Copernicus - eoSC AnaLytics Engine

C-SCALE

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Project Introduction

C-SCALE (Copernicus - eoSC AnaLytics Engine) - Grant agreement ID: 101017529

- Funded by the EU
  - under the Programme: H2020-EU.1.4.1.3. - Development, deployment and operation of ICT-based e-infrastructures
  - and the topic: INFRAEOSC-07-2020 - Increasing the service offer of the EOSC Portal
- Project duration: January 2021 – June 2023 (30 months)
- Coordinated by EODC, 11 partners with pan-European coverage
- Overall budget: ~ 2M €

Copernicus | Problem Statement

- EU Copernicus programme: key global source for high resolution EO data
  - Significant contribution to the *digital twin Earth* vision of EU

- There is no single European processing back-end that serves all datasets of interest
  - limits the integration of these data sources in science and monitoring applications

- Big (Copernicus) Data Analytics require a federated infrastructure with a core cloud computing and storage architecture optimised for very large data handling and fast user query response.

Project Mission

Vision

To empower European researchers, institutions and initiatives to easily discover, access, process, analyse and share Copernicus data, tools, resources and services through the EOSC Portal in a way that can be seamlessly integrated into their processes and research practices.

Mission

- Enhance EOSC Portal with pan-European federated data and computing infrastructure for Copernicus
- Integrate cross-/inter- disciplinary EOSC services, ensuring interoperability between distributed data catalogues, computational tools and infrastructure
- Increase the service offer of the EOSC Portal providing state-of-the-art research enabling services to its users.

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

C-SCALE Consortium

The C-SCALE consortium brings together expertise from:

- ✓ the EO sector:

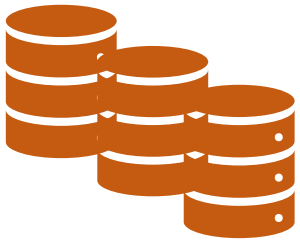
- ✓ e-Infrastructure:

Service provisioning

The C-SCALE federation will make available a suite of three services in through the EOSC Portal:

C-SCALE EO Data Archive

- Access and download data through the C-SCALE EO Data archive

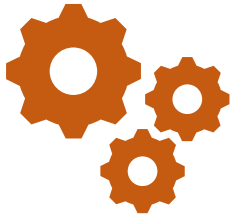


C-SCALE Compute Services

- Access large C-SCALE compute services through standard interfaces near to the data

C-SCALE Analytics Platforms

- Seamlessly deploy data analytics on top of the C-SCALE EO Data Archive and Compute Services

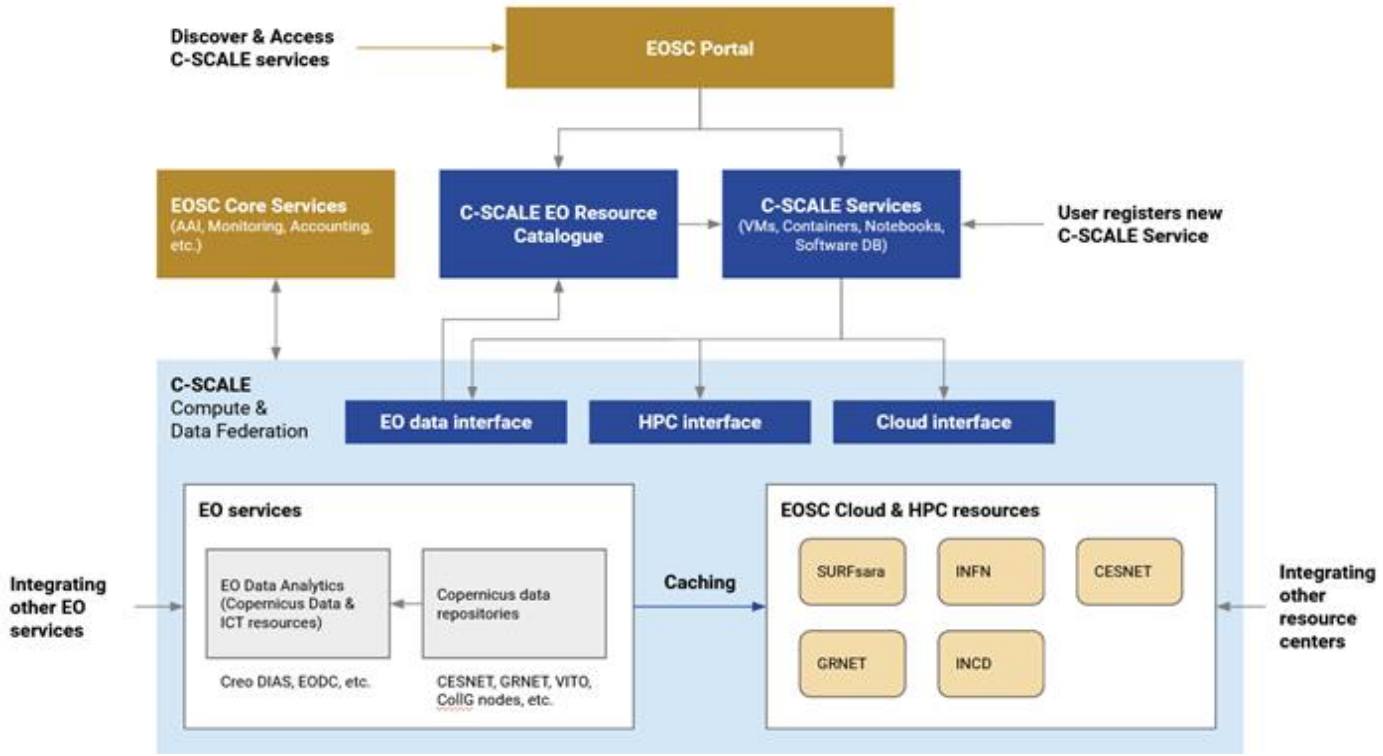


The C-SCALE federation services will be available in the EOSC Portal in the second half of 2022.

Federation of infrastructures and EO data

Federation principles

- Services accessible through homogeneous and standard interfaces
- EO data FAIR across the providers
- Burden to join the federation limited
- Adhere to EOSC policies and operational and technical requirements
- Basic and ops features (AAI, accounting, etc.) available through EOSC core services
- Maximise interoperability with other EOSC services



Use Cases

#	Use Case
1	Aqua Monitor
2	WaterWatch
3	HiSea
4	High-resolution Land Surface (Drought) Analysis
5	RETURN
6	Virtual European Sentinel Data Cubes

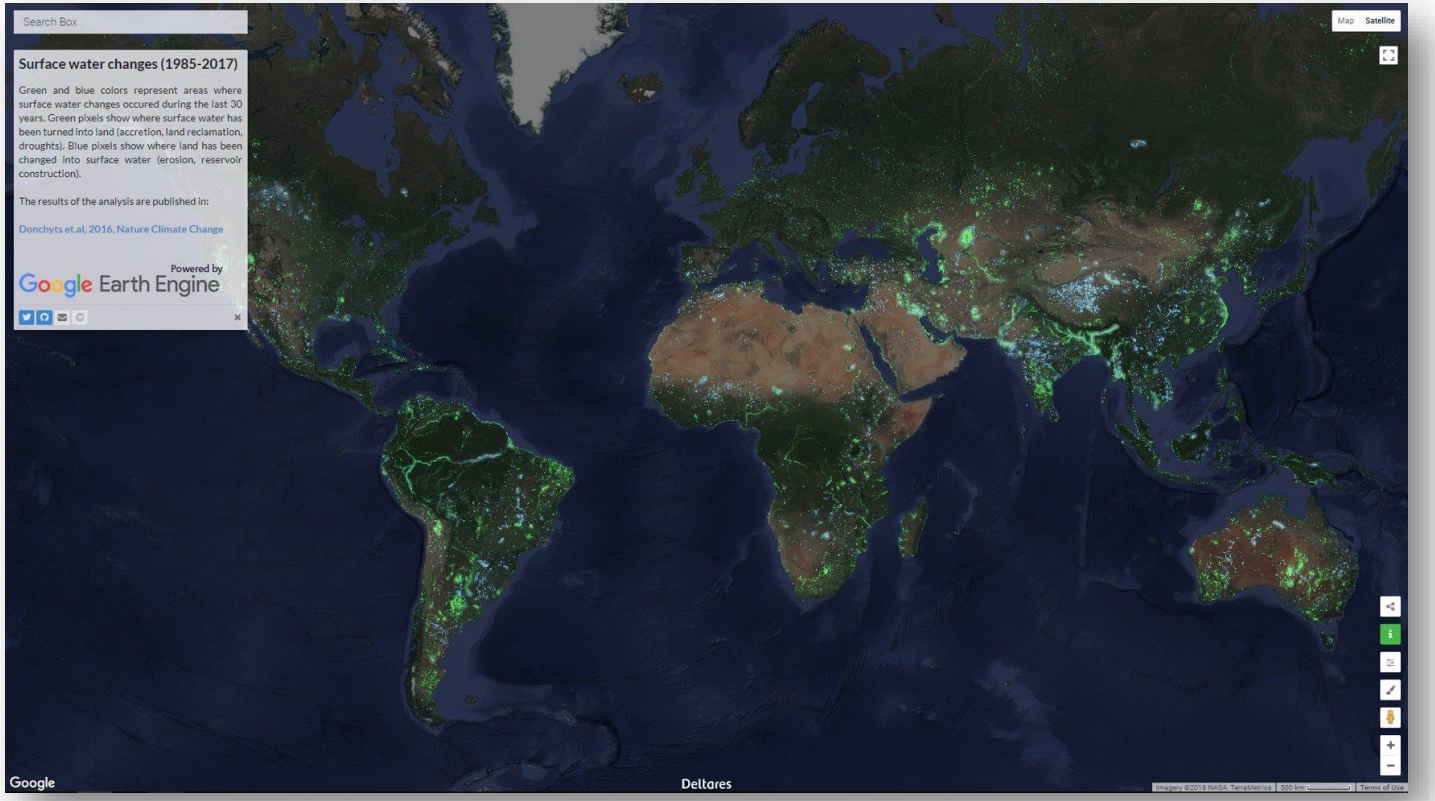
Role: validate and optimise the C-SCALE federation

Benefits:

- Cloud agnostic
- Independence from commercial, closed, non-EU providers
- Cross- / inter-disciplinary exposure
- FAIRer

Use case #1: Aquamonitor

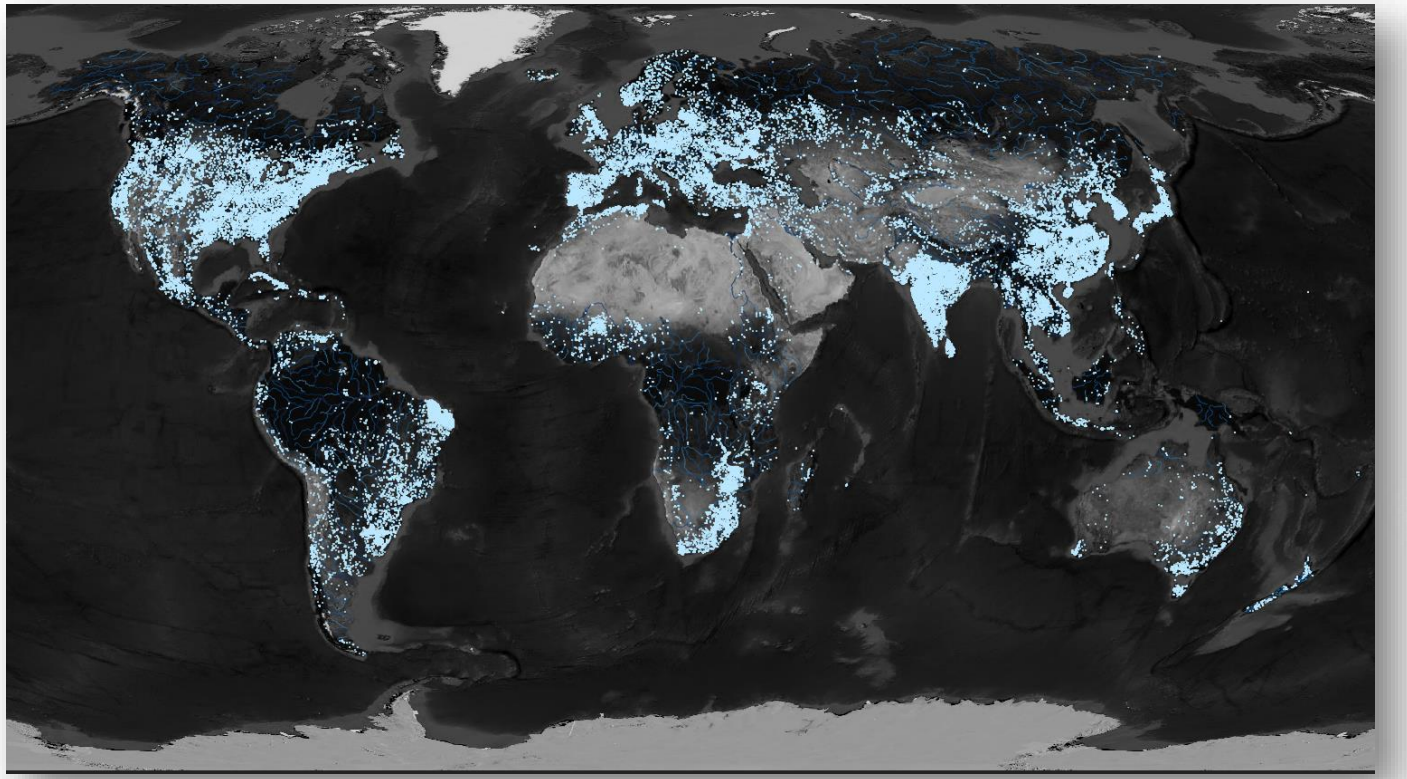
- Mapping of surface water changes globally
- Web app to explore surface water mask and changes
- Replicate functionality implemented using Google Earth Engine using EOSC infrastructure (or use hybrid approach)

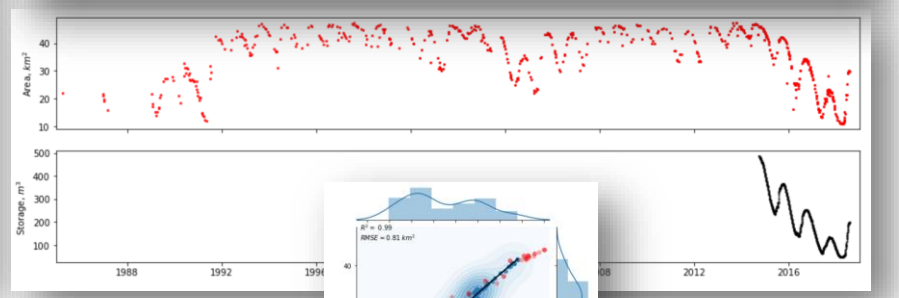


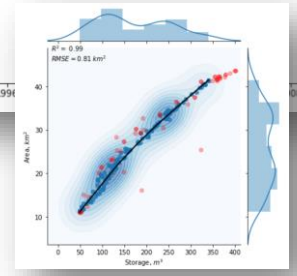
https://aqua-monitor.appspot.com/

Use case #2: WaterWatch

Near-real-time updates of the availability of surface water resources for 100k – 1M reservoirs (lakes, rivers, wetlands)







Users: water managers, agriculture, hydropower, droughts/floods, insurances

Use case #3: HiSea

Deliver accurate and reliable information, readily available, easily understandable and with high resolution

HiSea solution

- Co-designed with users
- Provides high resolution data of water quality at sea
- Develops operational Copernicus-based downstream information services
- Improves operation, planning and management of marine activities

HiSea Users

- Targets port and the aquaculture sectors

Further use cases

- Use case #4: High Resolution Land Surface (Drought) Analysis (HiResLSDA)
- Use case #5: RETURN (Monitoring tropical forest recovery capacity using Multispectral and Radar satellite data)
- Use case #6: Virtual European Sentinel Data Cubes

User support & training

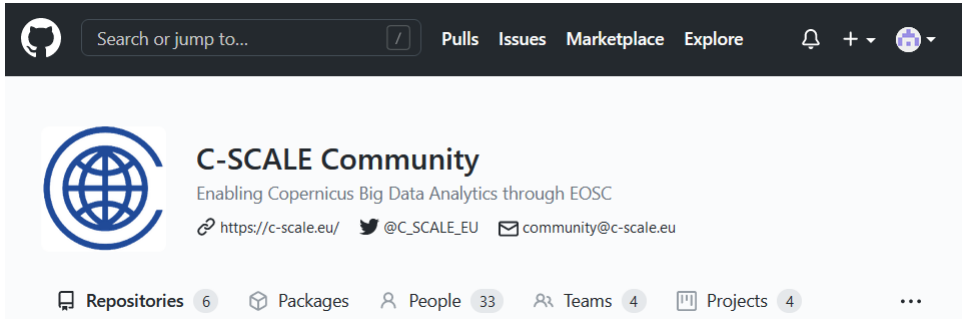
Training and user support to help them become proficient in using the C-SCALE federated data analytics infrastructure and platforms

- Create training material
- Organise webinars and tutorials
- Participate and contribute to events within the EO community
- Additional, on-demand, support to ensure efficient and effective service delivery and user satisfaction

First trainings are planned to start in Q3 2021.

User Forum

- Creation of a C-SCALE community
  - https://github.com/c-scale-community/discussions
  - "*The C-SCALE community is a place for researchers, end-users, institutions and initiatives: in short anyone with an interest in Copernicus data, tools, resources and services*"
- Serves for discussions, user support, community engagement



User engagement

User forum and functional co-design

- encourages advanced users to become active participants in the development of the future C-SCALE services
- mechanism to engage with the national and international organizations invested in Copernicus services

Early Adopter Programme

- launch open calls starting in June/July 2021
- expand the user community and further enable the co-design of C-SCALE components

Outreach activities

- increase awareness of Copernicus-related EOSC services and broaden the user community

C-SCALE Virtual Access resources

Installations (short name)	Service Category	Unit of access	Units
EODC EO Storage	Storage Service	TB year	150
EODC EO Cloud	Cloud Service	CPU year	620
EODC HPC	HPC/HTC Service	CPU Hour	600,000
CESNET MetaCentrumCloud - CPU	Cloud Service	CPU Month	2,850
INFN Bari Storage	Storage Service	TB Month	1,500
INFN Bari CPU	Cloud Service	CPU Month	3,840
SURFsara dCache Front end Storage	Storage Service	TB Year	154
SURFsara Spider (HTDP) storage	Storage Service	TB Year	160
SURFsara Data Processing Compute	HPC/HTC Service	CPU Hour	1,500,000
SURFsara MS4 Storage	Storage Service	TB Year	10
SURFsara MS4 SSD Storage	Storage Service	TB Year	96
SURFsara MS4 Compute	HPC/HTC Service	CPU Hour	147,600
VITO CVB (Storage)	Storage Service	TB Month	1,200
VITO CVB (Compute)	Cloud Service	CPU Hour	876,000
GRNET KNS-Storage Cloud	Storage Service	TB Hour	250,000
GRNET KNC Cloud	Cloud Service	CPU Hour	1,650,000
GRNET ARIS-Storage HPC	Storage Service	TB Hour	219,000
GRNET ARIS-Compute HPC	HPC/HTC Service	CPU Hour	1,000,000
CREODIAS – Storage	Storage Service	TB Month	2,762
CREODIAS - Compute	Cloud Service	vCore hour	1,500,000
CREODIAS – GPU	GPU service	GPU hour	6,000
INCD Lisbon (NCG) (Storage)	Storage Service	TB Month	450
INCD Lisbon (NCG) (Compute)	Cloud Service	CPU Day	4500

Total capacity of resources offered through VA:

- Cloud: 1648 CPU core/year
- HTC/HPC: 370 CPU core/year
- Storage: 1104 TB/Year;

Conclusion

- C-SCALE puts together EO and the e-infrastructure partners to:
  - Facilitate the exploitation of Copernicus data leveraging on large resources and advanced technologies from e-infras and EOSC
  - Make Copernicus resources easily accessible to new research areas and EOSC in general

- C-SCALE will deliver a federation of EO and e-infrastructure services and resources
  - Create a very large distributed repository of EO data close to compute resources
  - EO data will be FAIR through the federation
  - Federation services accessible through the EOSC Portal

- C-SCALE federation will be co-designed with researchers

- Large amount of resources available through the Virtual Access mechanism

C-SCALE

Thank you for your attention.

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