



living planet symposium

BONN
23–27 May
2022

**TAKING THE PULSE
OF OUR PLANET FROM SPACE**



Towards a Common Architecture for EO Exploitation Platforms



TELESPAZIO
a LEONARDO and THALES company

Richard Conway – Telespazio UK

25th May 2022

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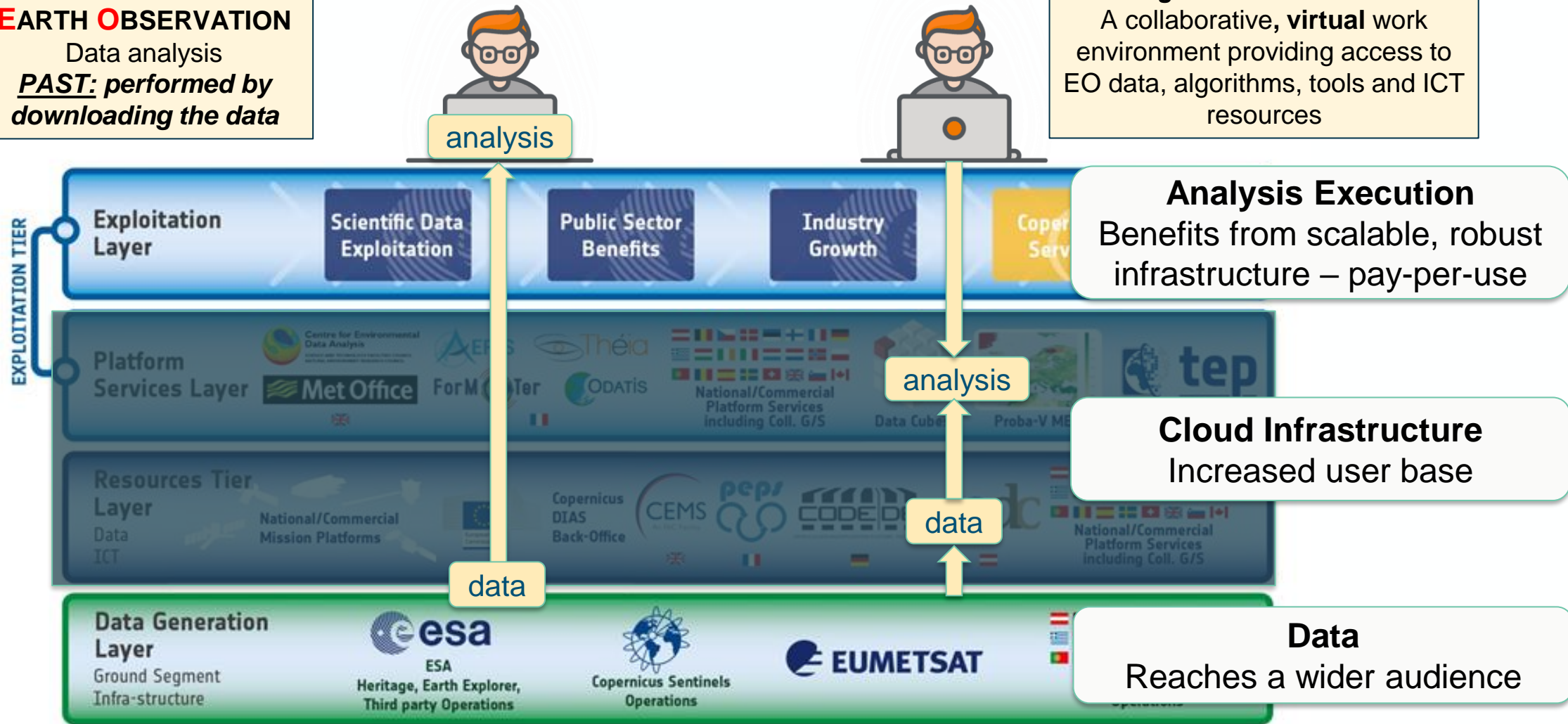
→ THE EUROPEAN SPACE AGENCY

Exploitation Platform



EARTH OBSERVATION
Data analysis
PAST: performed by downloading the data

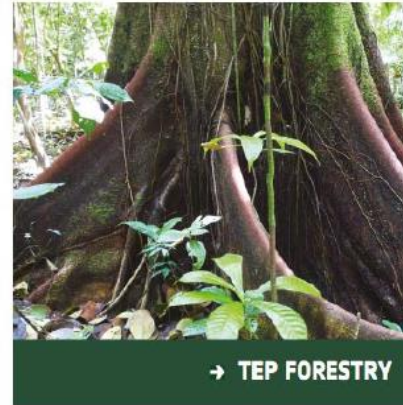
EXPLOITATION PLATFORM
"Bring the user to the data"
A collaborative, virtual work environment providing access to EO data, algorithms, tools and ICT resources



Platform Ecosystem – Network of Resources

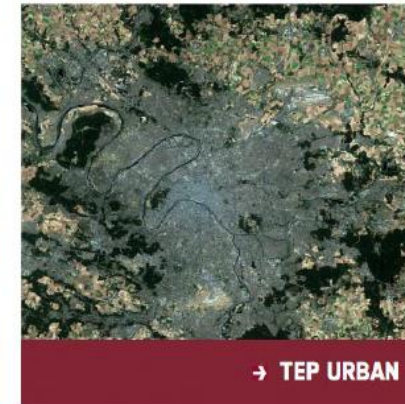
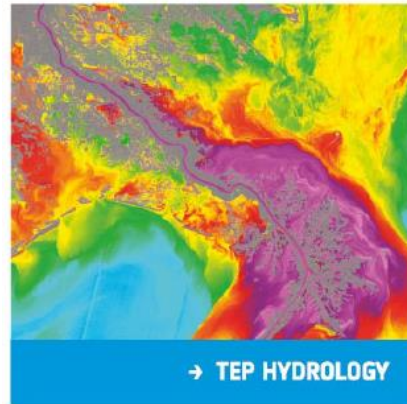
Platforms

- Virtual work environment
- Access data
- Develop algorithms
- Conduct analysis
- Share value-adding outcomes
- Collaborative communities



Platform Ecosystem

- Data sources
- Analysis tooling
- Cloud processing

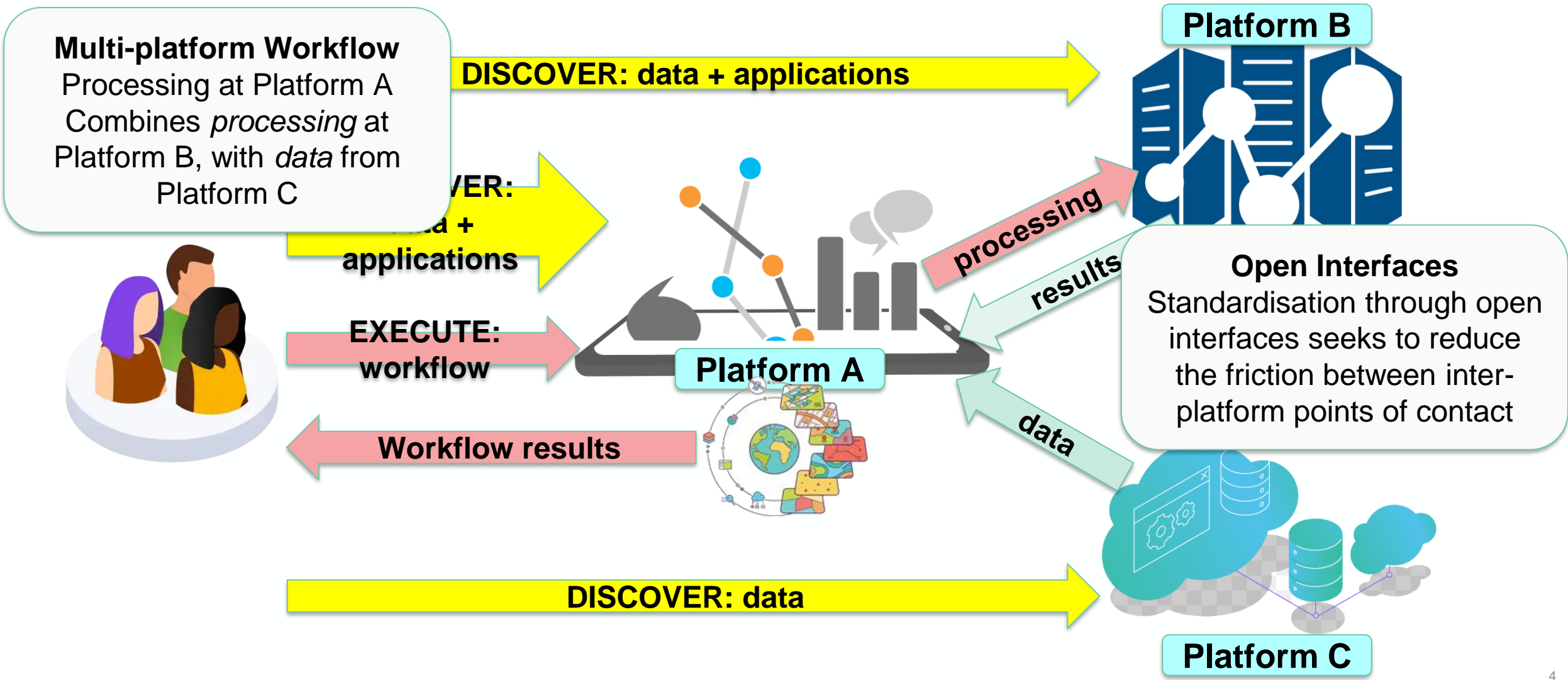


Interoperation

Users of one platform may consume the services of another directly platform-to-platform

Wouldn't it be nice if ... I didn't need to be an ICT wizard or instrument expert to integrate different data into my research or application?

Aspiration – Platform Interoperability





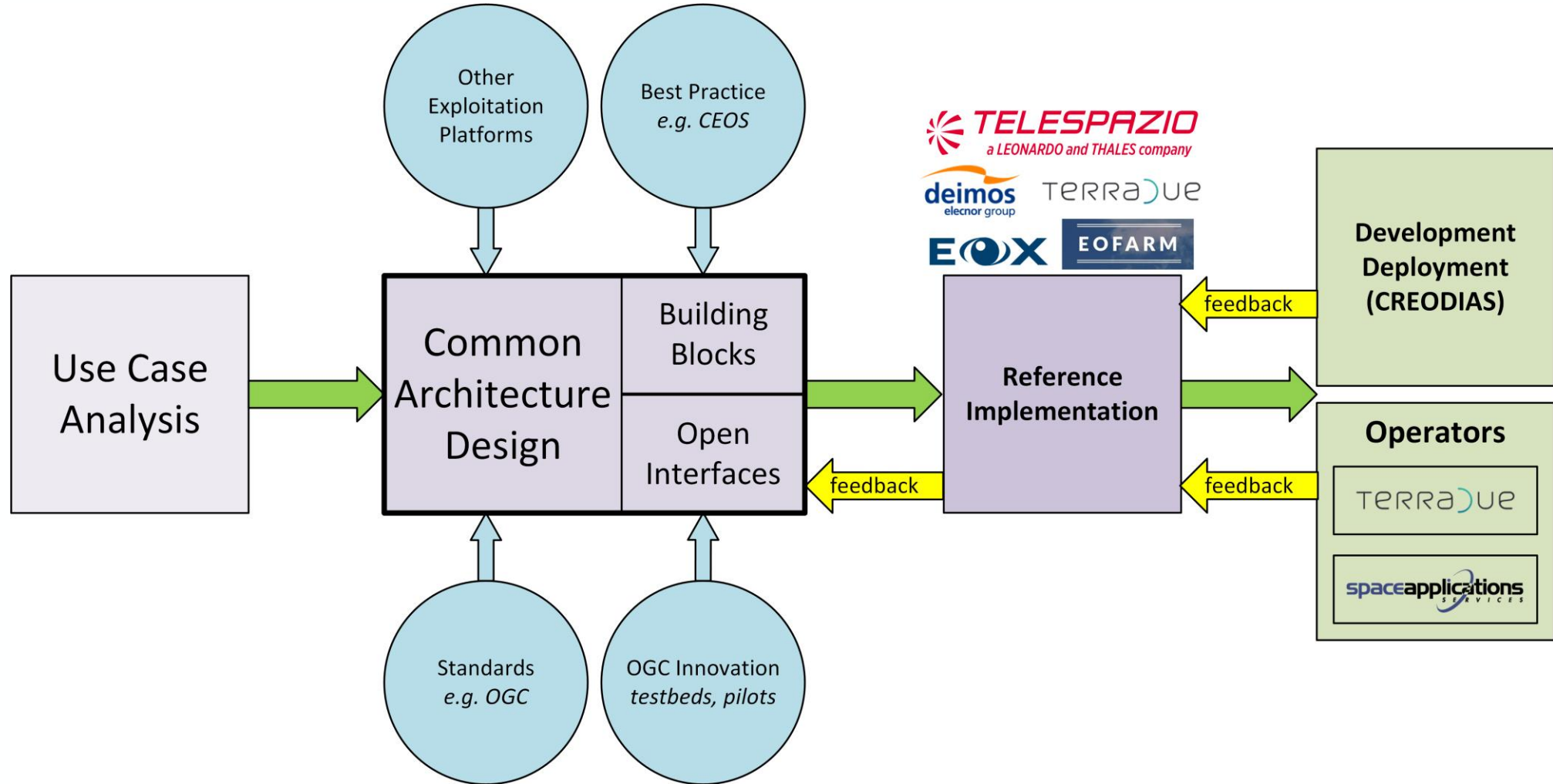
EOEPCA EARTH OBSERVATION EXPLOITATION PLATFORMS COMMON ARCHITECTURE

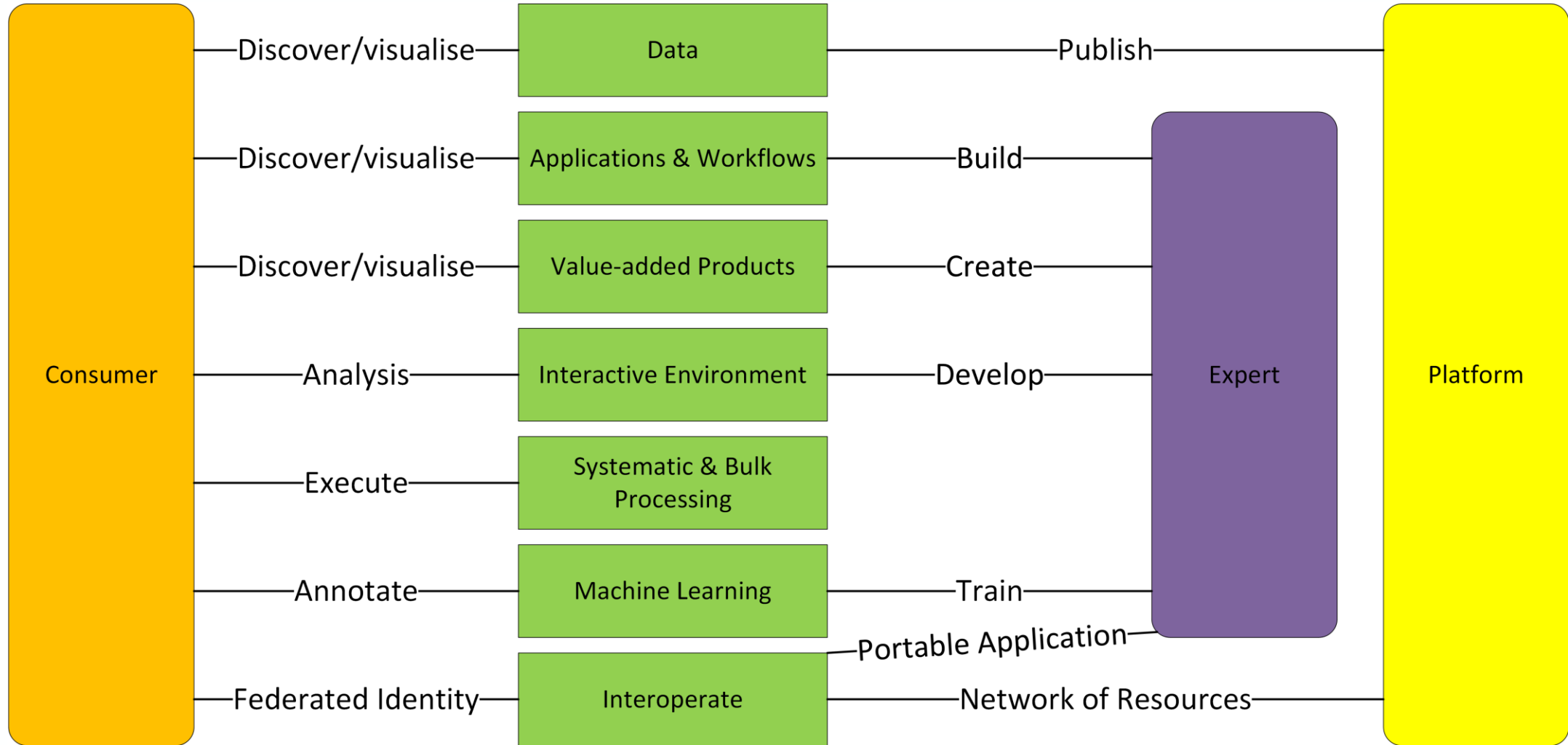
The goal of the Common Architecture is to define and agree a **re-usable exploitation platform architecture** by identifying a set of common building blocks that provide their services through open interfaces

To encourage federation of EPs through an open consensus-based architecture for EPs in the Network of Resources

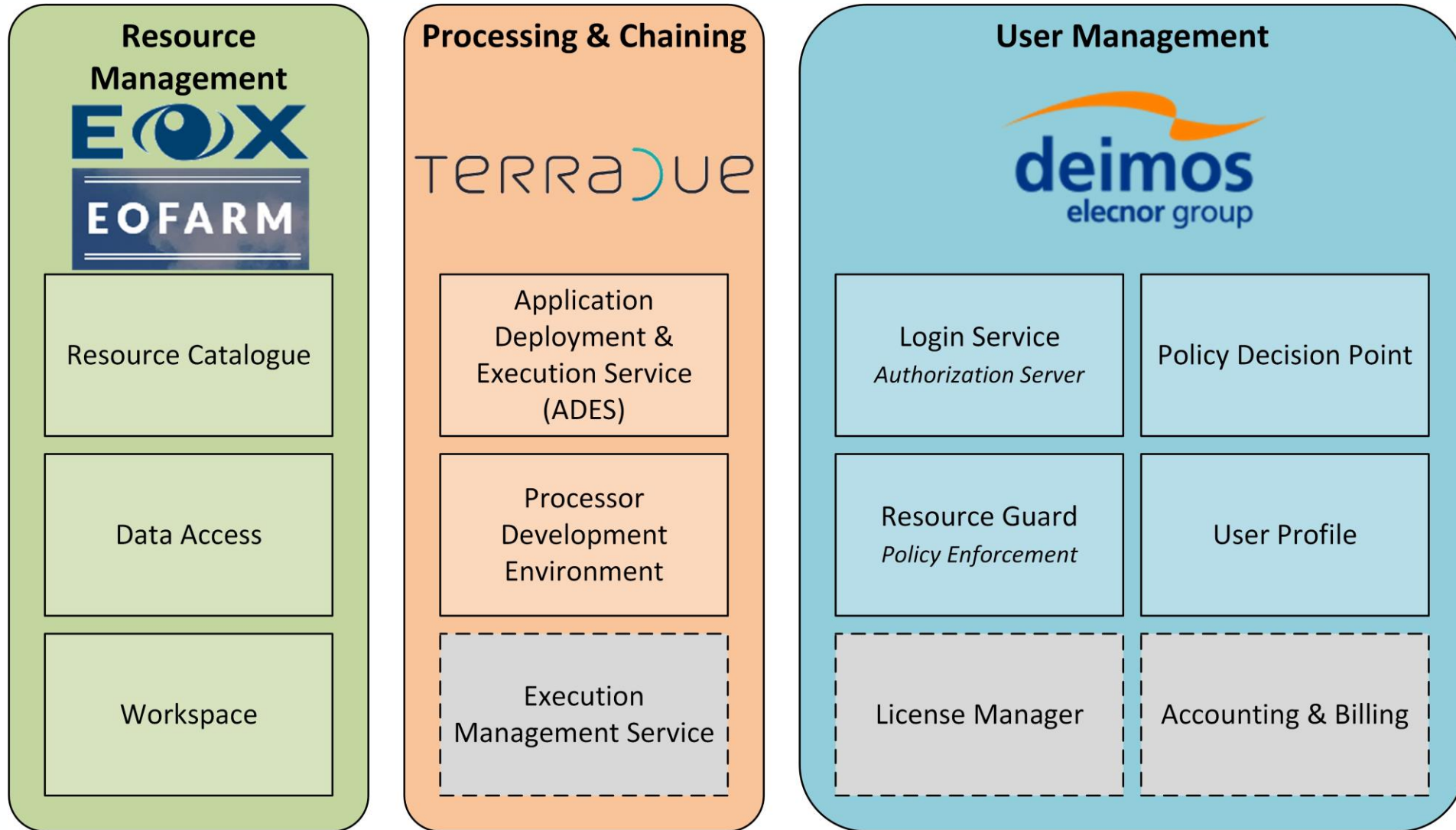
To provide an **open-source Reference Implementation** of the architecture

Our Approach





Building Blocks



Based on **pycsw**

Interfaces

- OGC CSW 2.0.2/3.0
- OGC API Records
- STAC
- OpenSearch with EO, Geo, Time

Data Model

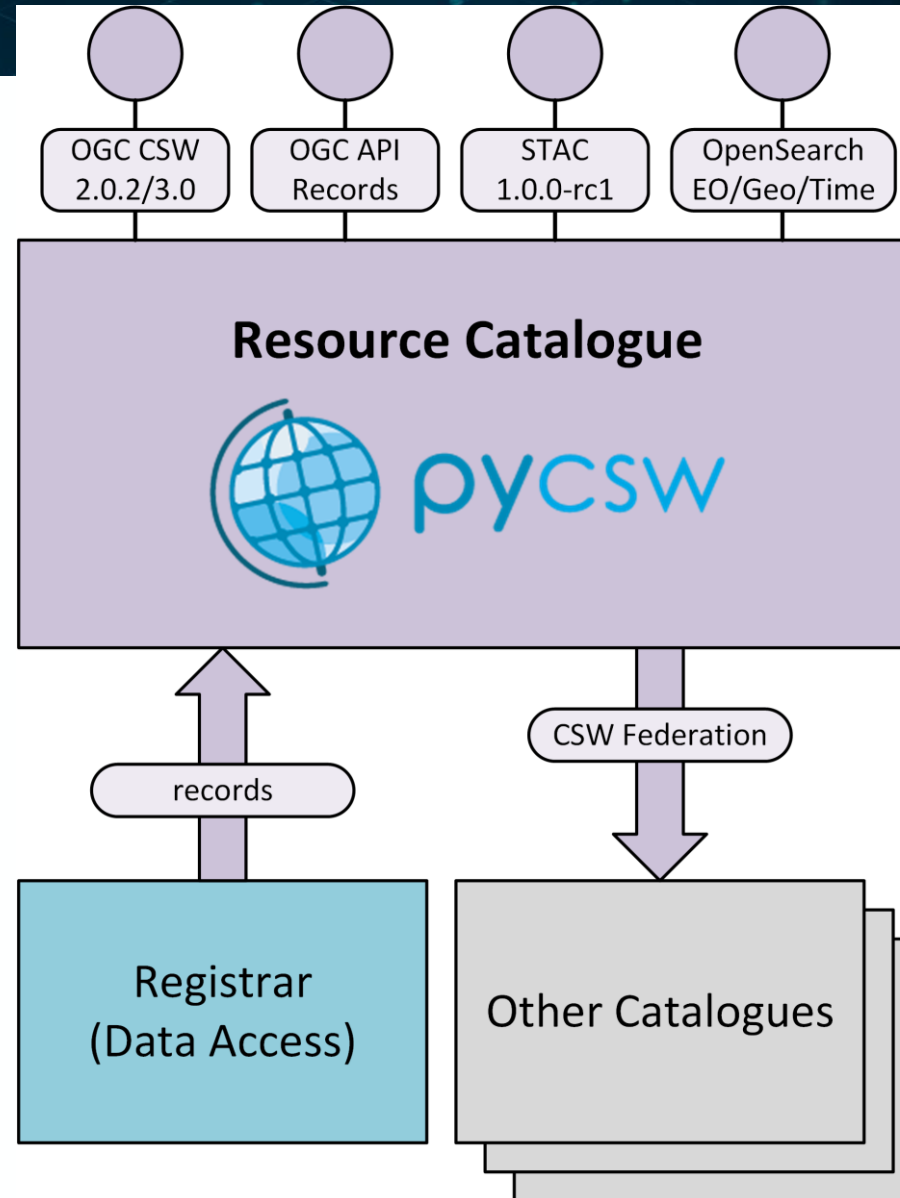
- ISO 19115-1/2

Harvesting

- Push from Registrar/Harvester (Data Access)

Federation

- Via OGC CSW



EOEPCA Resource Catalogue

[Home](#)

[Home](#) / [Collections](#) / [EOEPCA Resource Catalogue](#) / [Items](#)

[JSON](#) | [Contact](#)

Based on pycsw, a Python

[Collections](#)

OpenAPI

[Swagger](#)

[JSON](#)

[Conformance](#)

[CSW 3.0.0](#)

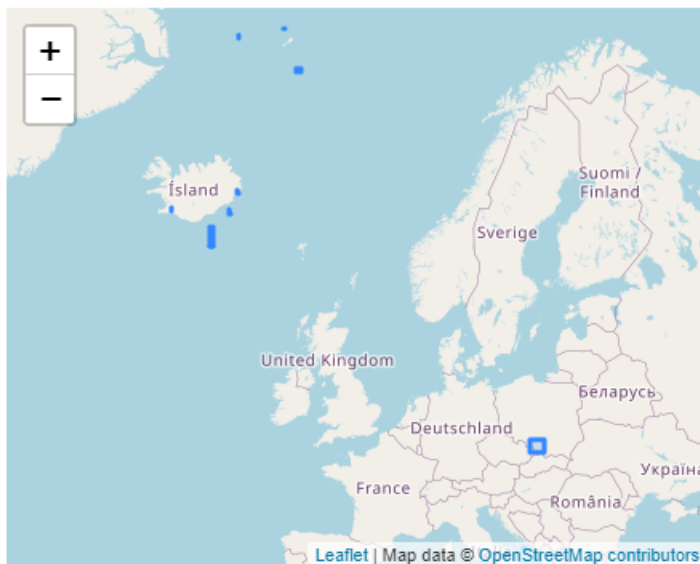
[CSW 2.0.2](#)

[OpenSearch](#)

[STAC API](#)

[OAI-PMH](#)

[SRU](#)



[Prev](#) [Next](#)

Title	Type
S2A_MSIL1C_20210521T125141_N0300_R138_T29WNT_20210521T145846.SAFE	dataset
S2A_MSIL1C_20201118T095311_N0209_R079_T34UCA_20201118T110128.SAFE	dataset
S2A_MSIL1C_20210521T125301_N0300_R138_T28VCQ_20210521T145846.SAFE	dataset
S2A_MSIL1C_20210521T125301_N0300_R138_T27WVM_20210521T145846.SAFE	dataset
S2A_MSIL1C_20201118T095311_N0209_R079_T33TXG_20201118T110128.SAFE	dataset
S2A_MSIL2A_20210521T125301_N0300_R138_T28VDO_20210521T153745.SAFE	dataset
S2A_MSIL1C_20210521T125301_N0300_R138_T28WES_20210521T145846.SAFE	dataset
S2A_MSIL1C_20210521T125301_N0300_R138_T28VDR_20210521T145846.SAFE	dataset
S2A_MSIL1C_20210521T125141_N0300_R138_T29WNV_20210521T145846.SAFE	dataset
S2A_MSIL1C_20210521T125141_N0300_R138_T28WEE_20210521T145846.SAFE	dataset

[Prev](#) [Next](#)

Based on EOxServer

Interfaces

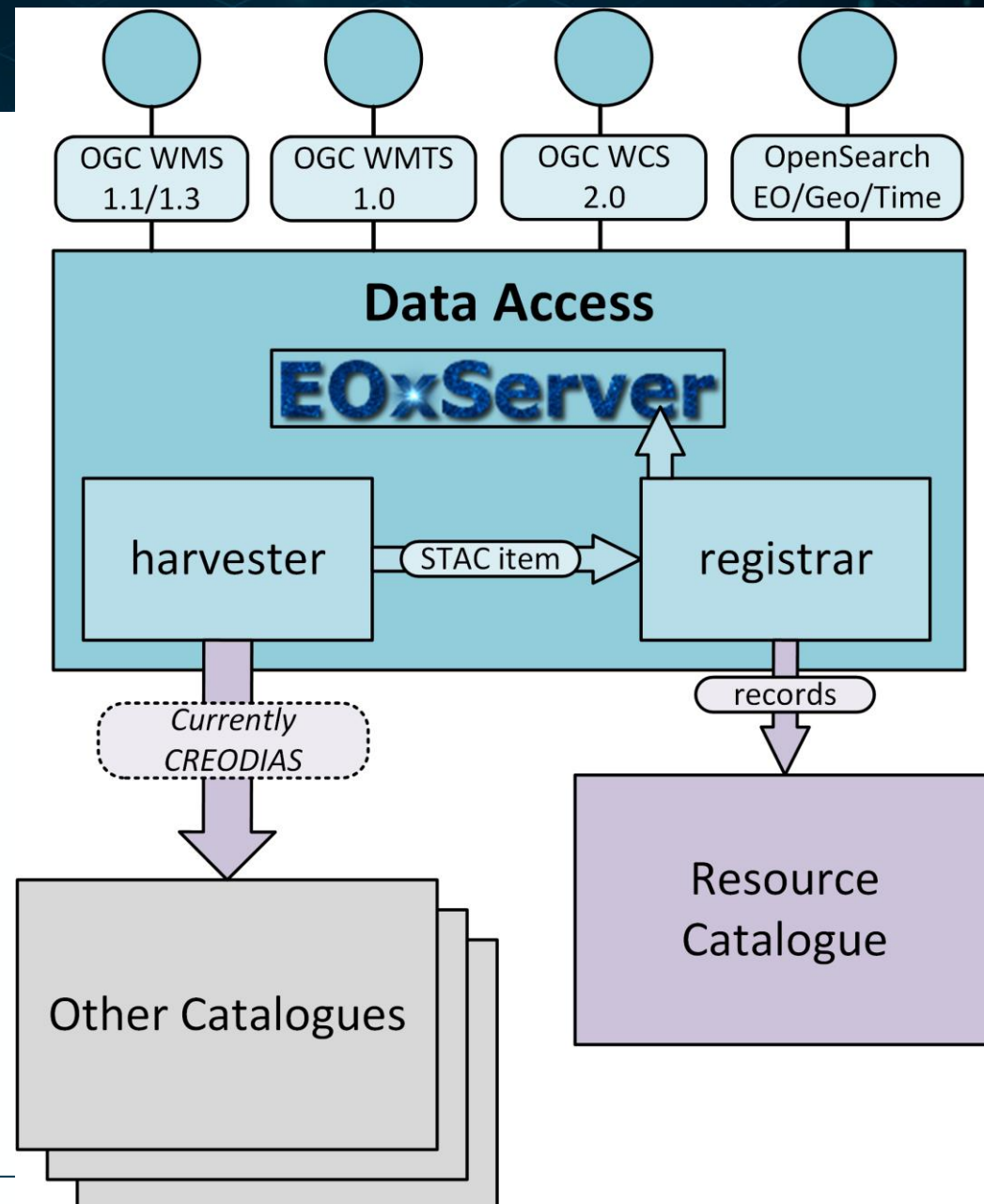
- OGC WMS 1.1-1.3
- OGC WMTS 1.0
- OGC WCS 2.0
- OpenSearch with EO, Geo, Time

Harvester

- Currently integrated with CREODIAS

Registrar

- STAC Items from harvester
- Populates Resource Catalogue and EOX View Server



EOEPKA Data Access View Server (VS) Client powered by EOX

Filters Layers

OVERLAYS

- EOX Borders and Labels

LAYERS

- Sentinel-2 Level 1C True C...
- Sentinel-2 Level 2A True C...

BASE LAYERS

- EOX Terrain-Light
- EOX Terrain
- EOX Sentinel-2 cloudless

Search Results Basket (0)

2 layers selected to show

- SENTINEL-2 LEVEL 1C TRUE COLOR ...
- SENTINEL-2 LEVEL 2A TRUE COLOR ...

Searching ..

Searching ..

Select all

06:00 12:00 18:00 SEP 09 2019 06:00 12:00 18:00 SEP 10 2019 06:00 12:00 18:00 SEP 11 2019 06:00

11.49, 39.67



Based on ZOO project

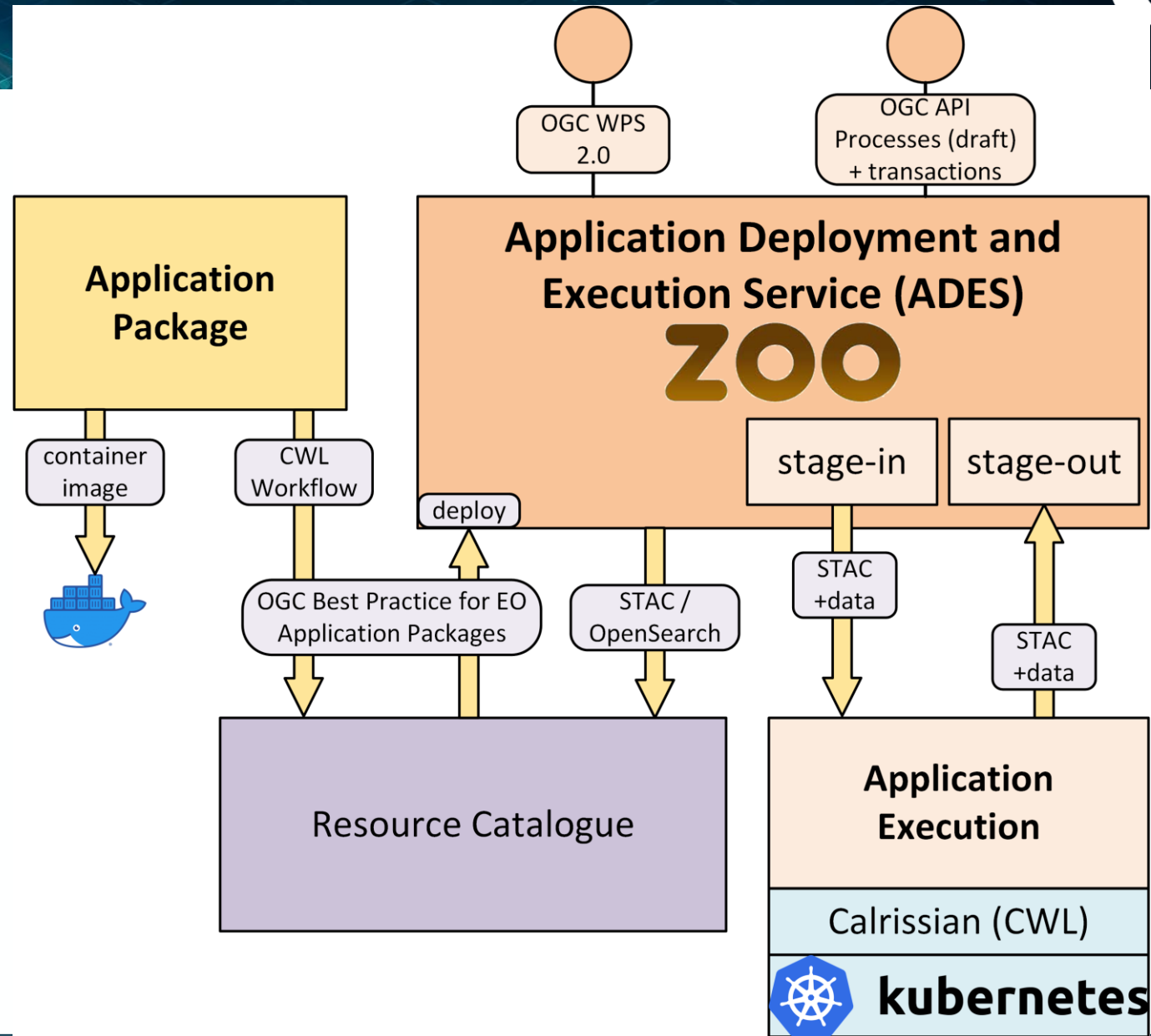
ADES

Deployment & execution of user-defined processing

- OGC WPS 2.0
- Draft API Processes
- + deploy/undeploy
- STAC abstraction
- Calrissian
CWL runner for Kubernetes

Application Package

- Metadata descriptor (CWL)
- Container image
- **OGC Best Practice for EO Application Packages**



Processor Development Environment (PDE)

- Integrated web tooling
 - Interactive analysis
 - Develop, test and package applications
- JupyterHub
 - Login integrates with platform authentication
- Spawns JupyterLab instance for user
- Replicate the conditions an application experiences when running in the ADES on a platform
- NEXT STEP – Integrate with User Workspace for Application publishing

JupyterLab

The screenshot shows the JupyterLab web interface. The browser address bar displays 'https://jupyterh...'. The interface features a file browser on the left with a search bar and a table of files. The main area is a 'Launcher' with various icons for creating new notebooks, consoles, and files. A red box highlights the 'JupyterLab' title in the browser tab.

Name	Last Modified
src-gen	3 months ago
package.json	3 months ago
README.md	2 hours ago
Untitled.ipynb	2 months ago

Theia IDE

The screenshot shows the Theia IDE web interface. The browser address bar displays 'https://jupyter...'. The interface features a file explorer on the left, a workspace area with a code editor, and a terminal. A red box highlights the 'Theia IDE' title in the browser tab.

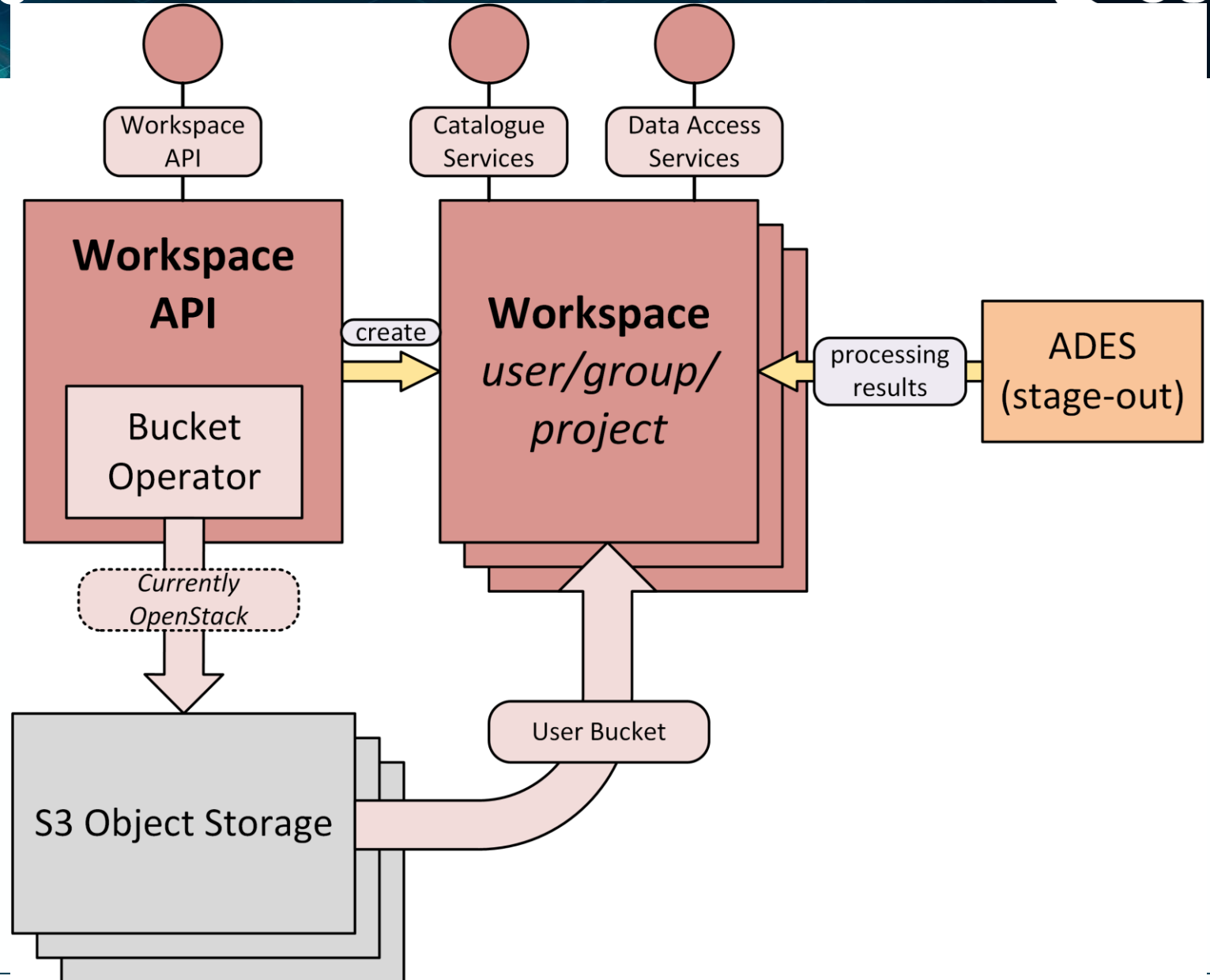
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7     "outputs": [],
8     "source": []
9   }
10  ],
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16    },
17    "language_info": {
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20        "version": 3
21      },
22      "file_extension": ".py",
23      "mimetype": "text/x-python",
24      "name": "python",
25      "nbconvert_exporter": "python",
26      "pygments_lexer": "ipython3",
27      "version": "3.9.9"
28    }
29  },
30  "nbformat": 4,
31  "nbformat_minor": 5
32  }
33 ]
```

Workspace

- Centralised management of user's owned resources:
 - Processing outputs
 - Application Packages
 - Uploaded products
- Can also be used as a Group/Project Workspace
- Dedicated Resource Catalogue
- Dedicated Data Access
- S3 bucket integration

Workspace API

- REST API
- Admin: create and manage workspaces
- User: register resources



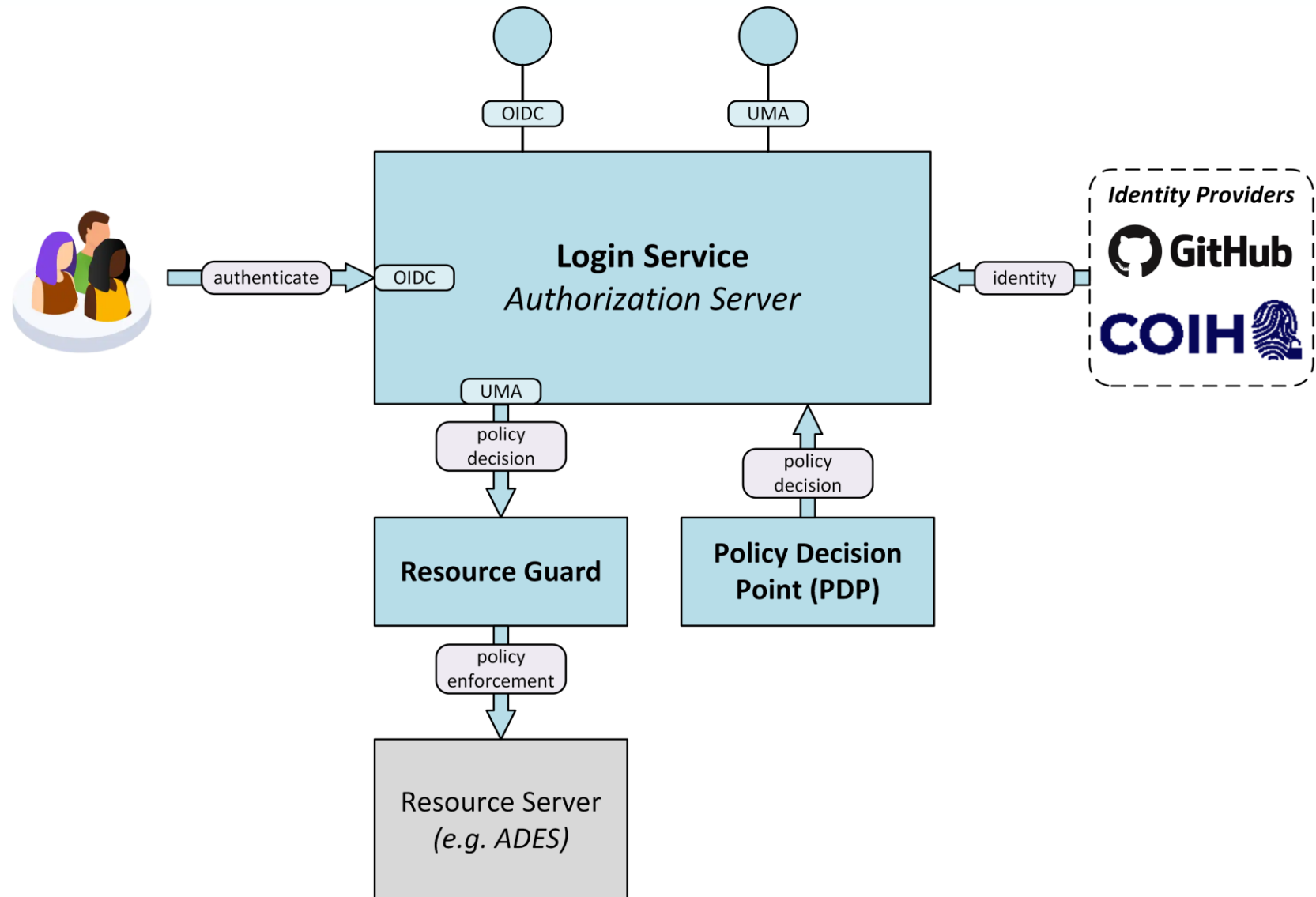
Federation of user requests amongst platforms

User Identity

- OpenID Connect (OIDC)
- External identity
 - GitHub
 - COIH

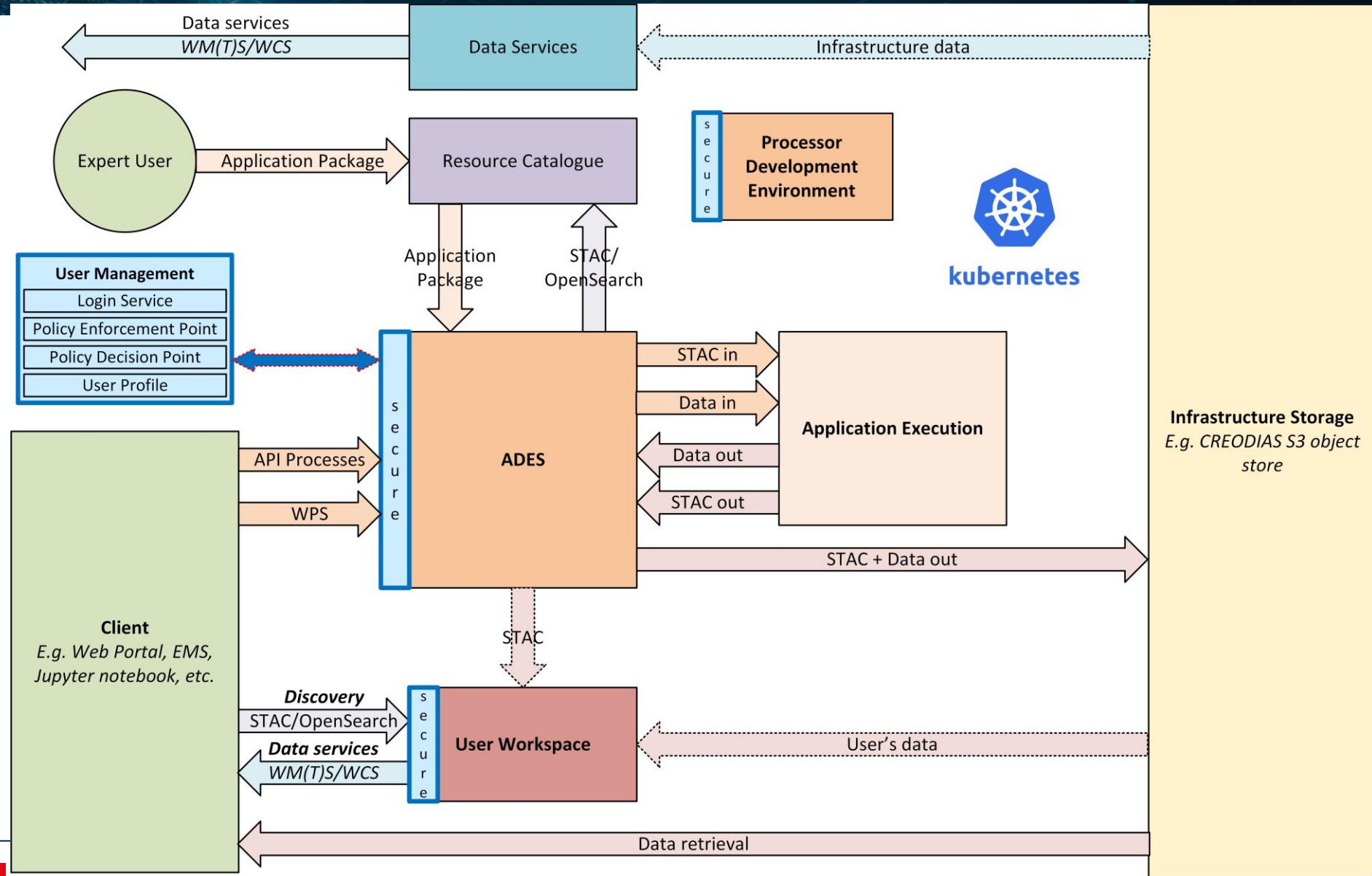
Access Management

- User Managed Access (UMA)
- Policy-based resource protection



Platform – Reference Implementation

- Kubernetes 'abstract' infrastructure
- Containerised components
- Helm charts for Kubernetes
- Deployed to CREODIAS



In Summary

- Exploitation Platform blueprint
- Reference implementation building blocks
- Embraces the 'apps-to-the-data' architecture
- Open interface standards
- Encourage platform interoperability

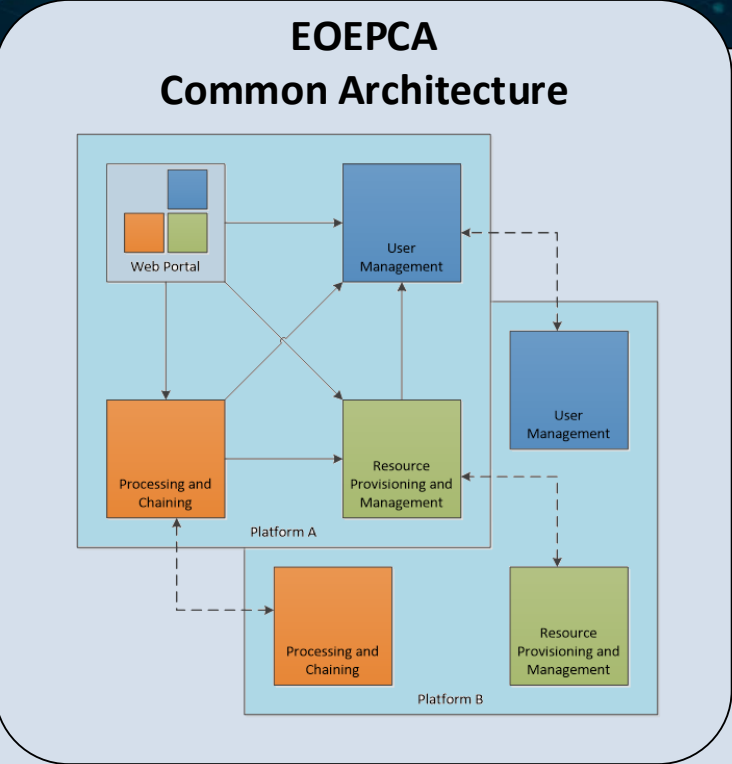
ADES
App Deploy/Execute



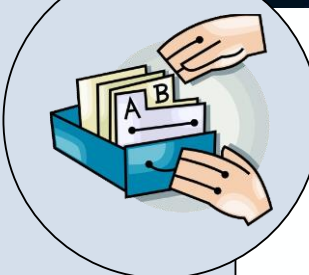
OGC Best Practice
EO App Package



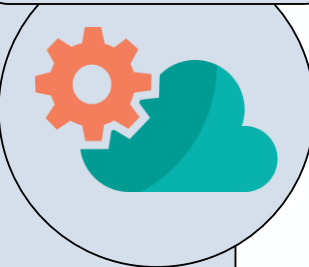
Processor Development Environment



Resource Catalogue



Data Access



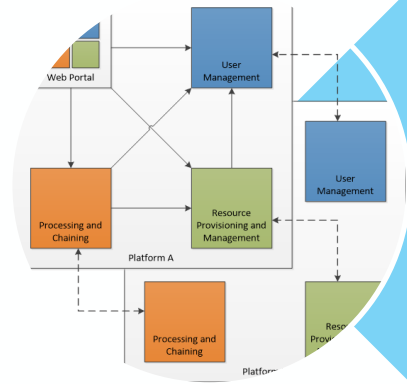
Federated Identity & Access Management



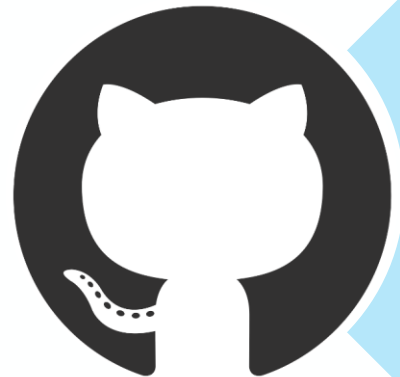
User Workspace



Where to find us...



Web Portal
<https://eoepca.org/>



GitHub
<https://github.com/EOEPCA>