Webservers      Browsers

Web sites  
Mobile phones  
Document tools

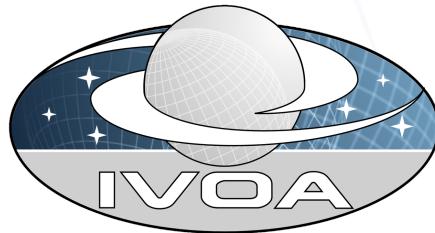
Social networks  
Financial services



# International Virtual Observatory Alliance



IVOA defines standards



VOTable Format Definition (VOTable)

Simple Image Access Protocol (SIAP)

Table Access Protocol (TAP)

Astronomy Data Query Language (ADQL)

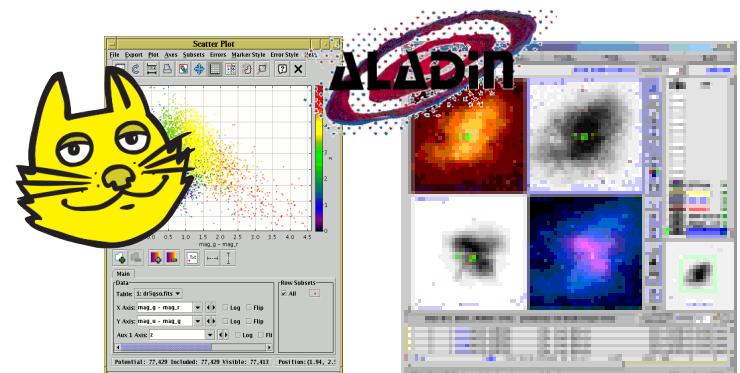
Members create software, services ..

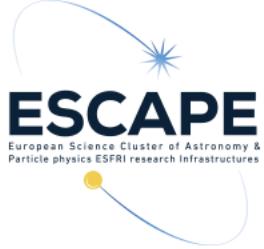


Published catalogs

Data access services

Analysis tools





# IVOA specifications



## IVOA services

SIAP Simple Image Access Protocol

SLAP Simple Line Access Protocol

SSAP Simple Spectra Access Protocol

TAP/ADQL Table Access Protocol

Astronomy Data Query Language

## IVOA Registry

## IVOA data models

VOTable

ObsCore

VO Model



# Simple Cone Search (CS)



One of the earliest services  
define by the IVOA

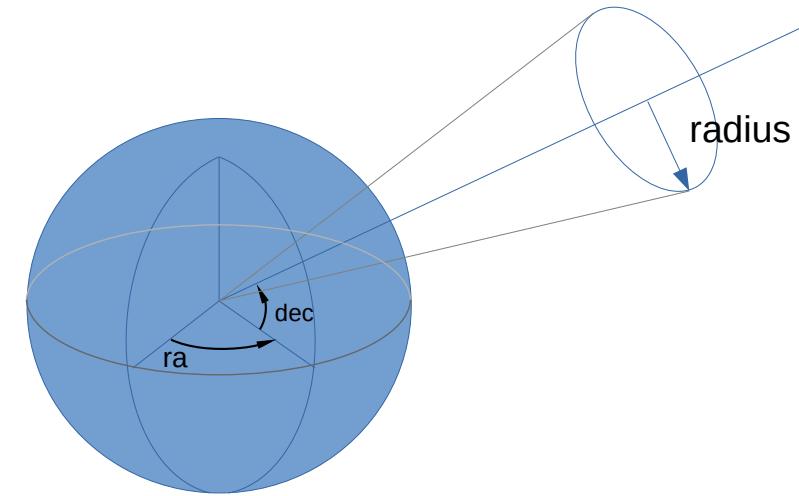
Version 1.0 adopted as an  
IVOA recommendation in 2006

HTTP GET request

RA = 208.0

DEC = 50.0

SR = 2.0



# Simple Cone Search (CS)



One of the earliest services  
define by the IVOA

Version 1.0 adopted as an  
IVOA recommendation in 2006

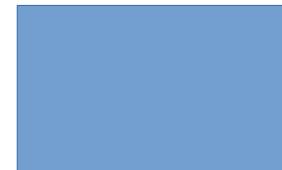
HTTP GET request

RA = 208.0

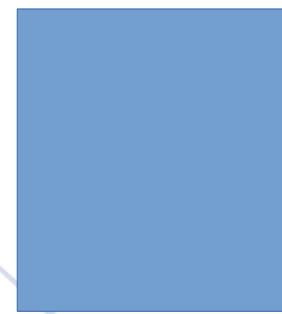
DEC = 50.0

SR = 2.0

XML response



metadata  
header



serialised  
data

Minimum 3 columns  
+ errors

ID\_MAIN

POS\_EQ\_RA\_MAIN

POS\_EQ\_DEC\_MAIN



# Simple Image Access Protocol (SIAP)



Specialization for image access

Version 2.0 published in 2015

## HTTP GET request

20 standard params

CIRCLE=208.0 50.0 2.0

BAND=500e-9 550e-9

TIME=55123.456 55123.466

TIMERES=-Inf 1.0

EXPTIME=600 +Inf

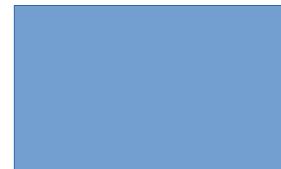
FOV=1.0 2.0

SPATRES=-Inf 0.2

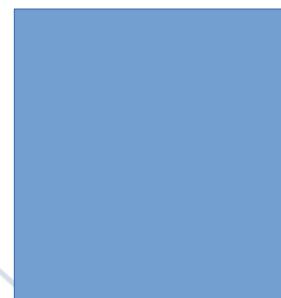
SPECRP=1000 +Inf

## XML response

COLLECTION  
FACILITY  
INSTRUMENT  
TARGET  
MAXREC  
FORMAT  
DPTYPE  
CALIB  
POLARITY



metadata  
header



serialised  
data

20 standard columns

ObsCore data model

dataproduct\_type

obs\_publisher\_did

obs\_collection

obs\_id

....



# Table Access Protocol (TAP)

## Astronomy Data Query Language

### SQL92 + geometry



HTTP POST request  
**QUERY =**

```
SELECT
  FLOOR(source_id / (2^47)) AS hpx_id,
  COUNT(*) AS n,
  AVG(pmra) AS avg_pmra,
  AVG(pmdec) AS avg_pmdec,
FROM
  gaia_source
GROUP BY
  hpx_id
```

XML response



metadata  
header



serialised  
data

Any/all columns  
from the database

Standard metadata for  
database schema

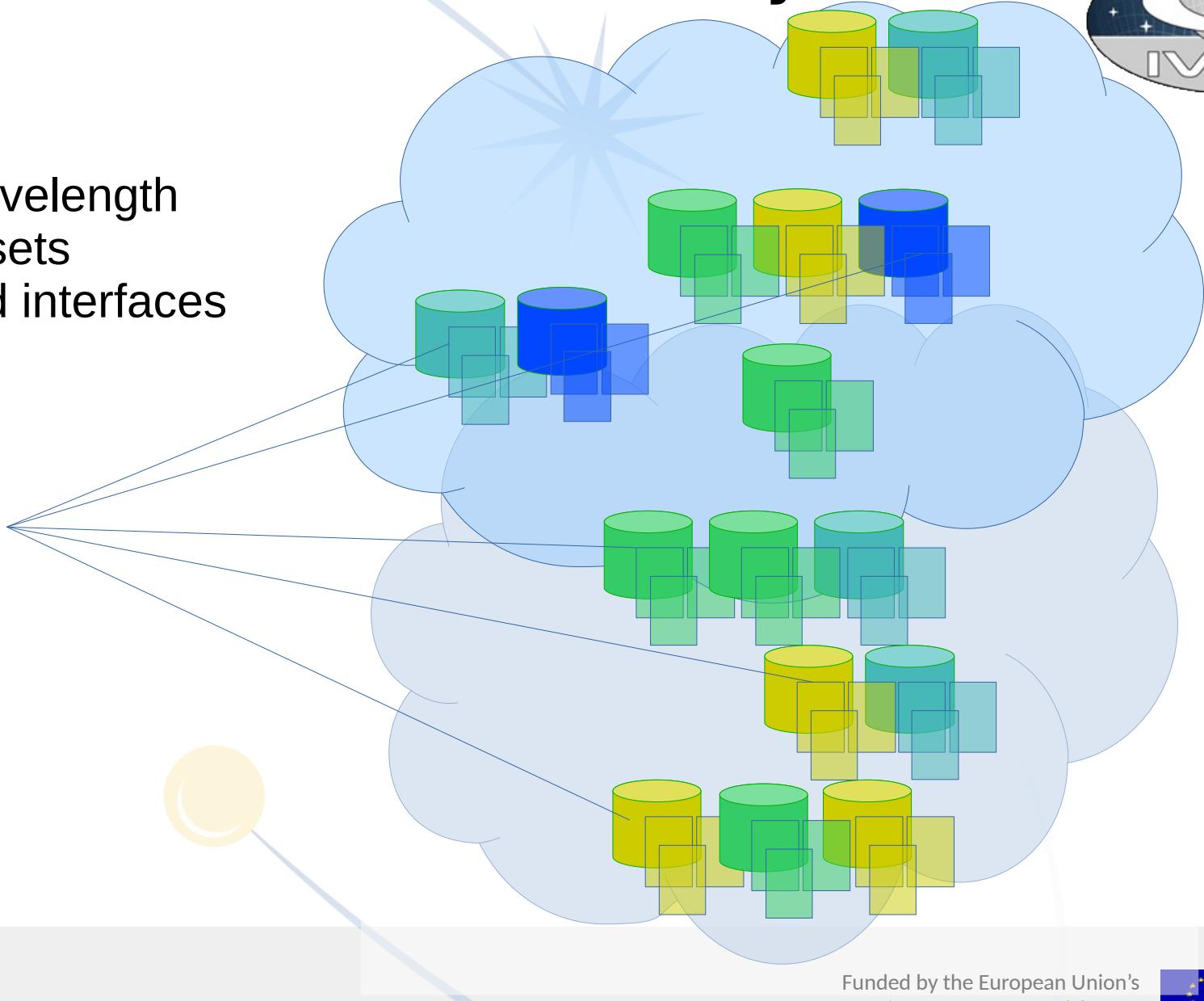
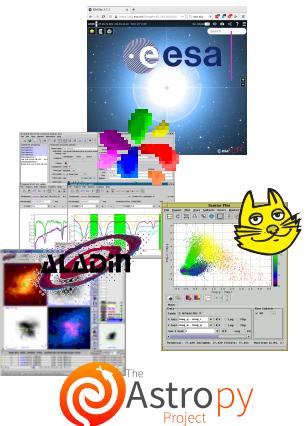
tables  
columns  
data type  
data model  
units

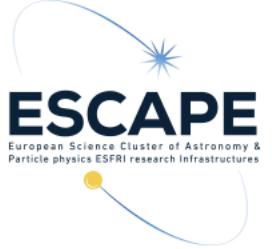


# The Virtual Observatory



Wide range of multi-wavelength  
multi-messenger data sets  
accessible via standard interfaces  
and analysis tools





# Thank you

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## ESCAPE WP4 - CEVO

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