



**CS³
MESH⁴
EOSC**

Connecting European Data



Science Mesh – Global Platform for Scientific Collaboration

Renato Furter (SWITCH), Guido Aben (SUNET), Maciej Brzeźniak (PSNC)

TNC23 Science Mesh Workshop



CS3MESH4EOSC has received funding from the European Union's Horizon 2020 Research and Innovation programme under **Grant Agreement No. 863353**.

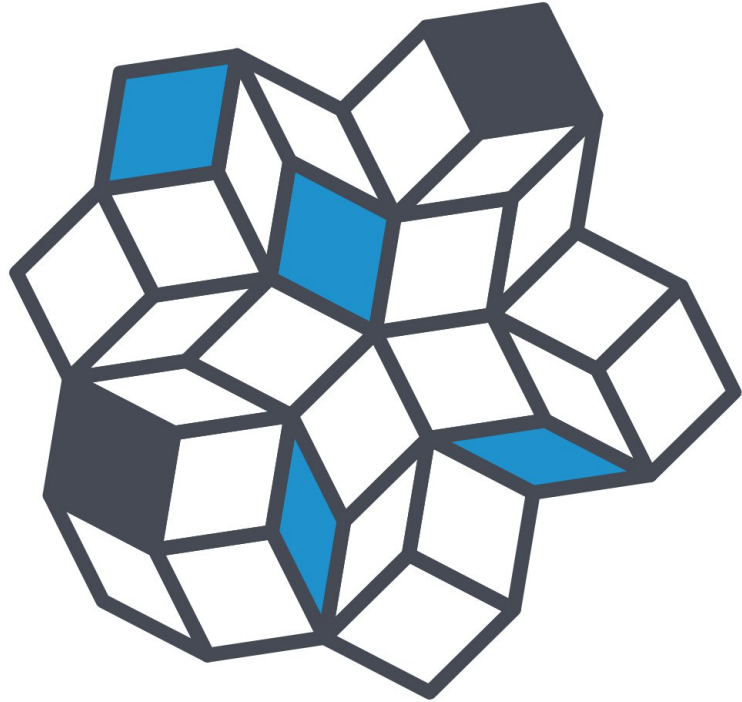


06/07/2023



CS³MESH⁴EOSC

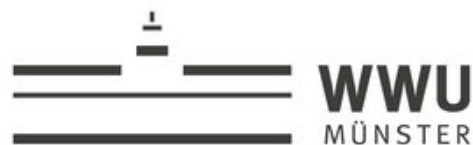
Connecting European Data



Science Mesh

Time	Topic	Presenter
9:30-10:00	Science Mesh introduction	Renato Furter - SWITCH
10:00-10:30	Demonstrations	Maciej Brzeźniak - PSNC
10:30-11:00	Coffee break	
11:00-11:15	How to join the Science Mesh	Guido Aben - SUNET
11:15-12:00	Discusson	All

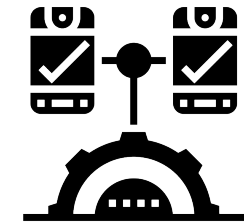
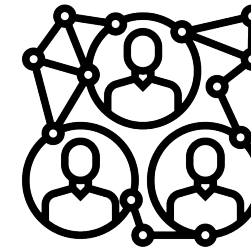
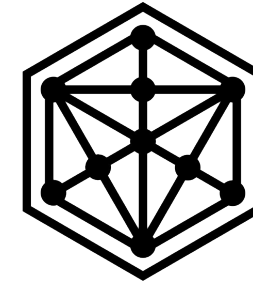
Partners



Adopters:



- # Born out of 3.5-year EU Project
- # Decentralized **mesh of EFSS nodes**
- # *Spin-off from our CS3 community!*
- # Based on **Open Standards**
- # Developed as **Open Source Software**
- # **Federated** research space for Europe
- # **Interoperability Platform**
to develop and connect new applications



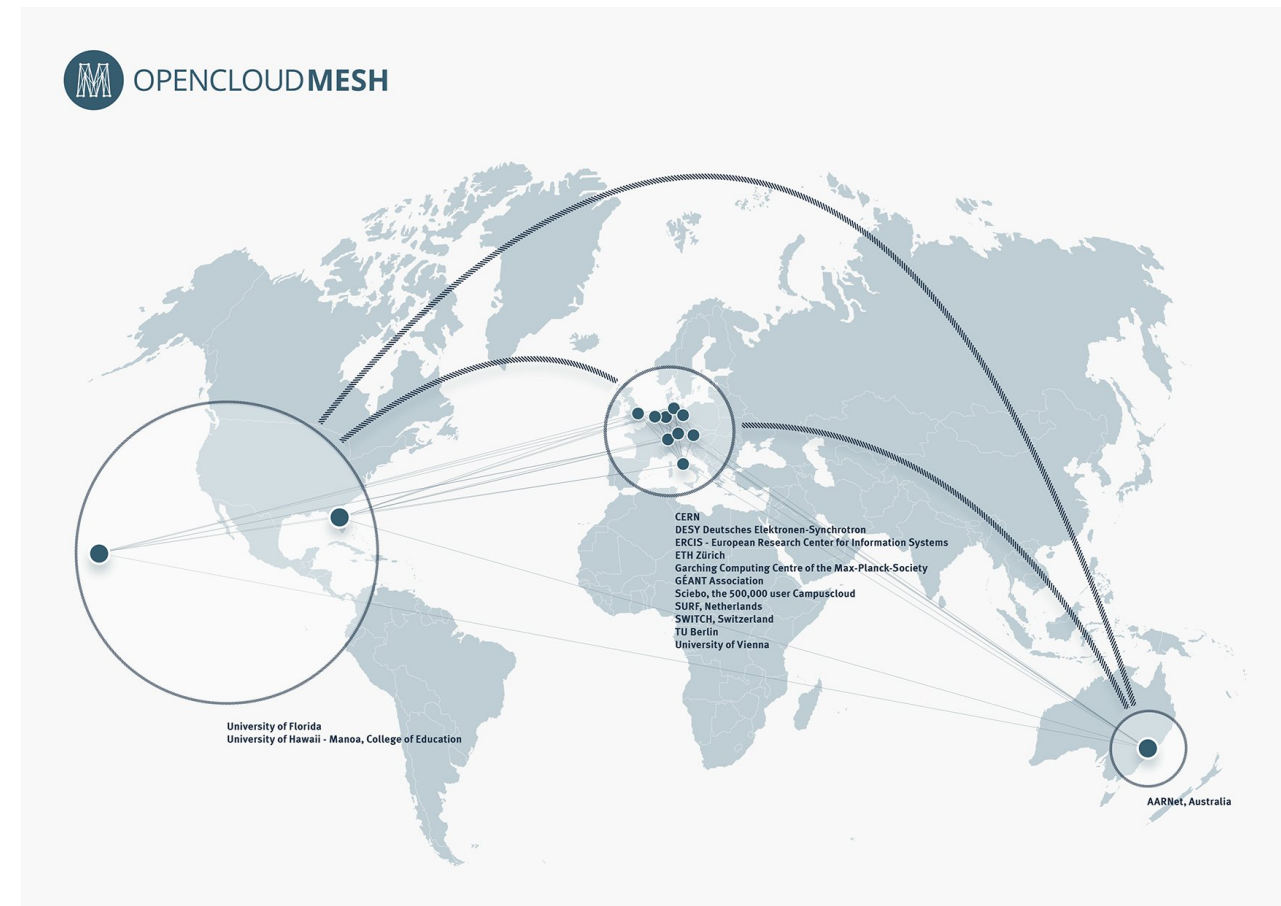


3 Dimensions

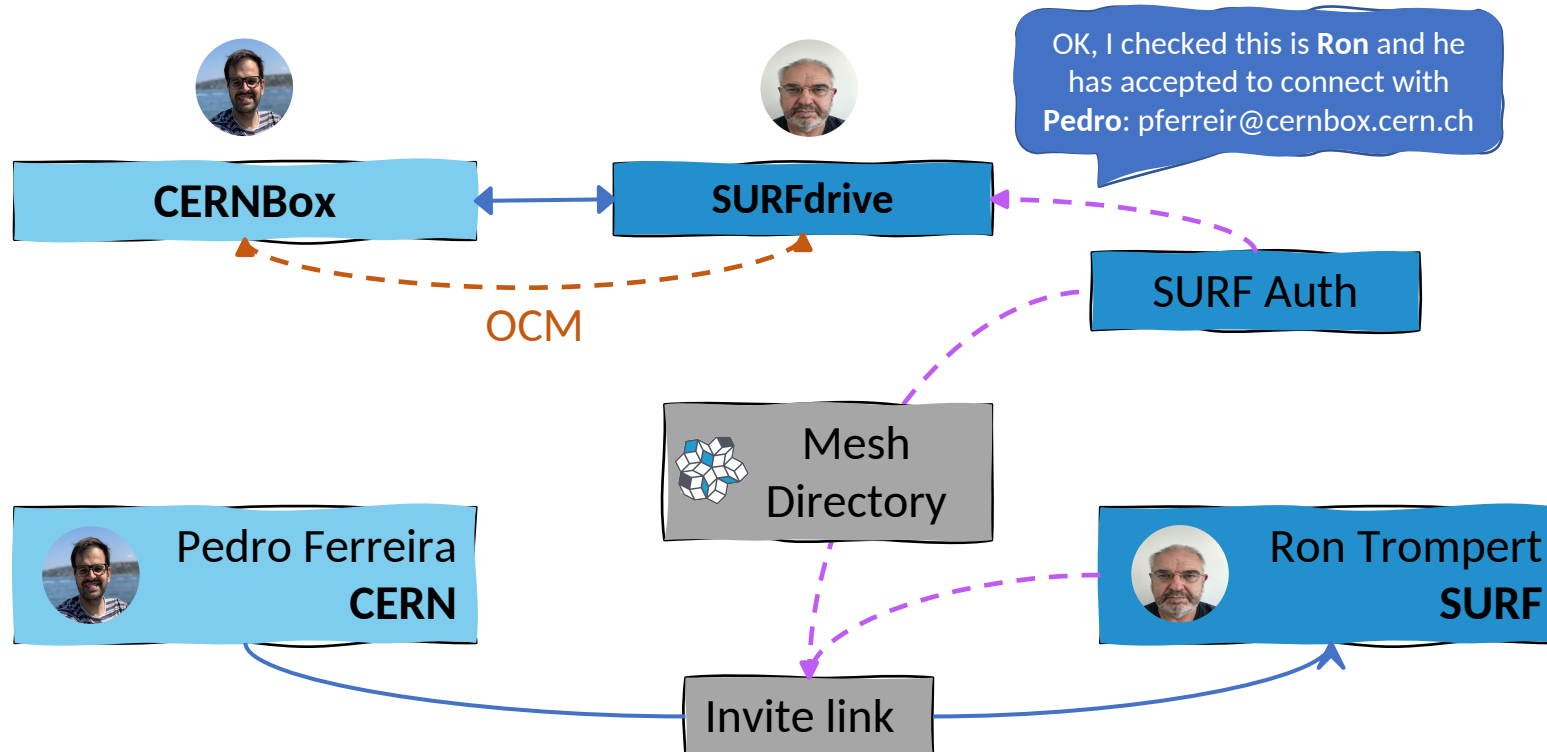


A trust-based federation

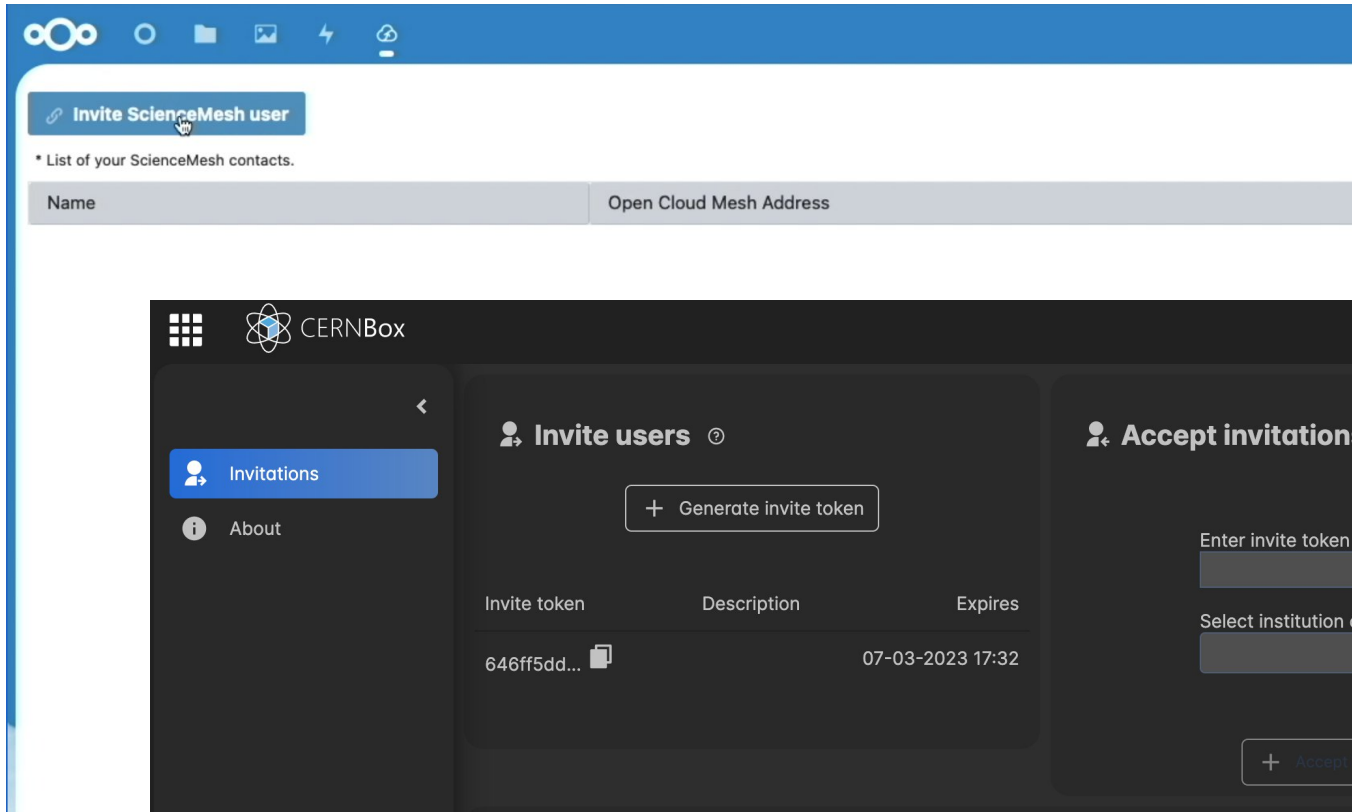
- # OCM - OpenCloudMesh – common data sharing layer across organizations
- # OCM – is a cloud interoperability standard developed within TERENA/Geant:
 - # Adopted (implemented) across industry: ownCloud, NextCloud, Seafiler, ...
 - # Taken up by CS3MESH4EOSC project as a basis for CS3APIs development
- # Perfect for 1:1 communication among EFSS system nodes
- # We "just" need to know the other person's user name on the target system



ScienceMesh = OCM + discovery mechanism + *trust establishment*



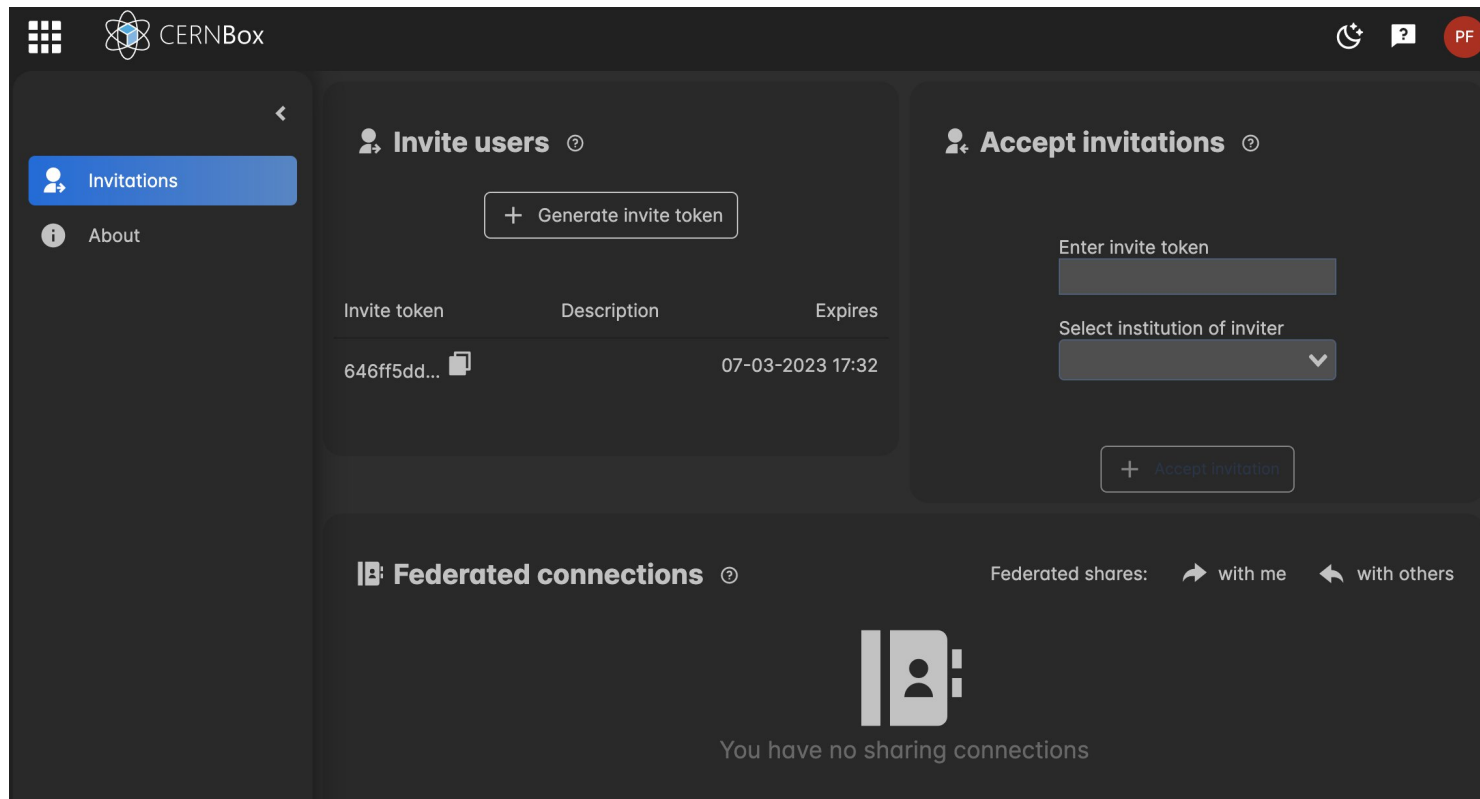
Nextcloud
ownCloud 10
OCIS



Invite ScienceMesh user

* List of your ScienceMesh contacts.

Name	Open Cloud Mesh Address



CERNBox

Invitations

About

Invite users

+ Generate invite token

Invite token	Description	Expires
646ff5dd...		07-03-2023 17:32

Accept invitations

Enter invite token

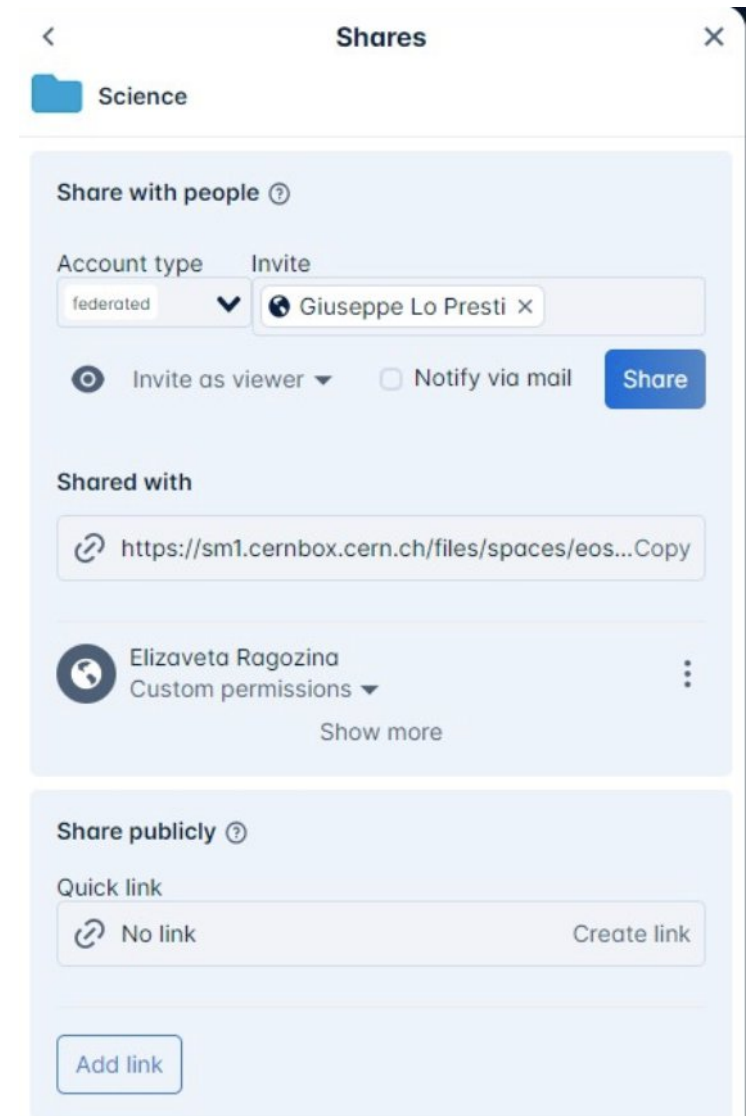
Select institution of inviter

+ Accept invitation

Federated connections

Federated shares: with me with others

You have no sharing connections



Shares

Science

Share with people

Account type: federated

Invite: Giuseppe Lo Presti

Invite as viewer Notify via mail

Share

Shared with

https://sm1.cernbox.cern.ch/files/spaces/eos...Copy

Elizaveta Ragozina

Custom permissions

Show more

Share publicly

Quick link: No link

Create link

Add link



Accept an invitation to collaborate from

PSNC ScienceMesh Test

using your

CESNET



ScienceMesh site account.

Accept





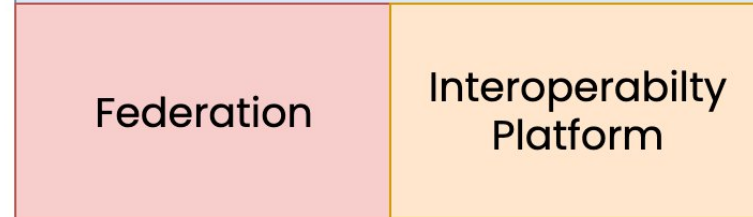
An application platform



New domain-specific applications developed in the community



Lightweight add-on
Easy to deploy and install new functionality



OCM, CS3APIs
REVA

Build upon existing infrastructure and long-term efforts



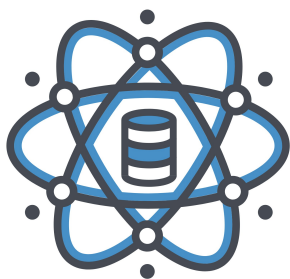
ownCloud,
Nextcloud,
Seafile
...



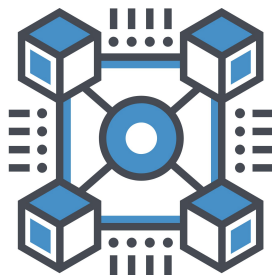
Connect to already deployed and commercially supported products



**Science
Mesh**



**Data Science
Environments**



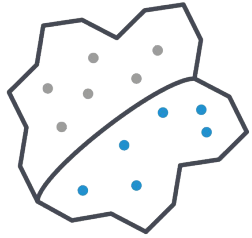
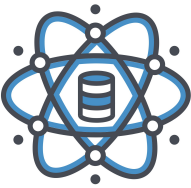
**Open Data
Systems**



**Collaborative
Documents**

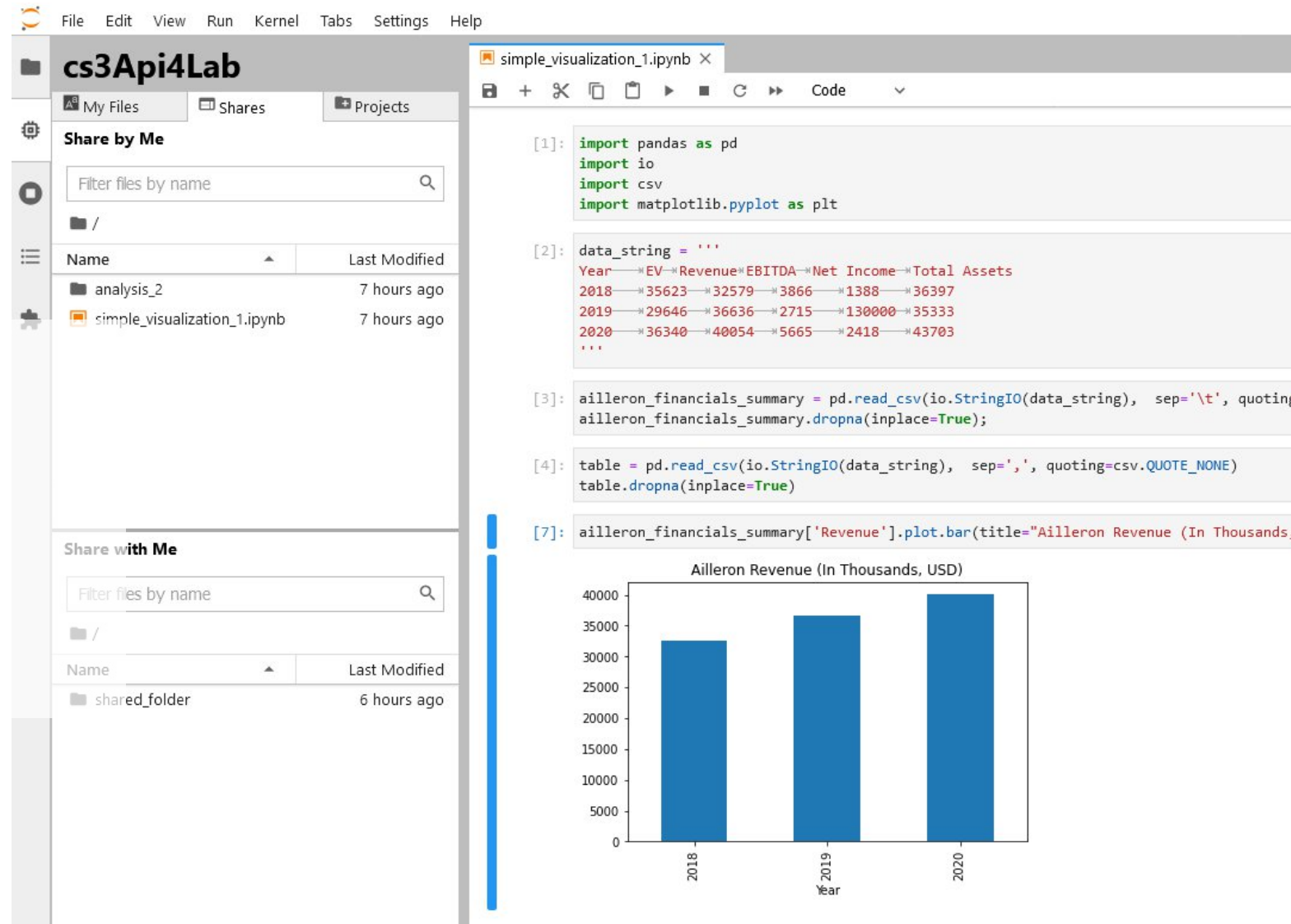


**On-demand
data transfer**



Data Science Environment

- # Share notebooks across users
- # Collaborate in data analysis
- # Import federated resources
- # Concurrent editing



The screenshot shows the **cs3Api4Lab** interface. On the left, there are two 'Share by Me' sections, each with a search bar and a table of files. The top section shows a folder 'analysis_2' and a file 'simple_visualization_1.ipynb', both last modified 7 hours ago. The bottom section shows a folder 'shared_folder' last modified 6 hours ago.

The main area displays a Jupyter notebook with the following code:

```
[1]: import pandas as pd
import io
import csv
import matplotlib.pyplot as plt

[2]: data_string = '''
Year→EV→Revenue→EBITDA→Net Income→Total Assets
2018→35623→32579→3866→1388→36397
2019→29646→36636→2715→130000→35333
2020→36340→40054→5665→2418→43703
'''

[3]: ailleron_financials_summary = pd.read_csv(io.StringIO(data_string), sep='\t', quoting=csv.QUOTE_NONE)
ailleron_financials_summary.dropna(inplace=True);

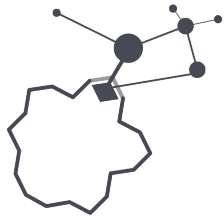
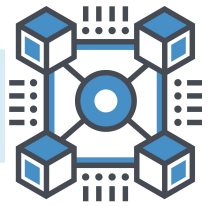
[4]: table = pd.read_csv(io.StringIO(data_string), sep=',', quoting=csv.QUOTE_NONE)
table.dropna(inplace=True)

[7]: ailleron_financials_summary['Revenue'].plot.bar(title="Ailleron Revenue (In Thousands, USD)

```

The bar chart, titled "Ailleron Revenue (In Thousands, USD)", shows revenue for the years 2018, 2019, and 2020. The y-axis ranges from 0 to 40,000. The bars represent revenue values of approximately 32,579 for 2018, 36,636 for 2019, and 40,054 for 2020.

Year	Revenue (In Thousands, USD)
2018	32,579
2019	36,636
2020	40,054



Open Data Workflow

- # Integrated workflow, from creation to publishing
- # Create, collaborate, | annotate and publish
- # Generate FAIR data
- # Based on battle-tested tools

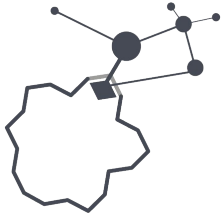
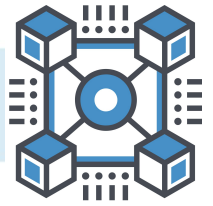



Researcher



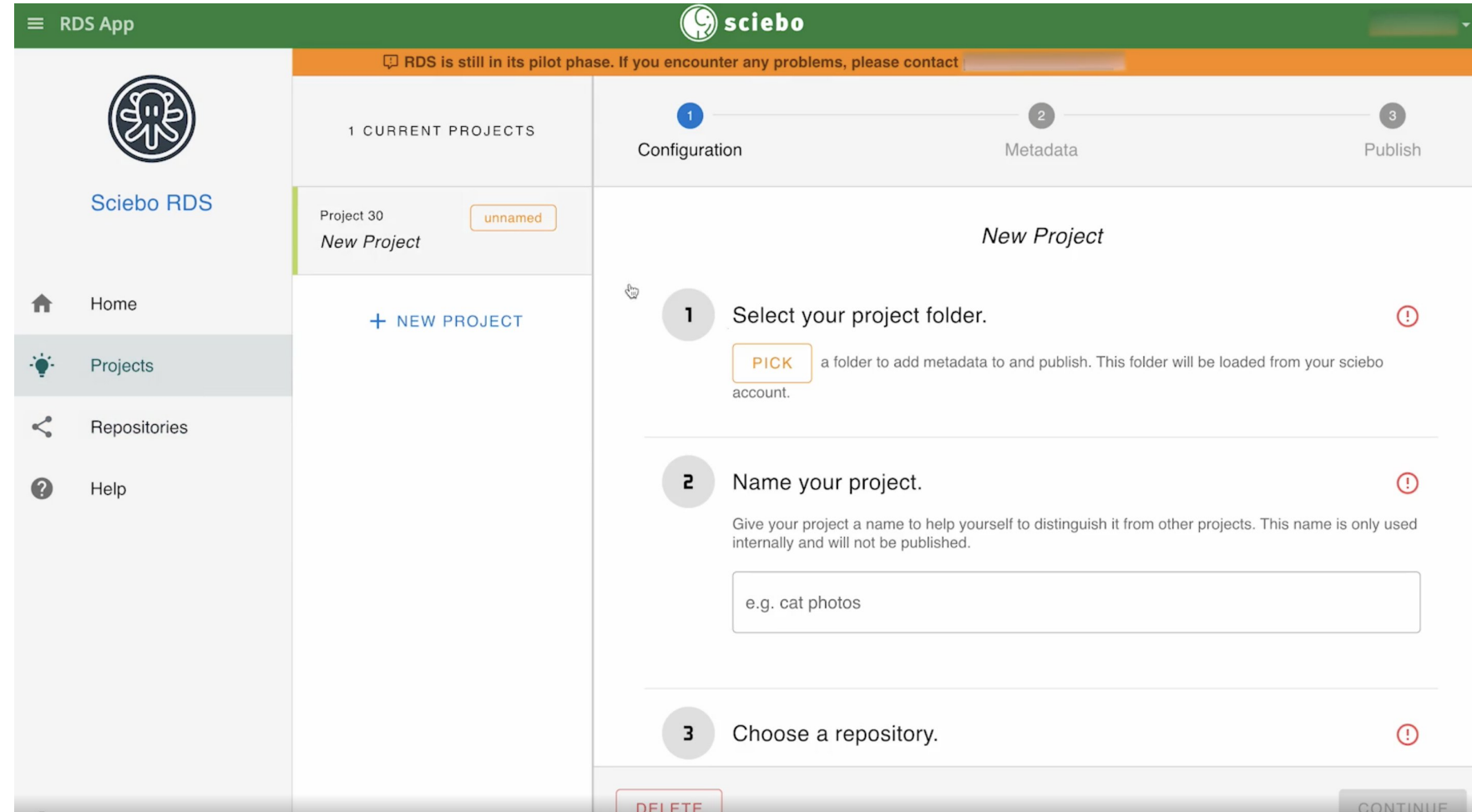
Describo

zenodo

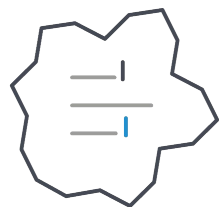


Open Data Workflow

- # Based on RORate - a research object annotation schema
- # Integration with Zenodo, OSF
- # Deployed at WWU, SURF and SUNET

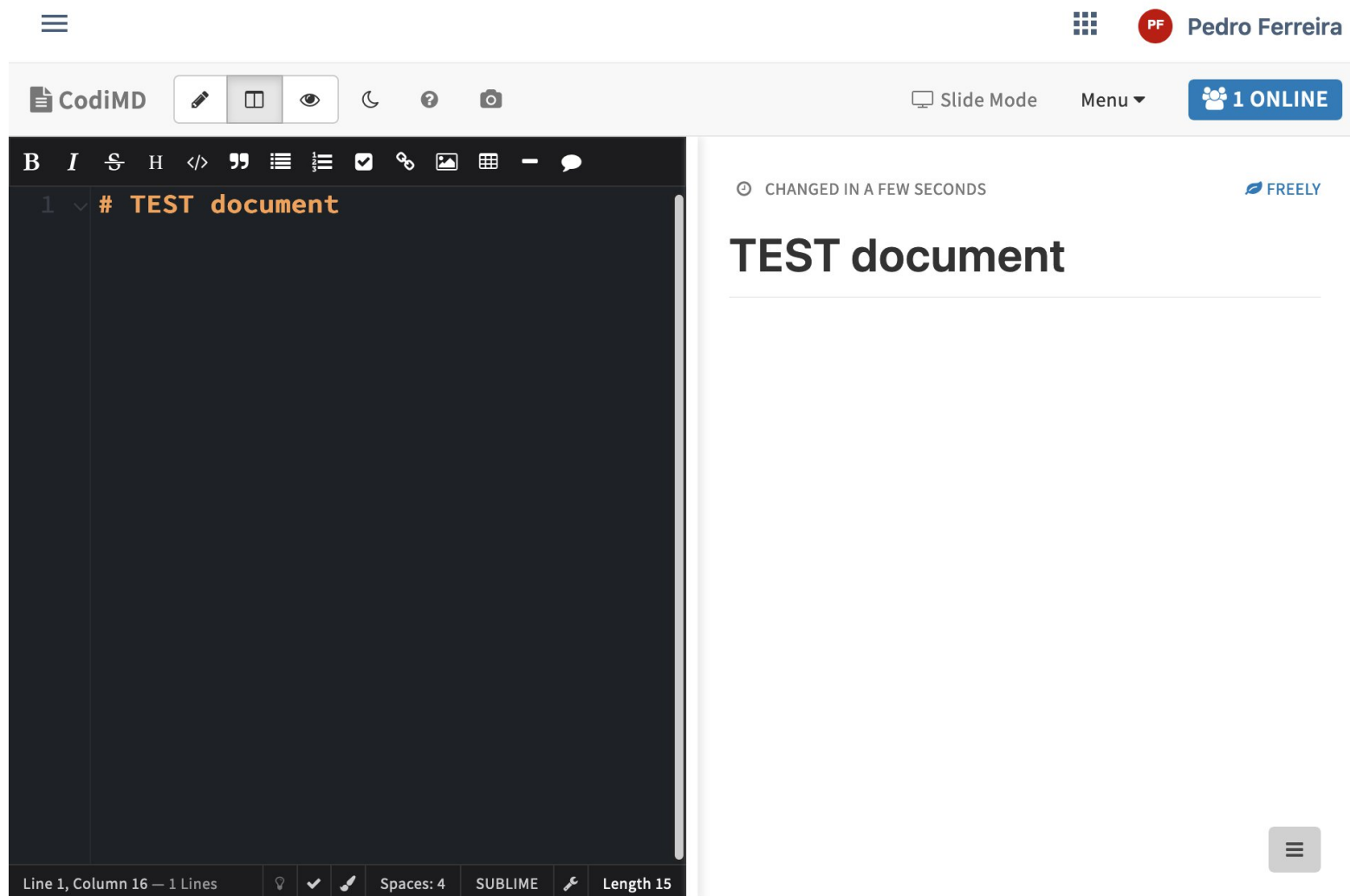


The screenshot displays the Sciebo RDS App interface. At the top, a green header contains the 'sciebo' logo and a notification: 'RDS is still in its pilot phase. If you encounter any problems, please contact [redacted]'. Below the header, a navigation sidebar on the left includes 'Home', 'Projects', 'Repositories', and 'Help'. The main content area shows '1 CURRENT PROJECTS' with a list containing 'Project 30' and 'New Project' (labeled 'unnamed'). A '+ NEW PROJECT' button is visible. The 'New Project' workflow is shown in three steps: 1. 'Select your project folder.' with a 'PICK' button and a note that the folder will be loaded from the user's sciebo account. 2. 'Name your project.' with a text input field containing 'e.g. cat photos'. 3. 'Choose a repository.' At the bottom, there are 'DELETE' and 'CONTINUE' buttons.

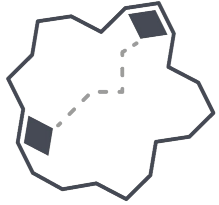


Markdown Editor

- # Open-source product (CodiMD)
- # Collaborative editing within teams
- # EFSS-centric storage of notes
- # Deployed at CERN
- # Can be run remotely



The screenshot shows the CodiMD collaborative document editor interface. At the top, there is a navigation bar with a hamburger menu, a grid icon, and a user profile for Pedro Ferreira. Below this is a toolbar with icons for editing, viewing, and other functions. The main editing area is dark-themed and shows a document titled "# TEST document" with a single line of text. The status bar at the bottom indicates "Line 1, Column 16 — 1 Lines", "Spaces: 4", "SUBLIME", and "Length 15". On the right side, there is a preview area showing the rendered document with the title "TEST document" and a "FREELY" label. A "1 ONLINE" indicator is also visible in the top right corner.



Data Transfers

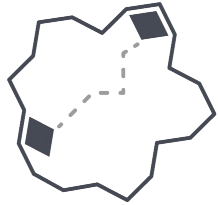
Point to point (Rclone)

- # CLI PoC successful
- # UI – WIP

Between VOs

- # FTS ↔ Reva: ready
- # Rucio ↔ Reva: WIP

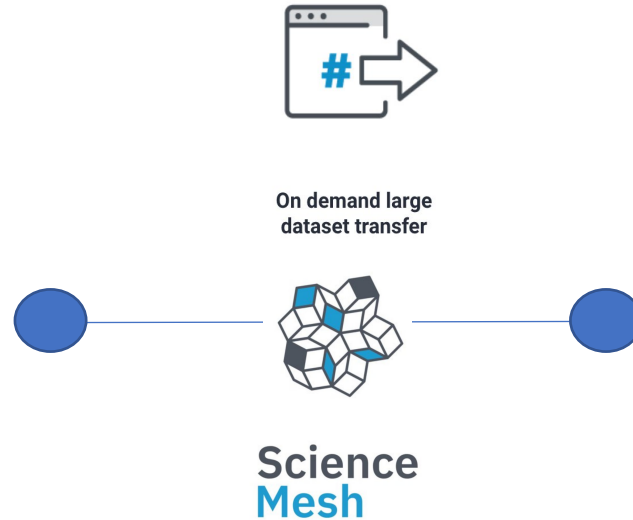




Data Transfers



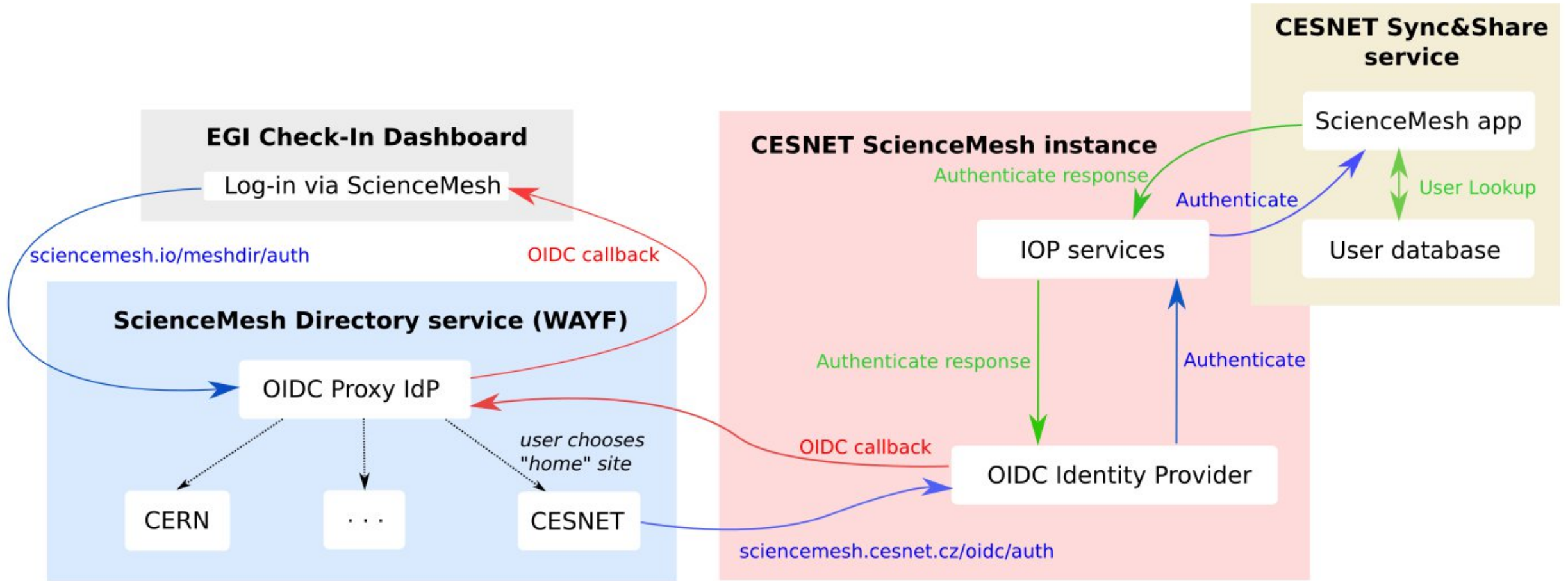
*Data stored at SURF and FZJ.
Initially processing (64x reduction).*



Data shipped to Poznań ;) for creating science quality images

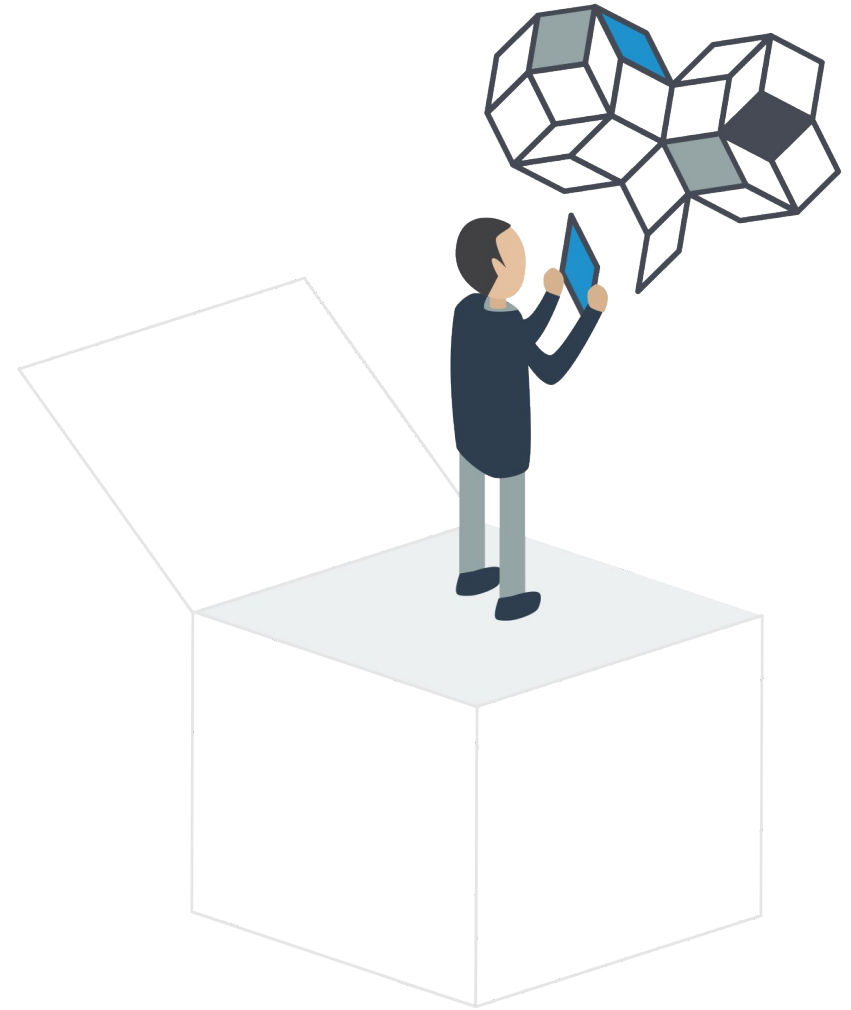


A connector of federations



Next steps

- # Establishing official mesh bodies
- # Perfecting documentation
- # Polishing user interfaces
- # Onboarding more nodes
- # Moving from testbed to QA for remaining nodes
- # Move to production Q3/4 2023



- # Looking into ways of bringing the federated layer into EOSC
- # Providing a service node to researchers with no institutional access
- # Representatives in several EOSC TFs:
 - # Interoperability: CS3 standards and protocols
 - # Long-term preservation of data
 - # Quality Infrastructure for Research



**EUROPEAN OPEN
SCIENCE CLOUD**

- # Learn how to join the MESH!**
- # Discussion**

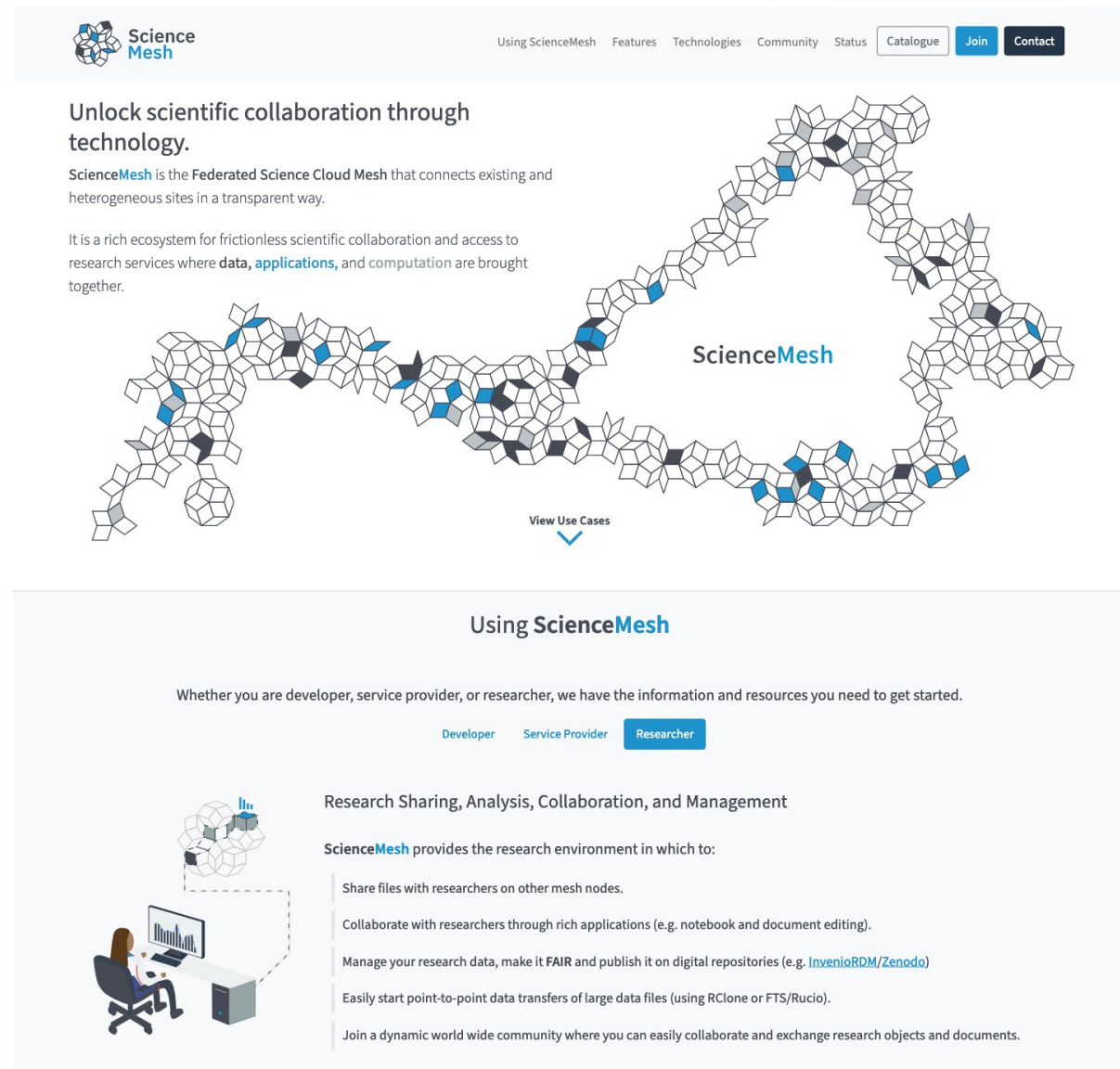
<https://sciencemesh.io>

- General information about platform
- Application Catalogue
- Documentation resources
 - *Setup*
 - *Usage*
 - *integrations*

<https://github.com/sciencemesh>

<https://gitter.im/sciencemesh/community>

More information



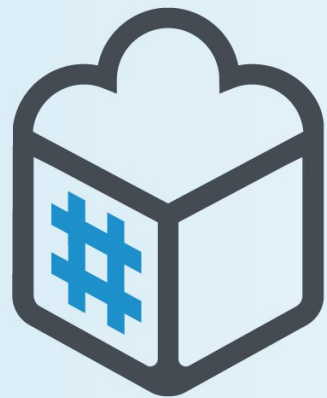
The screenshot shows the ScienceMesh website homepage. At the top, there is a navigation bar with the ScienceMesh logo, a menu (Using ScienceMesh, Features, Technologies, Community, Status), and buttons for Catalogue, Join, and Contact. The main content area features a large graphic of a network of interconnected nodes forming a circular shape, with the text "ScienceMesh" in the center. Below the graphic is a "View Use Cases" button with a downward arrow. The text above the graphic reads: "Unlock scientific collaboration through technology. ScienceMesh is the Federated Science Cloud Mesh that connects existing and heterogeneous sites in a transparent way. It is a rich ecosystem for frictionless scientific collaboration and access to research services where data, applications, and computation are brought together." Below this is a section titled "Using ScienceMesh" with a sub-header "Whether you are developer, service provider, or researcher, we have the information and resources you need to get started." and buttons for Developer, Service Provider, and Researcher. The Researcher button is highlighted. The text below reads: "Research Sharing, Analysis, Collaboration, and Management. ScienceMesh provides the research environment in which to:" followed by a list of features: "Share files with researchers on other mesh nodes.", "Collaborate with researchers through rich applications (e.g. notebook and document editing).", "Manage your research data, make it FAIR and publish it on digital repositories (e.g. InvenioRDM/Zenodo)", "Easily start point-to-point data transfers of large data files (using RClone or FTS/Rucio).", and "Join a dynamic world wide community where you can easily collaborate and exchange research objects and documents." An illustration of a person at a computer is shown on the left side of the "Using ScienceMesh" section.



<https://sciencemesh.io>

<https://gitter.im/sciencemesh/community>

<https://github.com/sciencemesh>



CS³
MESH⁴
EOSC

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Thank you!
Discover more on...

 cs3mesh4eosc.eu

 [company/cs3mesh4eosc](https://company.linkedin.com/cs3mesh4eosc)

 [@cs3mesh4eosc](https://twitter.com/cs3mesh4eosc)



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Links to demos:

CS3MESH4EOSC Invitation Workflow - **3:26**

- # <https://drive.google.com/file/d/17hL7PHp0C4Rty-1XcPPOiA8dffuxxTm4/view?usp=sharing>
- # <https://www.youtube.com/watch?v=BZ4SPMbdxqQ>

JupyterLab Sharing and Collaborative Editing - **4:58**

- # https://drive.google.com/file/d/17a8EdwqH_gsq0eR0tWta3T4pvgT08Jl9/view?usp=sharing
- # <https://www.youtube.com/watch?v=z5ckKTVoPAk>

Sciebo RDS demo: **(2:18)**

- # <https://drive.google.com/file/d/17mSE3nX68fMOA0aTwAtPa1v-luW1a6QE/view?usp=sharing>
- # <https://www.youtube.com/watch?v=ooFHlcC0mvs>

Applications integration beyond local clouds with OCM **(2:18)**

- # <https://www.youtube.com/watch?v=sXuMailUE9Y>

More videos on CS3MESH4EOSC

- # <https://www.youtube.com/@cs3mesh4eoscpject>