Open Innovation for Earth Observation Programmes

2-4 November 2022 | ESA-ESRIN | Frascati, Italy

Launching an EO business using Open Source and Open Data

Stephan Meißl

EOX IT Services GmbH

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2 November 2022 | ESA-ESRIN | Frascati, Italy

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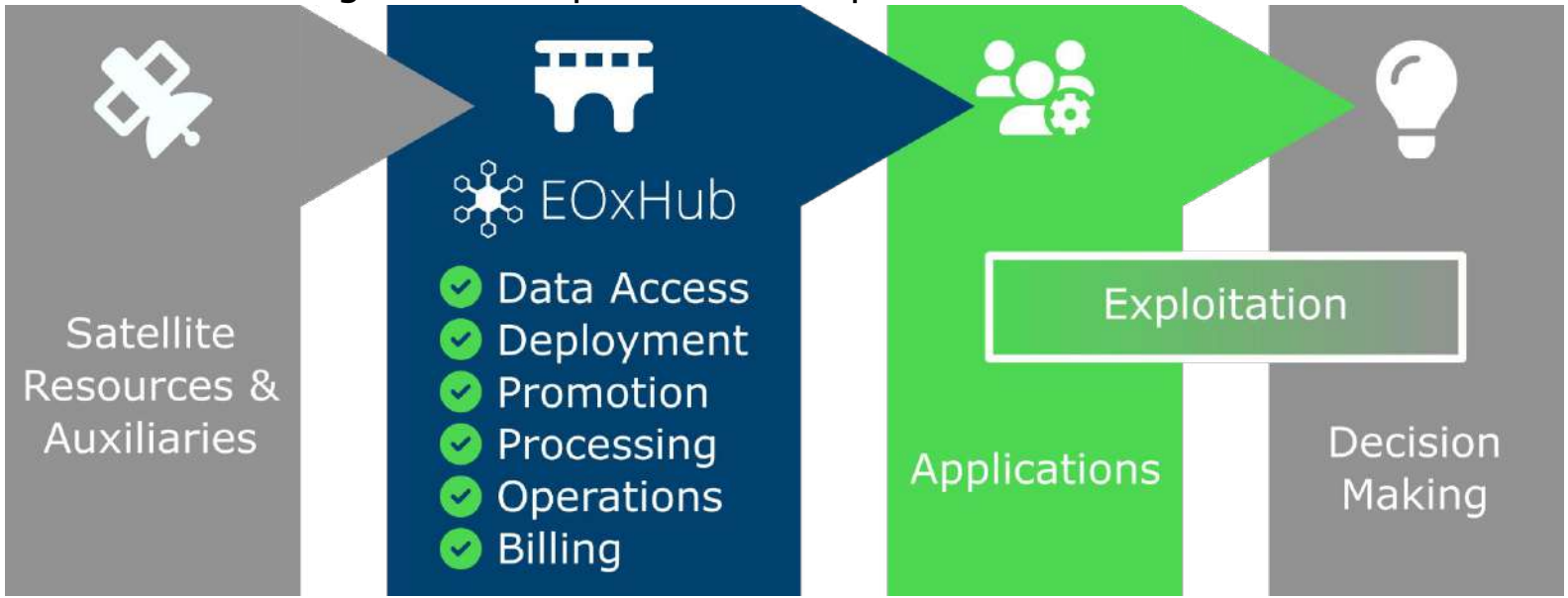
+43 664 9688701

Company

Platform Technology & Services

EOX makes the bridges for comprehensive exploitation of satellite Earth-observation

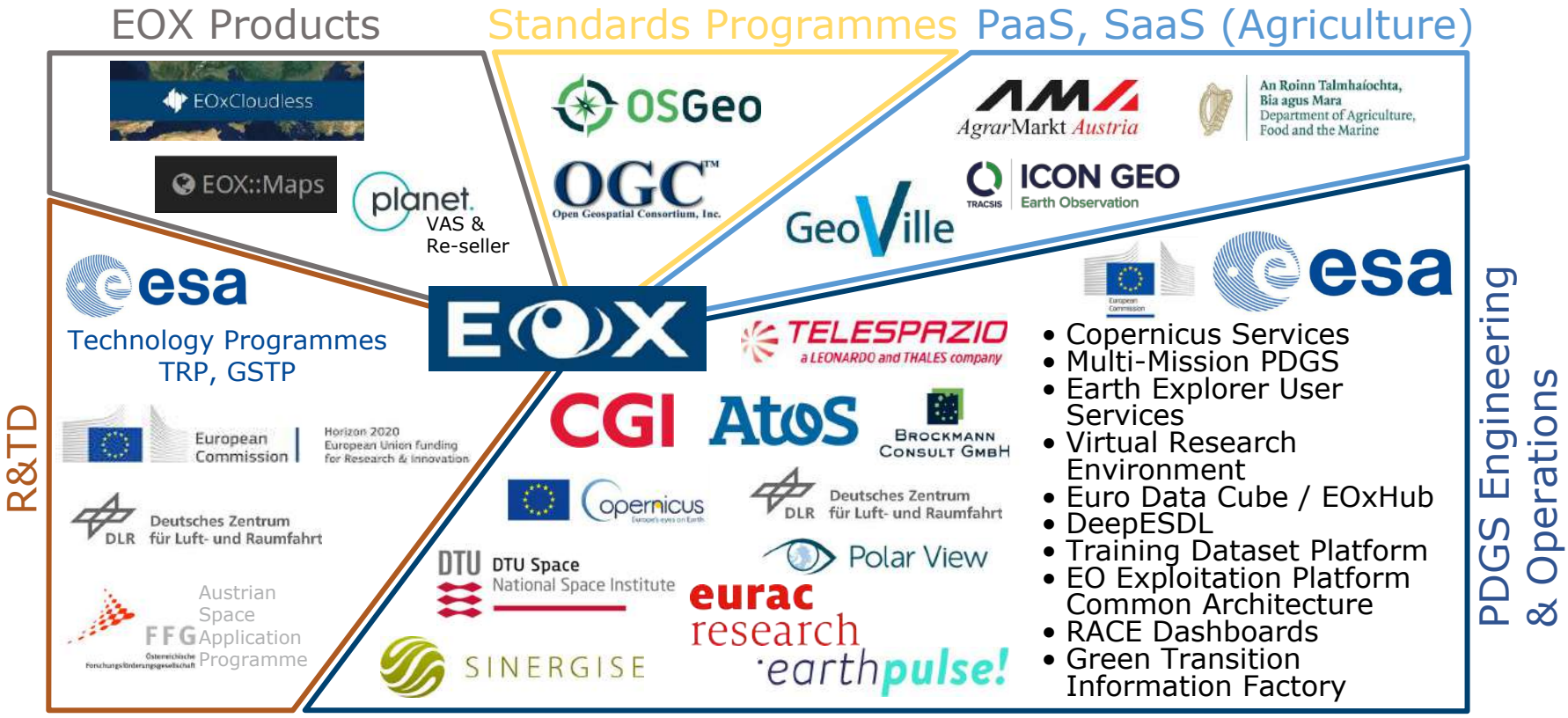


EOX stands for Open Source, Open Standards, Open Data, & Open Science

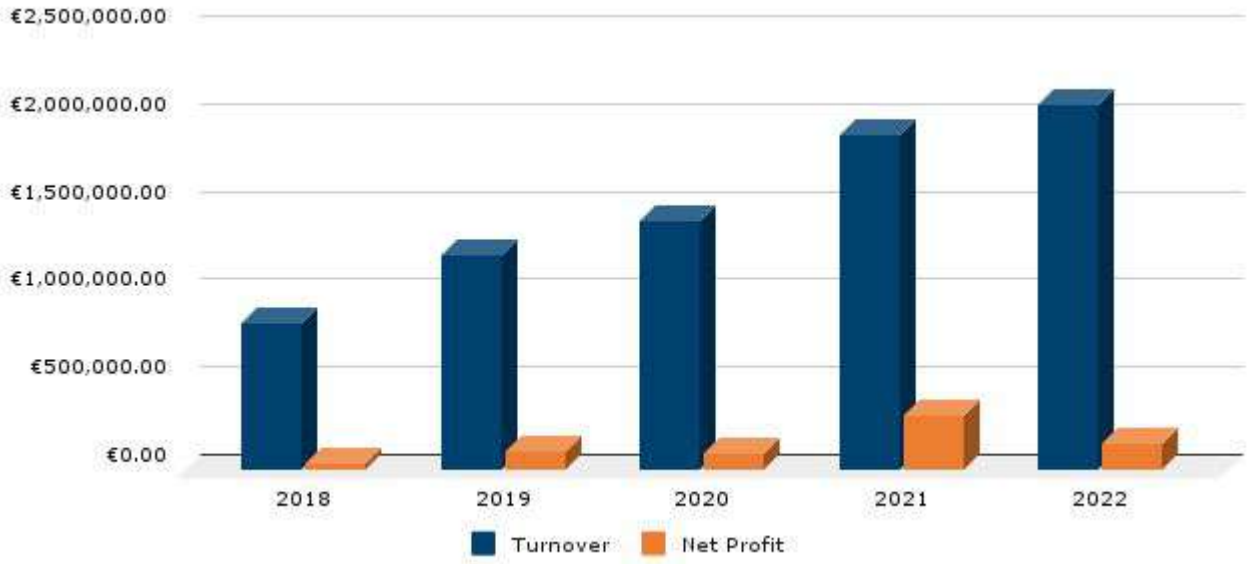
EOX
09/2022

EOX Team (11/2022)

Business Strategy Consultant Gerhard Triebnig	Chief Executive Officer Stephan Meißl	Chief Operations Officer Christian Schiller	Chief Information Officer Stefan Achtsnit	Personnel, Accounting, Taxes Inditax (ext.)
Senior Agricultural Consultant Bernadett Csonka	Senior IT Engineer Daniel Santillan	Senior IT Engineer Martin Pačes	Product Design Consultant Silvester Pari	Senior Financial Manager Aleksandra Belonić
Senior IT Engineer Fabian Schindler	Senior IT Engineer Bernhard Mallinger	IT Engineer Lubomír Doležal	Senior GIS Consultant Joachim Ungar	GIS Consultant Stefan Brand
Geospatial IT Engineer Nikola Jankovic	System Engineer Karl Grube	GIS Consultant Petr Ševčík	Data Scientist Tyna Doležalova	GIS Consultant Elias Wanko
IT Consultant Mussab Abdalla	Programmer Anna Romanova	IT Engineer Radu-Mihai Pașparugă	Front-end Developer Moritz Riede	Front-end Developer Viktor Farkas


EOX Products
Standards Programmes
PaaS, SaaS (Agriculture)
EOxCloudless
EOX::Maps
planet.
VAS & Re-seller
OSGeo
OGC
Open Geospatial Consortium, Inc.
AMA
AgrarMarkt Austria
An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine
GeoVille
TRACSIS
ICON GEO
Earth Observation
esa
Technology Programmes
TRP, GSTP
EOX
TELESPAZIO
a LEONARDO and THALES company
CGI
Atos
Brockmann Consult GmbH
European Commission
Horizon 2020
European Union funding for Research & Innovation
Copernicus
DLR
Deutsches Zentrum für Luft- und Raumfahrt
Polar View
DTU
DTU Space
National Space Institute
eurac research
earthpulse!
FFG
Austrian Space Application Programme
SINERGISE
R&TD
PDGS Engineering & Operations
• Copernicus Services
• Multi-Mission PDGS
• Earth Explorer User Services
• Virtual Research Environment
• Euro Data Cube / EOxHub
• DeepESDL
• Training Dataset Platform
• EO Exploitation Platform Common Architecture
• RACE Dashboards
• Green Transition Information Factory

Business Report - Turnover & Net Profit



Open Source & Open Data at EOX

- Fully committed to Open Source since day one
- OSGeo
  - Sponsor of OSGeo FOSS4Gs, code sprints, etc.
  - Several OSGeo charter members
  - OSGeo code sprint organizer in 2014
  - MapServer PSC member
- OGC
  - Active OGC member in Testbeds, pilots, working groups, etc.
  - Coverages working groups co-chair

EOX
06/2021

Examples

EOX Open Source & Open Data Examples

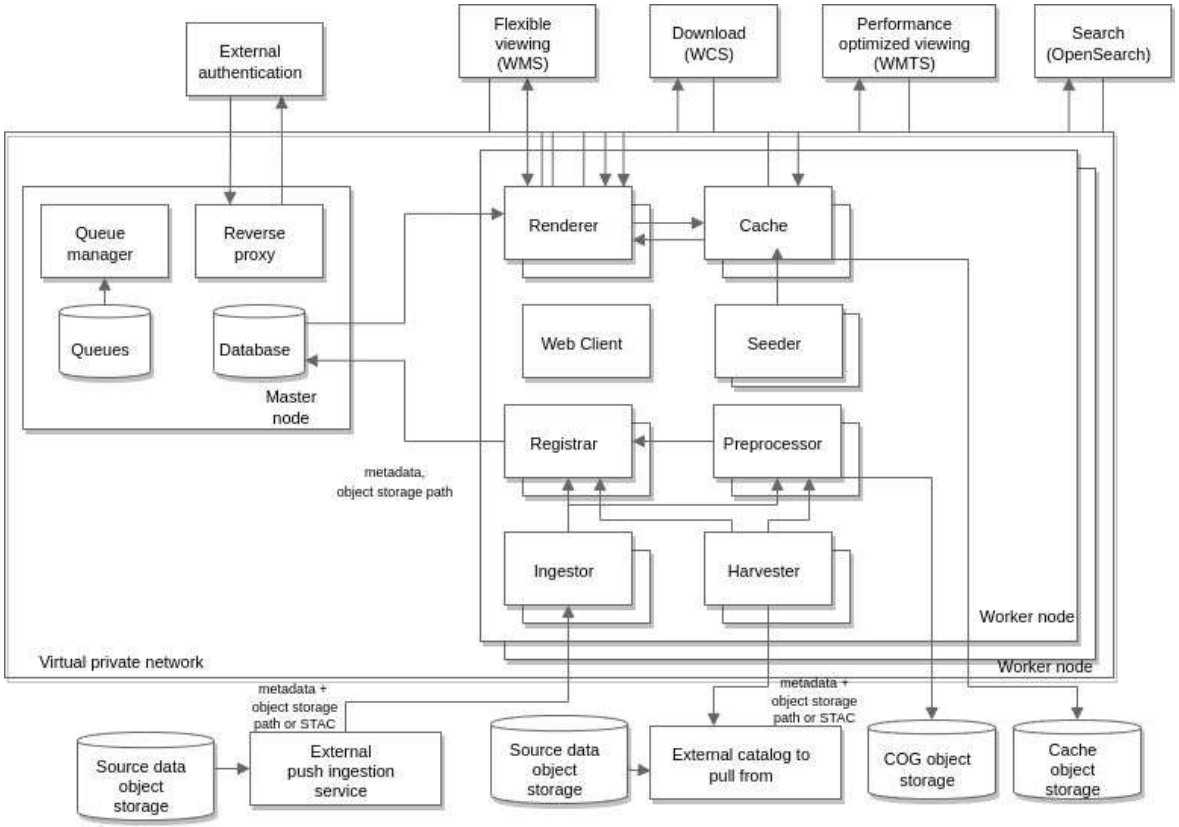
- View Server
- EOxHub
- VirES
- eodash
- EU Common Agricultural Policy AMS
- EOxCloudless - Sentinel-2 cloudless

View Server

View Server 

- Fully based on **Open Source** software
  - EOxServer, MapServer, GDAL, EOxC, etc.
  - PostgreSQL, Gunicorn, nginx, traefic, etc.
  - Docker, Swarm or Kubernetes, etc.
- Modularization in **microservices**
- Truly c**loud native** - Docker, Kubernetes or Swarm, Object Storage, Helm chart, Flux GitOps, logging and monitoring, etc.
- Scalable to a virtual unlimited size of **EO repositories**
- **Flexible** concerning different rendering scenarios (On-the-fly, masking, CQL, layers, projections, etc.)
- Direct product registration, or highly configurable preprocessing to **COG**, pull/push based
- **OGC Open Standard** APIs and services

View Server Architecture



View Server Summary 

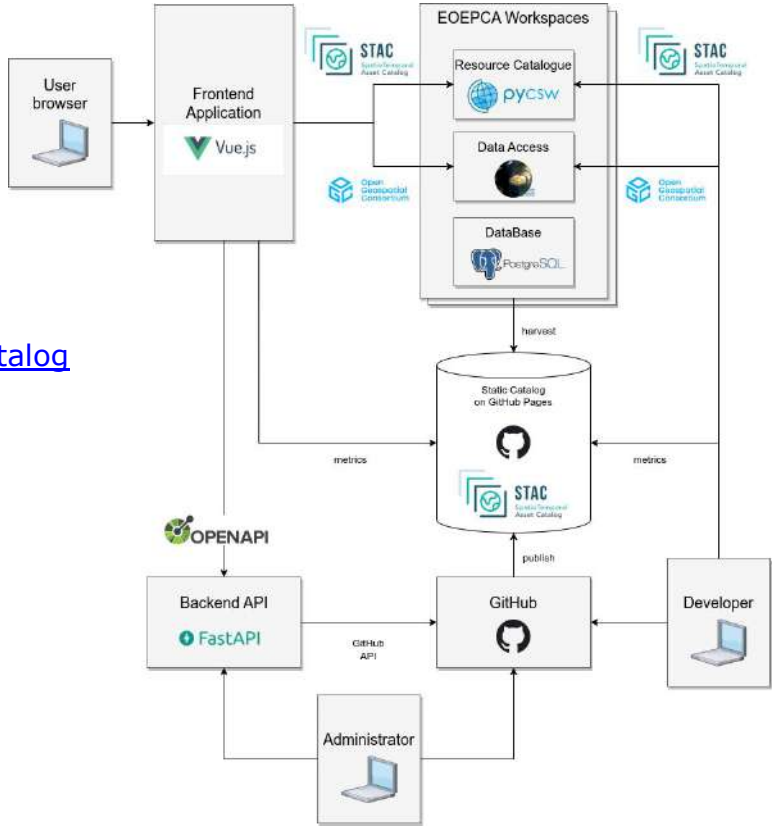
- Open Source Software - MIT License
- Source Code - https://gitlab.eox.at/vs
- Documentation - https://vs.pages.eox.at/documentation/

- PRISM
- Multi-Mission PDGS - EO-CAT
- EOEPCA - Earth Observation Exploitation Platform Common Architecture
- InCubed+ EO-WIDGET

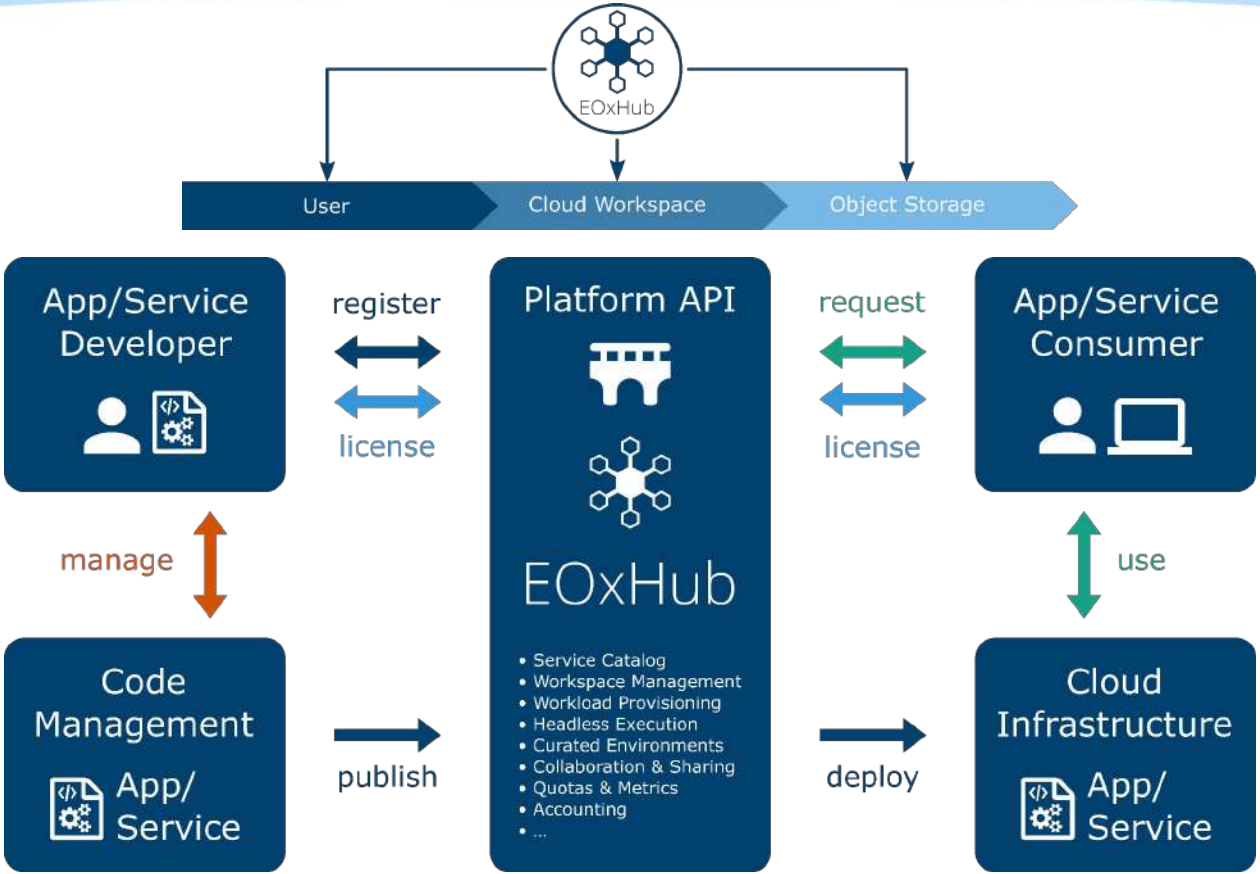
Open Science Catalog

https://opensciencedata.esa.int

- Source code - https://github.com/search?q=org%3AEOEPCA+open-science-catalog



EOxHub

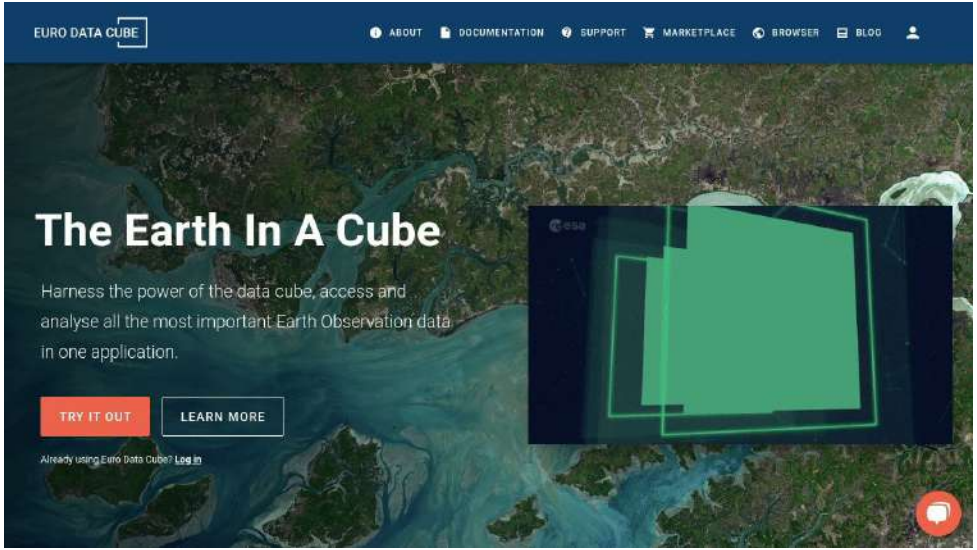

EOxHub
User
Cloud Workspace
Object Storage
App/Service Developer
register
license
Platform API
request
license
App/Service Consumer
manage
use
EOxHub
• Service Catalog
• Workspace Management
• Workload Provisioning
• Headless Execution
• Curated Environments
• Collaboration & Sharing
• Quotas & Metrics
• Accounting
• ...
Code Management
App/ Service
publish
deploy
Cloud Infrastructure
App/ Service

EOxHub as a Product - Capabilities

- Preconfigured hosted **Cloud footprint** - "**Workspace as a Service**" for teams, projects, communities, etc.
- Building upon a **managed JupyterLab** environment
- Optional additional tooling like for **Machine Learning**
- Collection of **Jupyter Notebooks**
- Targeting the **EO domain** - data access
- Running on a **cloud provider of choice** like AWS, OTC, or CreoDIAS
- **Reproduce and share** (BYOA) workflows

EOxHub as a Product - Usage

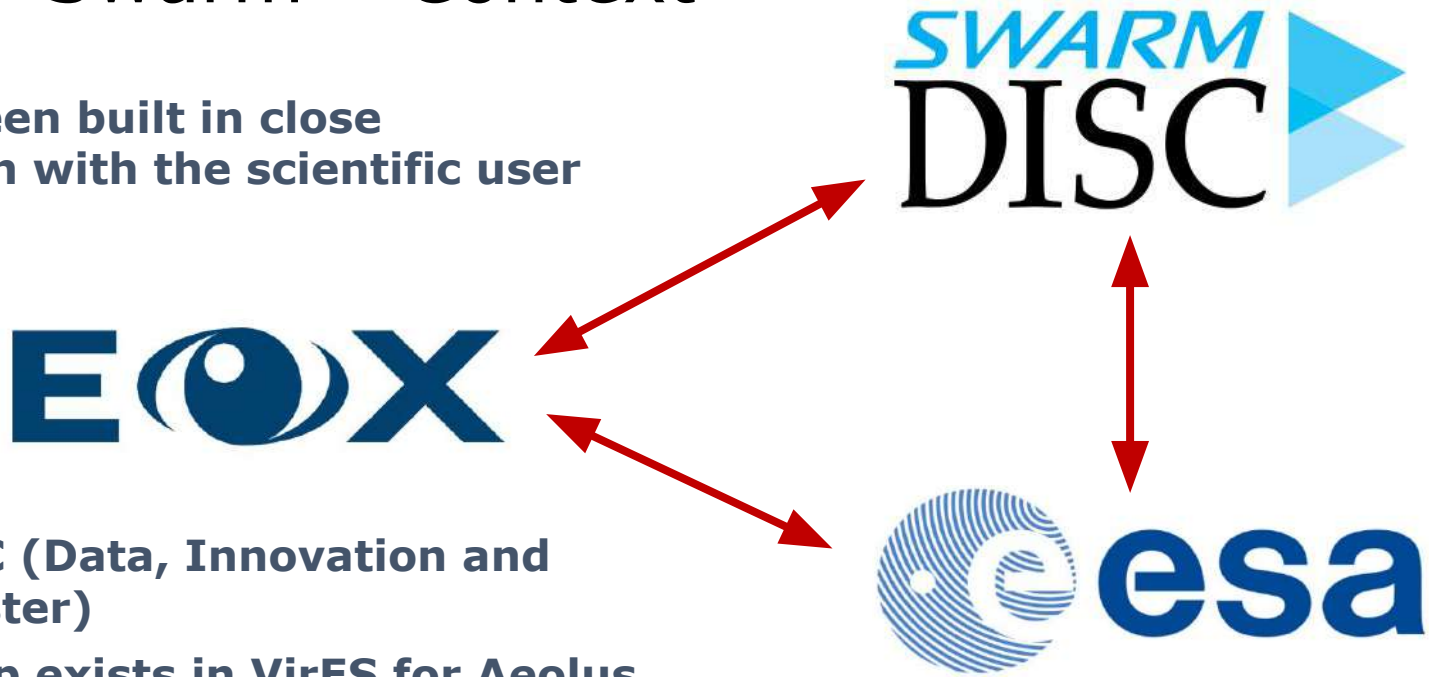
- Euro Data Cube, Polar TEP, DeepESDL, Training Dataset Platform, etc.
- VRE for VirES, Agri workspaces (see later)
- RACE, EO Dashboard, GTIF
- SMAIL, FAIRiCUBE
- Workshops, tutorials, contests, etc.



VirES

VirES for Swarm – Context

VirES has been built in close collaboration with the scientific user community



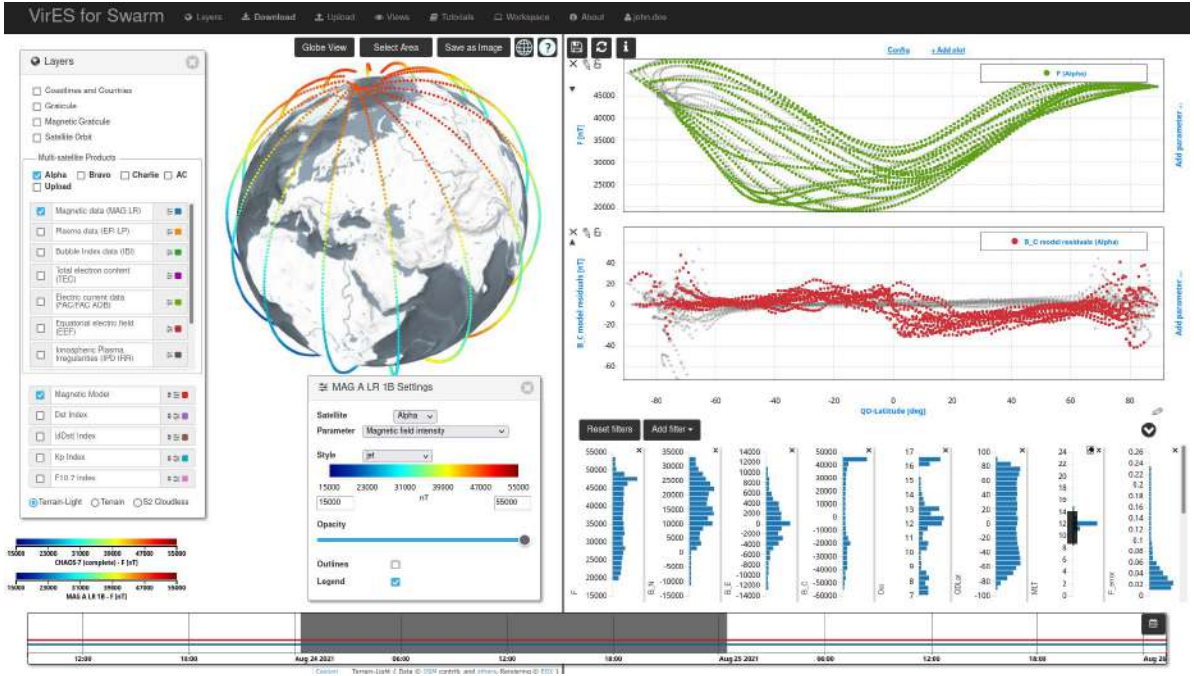
Swarm DISC (Data, Innovation and Science Cluster)

Similar setup exists in VirES for Aeolus

VirES for Swarm – Data Visualization Platform

https://vires.services

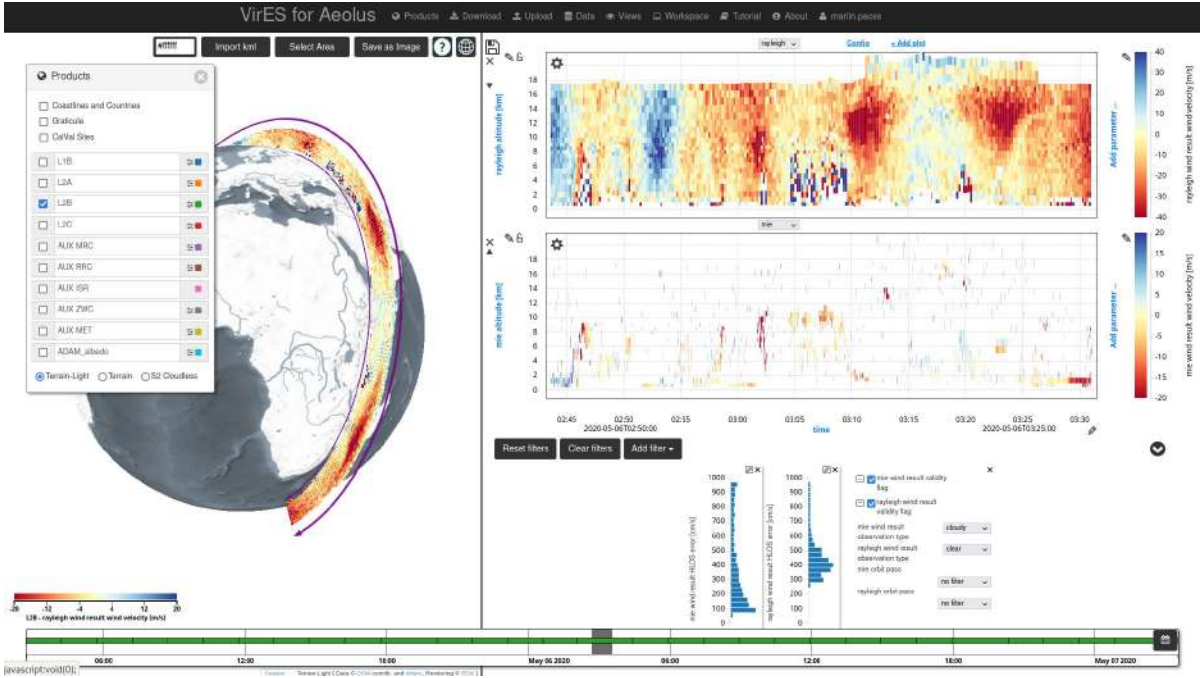
- time of interest selection
- on-line interactive data exploration
- data filtering by various parameters
- filtered data subset download
- VRE for analysis

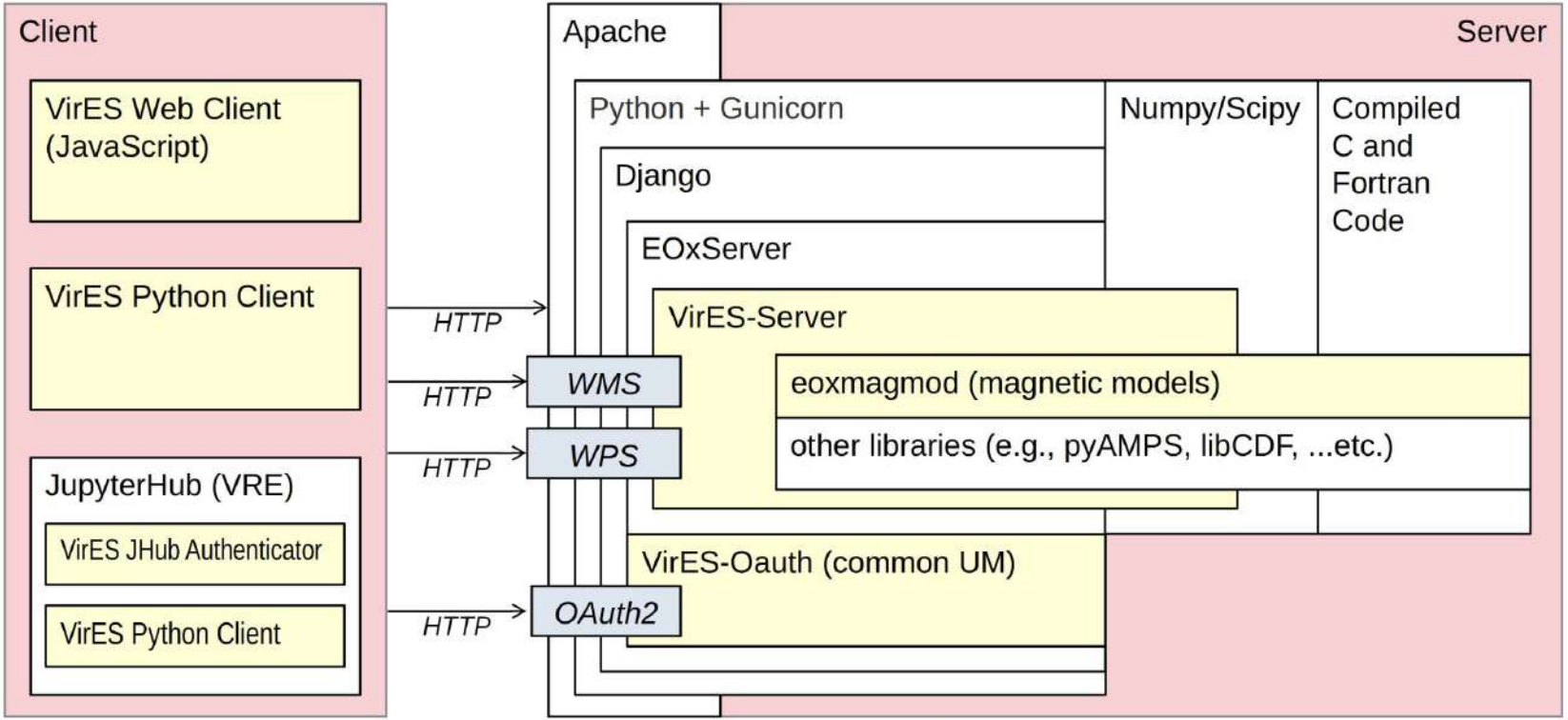


VirES for Aeolus – Data Visualization Platform

https://aeolus.services

- time of interest selection
- on-line interactive data exploration
- data filtering by various parameters
- filtered data subset download
- VRE for analysis





https://github.com/esa-vires

eodash

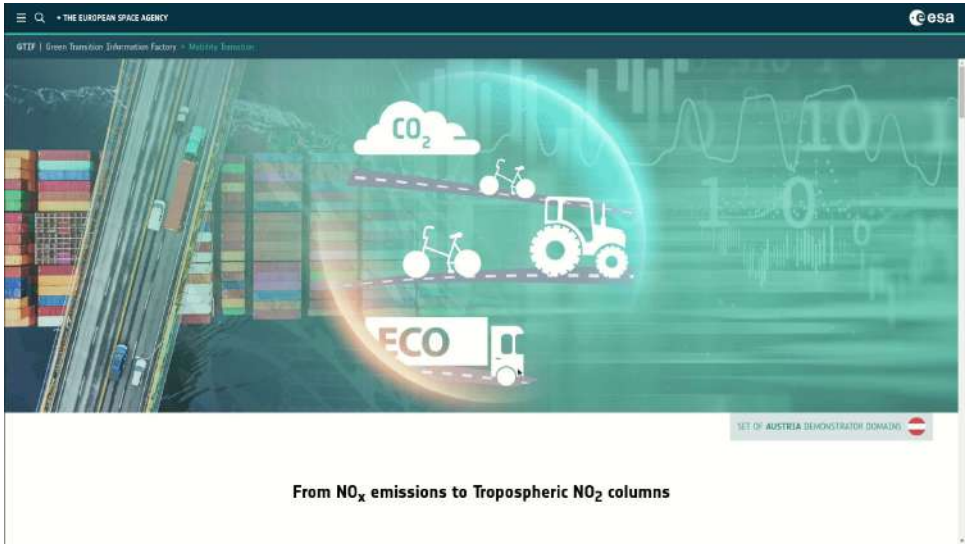
eodash

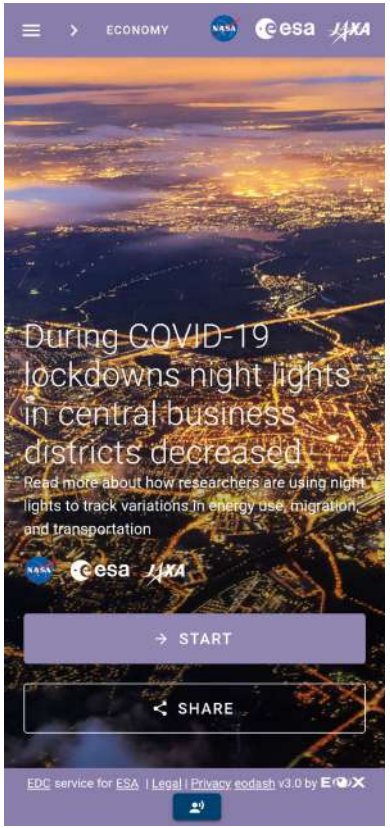
- Rapid Action for Citizens with Earth Observation https://race.esa.int
- EO Dashboard by NASA, JAXA, and ESA https://eodashboard.org
- Open for everyone
- Collaborative features

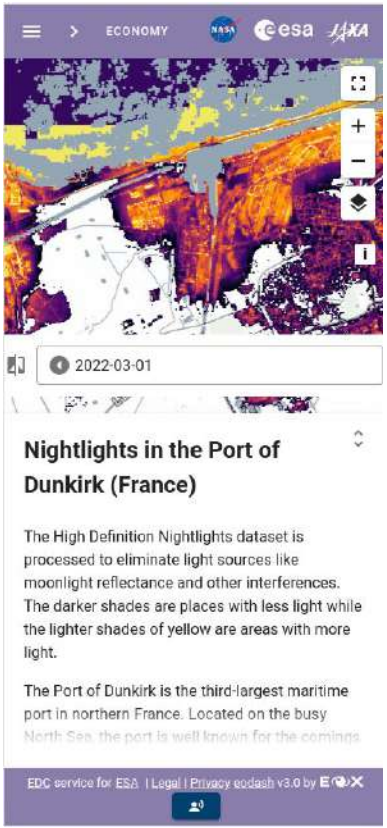
Green Transition Information Factory - GTIF

- Sneak peek

Story- & Scrollytelling







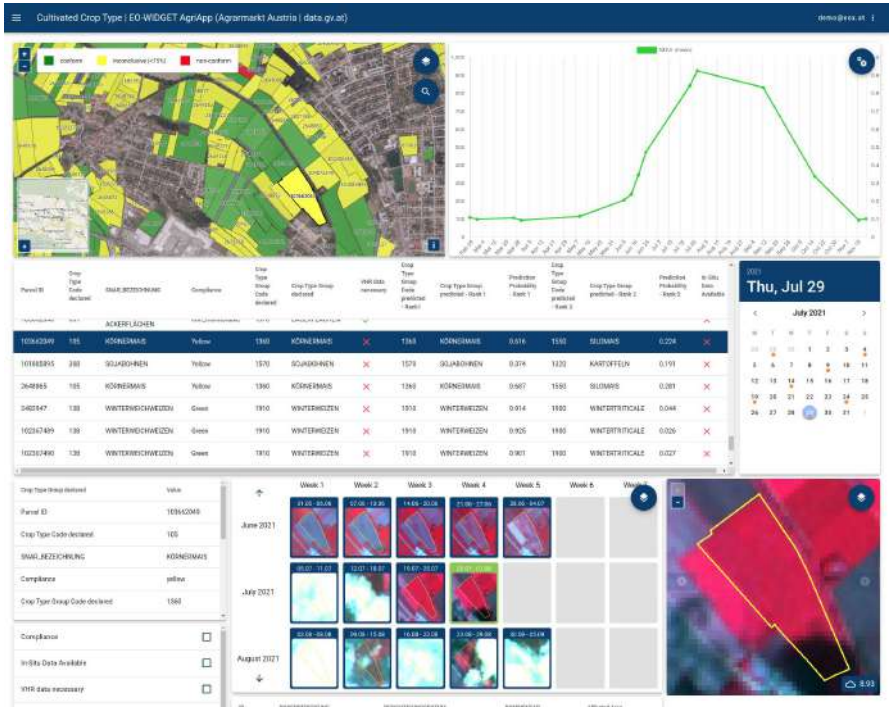
Open Source

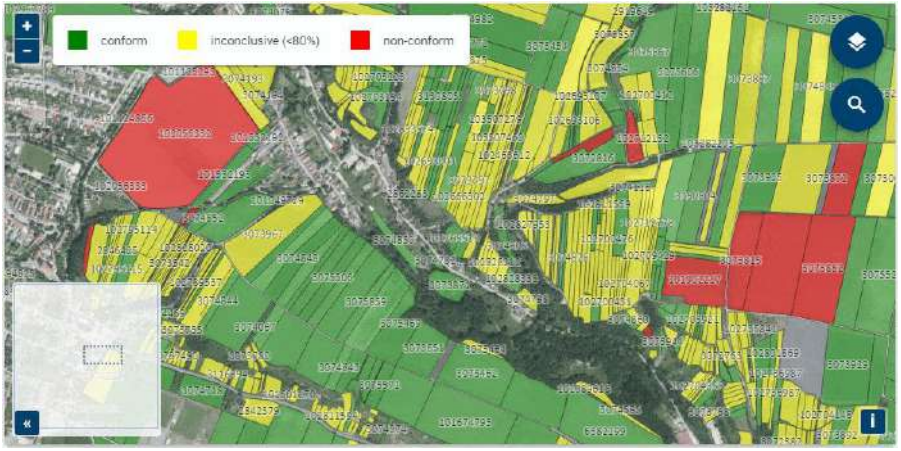
- Source code - https://github.com/eurodatacube/eodash
- Based on Vue.js, Vuetify, OpenLayers, EOxElements, Chart.js, geotiff.js, etc.

- Feedback and contributions are welcome

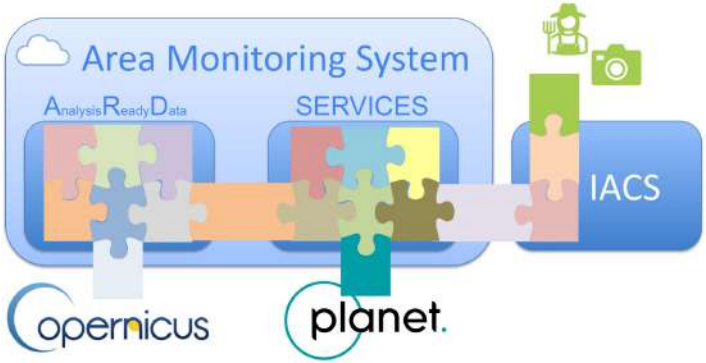

EOX
EU Common
Agricultural Policy
AMS

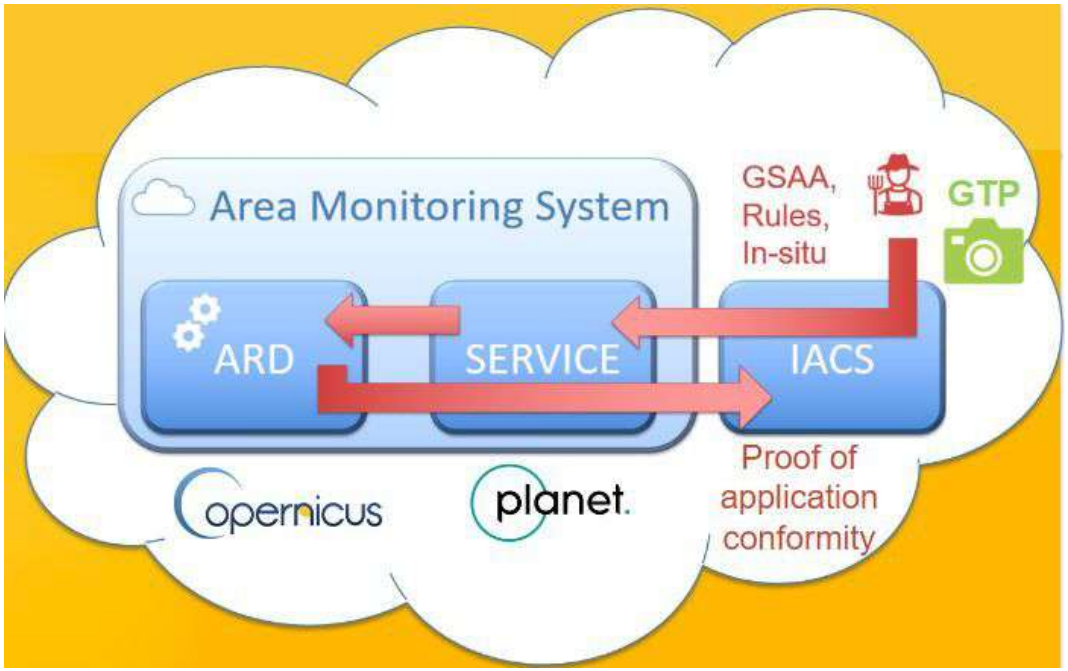
EU Common Agricultural Policy AMS - Agri App



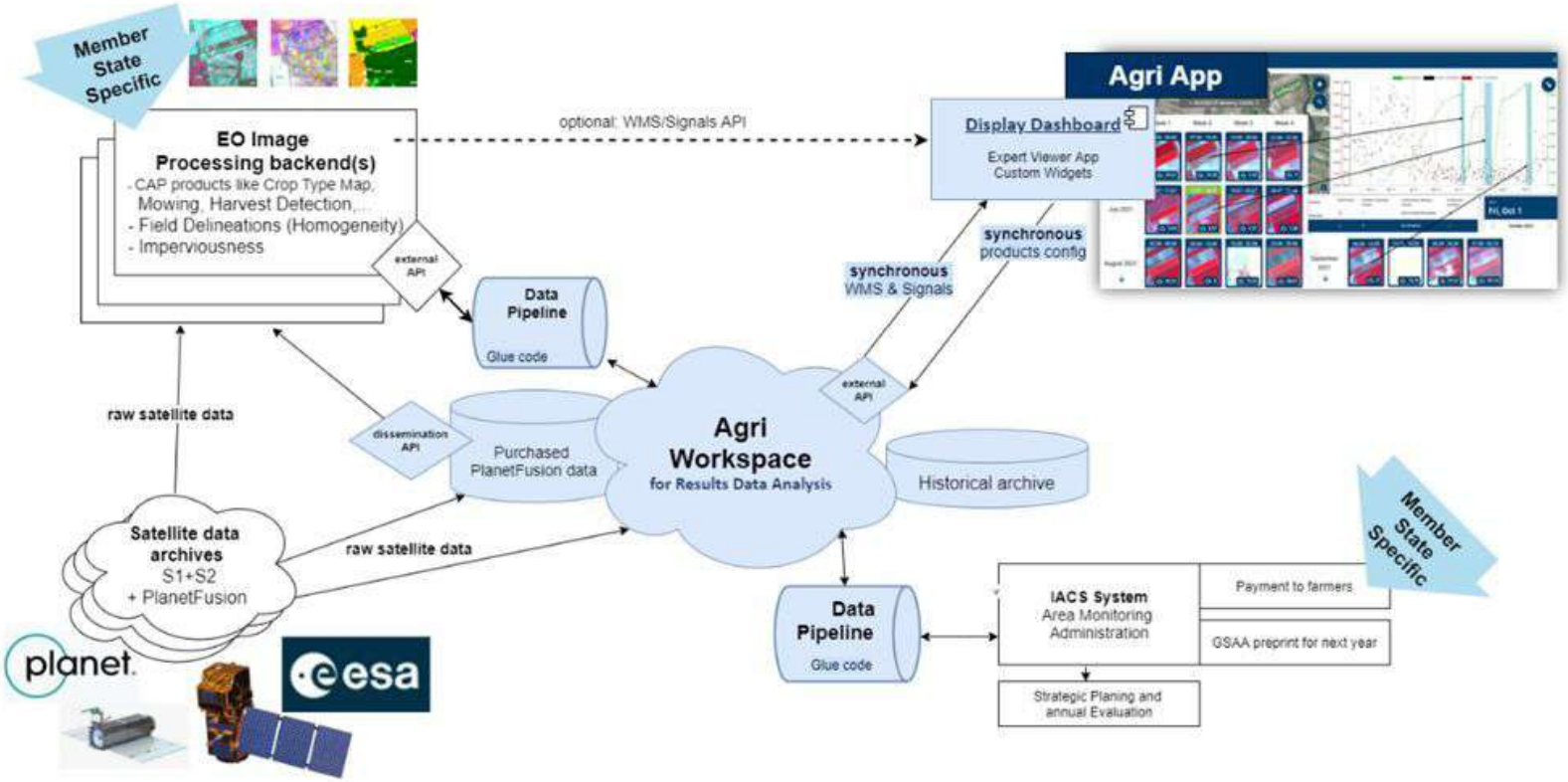


Area Monitoring System - Open Value Chain





Service Architecture



Managed Agricultural Area Monitoring System

- Contractor-Operated Services
- Public demo https://agri-ogd-at-public.demo.hub.eox.at

- Open Source to minimize risk for paying agencies

- Open Data - Copernicus Sentinels
- Open Source - Sen4Cap, View Server, Agri App

EOxCloudless - Sentinel-2 cloudless

Sentinel-2 cloudless

https://s2maps.eu

- Yearly global cloudless mosaics from Sentinel-2 data
- Open Data for non-commercial use
  - CC BY NC 4.0
  - 2016 CC BY 4.0

EOxCloudless

EOxCloudless

https://cloudless.eox.at

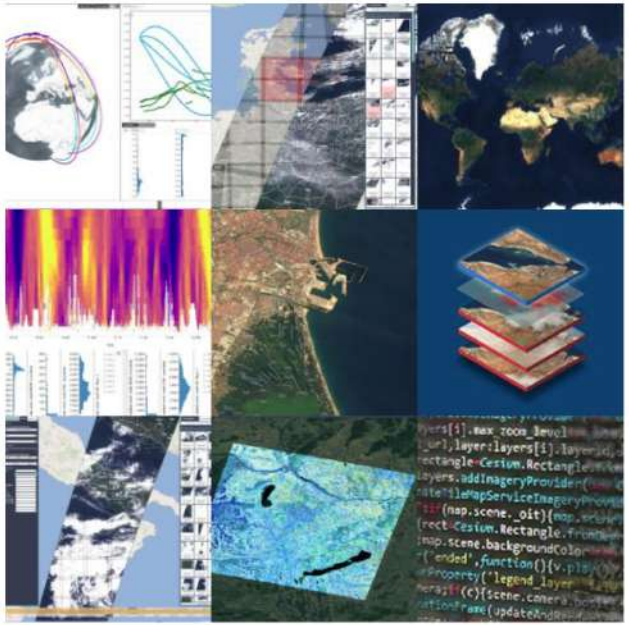
- Exploitation-ready satellite imagery
- Source Data for Viewing and Analysis
- Tailored cloudless mosaics - Adding value to Sentinel-1 and 2 data
- Commercial usage license for same data

Summary

Summary

Launching an EO business using Open Source & Open Data

- Wouldn’t be possible without Open Data & Open Source
- Community building takes time and efforts, make use of support by OSGeo
- Use public repositories like GitHub or GitLab
- Support by providing resources (NoR) is great but need to solve long term availability
- Agencies as sponsors to ask for results be made openly available



VIEW THE WORLD THROUGH OUR EYES

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