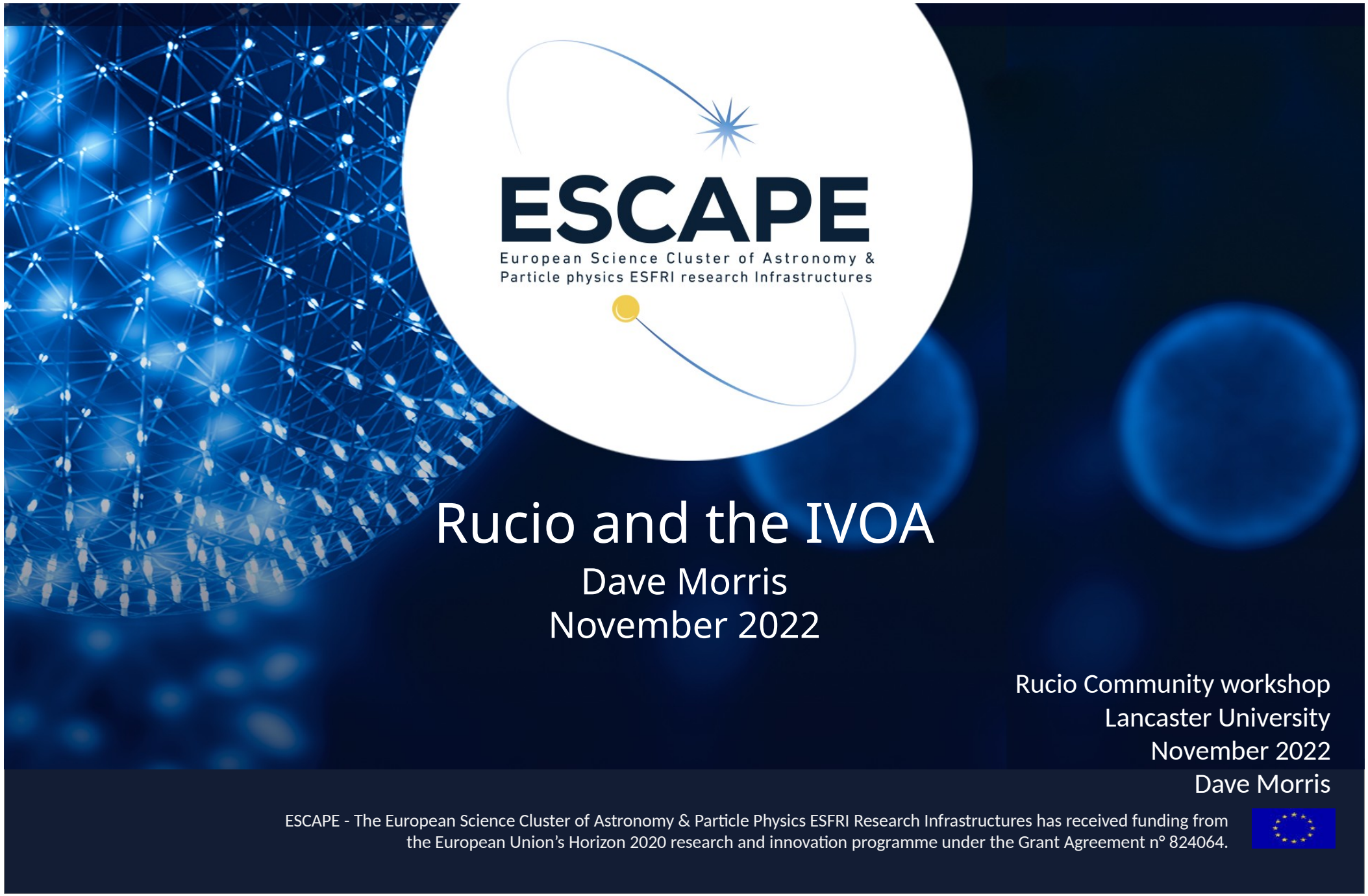

Rucio and the IVOA

Dave Morris

November 2022

Rucio Community workshop
Lancaster University
November 2022
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.

What is the VO ?

128 publishers

23,975 datasets

44,158 services

Global observatory for astronomy

Active for 20 years, since 2002

- 348 image access
- 18737 cone services
- 162 spectra services
- 24908 table services
- 65380 database tables

FAIR access to data

Findable Accessible Interoperable Reusable

https://www.go-fair.org/

Flexible resource registry

Enables “blind discovery”, finding data by physical constraints

Find data based on sky position, waveband etc

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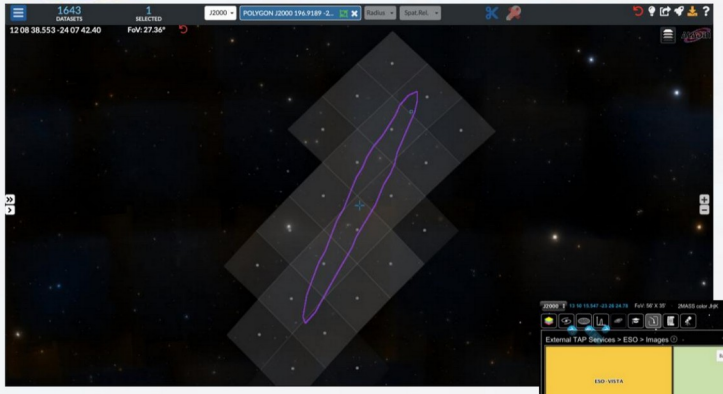
SCIENTIFIC DATA MANAGEMENT RUCIO

IVOA

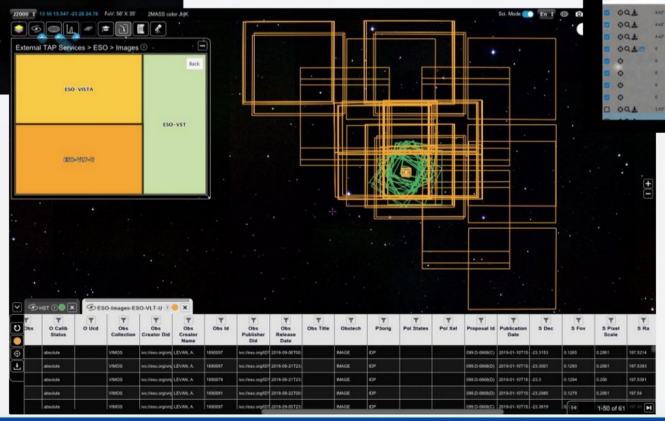
ESCAPE
European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures

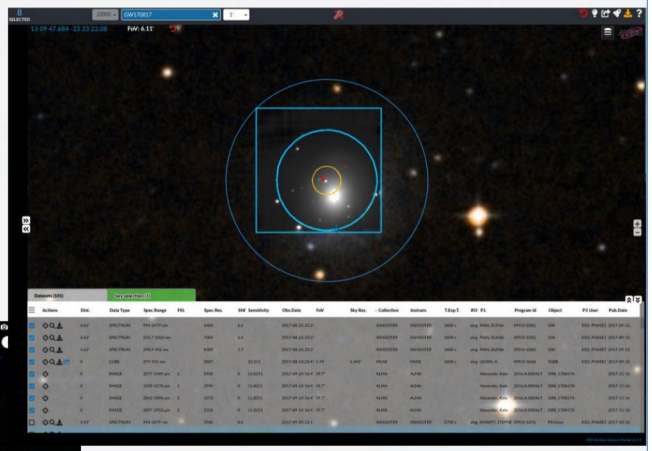
Multi-messenger, multi-wavelength view of neutron star merger GW170817



ESO + LIGO/Virgo

ESO + HST (ESASky)





ESO La Silla Paranal + ALMA

UO inside!

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What is the IVOA ?

International Virtual Observatory Alliance

http://www.ivoa.net/

Developing common standards

Service interfaces, metadata and vocabularies

- VOTable
- VOResource
- SimpleImageAccess (SIA)
- Unified Content Descriptors (UCD)

Internet Engineering Task Force (IETF)
World Wide Web Consortium (W3C)

Developing common standards

Protocols and data formats

- HyperTextTransferProtocol (HTTP)
- HyperTextMarkupLanguage (HTML)
- Extensible Markup Language (XML)

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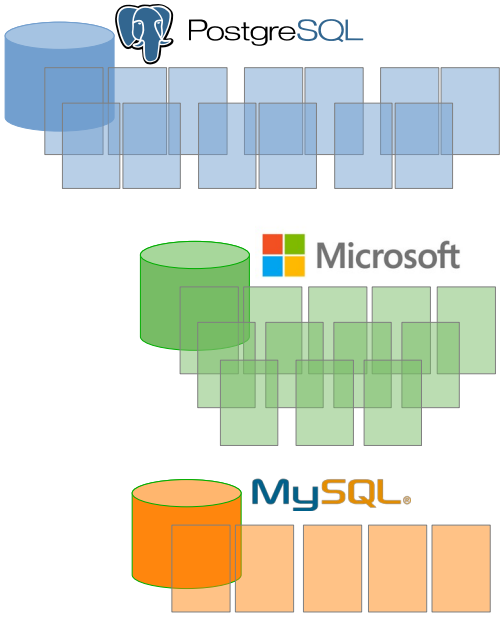
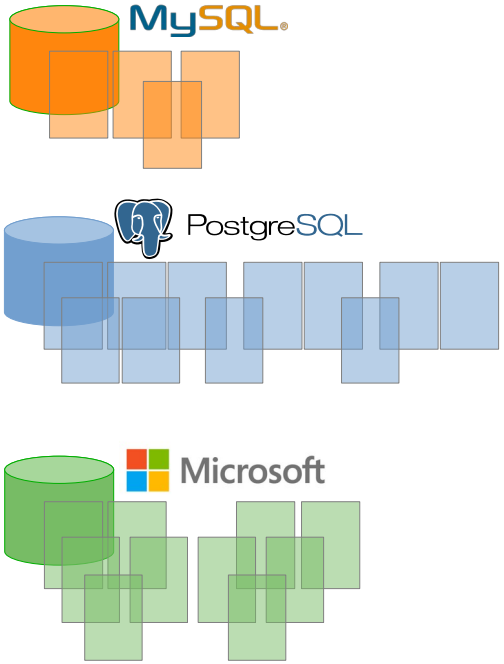
IVOA makes the VO work



Different database platforms

Different database structures



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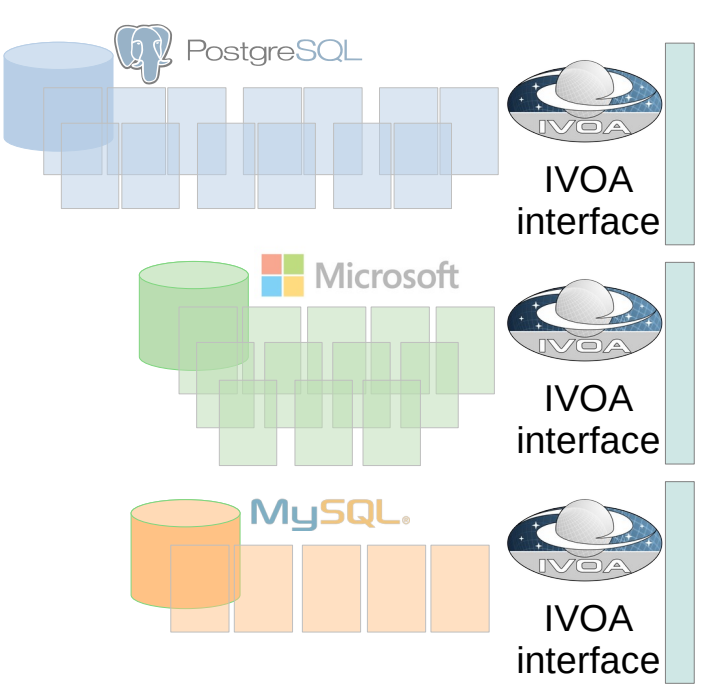
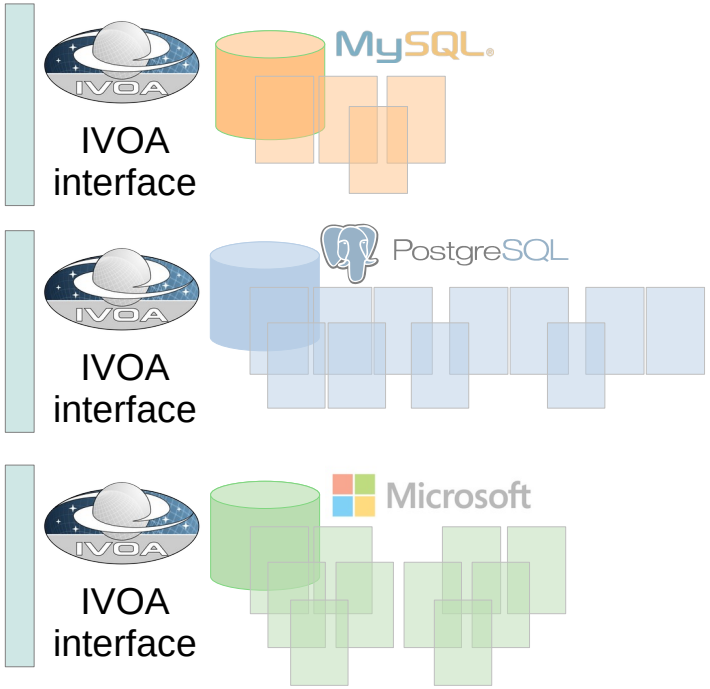
IVOA makes the VO work



Standard interfaces
Uniform metadata



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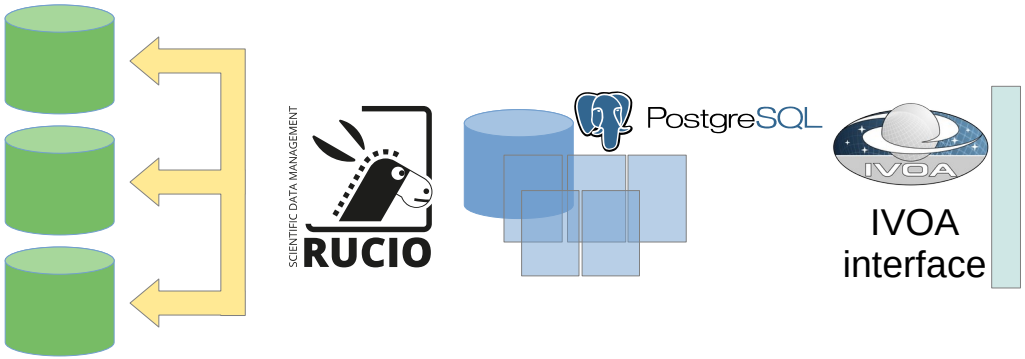
Publishing Rucio metadata in the VO



Publishing Rucio metadata as an IVOA service

Prototypes being explored by Astron and SKA

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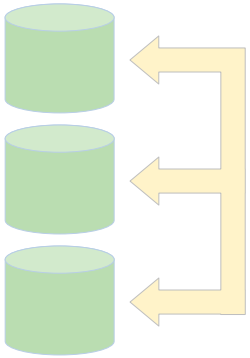
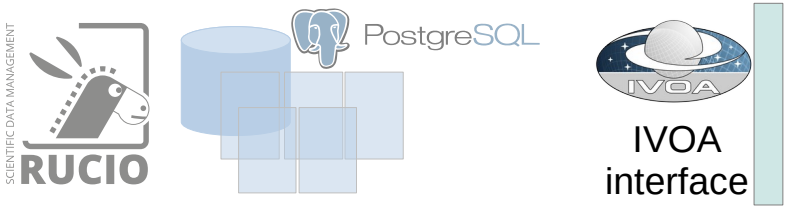
Publishing Rucio metadata in the VO





Publishing Rucio metadata as an IVOA service

Prototypes explored by SKA and Astron

https://gitlab.com/ska-telescope/src/ska-rucio-ivoa-integration

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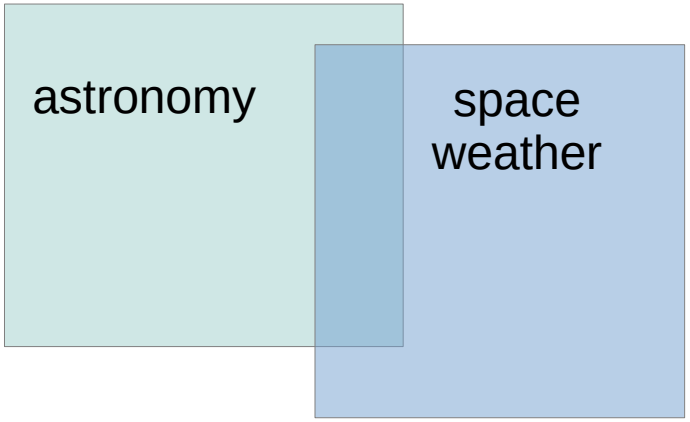
Could we do this for other domains ?

Extending the IVOA to include adjacent domains



Build on overlapping factors to develop a common data model

Gradual process of evolving and extending the data model

Works up to a point ….

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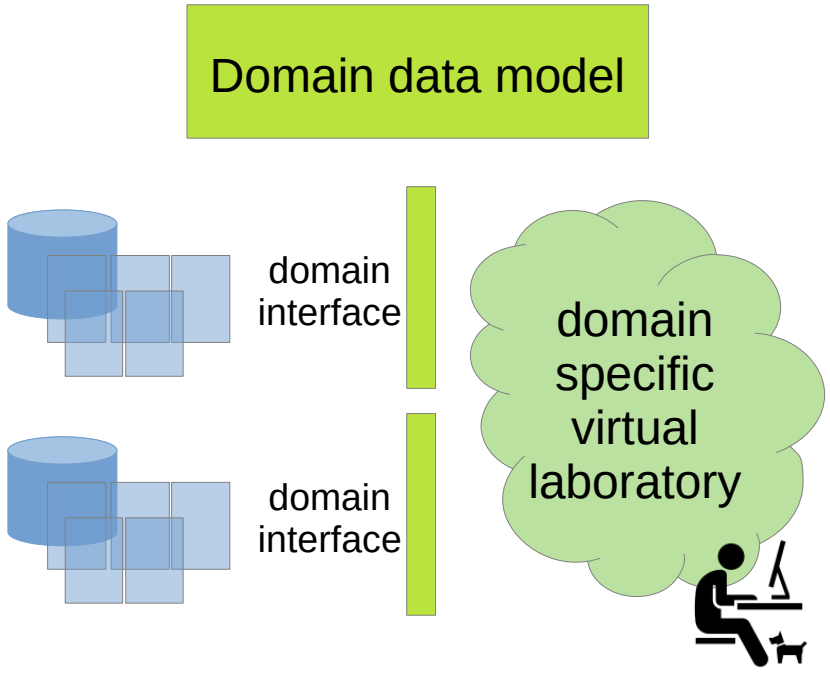
Could we do this for other domains ?

Decouple the services from the domain model

Could we create a generic toolkit for building *'virtual laboratories'* ?



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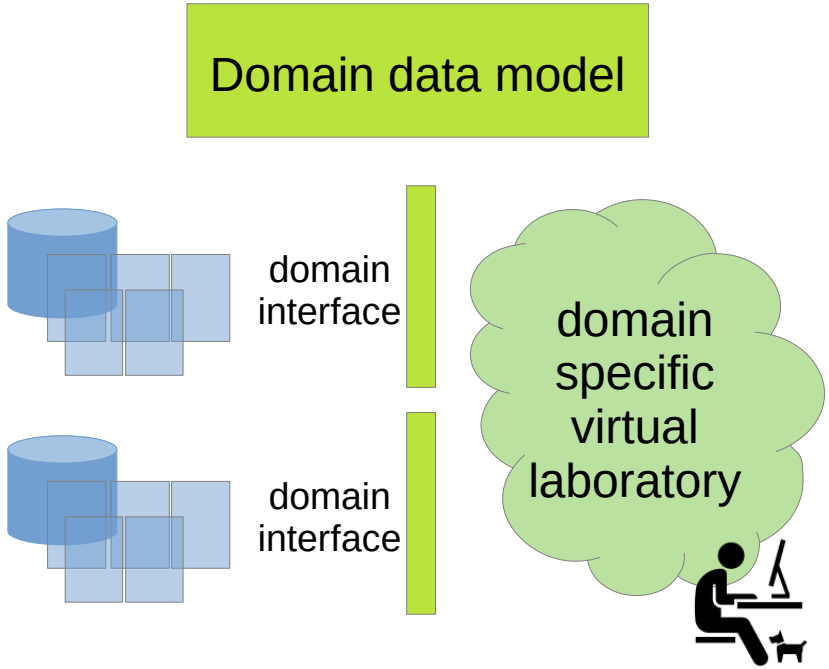
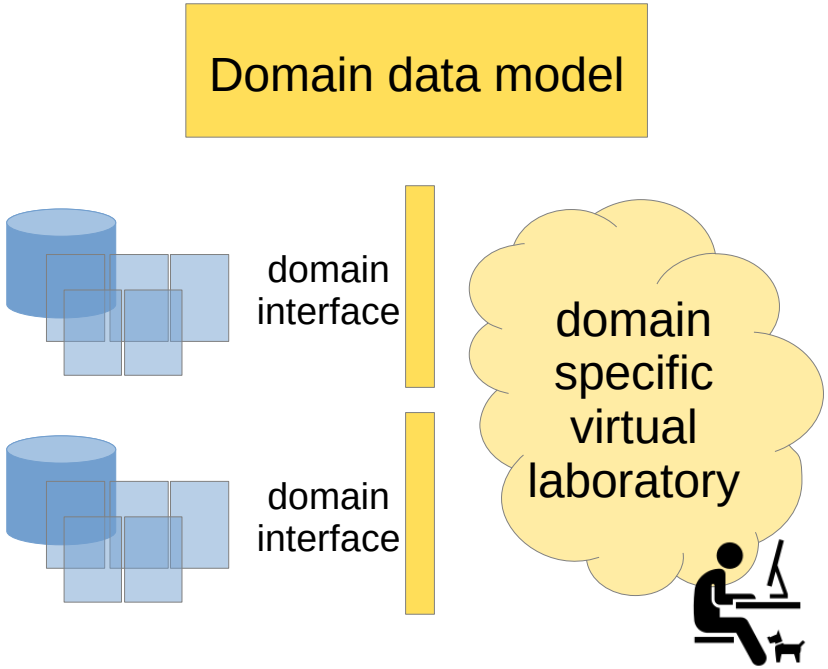
Could we do this for other domains ?

Could we create a generic toolkit for building *'virtual laboratories'* ?





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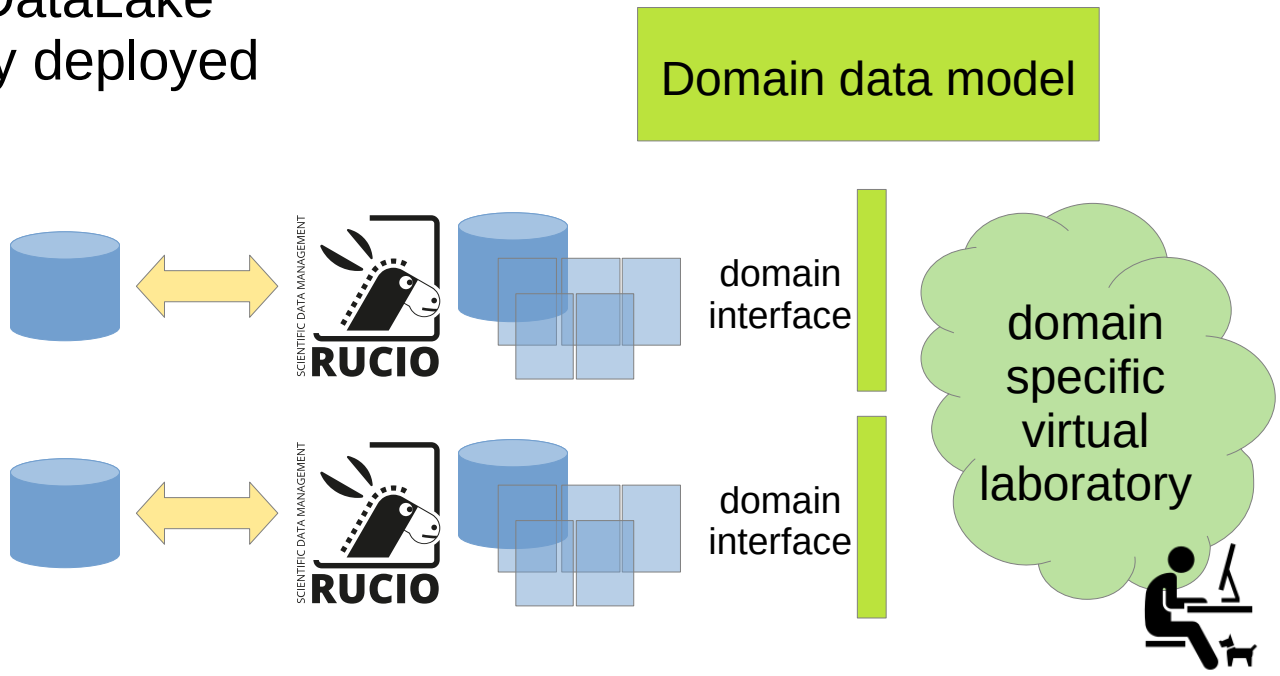
Why base it on Rucio ?

Success of the ESCAPE DataLake means Rucio will be widely deployed

Provides a common platform to build on

Extending something they already have lowers barrier to entry



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Why now ?

ESCAPE futures meeting in Brussels

ESCAPE
European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

Panel discussion with representatives from European Commission and EOSC

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Why now ?

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Word cloud of what they said

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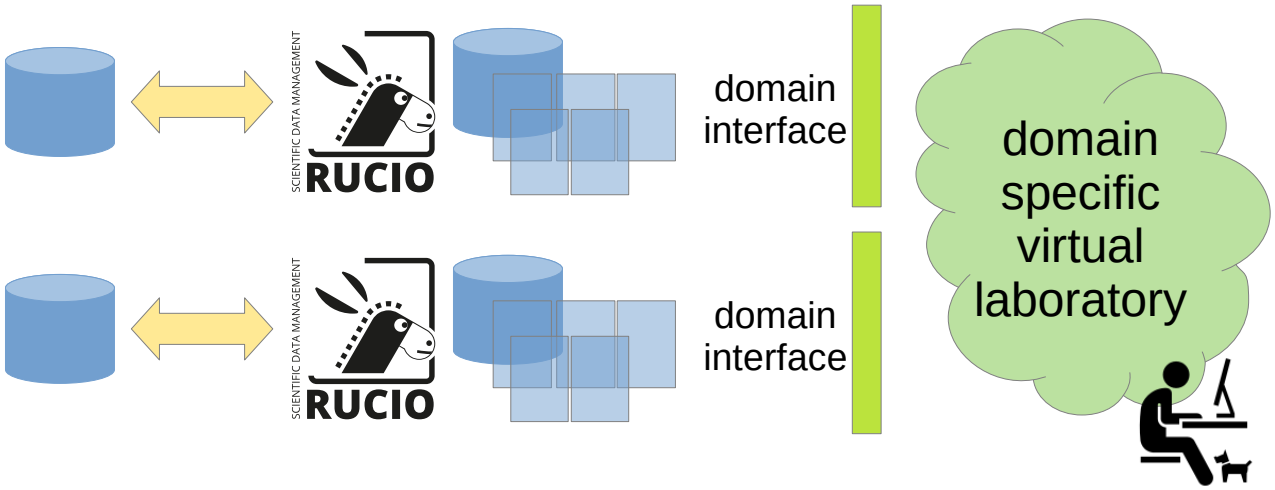
Toolkit for creating virtual laboratories

Based on Rucio metadata

Domain data model



Cross-domain

Multi-discipline

Interoperability

Words
More stuff
Other stuff
Metadata
Keywords

Interfaces based on IVOA services

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Thanks
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dmr@roe.ac.uk

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Example queries

Simple cone search, point (43,45) radius 3 deg

```
curl --get \
    --data 'RA=43' \
    --data 'DEC=45' \
    --data 'SR=3' \
    'http://vo.km3net.de/ant20_01/nu/cone/scs.xml'
```

IVOA Cone Search

https://ivoa.net/documents/cover/ConeSearch-20080222.html

https://github.com/hendhd/ivoa_newcomers/blob/main/IVOA_interop/pysrc/example2

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Example queries

ADQL query for first 5 rows of a dataset

```
curl --get \
    --data 'LANG=ADQL' \
    --data-urlencode 'query=SELECT TOP 5 * FROM ivoa.obscore' \
    'http://dc.zah.uni-heidelberg.de/tap/sync'
```

IVOA TableAccessProtocol

https://ivoa.net/documents/TAP/

https://github.com/hendhd/ivoa_newcomers/blob/main/IVOA_interop/pysrc/example1

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VOTable responses are self-describing

```
<FIELD ID="s_ra" datatype="double" name="s_ra" ucd="pos.eq.ra" unit="deg"
  utype="obscore:char.spatialaxis.coverage.location.coord.position2d.value2.c1">
  <DESCRIPTION>RA of (center of) observation, ICRS</DESCRIPTION>
</FIELD>
```

Humans never need to read this

Machines use this to understand the data

IVOA VOTable format

https://ivoa.net/documents/VOTable/

https://github.com/hendhd/ivoa_newcomers/blob/main/IVOA_interop/pysrc/example1/explain.md

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