



# ESCAPE

European Science Cluster of Astronomy &  
Particle physics ESFRI research Infrastructures

## IVOA ExecutionPlanner

November 2022

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The problem – different compute platforms use different technologies

We end up having to understand all of them.



EUROPEAN OPEN  
SCIENCE CLOUD



Which becomes more complex as the questions get more detailed.



The problem depends on scale  
Working with (UN)limited resources  
Tiny task, huge cloud  
Simple answer  
YES



The problem depends on scale

Working with limited resources

Big data, complex analysis



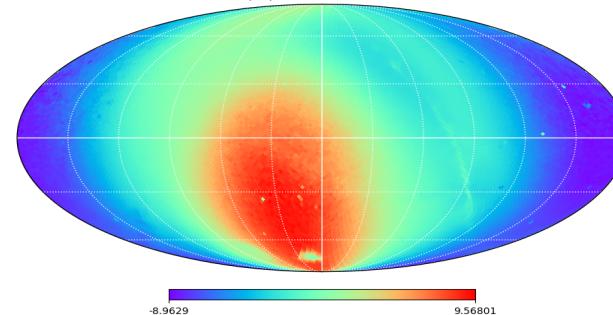
Gaia Data Mining Platform (Gaia DMP)

8 Tbytes of data

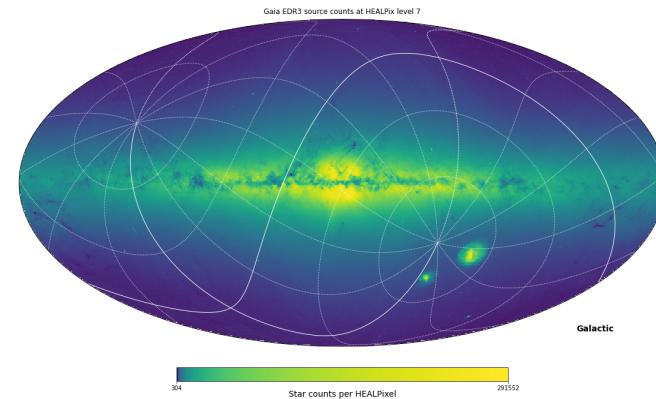
200 cores, 350G memory

> 9hrs for a complex analysis

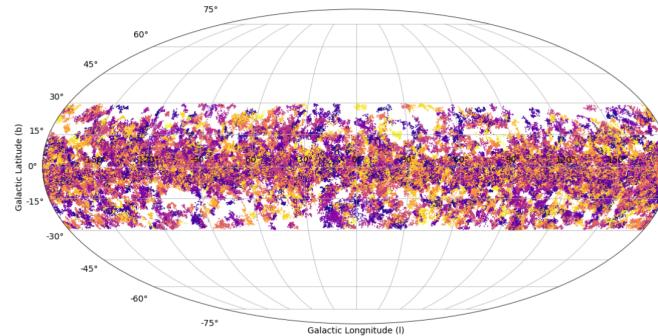
Mean RA proper motion at HEALPix level 5



Mean proper motions, N. Hambly, 2022



Mean proper motions, N. Hambly, 2022



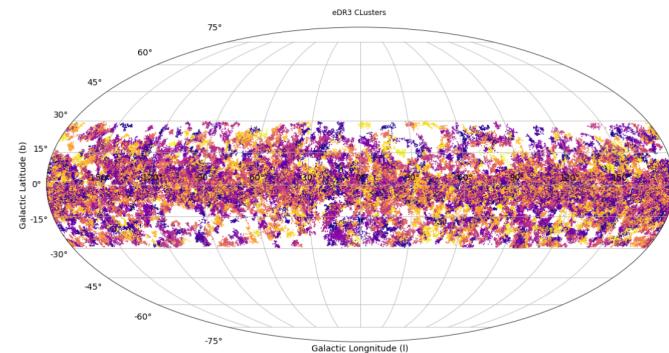
HDBSCAN Clustering, D. Crake, 2022



EOSC resource allocation depends on the site and virtual-organization (VO)

Working with limited resources  
Large task, small allocation

Gaia DMp clustering notebook



8 Tbytes of data  
200 cores, 350G memory  
> 9hrs for a complex analysis

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Site : CESGA

VO : vo.access.egi.eu

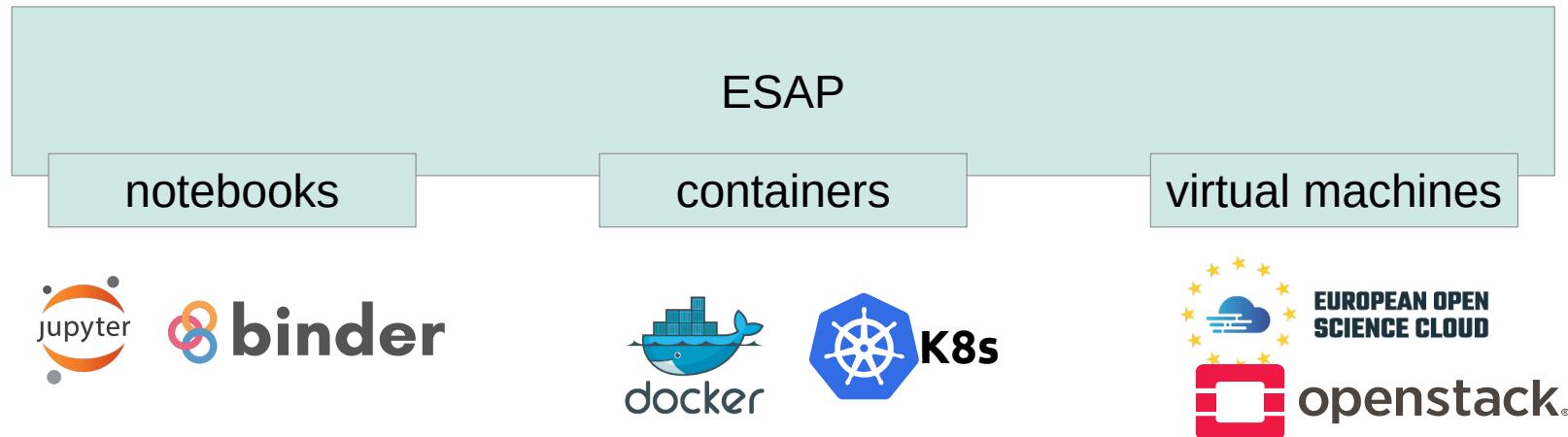


**Limited resource allocation**

**The analysis would not fit in the resources available to this VO.**

**The notebook would fail ~2hrs into the task**

ESAP has components capable of executing different types of task.



ESAP itself has two layers, the client app and the back-end web service .

ESAP – React client

ESAP – Django web service

notebooks



containers



virtual machines



Sometimes the capabilities overlap and more than one platform can run a particular type of task

ESAP – React client

ESAP – Django web service

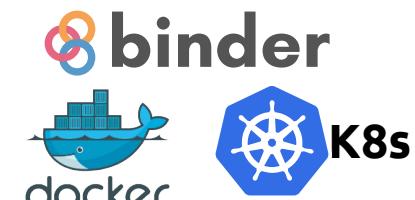
platform #23

platform #44

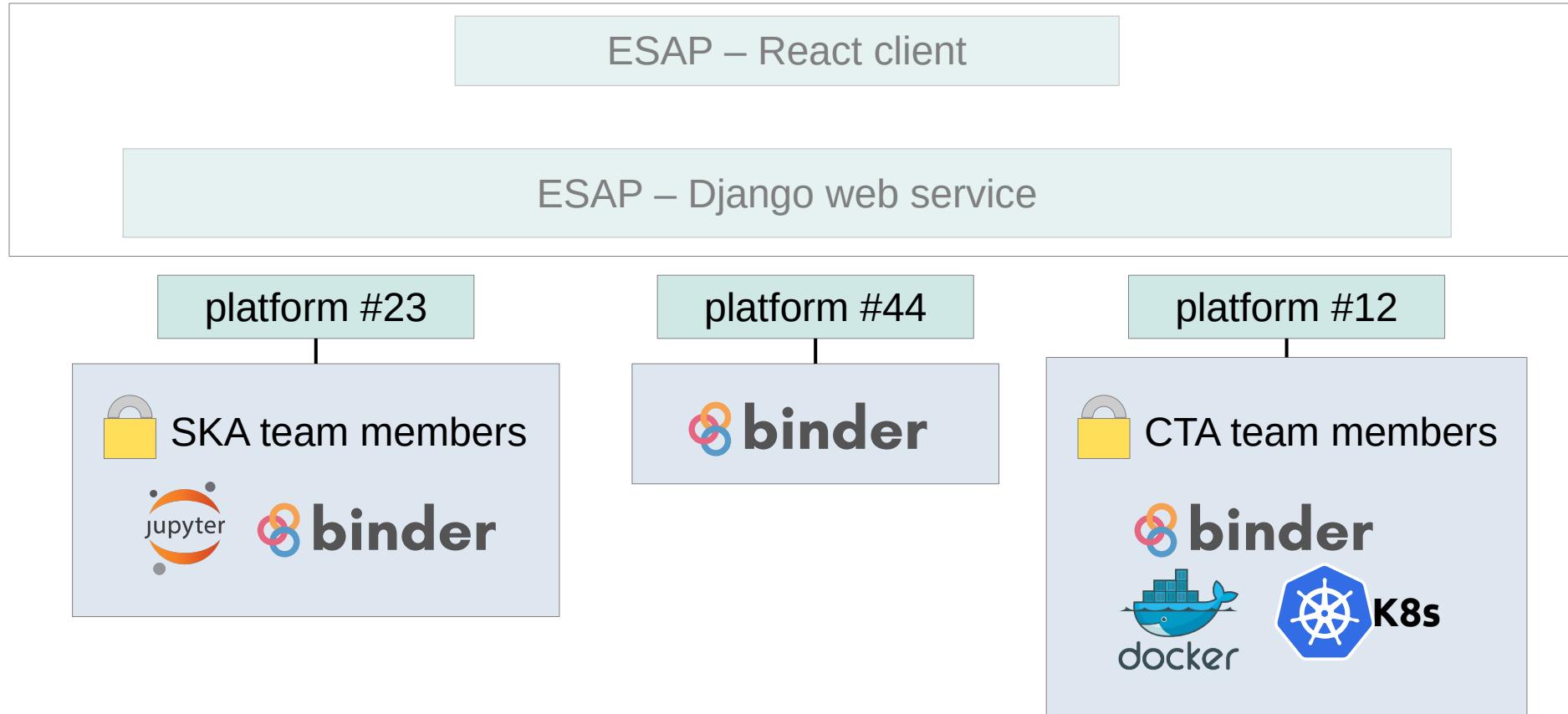
platform #12



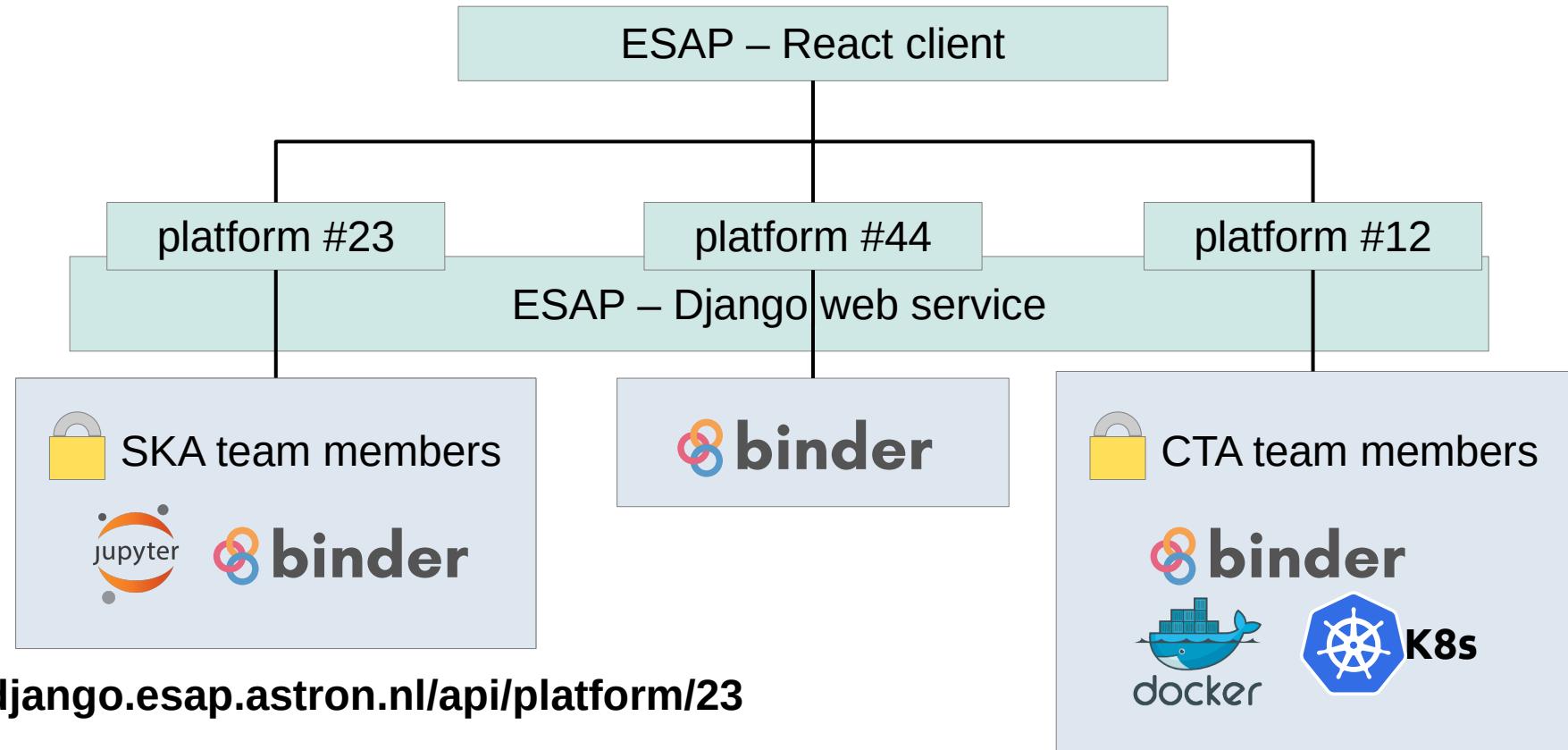
binder



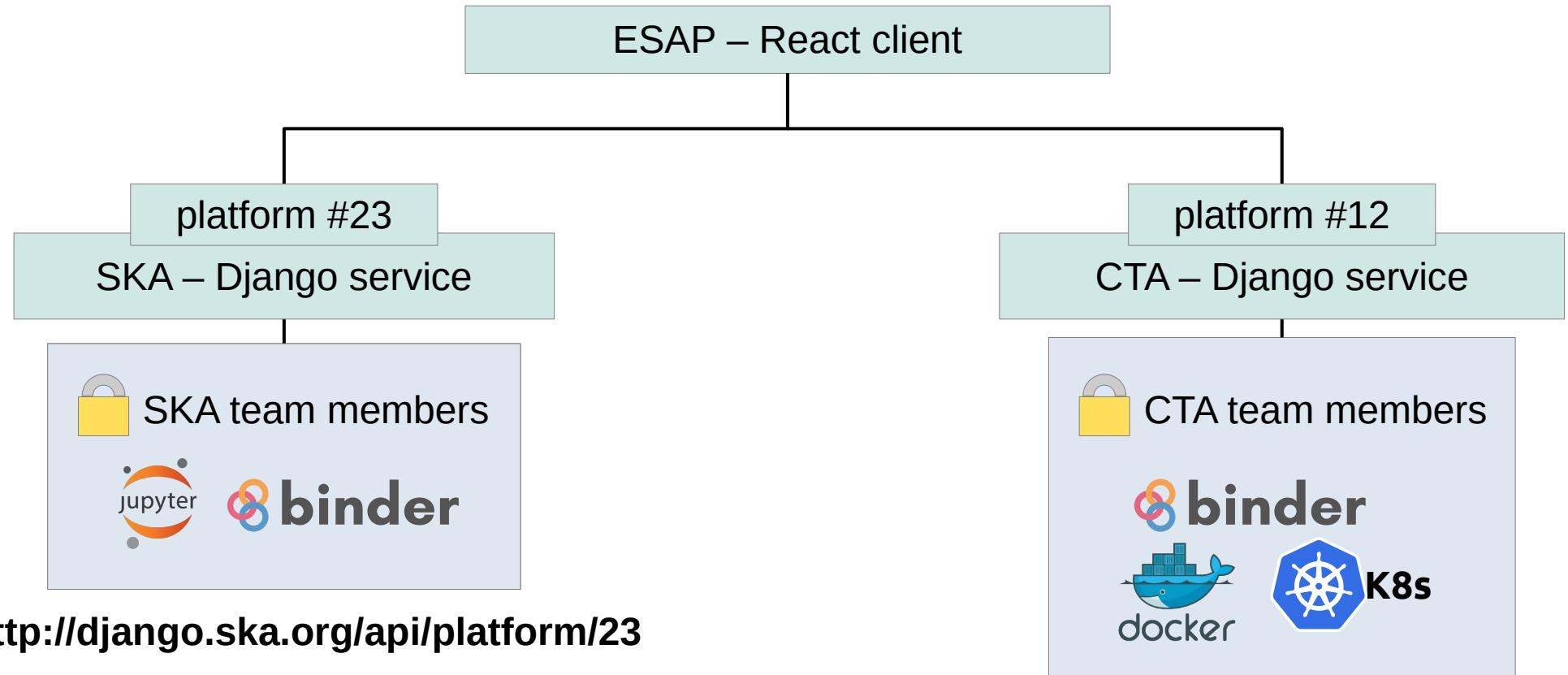
Sometimes the capabilities depend on the resources allocated to a user account



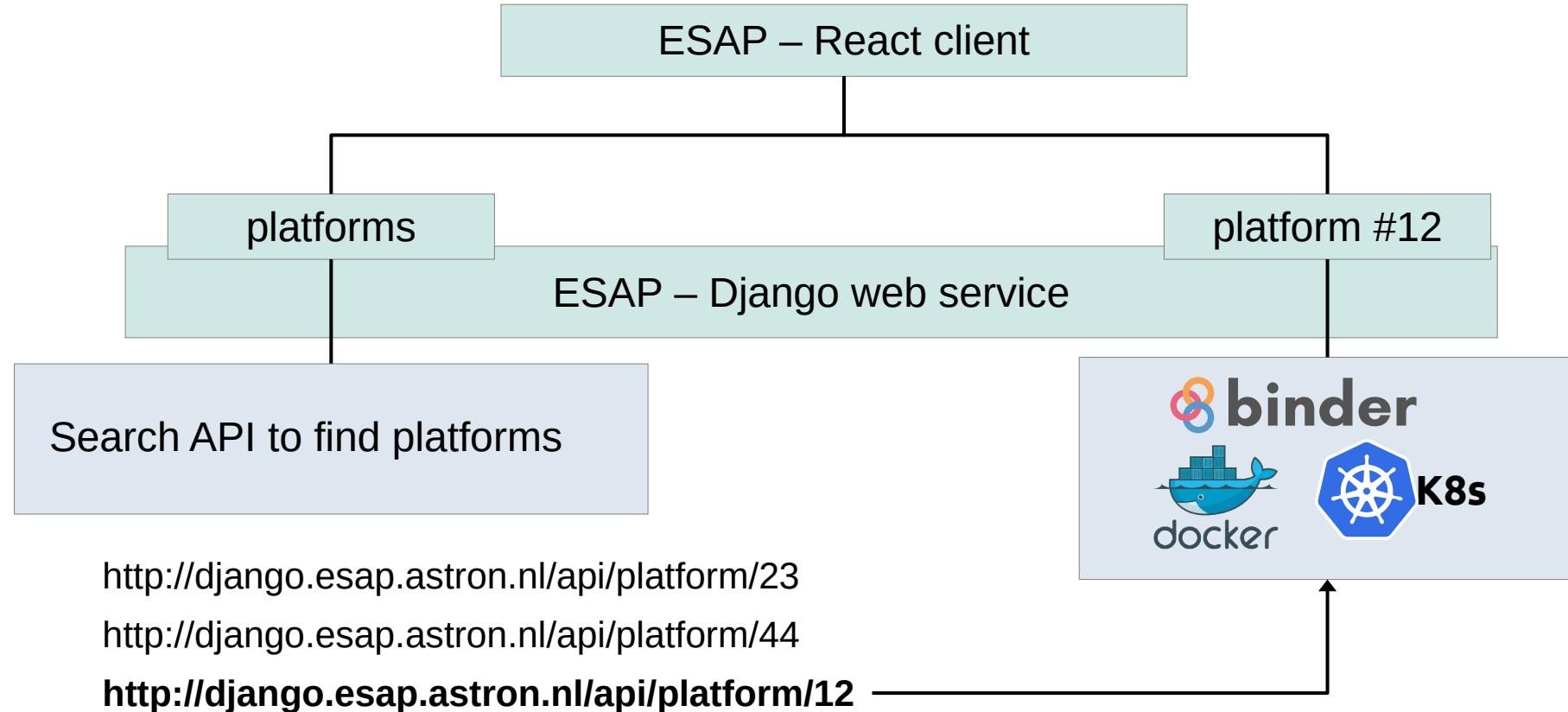
Django web service implements the API for each platform



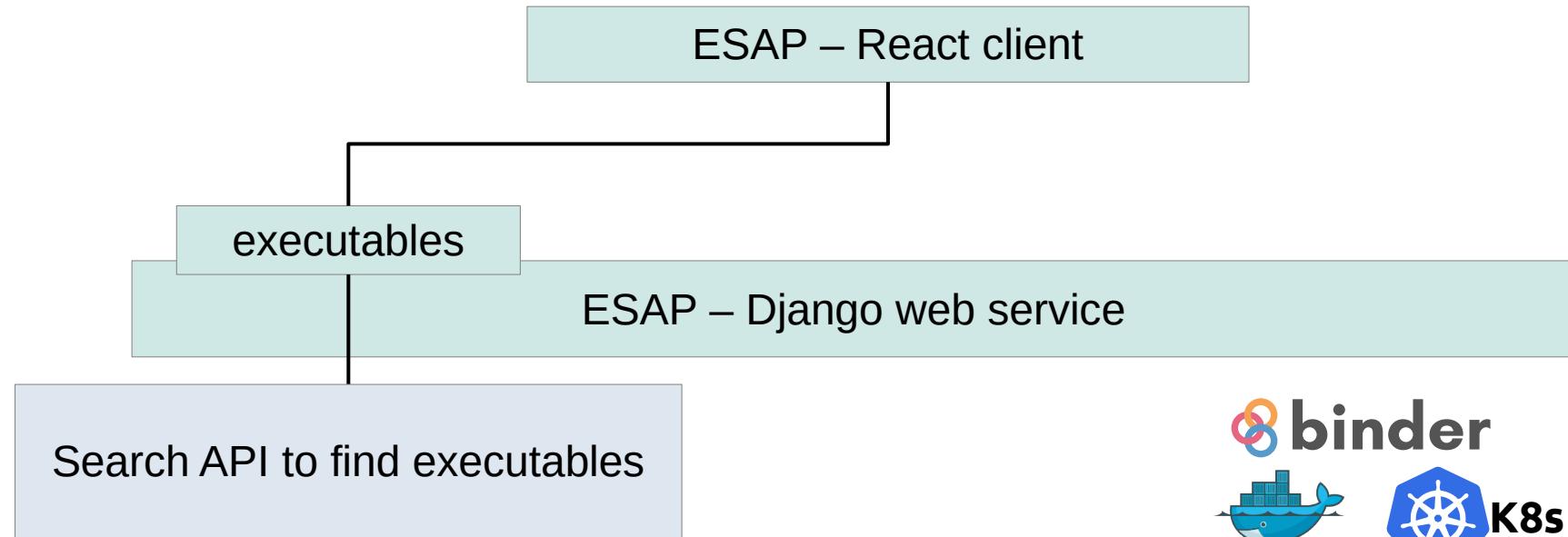
It doesn't need to be the SAME Django web service for each platform



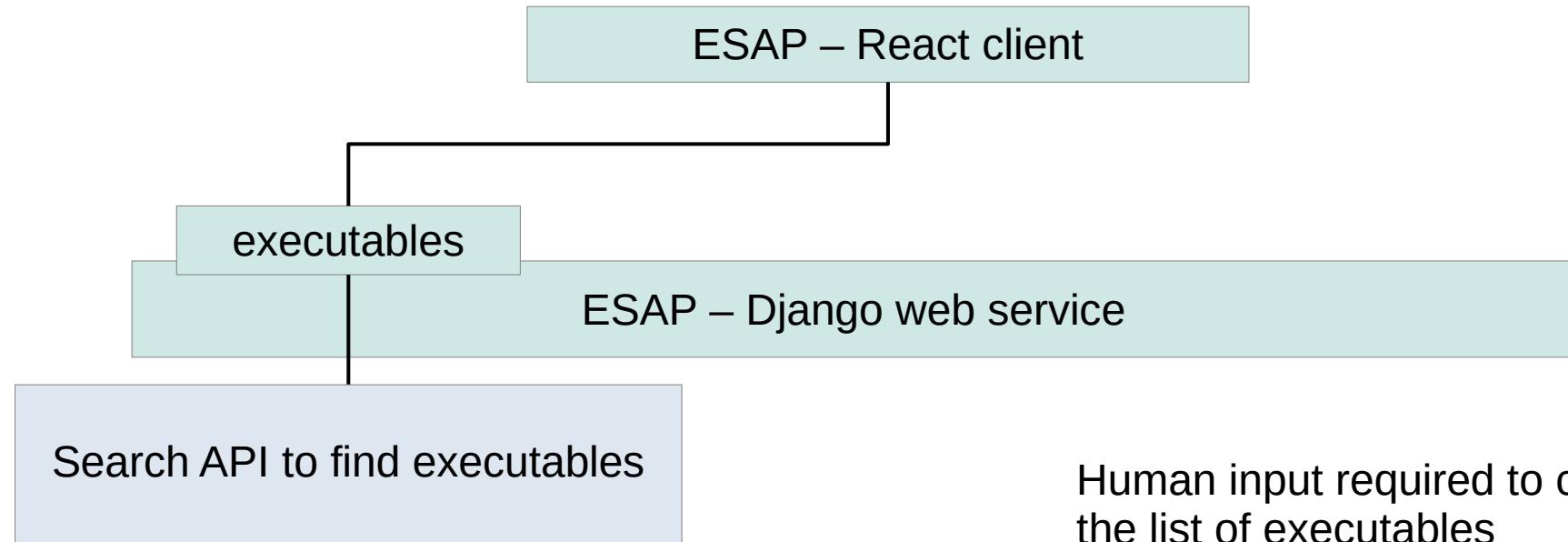
Django web service provides lists of platforms



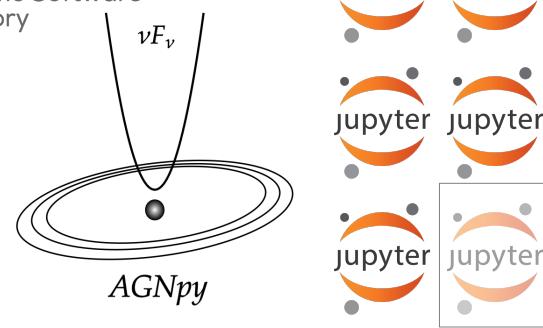
Django web service provides lists of executables (notebooks, containers etc.)



One Zenodo entry may contain multiple executables (notebooks, containers etc.)



Open-source Scientific Software  
and Service Repository



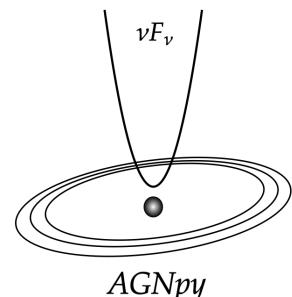
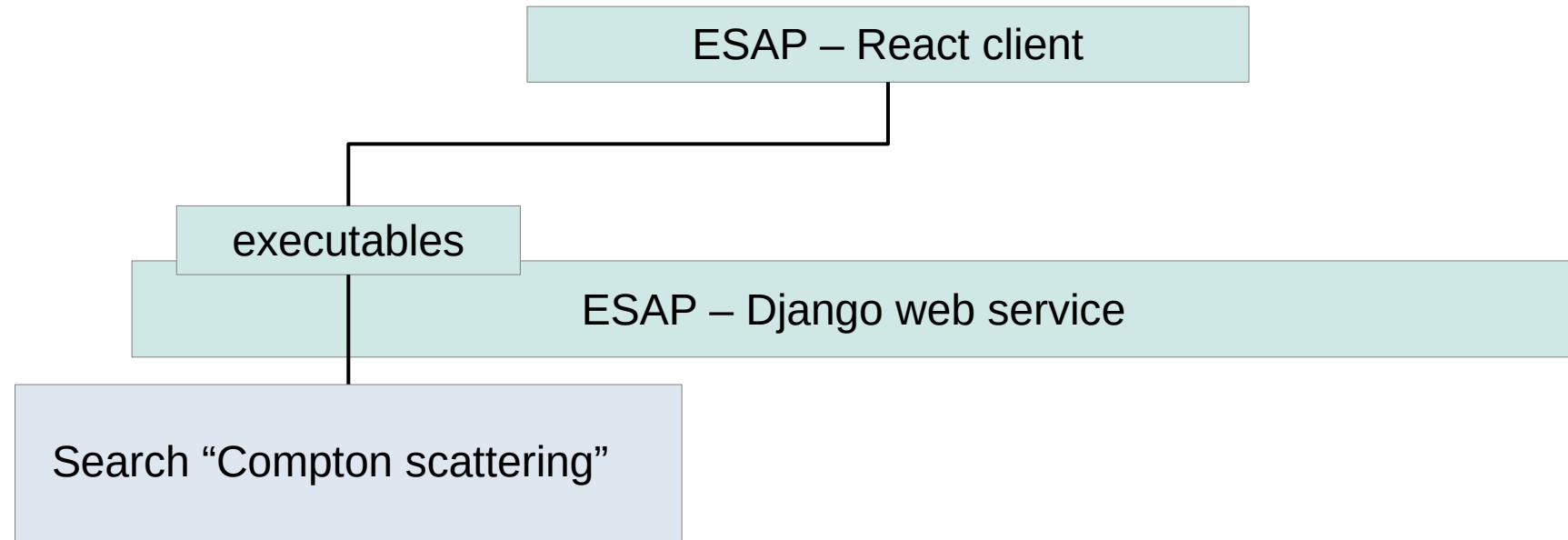
Human input required to curate  
the list of executables

Git repo for AGNpy library  
has 10 tutorial notebooks

Each notebook addresses a  
specific science case

The same repo also contains  
several experimental notebooks

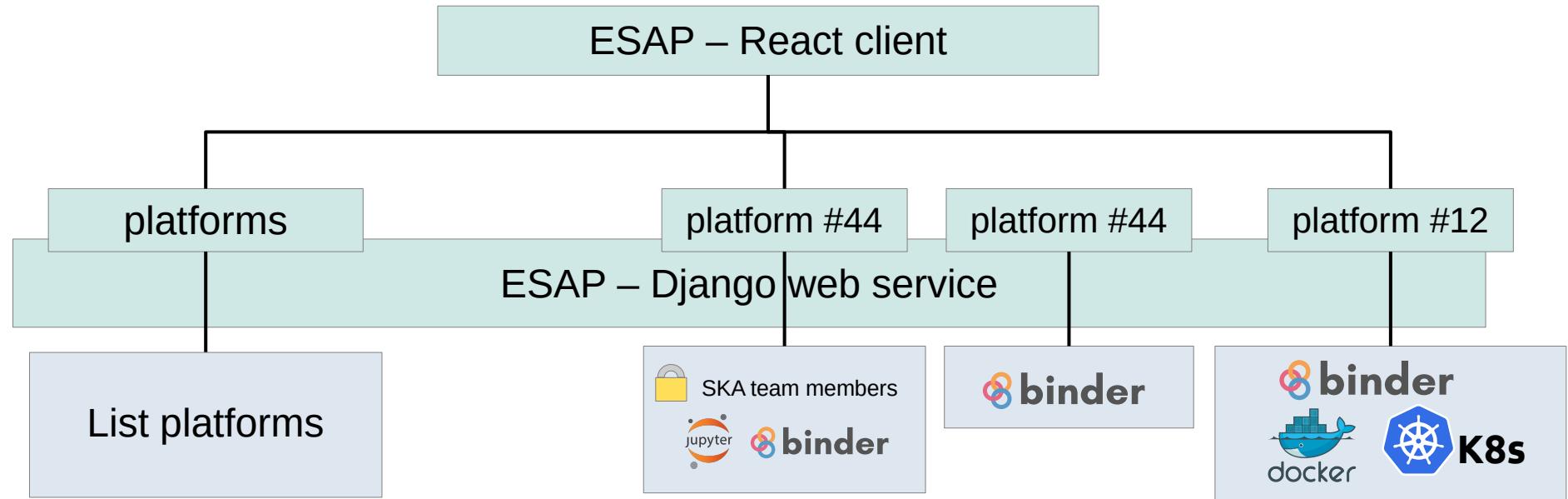
Search the executables by science description



AGNpy - External Compton scattering

*In this tutorial we will show how to compute the Spectral Energy Distribution produced by Compton scattering by the blob electrons of three different photon targets: a Shakura Sunyaev accretion disk, a Broad Line region represented as a spherical shell and a Dust Torus represented as a simple ring.*

Iterate the list of platforms, and ask “can I do this ?”

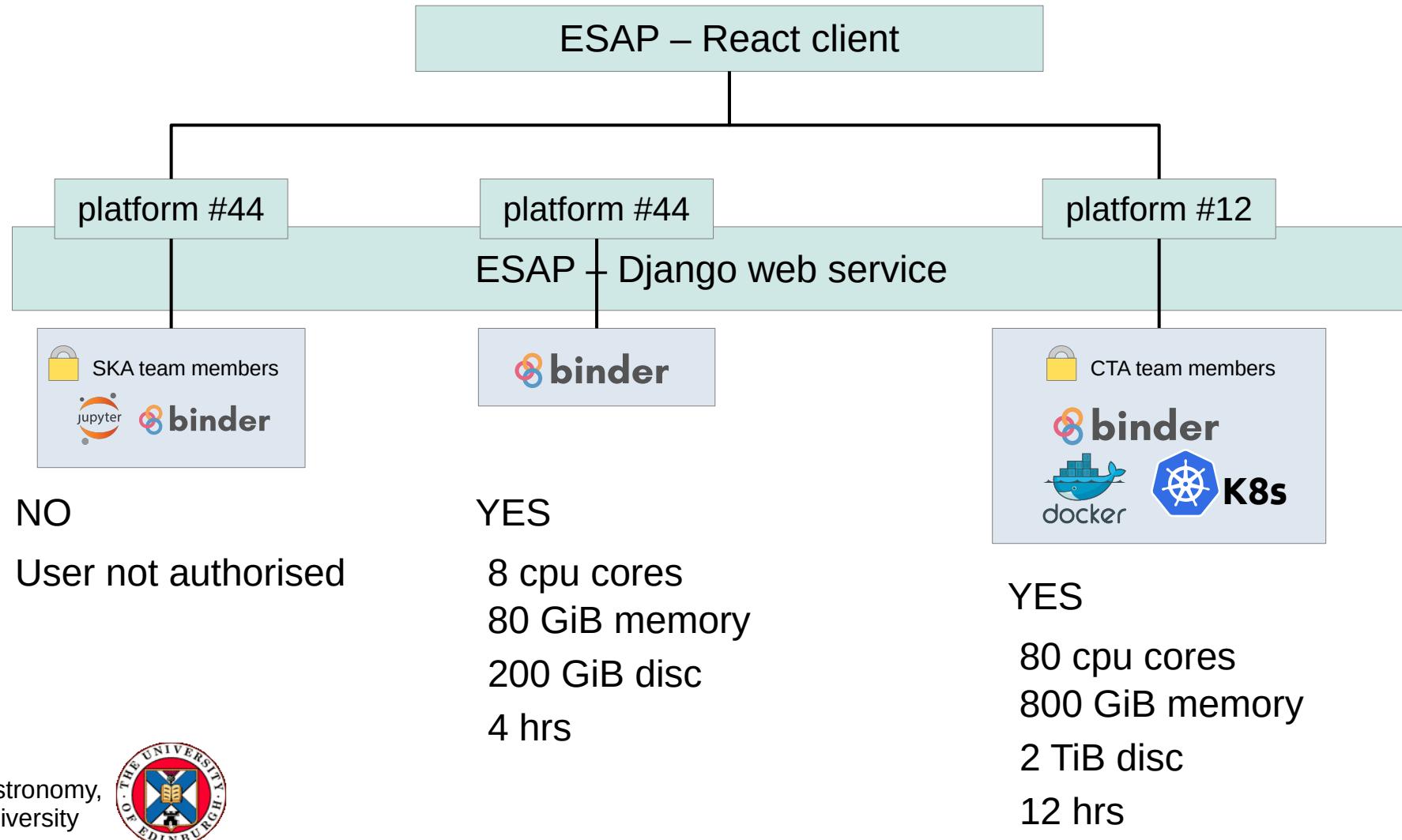


<http://django.esap.astron.nl/api/platform/23>

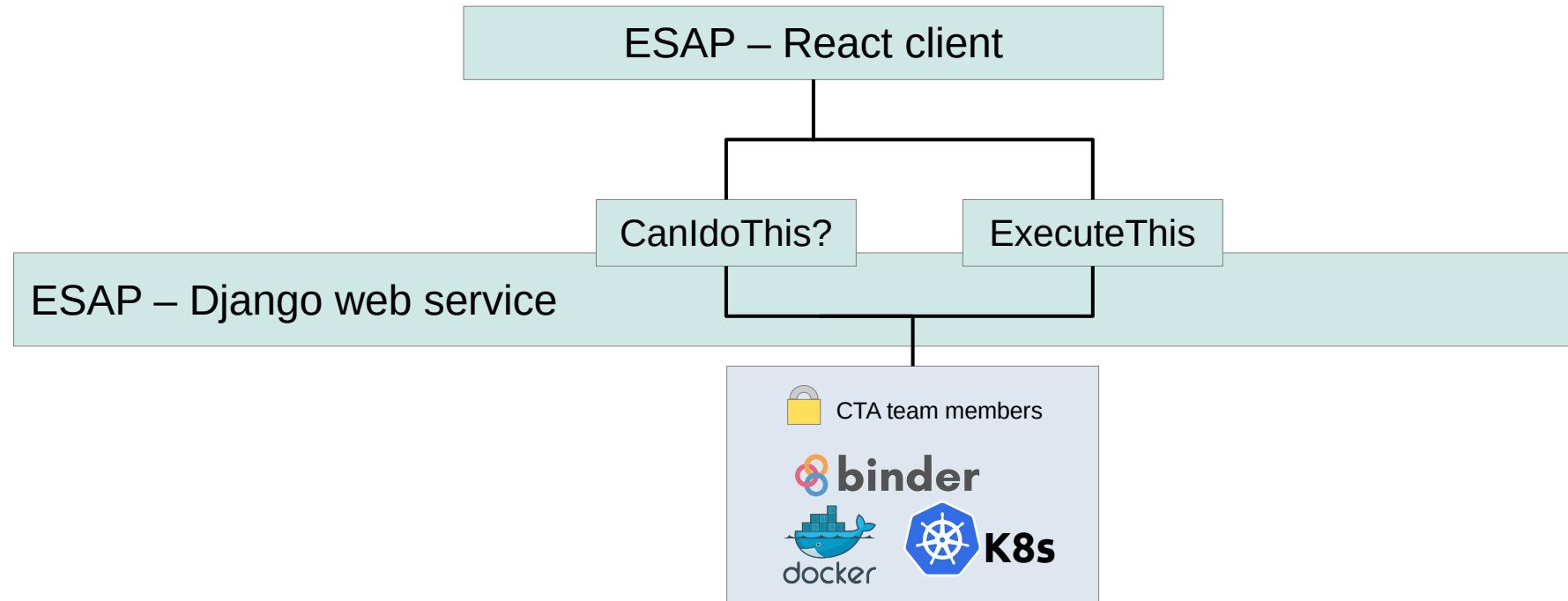
<http://django.esap.astron.nl/api/platform/44>

**<http://django.esap.astron.nl/api/platform/12>**

Platforms respond with an “offer” of resources to execute the task



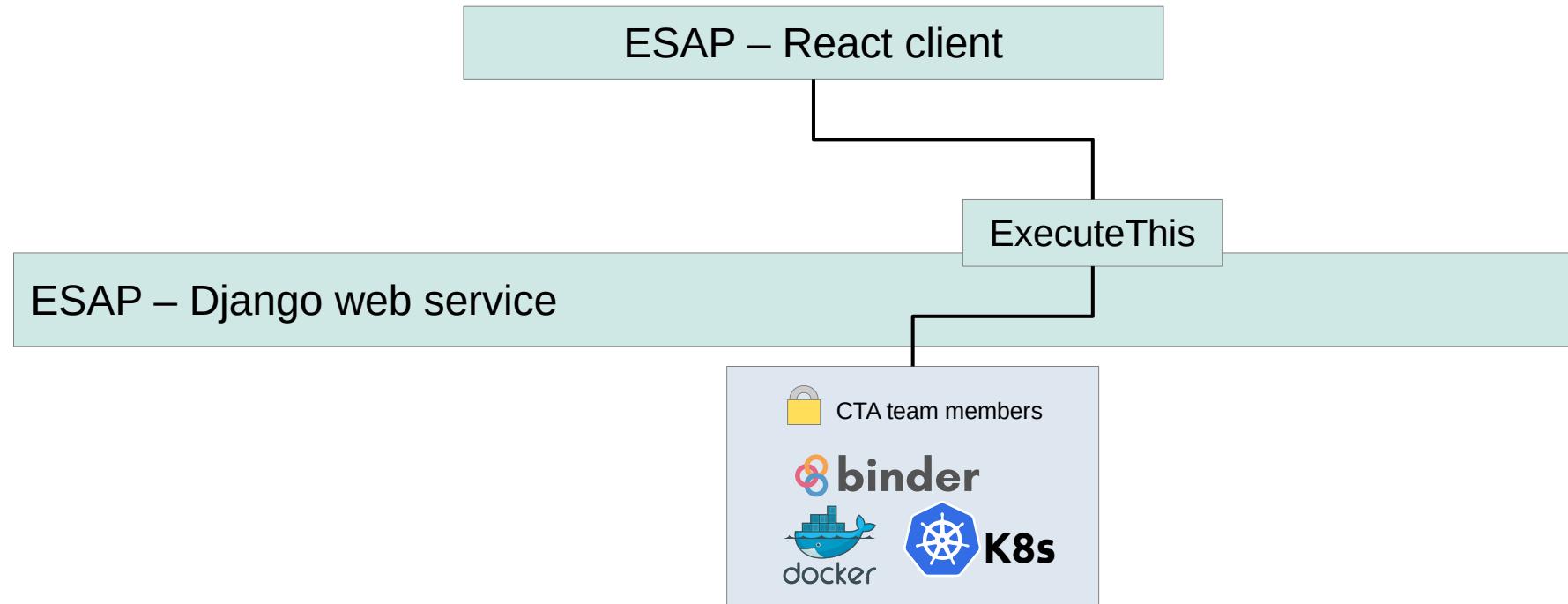
User chooses which “offer” they want to use and sends the task for execution



YES

80 cpu cores  
800 GiB memory  
2 TiB disc  
12 hrs

“executeThis” webservice API based on IVOA UWS interface



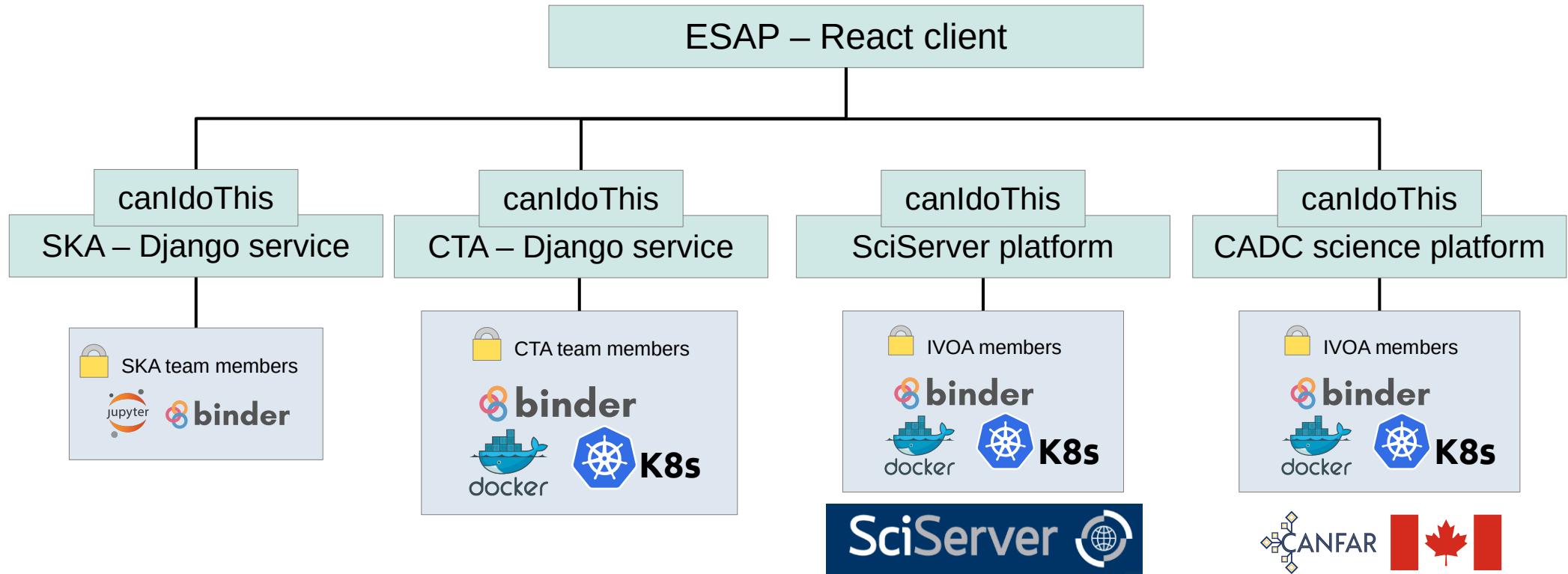
UWS interface

POST the task description

UWS configures the platform to run the task

UWS response contains redirect URL

Using standard interfaces allows us to inter-operate with external platforms



List of platforms generated from the IVOA registry