



Copernicus - eoSC AnaLytics Engine

# Implementing a European Big Copernicus Data Analytics platform: The C-SCALE service offer in a nutshell

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# The C-SCALE Project



Europe lacks an **integrated compute** and **storage infrastructure** for the exploitation of **Copernicus** datasets in scientific and applied applications.



C-SCALE responds to that challenge by **enhancing the EOSC Portal** with **pan-European federated data and computing infrastructure** services for Copernicus.

## C-SCALE: Copernicus - eoSC AnaLytics Engine

- Project duration: Jan 2021 – June 2023
- Budget: ~ 2 million Euros
- Consortium of 11 partners with pan-European coverage



# Project Objectives and KERs



## Objectives

- O1: **Scale-up the EOSC Portal** integrating pan-European computing and data resources for Copernicus
- O2: **Federate Copernicus resources** with EOSC computing and storage providers
- O3: Piloting the provision of a distributed **online Sentinel long-term archive** in EOSC
- O4: **Co-design** of the federation with relevant scientific communities across Europe

## Key Exploitable Results:



FedEarthData



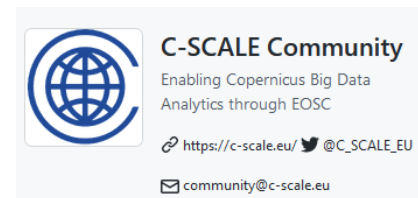
openEO Platform



Earth Observation  
Metadata Query  
Service

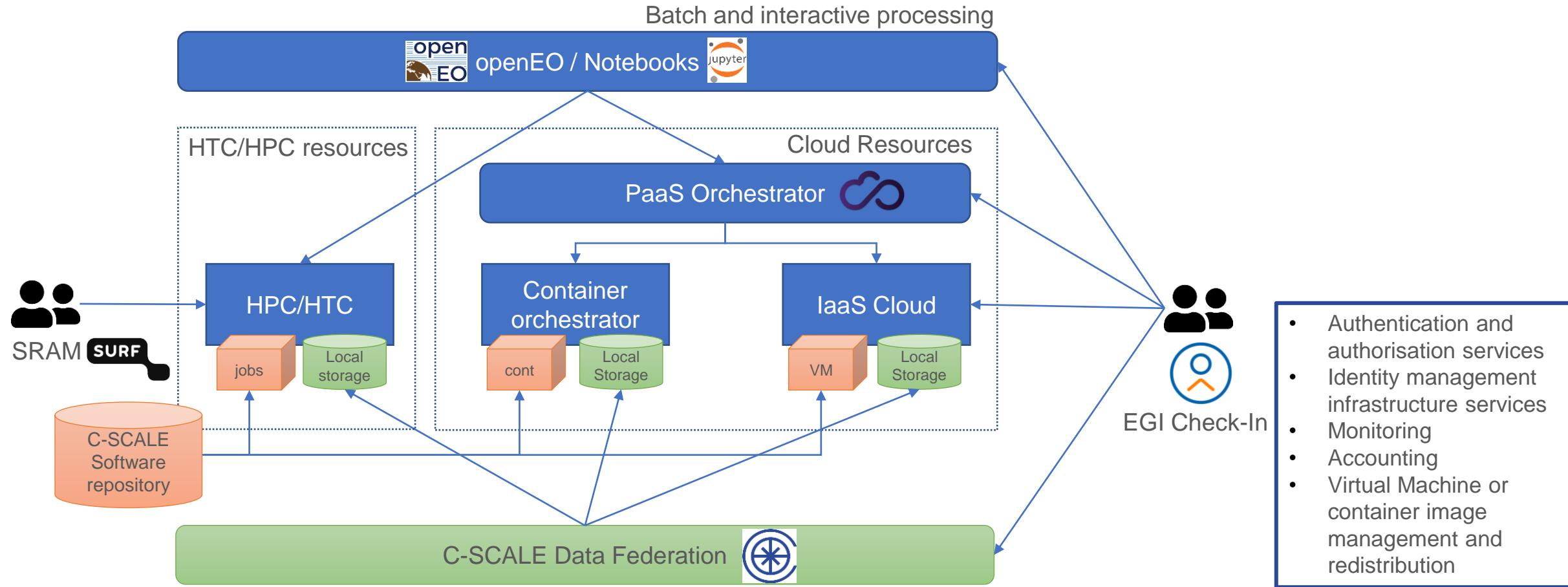


Workflow solutions



C-SCALE Community

**FedEarthData:** federation of Earth observation data archives and computing resource providers, enabling execution of Earth observation processing workflows with seamless access to data

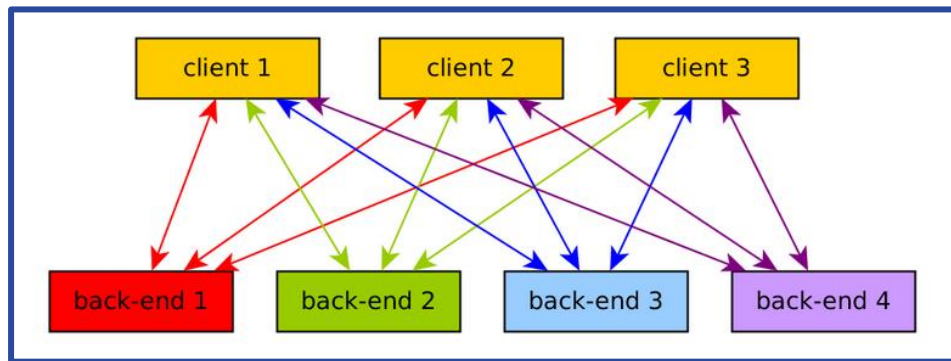




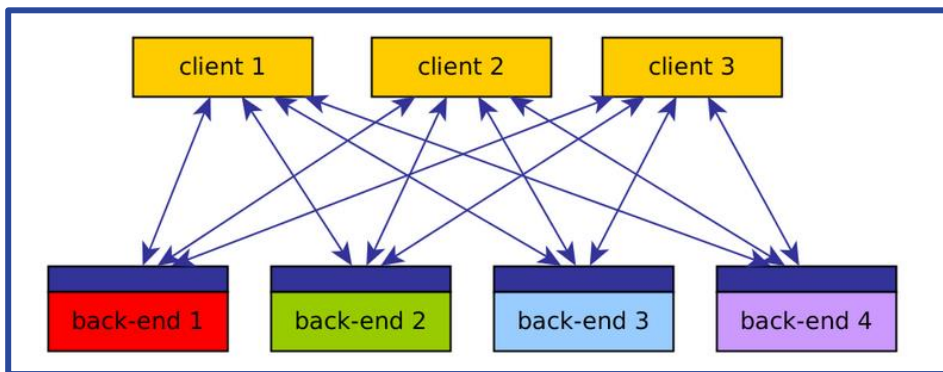
# openEO Platform



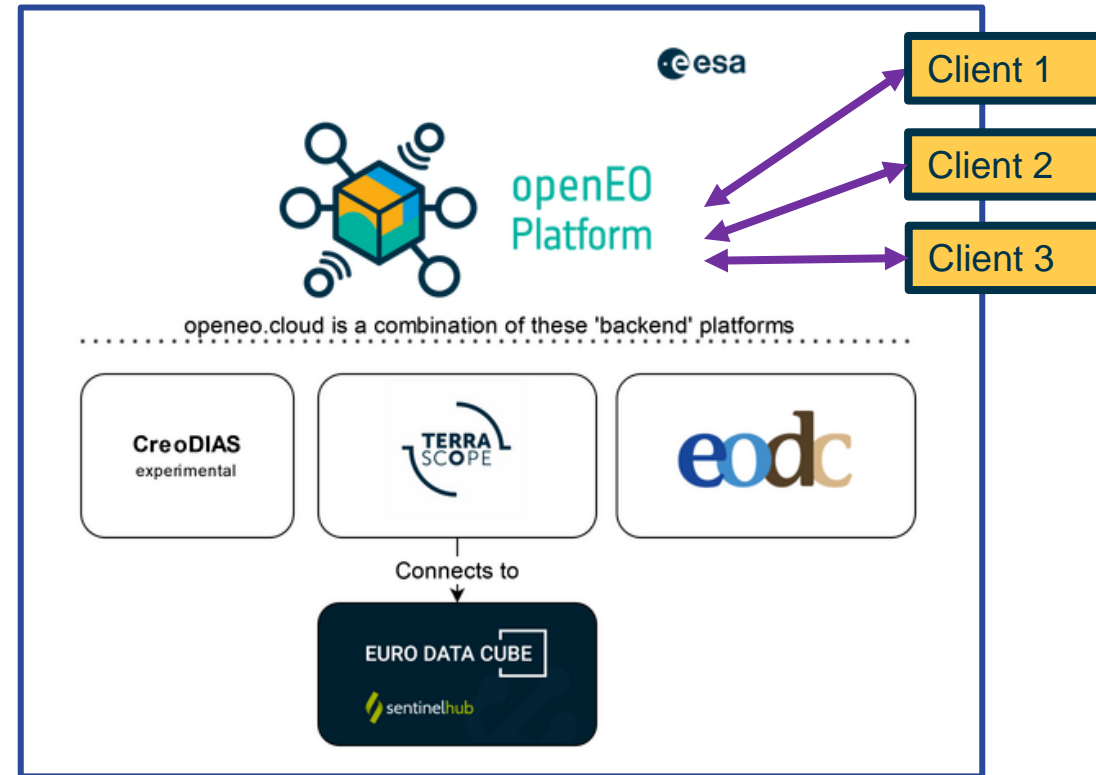
Situation before openEO:



openEO API:



openEO Platform:



- Clients: Python, R, Javascript
- Web Editor
- JupyterLab

# Earth Observation Metadata Query Service



- ❑ **Earth Observation data discovery** service arching over FedEarthData member providers
- ❑ Data providers already know where their data are
  - Bring their discovery interfaces under a common one
    - **single point**
    - **shared protocol**
- ❑ **Spatio-Temporal Asset Catalogue (STAC)** interface to enable queries across the federation
- ❑ EO-MQS is a **query broker** and **aggregator**, it is **not yet another metadata database**.
- ❑ **Focus and data retention policies** at member sites - avoiding polling resources irrelevant to the given query

C-SCALE Earth Observation Metadata Query Service (EO-MQS)

C-SCALE Earth Observation Metadata Query Service (EO-MQS) (stac-fastapi)

<https://eo-mqs.c-scale.eu/stac/v1>

The Earth Observation Metadata Query Service (EO-MQS) is the central entry point to query for metadata across the C-SCALE federation.

Collections	Catalogs	Items	Links
Identifier	Title		
EODC sentinel1-grd	Sentinel-1 SAR L1 GRD		
EODC sentinel-2-l1c	Sentinel-2 MSI Products: Level-1C data		
EODC s1-global-sigma0	Sentinel-1 Sigma0 Products		
EODC s1-demo-sigma0	Sentinel-1 Sigma0 Demo Products		
EODC landsat-c2-l1	Landsat Collection 2 Level-1 Data		
GRNET-OPENSTACK sentinel-1-grd	sentinel-1-grd		
GRNET-OPENSTACK sentinel-1-ocn			
GRNET-OPENSTACK sentinel-1-raw			
GRNET-OPENSTACK sentinel-1-slc			
GRNET-OPENSTACK sentinel-2-l1b			
GRNET-OPENSTACK sentinel-2-l1c			
GRNET-OPENSTACK sentinel-2-l2a			
GRNET-OPENSTACK sentinel-3-olci-l1b			
GRNET-OPENSTACK sentinel-3-olci-l2			
GRNET-OPENSTACK sentinel-3-slstr-l1b			
GRNET-OPENSTACK sentinel-3-slstr-l2			
GRNET-OPENSTACK sentinel-3-slm-l2			
GRNET-OPENSTACK sentinel-3-syn-l2			
GRNET-OPENSTACK sentinel-5p-l1b			
CREODIAS LANDSAT-5			

C-SCALE Earth Observation Metadata Query Service (EO-MQS) / Sentinel-1 SAR L1 GRD

## Sentinel-1 SAR L1 GRD (EODC|sentinel1-grd)

<https://eo-mqs.c-scale.eu/stac/v1/collections/EODC|sentinel1-grd>

Level-1 Ground Range Detected (GRD) products consist of focused SAR data that has been detected, multi-looked and projected to ground range using the Earth ellipsoid model WGS84. The ellipsoid projection of the GRD products is corrected using the terrain height specified in the product general annotation. The terrain height used varies in azimuth but is constant in range (but can be different for each IW/EW sub-swath). Ground range coordinates are the slant range coordinates projected onto the ellipsoid of the Earth. Pixel values represent detected amplitude. Phase information is lost. The resulting product has approximately square resolution pixels and square pixel spacing with reduced speckle at a cost of reduced spatial resolution. For the IW and EW GRD products, multi-looking is performed on each burst individually. All bursts in all sub-swaths are then seamlessly merged to form a single, contiguous, ground range, detected image per polarisation.

Collections	Catalogs	Items
Title	Date Acquired	
S1A_IW_GRDH_TSSH_20220401T233117_20220401T233146_042586_051487_C4D2	Fri, 01 Apr 2022 23:31:31 GMT	
S1A_IW_GRDH_TSDV_20220401T105102_20220401T105127_042579_05143E_8532	Fri, 01 Apr 2022 10:51:15 GMT	
S1A_IW_GRDH_TSSH_20220401T015411_20220401T015436_042573_051408_458D	Fri, 01 Apr 2022 01:54:24 GMT	
S1A_IW_GRDH_TSDH_20220329T091454_20220329T091519_042534_0512C4_FD57	Tue, 29 Mar 2022 09:15:06 GMT	
S1A_IW_GRDH_TSDV_20220324T020808_20220324T020831_042457_051023_3F41	Thu, 24 Mar 2022 02:08:19 GMT	
S1A_IW_GRDH_TSSV_20220314T095817_20220314T095848_042316_050854_9E4A	Mon, 14 Mar 2022 09:58:33 GMT	
S1A_IW_GRDH_TSDV_20220101T234855_20220101T234921_041274_04E7D7_27C0	Sat, 01 Jan 2022 23:49:08 GMT	
S1A_IW_GRDH_TSDV_20220101T234510_20220101T234535_041274_04E7D7_182F	Sat, 01 Jan 2022 23:45:22 GMT	
S1A_IW_GRDH_TSDV_20220101T234445_20220101T234510_041274_04E7D7_79CF	Sat, 01 Jan 2022 23:44:57 GMT	
S1A_IW_GRDH_TSDV_20220101T234420_20220101T234445_041274_04E7D7_D3C2	Sat, 01 Jan 2022 23:44:32 GMT	



METADATA
STAC Version 1.0.0
Keywords sentinel, copernicus, esa, sar, radar
License proprietary
Temporal Extent 03/10/2014, 02:00:00 - now
PROVIDER
ESA (producer, processor, licensor)
ITEM SUMMARY
Platform • sentinel-1a • sentinel-1b
Constellation sentinel-1



Deltares






# How to access the C-SCALE services






Main exploitation paths:

- [EOSC Marketplace](#)
- [C-SCALE website](#)
- [openEO Platform website](#)







**Federated Earth System Simulation and Data Processing Platform**  
FedEarthData

Easy processing of Copernicus data

Organisation: EGI Foundation  
Provided by: CloudFerro, CESNET, Italian National Institute of Nuclear Physics, Earth Observation Data Centre for Water Resources Monitoring, Portuguese National Distributed Computing Infrastructure (INCD), SURF, VITO NV (Vlaamse Instelling voor Technologisch Onderzoek NV)

☆☆☆☆☆ (0.0 / 5) 0 reviews ☐ Add to comparison ☐ Add to favourites

Access the service


🔒 ORDER REQUIRED




→ Webpage → Helpdesk → Helpdesk e-mail  
→ Manual

Ask a question about this service?

ABOUT DETAILS REVIEWS (0)

OPERATIONAL





**Earth Observation Metadata Query Service**  
EO-MQS

Efficient discovery of Copernicus data assets

Organisation:  
Earth Observation Data Centre for Water Resources Monitoring  
Provided by: CESNET

☆☆☆☆☆ (0.0 / 5) 0 reviews ☐ Add to comparison ☐ Add to favourites

Access the service


🔓 FULLY OPEN ACCESS




→ Webpage → Helpdesk → Helpdesk e-mail  
→ Manual → Training information

Ask a question about this service?

ABOUT DETAILS REVIEWS (0)

OPERATIONAL





**openEO Platform**  
openEO Platform

Enabling analysis of large-scale Earth Observation data with federated computational infrastructure

Organisation:  
Earth Observation Data Centre for Water Resources Monitoring  
Provided by: Sinergise, VITO NV (Vlaamse Instelling voor Technologisch Onderzoek NV)

☆☆☆☆☆ (0.0 / 5) 0 reviews ☒ Remove from comparison ☐ Add to favourites

Access the service

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ABOUT DETAILS REVIEWS (0)

OPERATIONAL

<https://marketplace.eosc-portal.eu/services/eosc.egi-fed.fedearthdata>

<https://marketplace.eosc-portal.eu/services/eosc.eodc.eo-mqs>

<https://marketplace.eosc-portal.eu/services/openeo-platform/>



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# C-SCALE workflow solutions



Workflows for **Copernicus** data processing: easy deployment of workflows supporting **monitoring, modelling** and **forecasting** of the **Earth** system

- Provided by **C-SCALE Use Cases**
- **Templates** and **reusable components** for users to build their own applications on FedEarthData



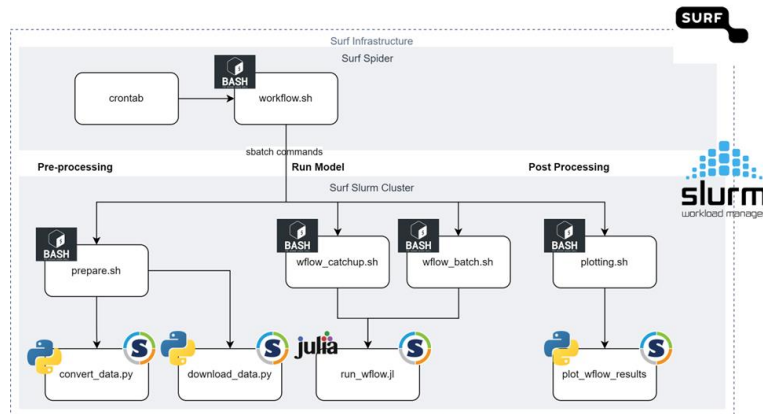
AquaMonitor using OpenEO on C-SCALE

RoHub [Link](#) Zenodo [Link](#)



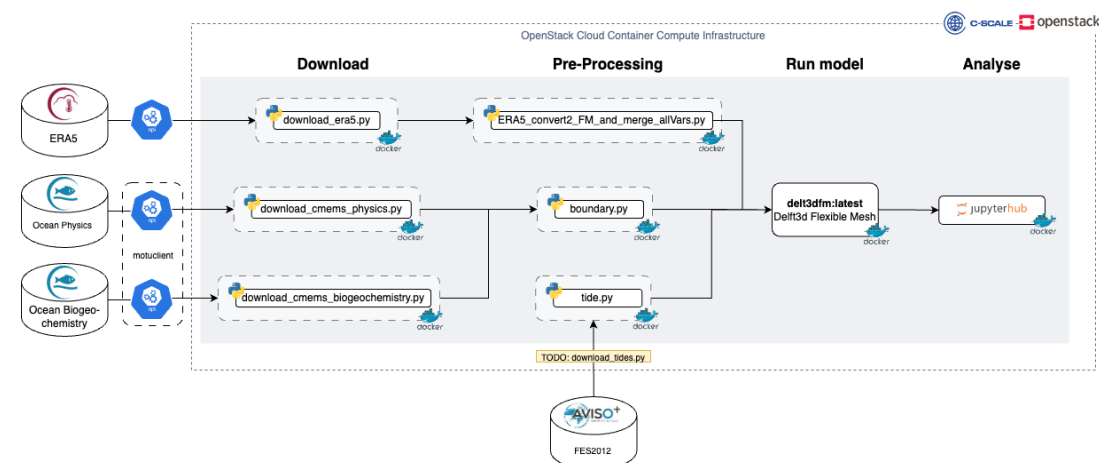
Global Water Watch using OpenEO on C-SCALE

RoHub [Link](#)



Automated monthly river forecasts using Wflow

RoHub [Link](#) Zenodo [Link](#)



Coastal hydrodynamic and water quality modelling using Delft3D FM

RoHub [Link](#) Zenodo [Link](#)



# User engagement

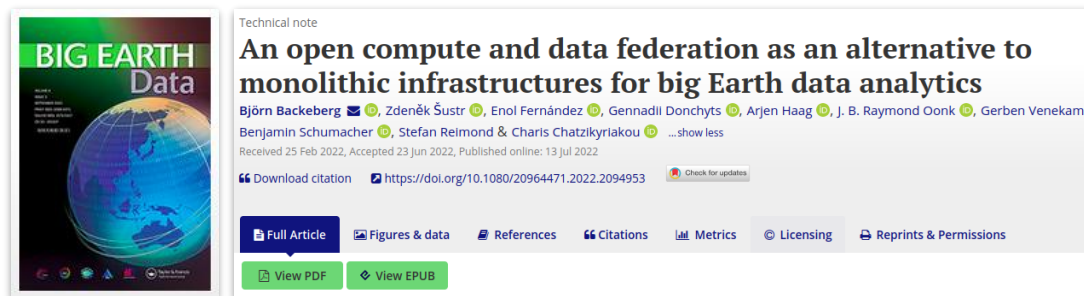
## User forum and functional co-design

- C-SCALE community: <https://github.com/c-scale-community/discussions>
- encourages advanced users to become active participants in the development of the future C-SCALE services
- mechanism to engage with the national and international organisations invested in Copernicus services

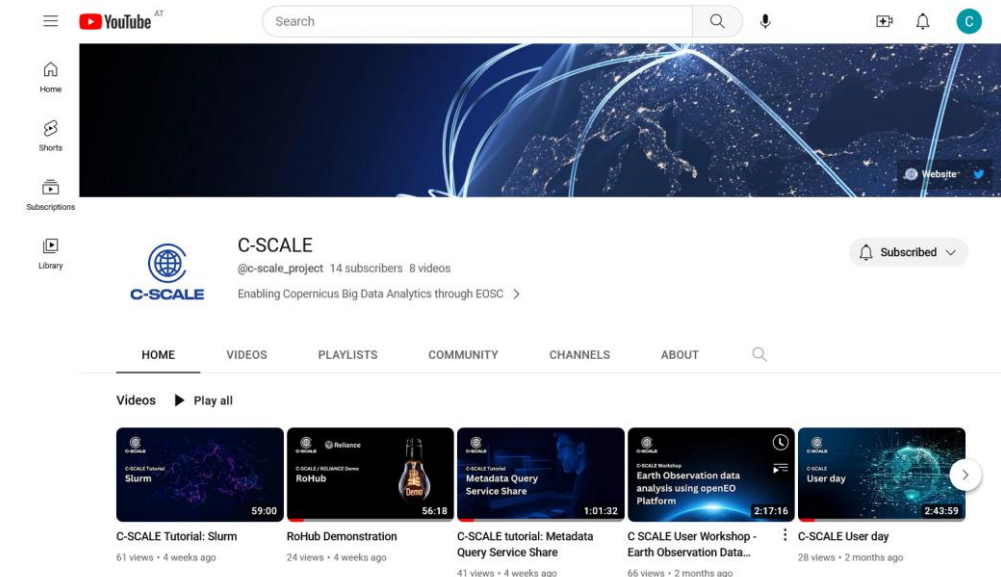
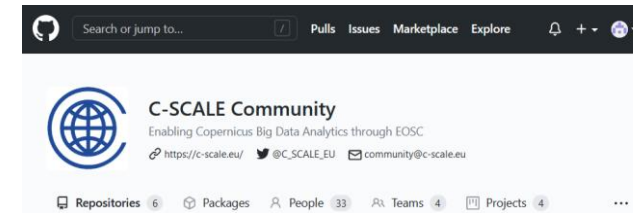


## C-SCALE documentation, training and support

- <https://wiki.c-scale.eu/C-SCALE>
- [https://www.youtube.com/@c-scale\\_project](https://www.youtube.com/@c-scale_project)



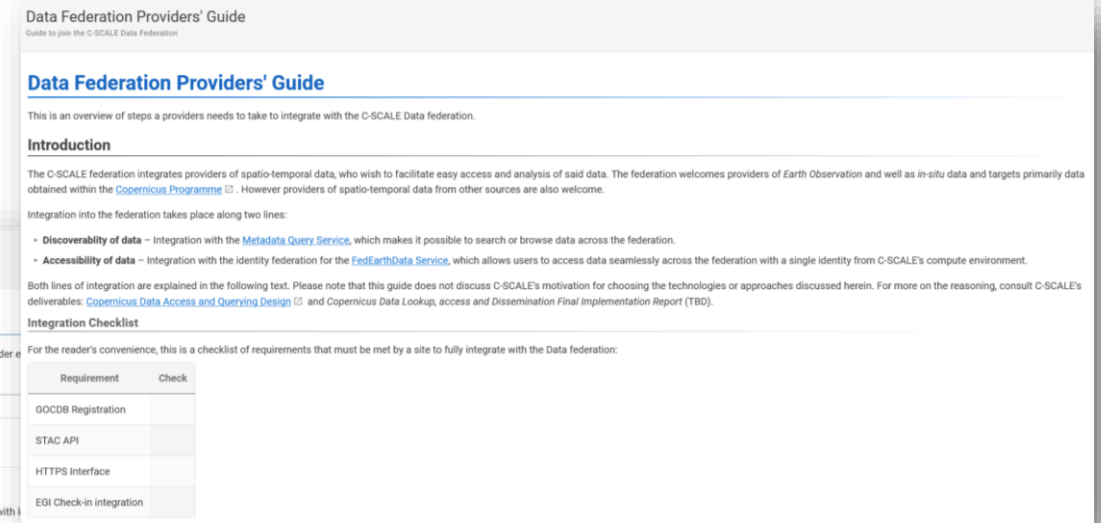
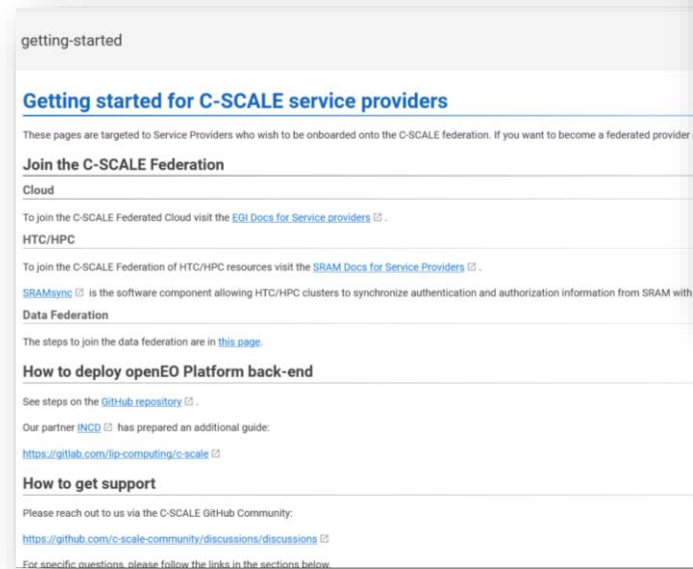
<https://doi.org/10.1080/20964471.2022.2094953>



# Provider onboarding

C-SCALE aims to **expand its Compute and Data federation** with new service providers!

- **Well-defined guidelines** to join the federation
  - Technical integration
    - configure your system to allow federated identity
    - register in catalogues
  - Non-technical integration: contacts, AUP, Privacy Policies...
- **Support** is provided through the whole process
- If you interested, **get in contact with us!**





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# Thank you for your attention.

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 [@C\\_SCALE\\_EU](https://twitter.com/C_SCALE_EU)

 [https://www.youtube.com/@c-scale\\_project](https://www.youtube.com/@c-scale_project)

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