

IVOA ExecutionPlanner

Data model and metadata schema

May 2022

Dave Morris, Edinburgh University







The problem – different compute platforms use different technologies

We end up having to understand all of them.















Which becomes more complex as the questions get more detailed.







The problem – different compute platforms use different technologies

Plugin architecture helps

notebooks

containers

virtual machines

Lipyter binder

Apache
Zeppelin

ESAP

Virtual machines

Virtual machines

Openstack.









Working with limited resources

Small task, large cloud Simple answer YES









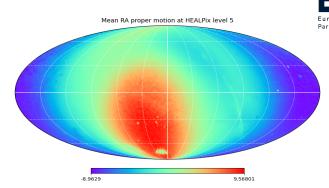
Working with limited resources

Big data, complex analysis

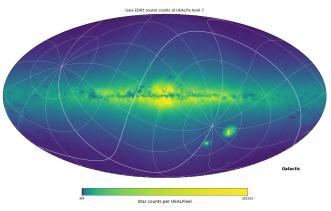


Gaia Data Mining Platform (Gaia DMp)

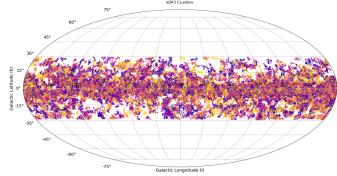
3.7 Tbytes of numerical dataZeppelin - 54 cores, 86G memorySpark - 6x 26 cores, 43G memory> 9hrs for a complex analysis



Mean proper motions, N. Hambly, 2022



Mean proper motions, N. Hambly, 2022



HDBSCAN Clustering, D. Crake, 2022

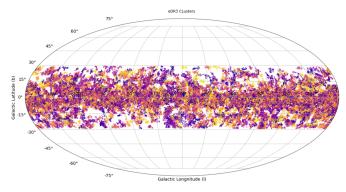




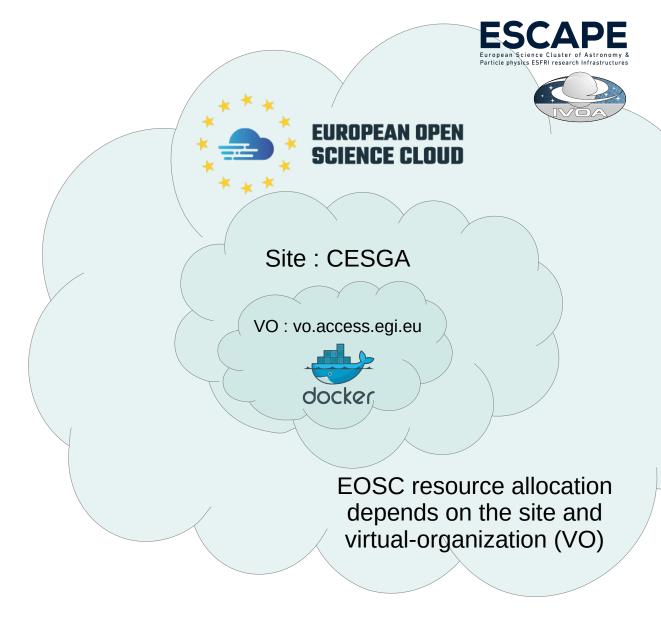
Working with limited resources

Large task, small allocation

Gaia DMp clustering notebook



3.7 Tbytes of numerical data54 cores, 86G memory9hrs for a complex analysis





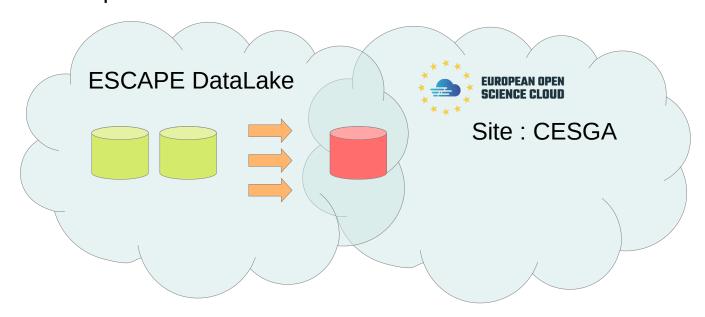
This notebook would not fit on this platform

This notebook would fail ~2hrs into the task





Working with large data Data and compute within ESCAPE



How do you know where the data is?
How do you know where the compute is?

How do you know how long staging will take?

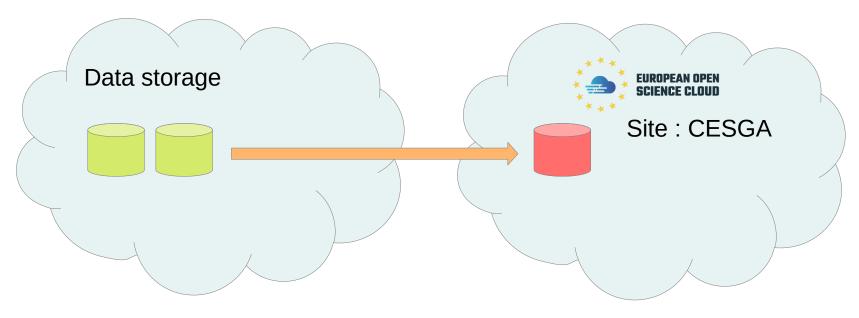






Working with large data

Data and/or compute outside ESCAPE



How do you know where the data is ?

How do you know where the compute is?

How do you know how long staging will take?

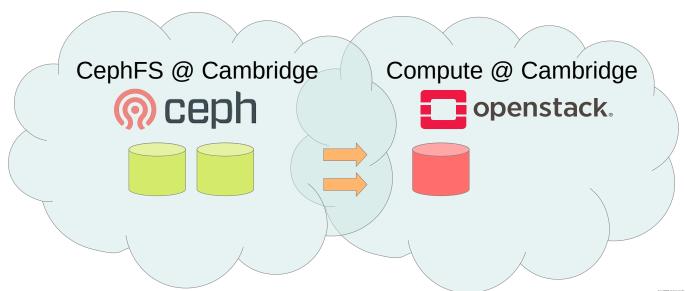






Working with large data

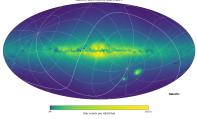
Data and compute within the same facility





Gaia Data Mining Platform (Gaia DMp)

3.7 Tbytes of numerical data several **hours** data transfer **within the same system**









Common language for describing things

Meeting all the use cases adds complexity

```
"type": "uri://docker-container",
  "task": {
    "image": "docker.io/example:1.0"
    }
  "data-resources": [
    ....
    ]
  "compute-resources": [
    ....
    ]
  "storage-resources": [
    ....
    ]
```

New sections added to the schema

Based on ESAP and GaiaDMp use cases







Common language for describing things

Meeting all the use cases adds complexity

Lower the barrier to entry by making details optional

```
simple

{
    "type": "uri://docker-container",
    "task": {
        "image": "docker.io/mycontainer"
      }
}
```

```
complex
{
  "type": "uri://docker-container",
  "task": {
      "image": "docker.io/mycontainer"
      }
  "data-resources": [ .... ]
  "compute-resources": [ .... ]
  "storage-resources": [ .... ]
}
```





Common language for describing things

Meeting all the use cases adds complexity

Lower the barrier to entry by making details optional

Flexible vocabulary is not a problem

Customer: Can I buy an <apple>

Bakery: No, we are a <bakery>, we only sell

 bread>.

Customer: Can I buy an <apple>

Grocery: Yes, we can offer <5> different varieties of <apple>.

Bakery does not need to understand anything about <fruit>.







Common language for describing things

Meeting all the use cases adds complexity

Lower the barrier to entry by making details optional

Adding more detail is not a problem

Customer: Can I buy an <iPad> with <64G memory> and <5G network>

Bakery: No, we are a <bakery>, we only sell

 bread>.

Customer: Can I buy an <iPad> with <64G memory> and <5G network>

GameStop: Yes, we can offer 2 different configurations.

Bakery does not need to understand what <Gbytes> are.







User interface display and edit

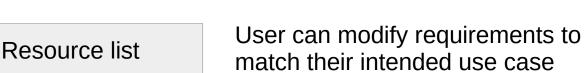
ESAP

OSSR metadata

Execution platform







ESCAPE

European Science Cluster of Astronomy & Particle physics ESFRI research Infrastructures

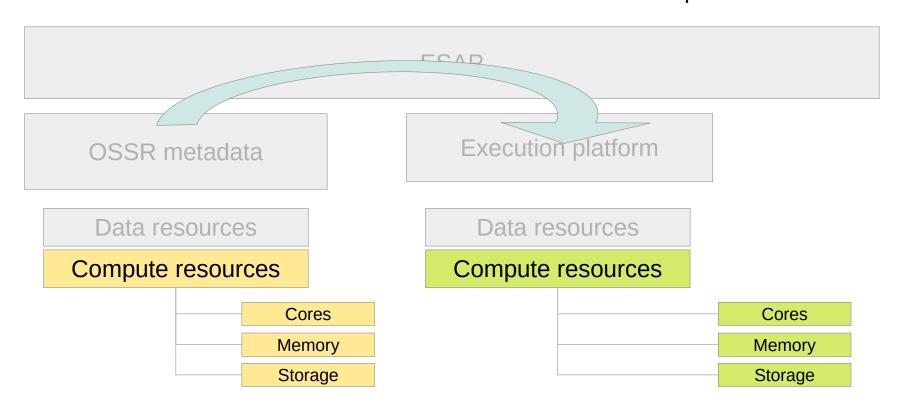
Cores

Memory

Storage

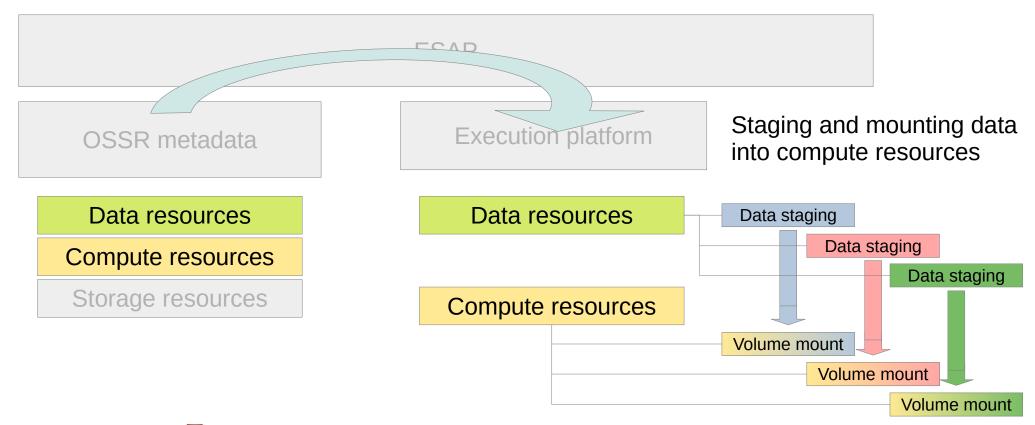
Increase requirements to give themselves more space

Decrease requirements to be able to run on more platforms













Example image processing notebook.



Requires images and calibration data Data located in shopping cart

Basic task description

```
{
"type": "https://purl.org/esap.escape.eu/task-type/binder-notebook",
"description": "A notebook that applies a set of calibration data to a set of images.",
"task": {
    "repository": {
        "type": "gitlab",
        "url": "https://gitlab.in2p3.fr//..."
      },
      "path": "calibrator.ipynb"
    }
    How do we do
```

How do we do authentication for protected repositories?





Example image processing notebook.



Requires images and calibration data Data located in shopping cart

```
Image data
  "data-resources": [
     "uuid": "b77cc829-ac12-43b5-9dbe-48cfa727d14c",
     "type": "urn:data-reference",
     "description": "The image data to be processed.",
     "data-type": "https://purl.org/esap.escape.eu/data-type/optical-images",
     "mime-type": "image/fits"
```





Edinburgh University

Example image processing notebook.



Requires images and calibration data Data located in shopping cart

```
Image data
       "data-resources": [
         "uuid": "b77cc829-ac12-43b5-9dbe-48cfa727d14c",
         "type": "urn:data-reference",
         "description": "The image data to be processed.",
         "data-type": "https://purl.org/esap.escape.eu/data-type/optical-images",
         "mime-type": "image/fits",
         "location":{
          "type": "https://purl.org/esap.escape.eu/data-location/shopping-cart",
          "uuid": "9620d56c-eea1-4b98-aa85-ca5c7e439178",
          "href": "https://sdc-dev.astron.nl/shopping-cart/9620d56c-eea1-4b98-aa85-ca5c7e439178"
D.Morris<sub>1</sub>
Institute for Astronomy,
```