



ESCape

European Science Cluster of Astronomy &
Particle physics ESFRI research Infrastructures

I/OA ExecutionPlanner

November 2022

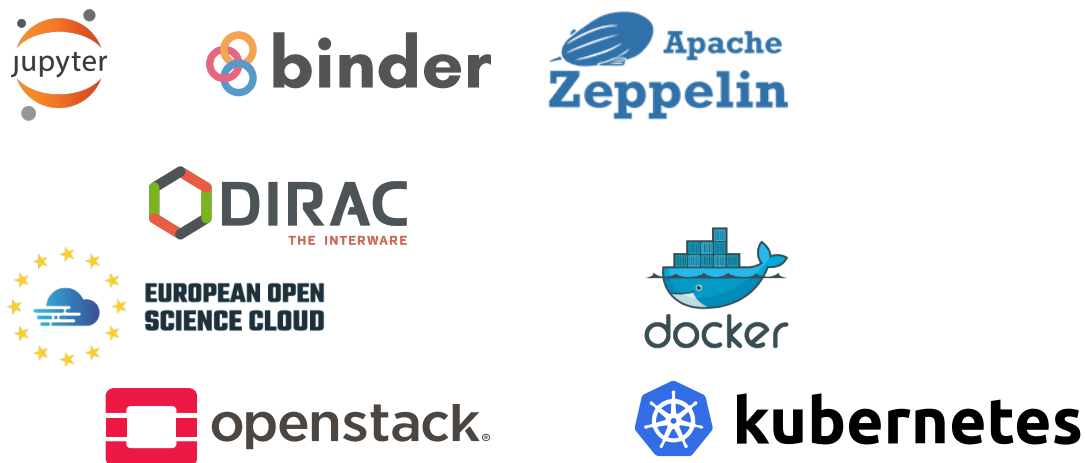
Dave Morris, Edinburgh University

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.



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 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



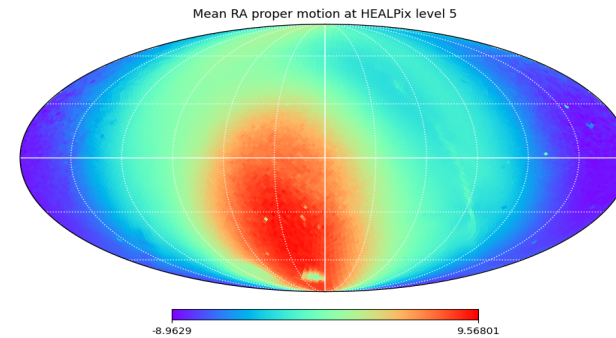
gaia

Gaia Data Mining Platform (Gaia DMP)

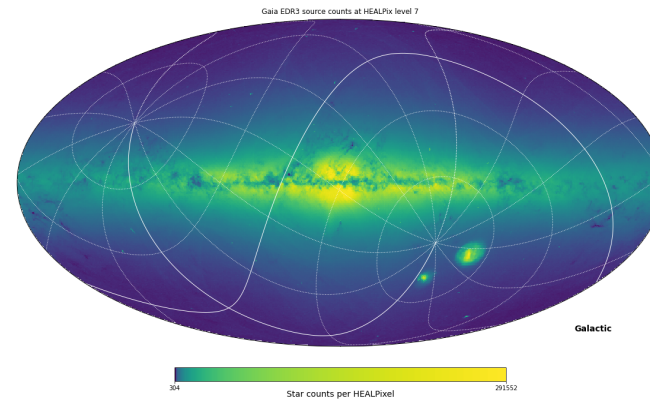
8 Tbytes of data

200 cores, 350G memory

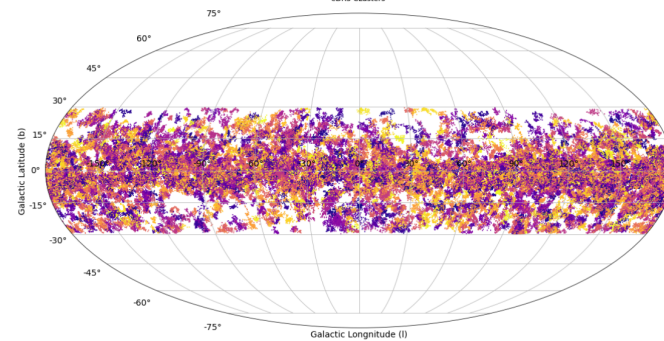
> 9hrs for a complex analysis



Mean proper motions, N. Hambly, 2022



Mean proper motions, N. Hambly, 2022



HDBSCAN Clustering, D. Crake, 2022



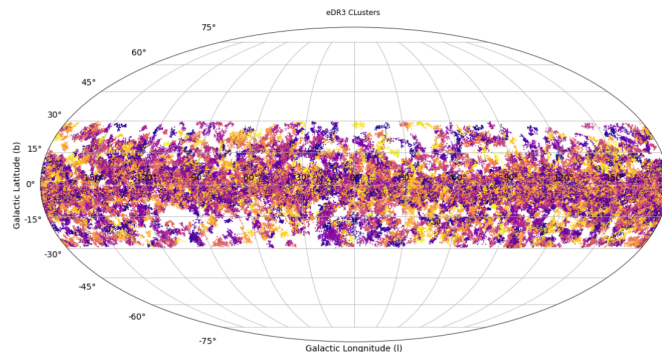
EOSC resource allocation
depends on the site and
virtual-organization (VO)



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



**EUROPEAN OPEN
SCIENCE CLOUD**

Site : CESGA

VO : vo.access.egi.eu

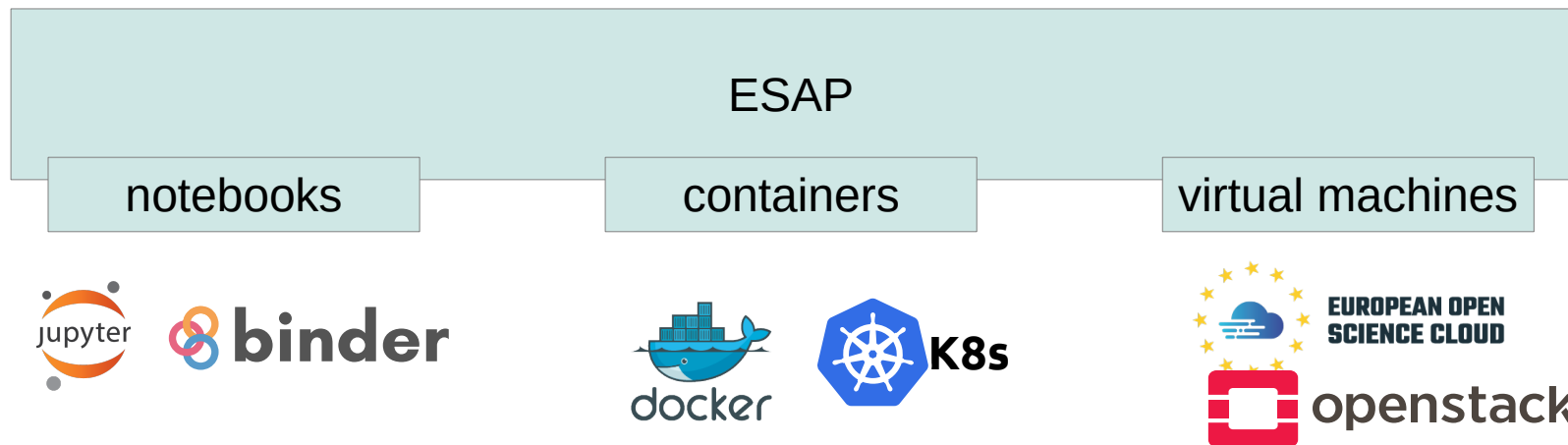


**Limited
resource
allocation**

**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



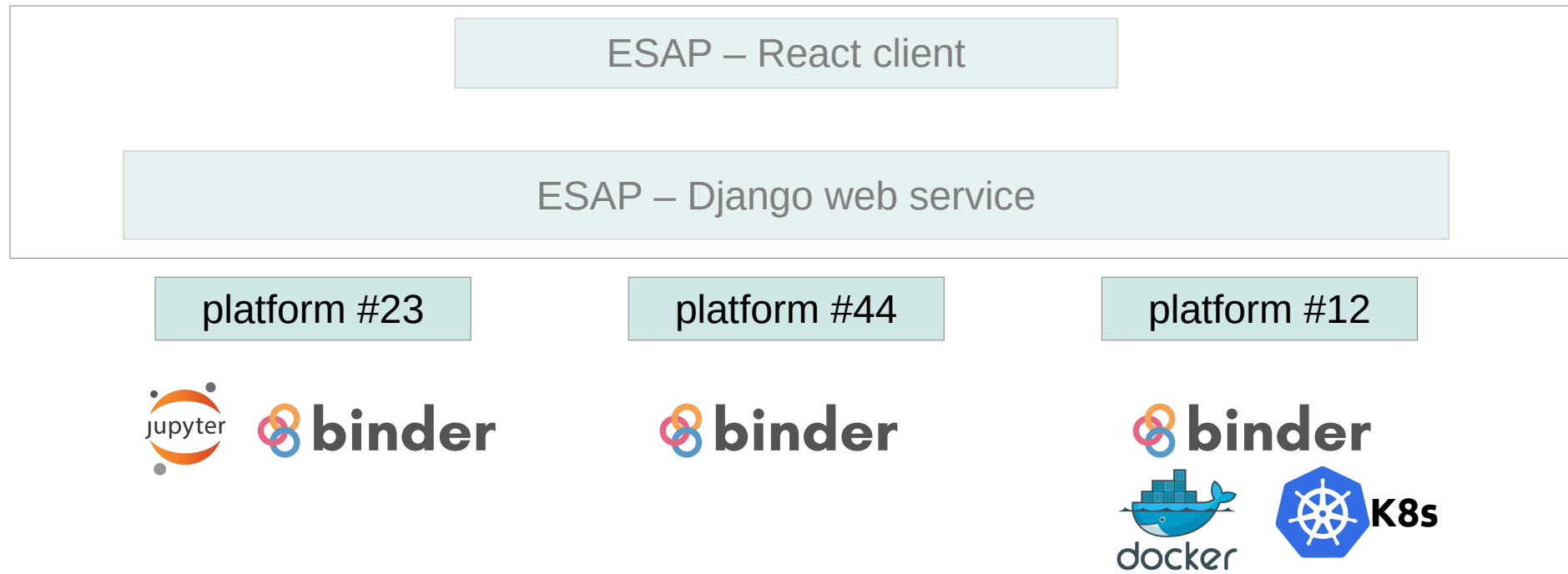
containers



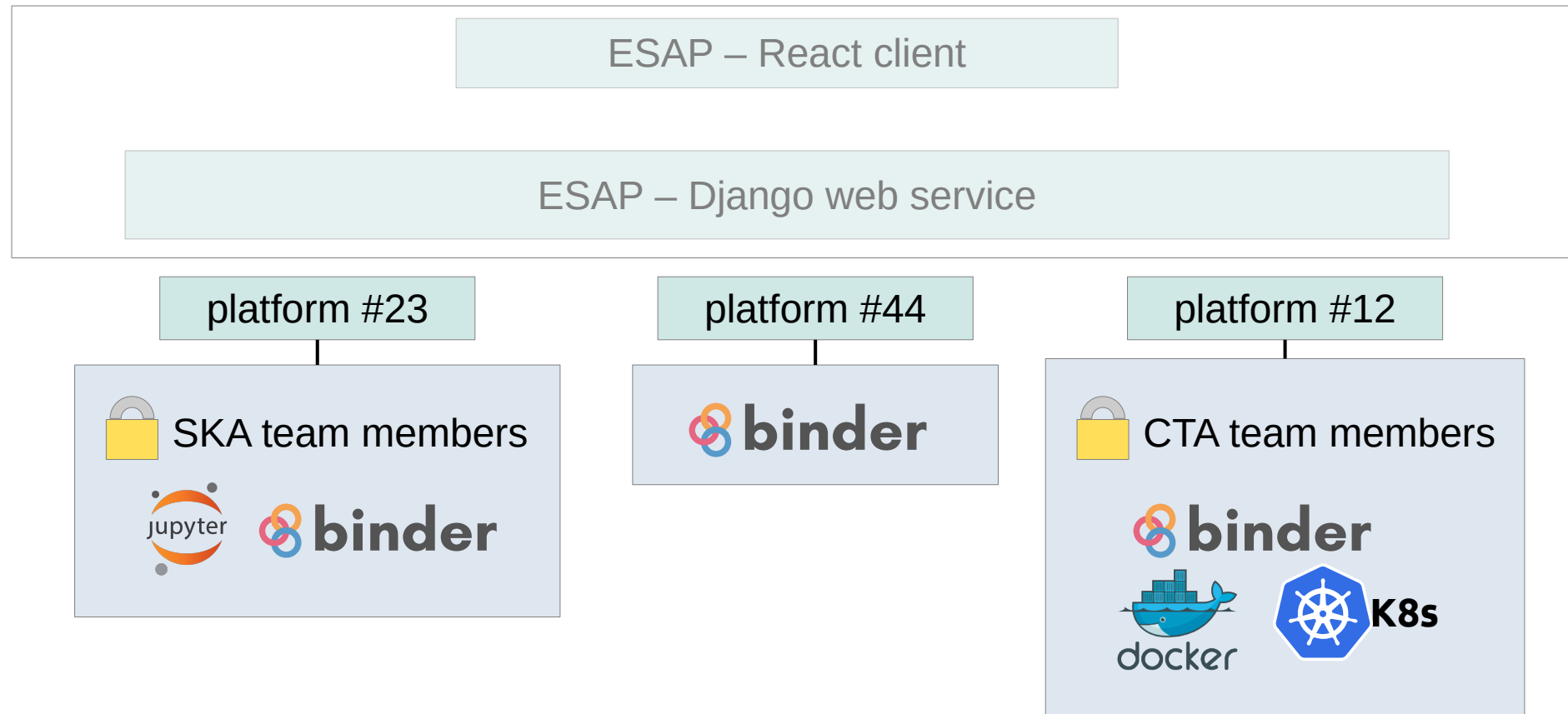
virtual machines



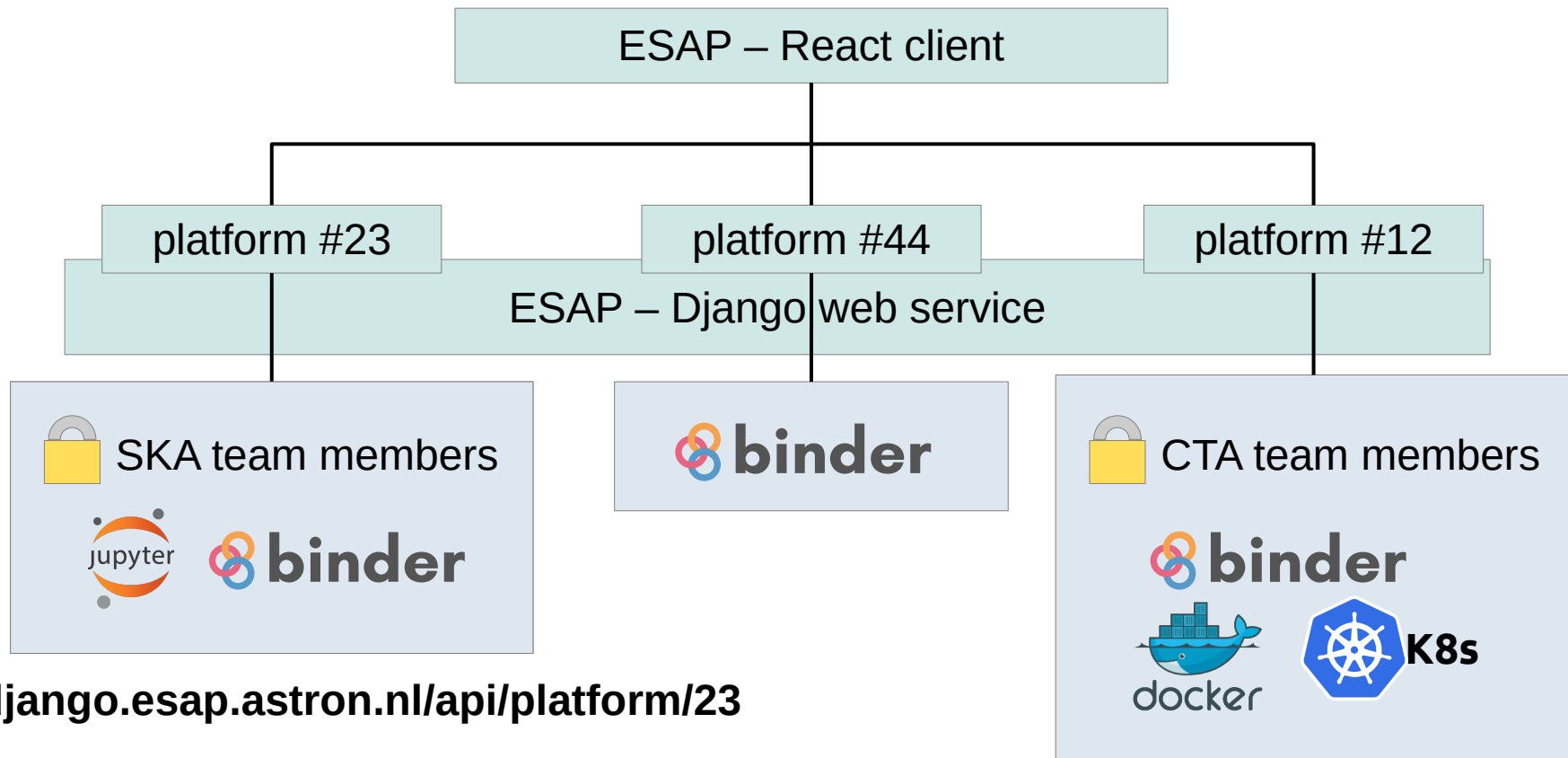
Sometimes the capabilities overlap and more than one platform can run a particular type of task



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



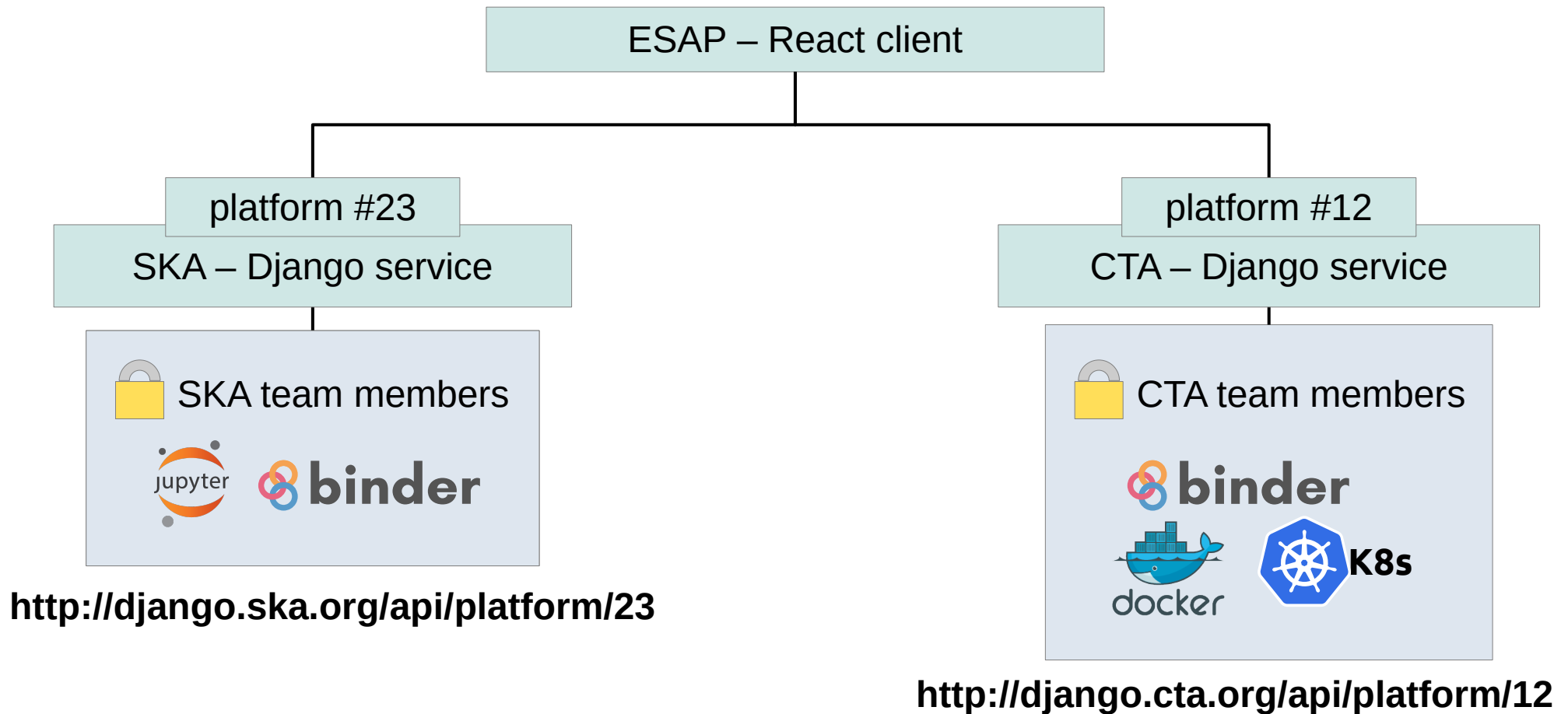
Django web service implements the API for each platform



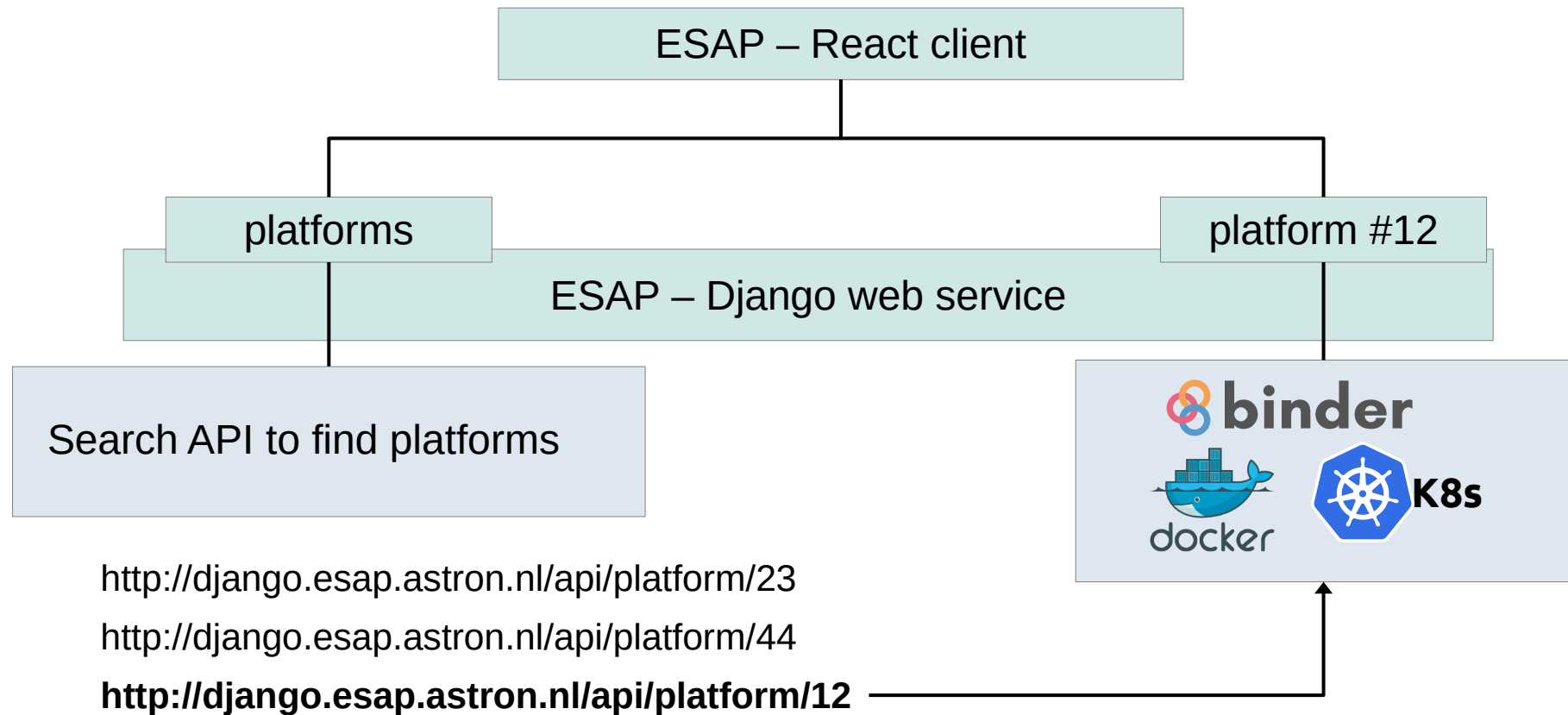
<http://django.esap.astron.nl/api/platform/23>

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

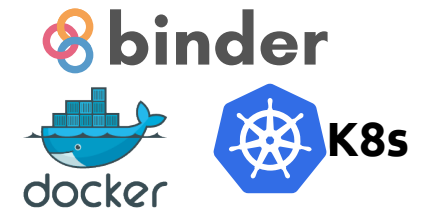
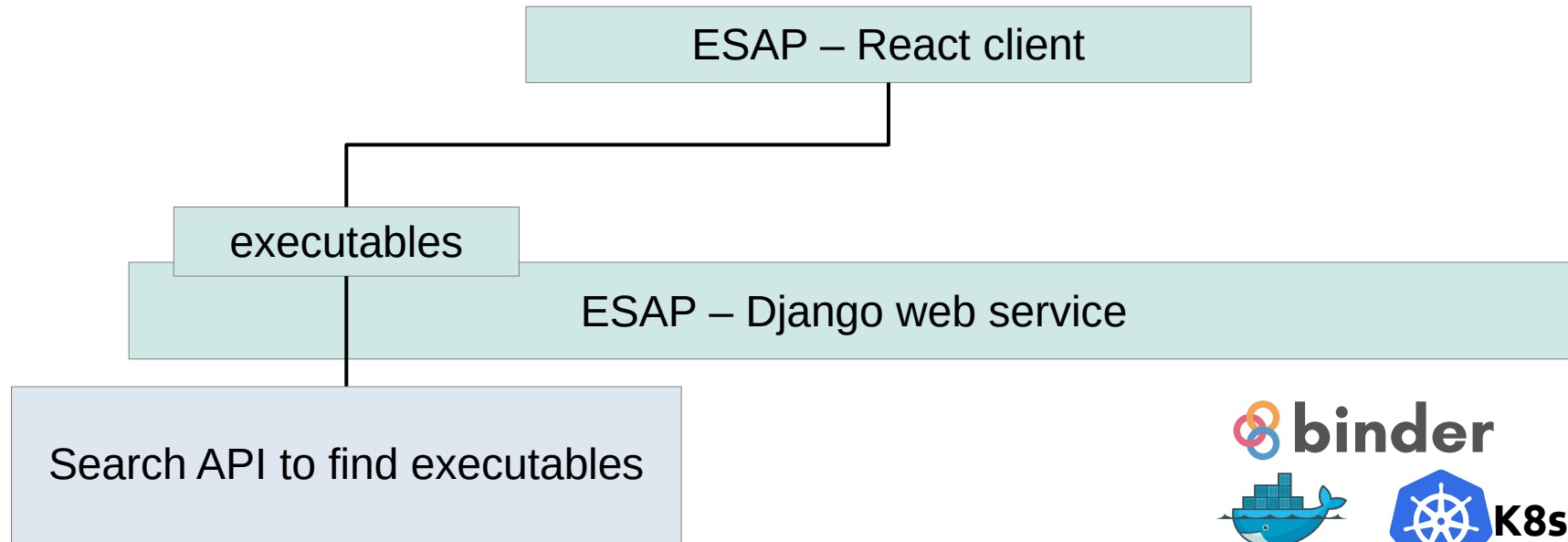
It doesn't need to be the SAME Django web service for each platform



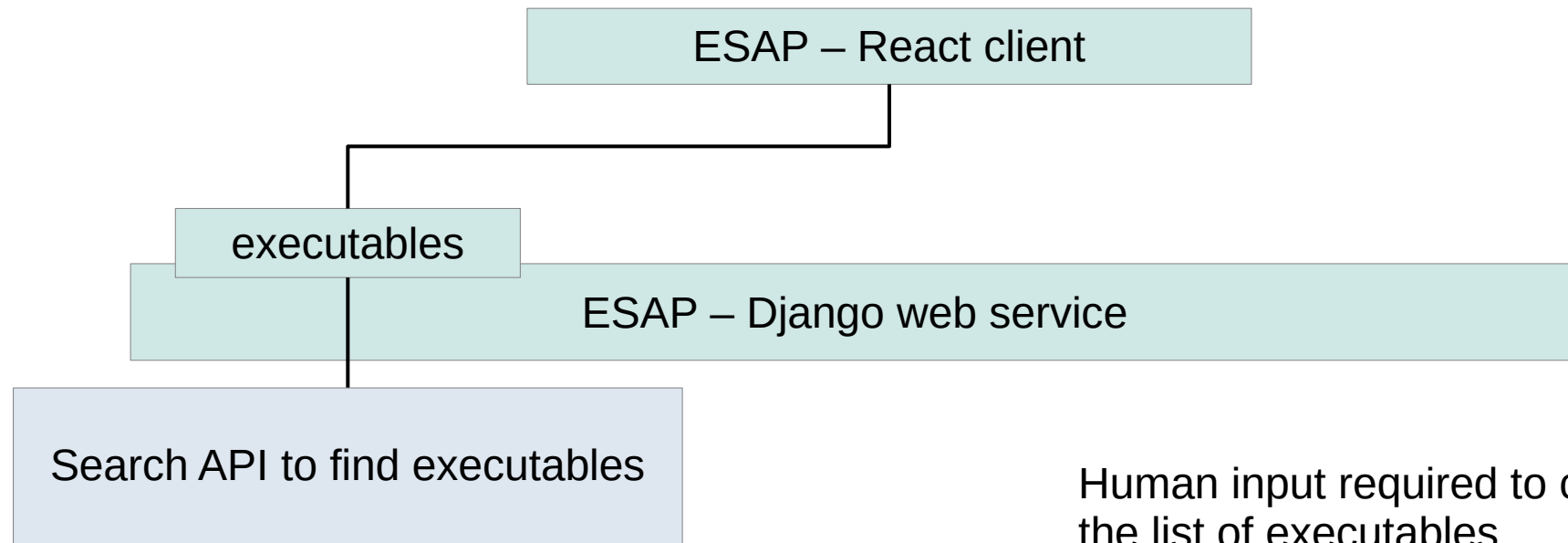
Django web service provides lists of platforms



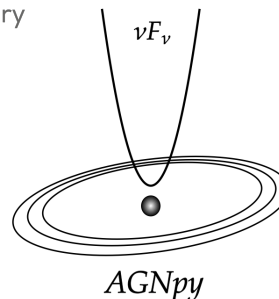
Django web service provides lists of executables (notebooks, containers etc.)



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



Human input required to curate the list of executables

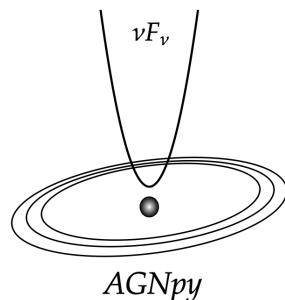
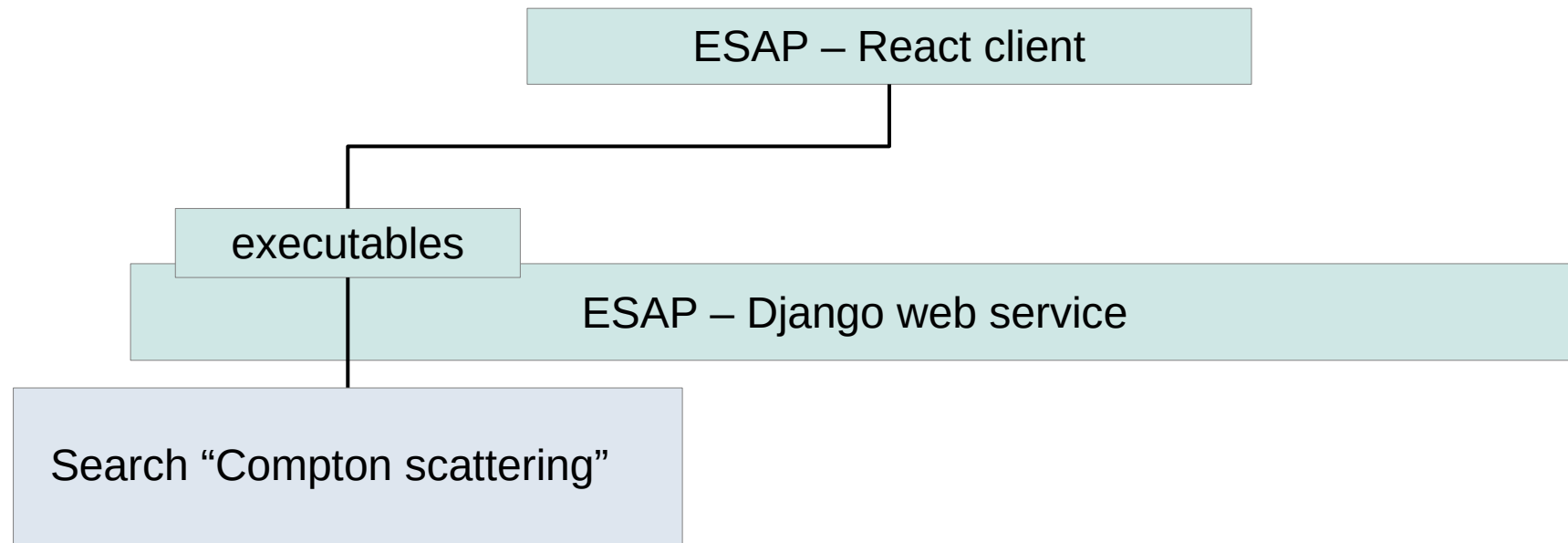


Git repo for AGNpy library has 10 tutorial notebooks

Each notebook addresses a specific science case

The same repo also contains several experimental notebooks

Search the executables by science description

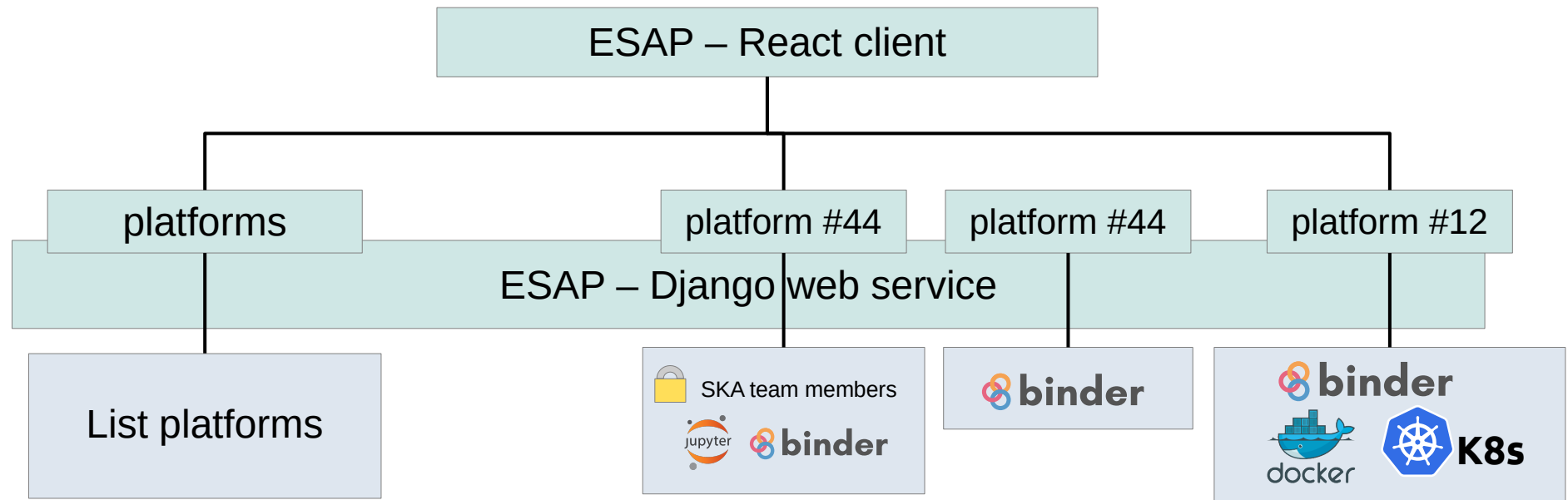


AGNpy - External Compton scattering

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 ?”



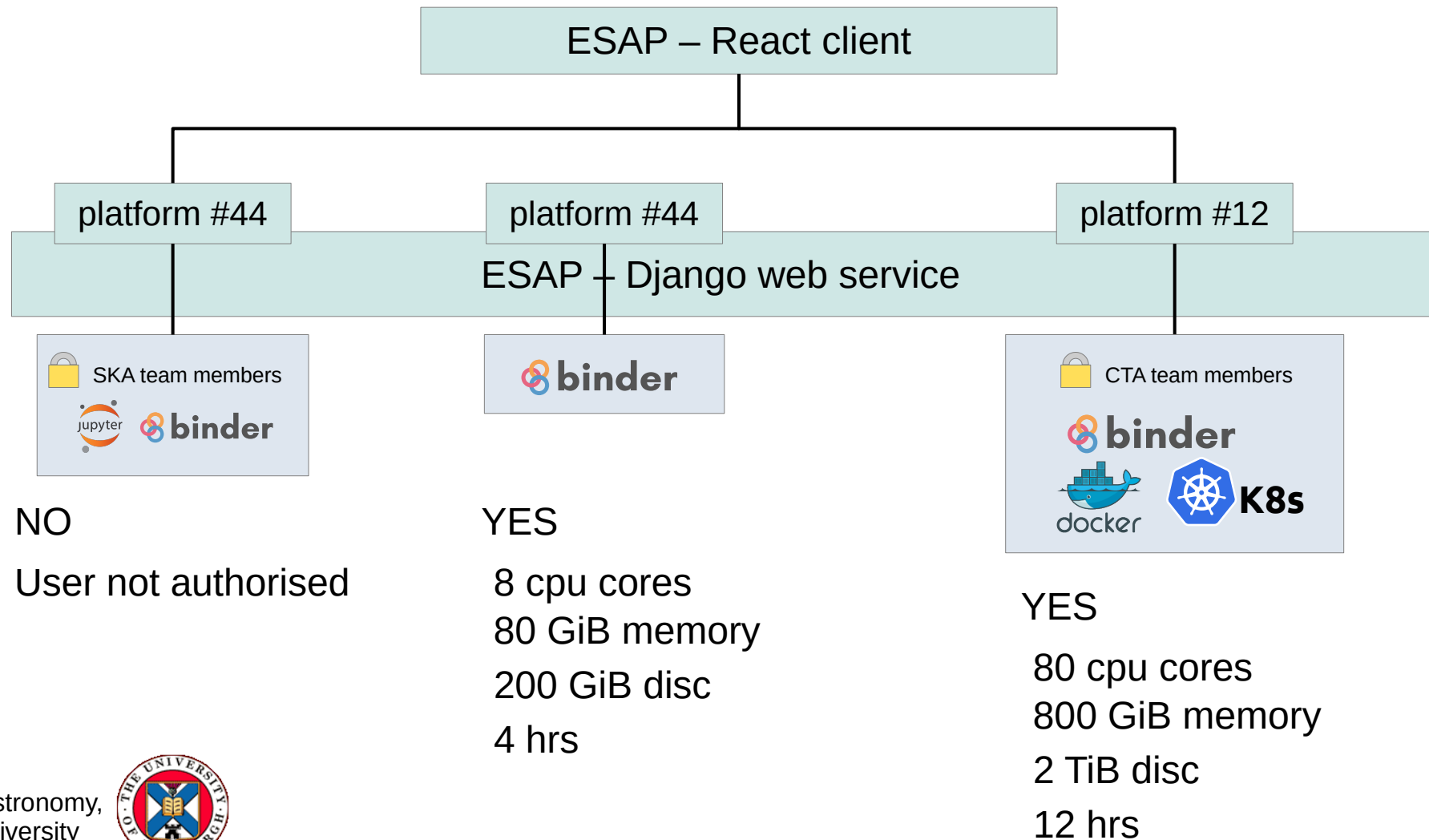
<http://django.esap.astron.nl/api/platform/23>

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

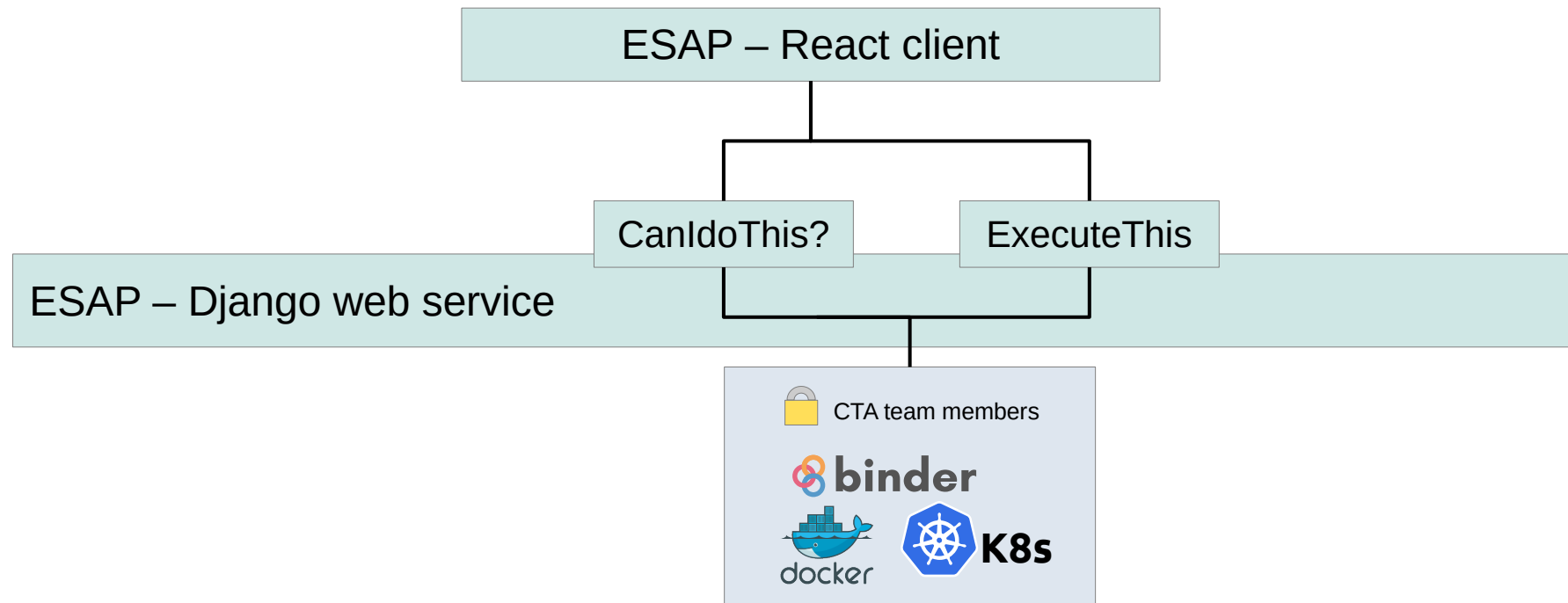
<http://django.esap.astron.nl/api/platform/12>



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

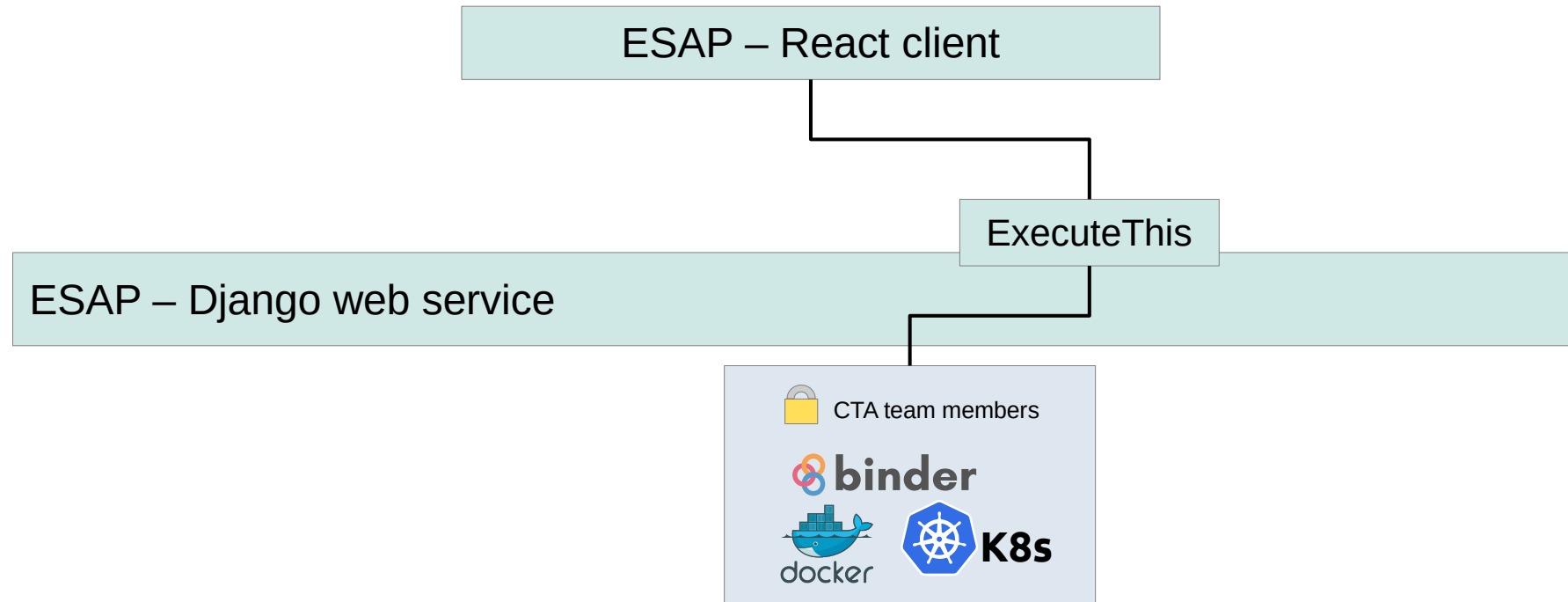
80 cpu cores

800 GiB memory

2 TiB disc

12 hrs

“executeThis” webservice API based on IVOA UWS interface



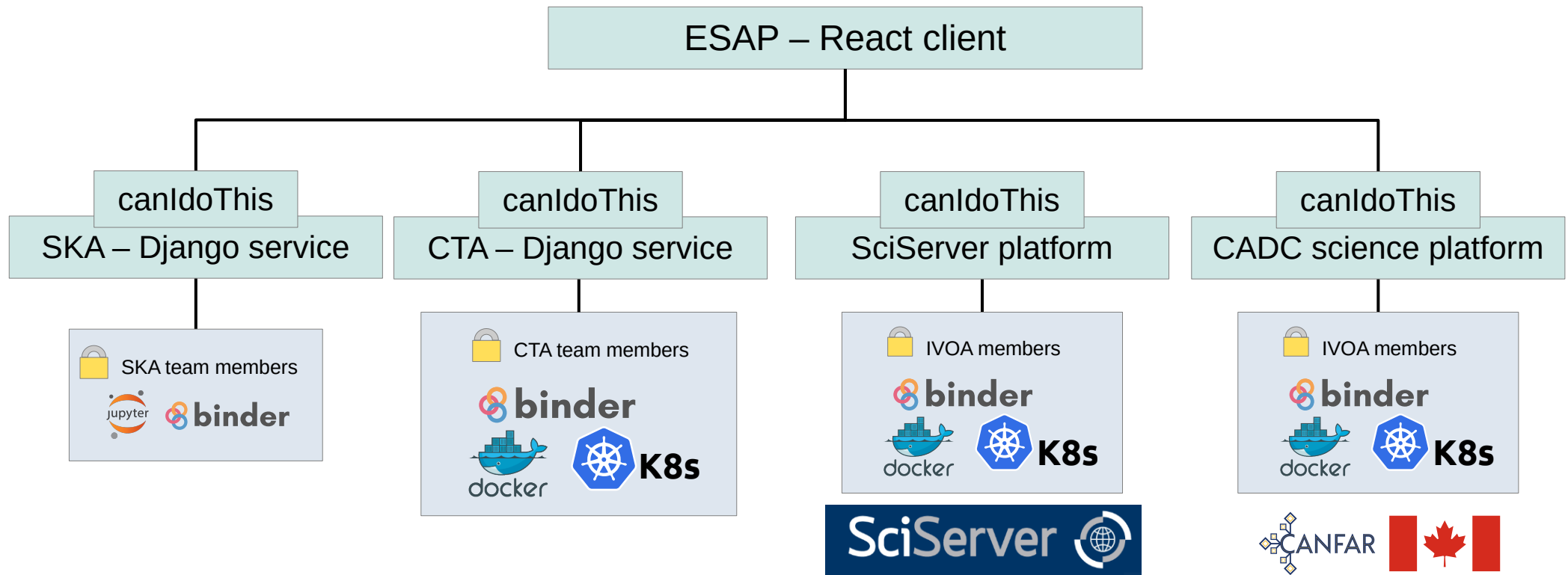
UWS interface

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