



**CS<sup>3</sup>  
MESH<sup>4</sup>  
EOSC**

**Connecting European Data**



## ScienceMesh: An Interoperable Federation of EDFS services for EOSC

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CS3 2022



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

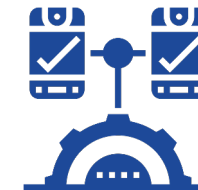
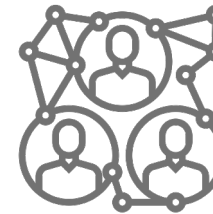


25/01/22



# Science Mesh

- # Decentralized **Mesh of EFSS nodes**
  - # *Years of successful operation and established services. > 300K users*
- # Based on **Open Standards** and **Open Source Software**
- # **Federated** research space for Europe
  - # *Promote Open Science, Collaborative Research and support Full Research Lifecycle*
- # **Interoperability Platform** to develop and connect new applications
  - # *Close collaboration with EFSS industry and other commercial partners*



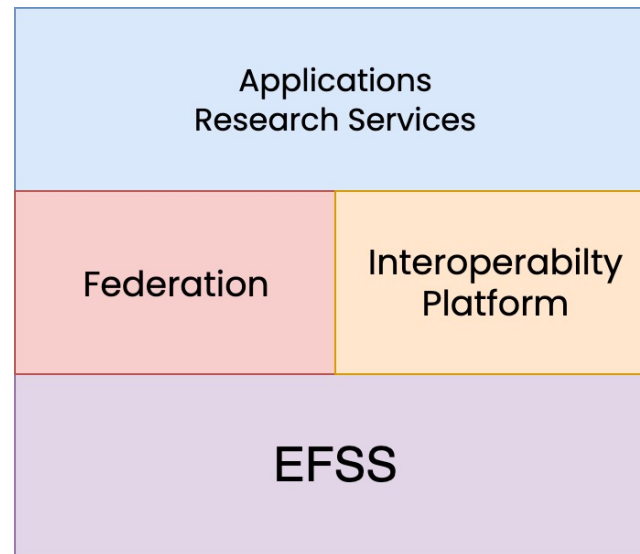




New domain-specific applications developed in the community



Build upon existing infrastructure and long-term efforts



OCM, CS3APIs  
REVA

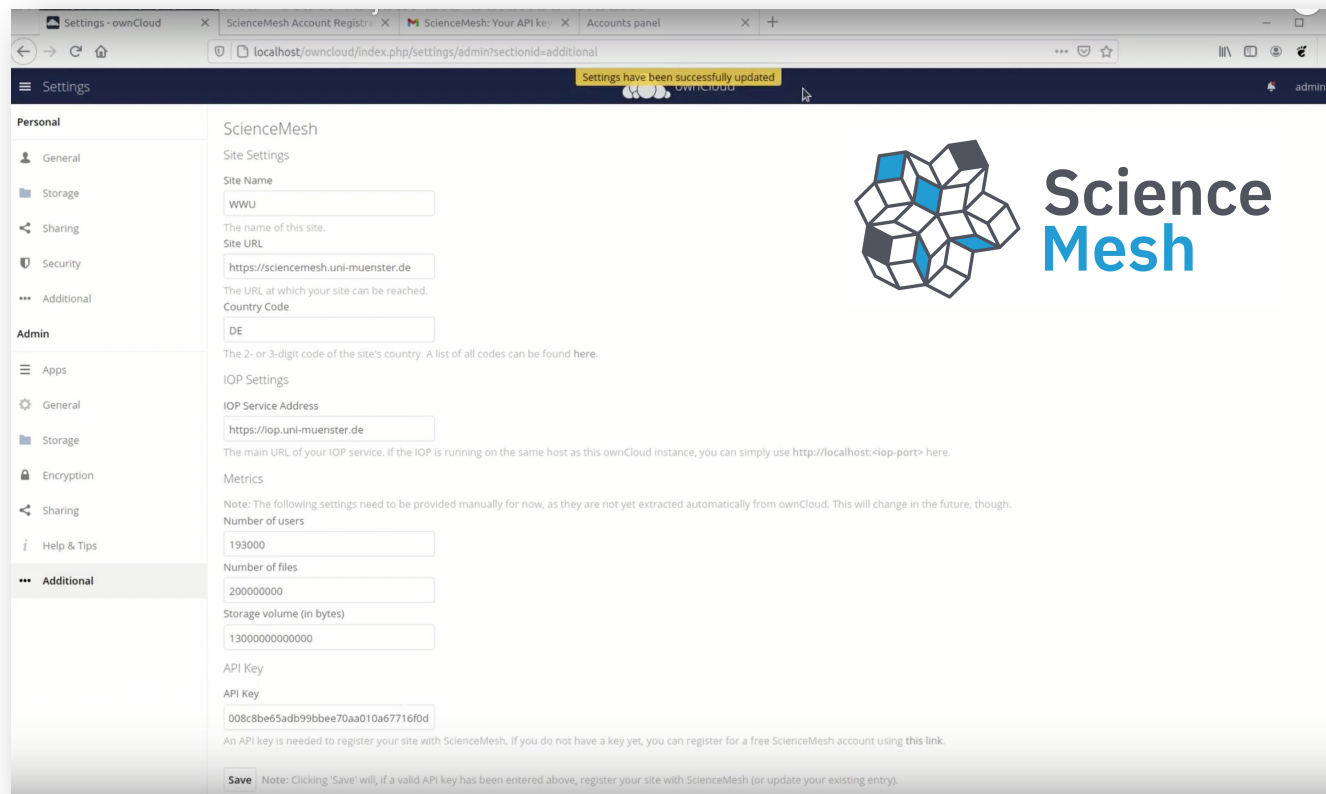


Lightweight add-on  
Easy to deploy and install new functionality

ownCloud,  
Nextcloud,  
Seafile  
...



Connect to already deployed and commercially supported products



Connectors developed by the community for **Owncloud**, **Nextcloud** and **Seafile**

## # Nextcloud

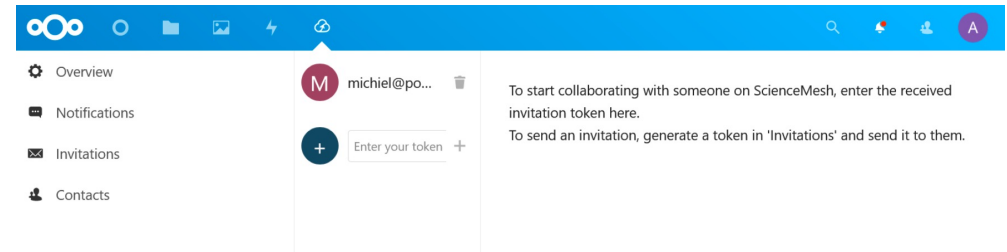
- # outsourced to PonderSource (alpha stage);
- # UI and backend;

## # ownCloud

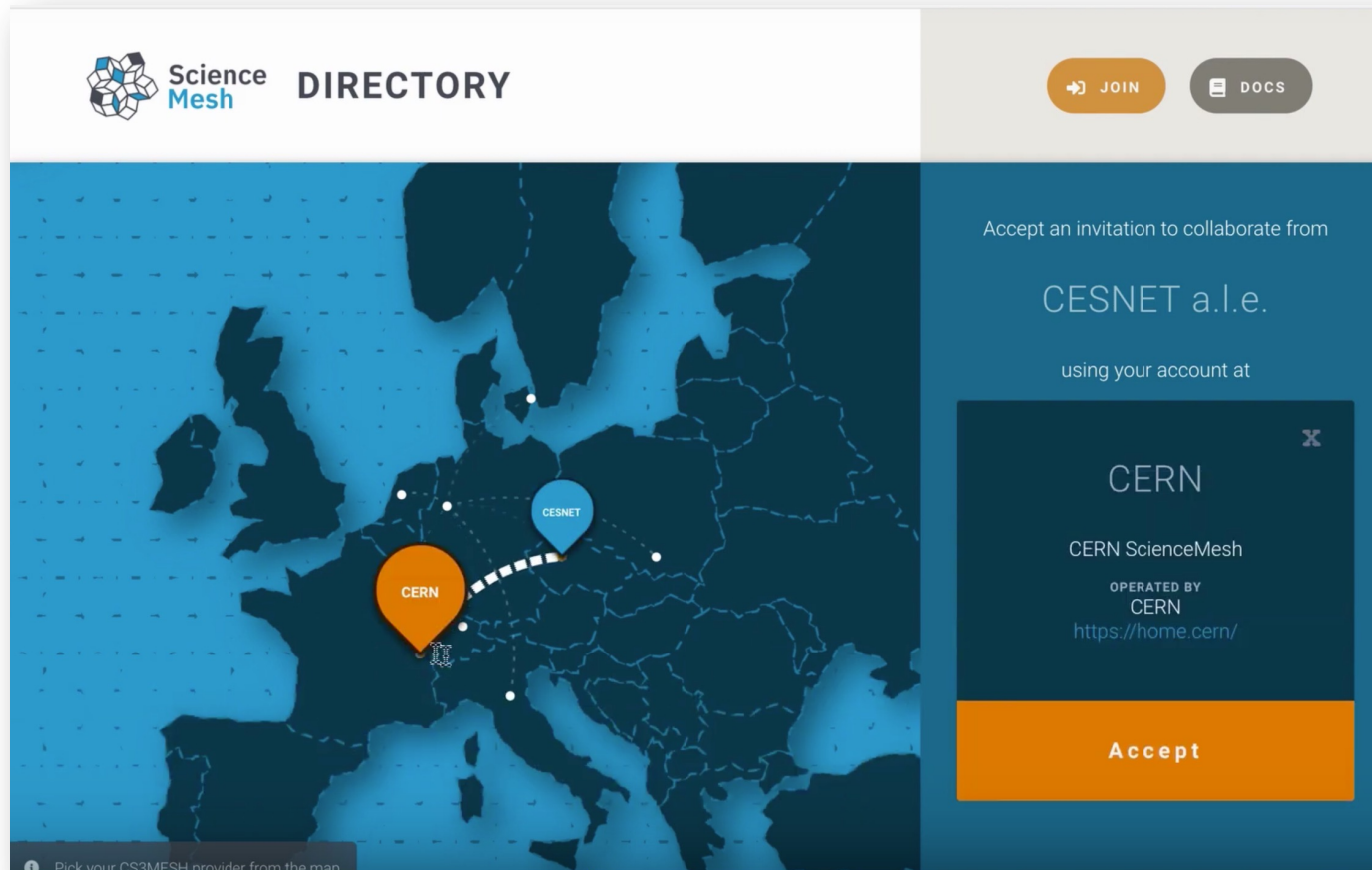
- # OCIS - using REVA, still UI work to do;
- # version 10 - backport by PonderSource (March 2022);

## # Seafile

- # *under discussion*







The screenshot displays the Science Mesh DIRECTORY interface. On the left, a map of Europe shows two locations: CERN (orange pin) and CESNET (blue pin), connected by a dashed line. On the right, a notification panel shows an invitation to collaborate from CESNET a.l.e. using the user's account at CERN. The notification includes the text "CERN ScienceMesh OPERATED BY CERN https://home.cern/" and a prominent orange "Accept" button. At the top right of the interface are "JOIN" and "DOCS" buttons. A small tip at the bottom left of the map area reads "Pick your CS3MESH provider from the map".

Science Mesh **DIRECTORY**

JOIN DOCS

Accept an invitation to collaborate from

CESNET a.l.e.

using your account at

CERN

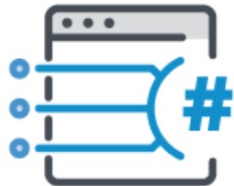
CERN ScienceMesh

OPERATED BY  
CERN  
<https://home.cern/>

**Accept**

Pick your CS3MESH provider from the map





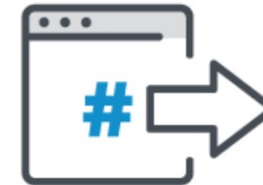
**Data Science  
Environments**



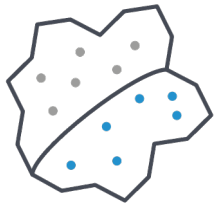
**Open Data Systems**



**Collaborative  
Documents**




**On demand large  
dataset transfer**



## Data Science Environment



- # Web-based, interactive platform that combines code, text and outputs
  - # Ideal for Collaboration, Sciences, Education, Interactive Dashboards...
  - # Many languages supported (Python, C++, R, Octave...)
- # De facto standard for data science



The screenshot shows a Jupyter Notebook interface with three orange callout boxes on the left: 'Text', 'Code', and 'Graphics'. The 'Text' box points to a paragraph of text. The 'Code' box points to a code cell containing: 

```
In [4]: TCanvas c;  
h.Draw();  
e.Draw();
```

 The 'Graphics' box points to a histogram plot titled 'My Histo'. The plot shows a distribution of data points with a mean of 0.02680 and a standard deviation of 1.038. The plot is titled 'My Histo' and has a legend box in the top right corner with the following statistics: 

myHisto	
Entries	1000
Mean	0.02680
Std Dev	1.038

 Below the plot, there is another code cell: 

```
In [5]: h.SetFillColor(kBlue-10);  
c.SetGrid();  
h.Draw();  
c.Draw();
```



### Big Data Platform at JRC

- Copernicus Earth Observation
- Geo Visualization and Data Exploration
- Interactive Dashboards

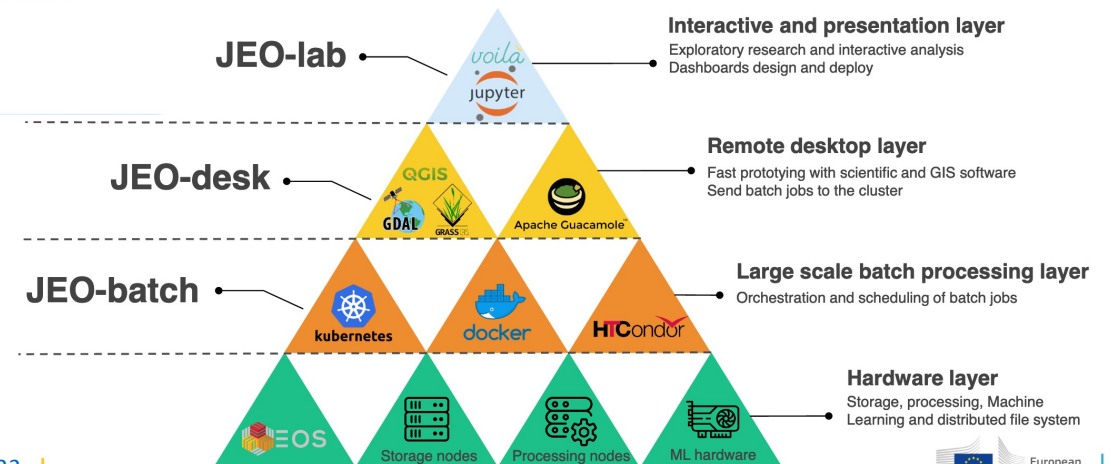
[D. De Marchi, CS3 2021](https://indico.cern.ch/event/970232/contributions/4158372)

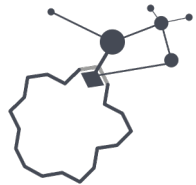
<https://indico.cern.ch/event/970232/contributions/4158372>

### SWAN Service at CERN

- High Energy Physics
- Interactive Data Analysis
- LHC Machine Learning
- Accelerator Logging

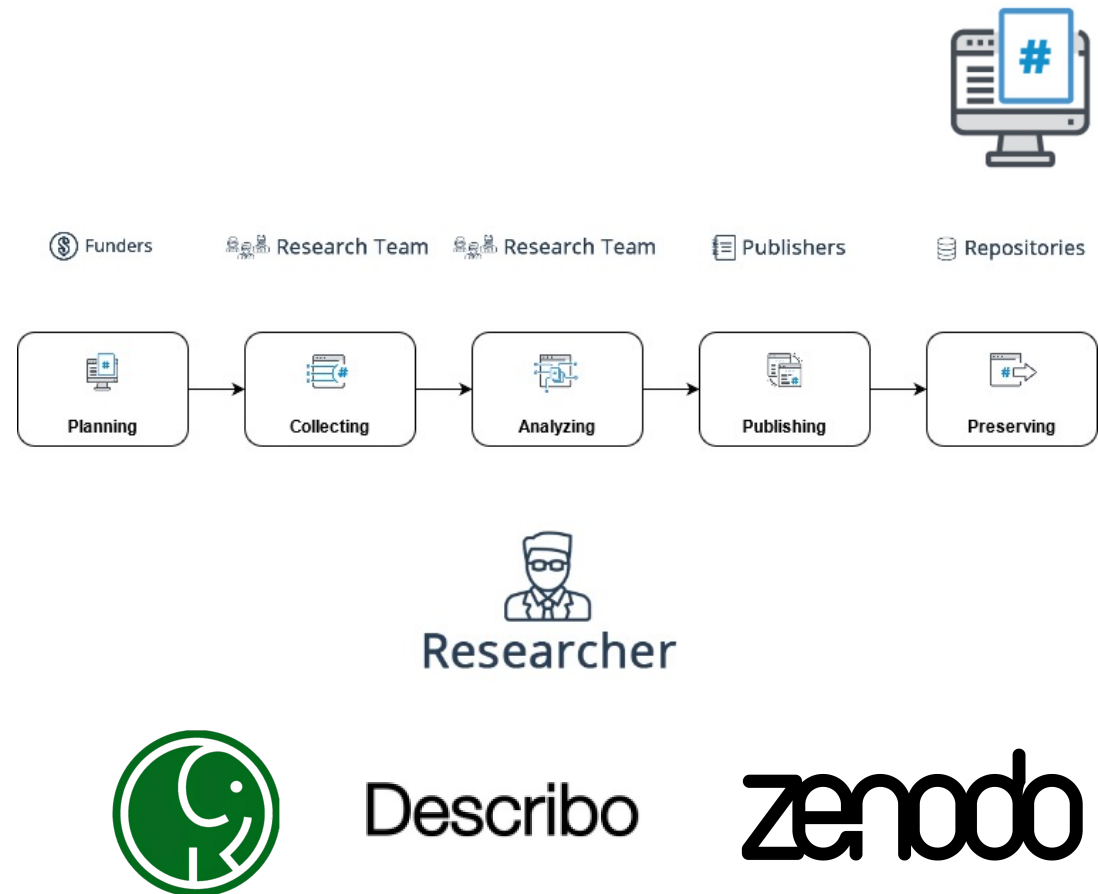
.... [D.Castro, CS3 2020](https://indico.cern.ch/event/854707/contributions/3680522)  
<https://indico.cern.ch/event/854707/contributions/3680522>





## Open Data Workflow

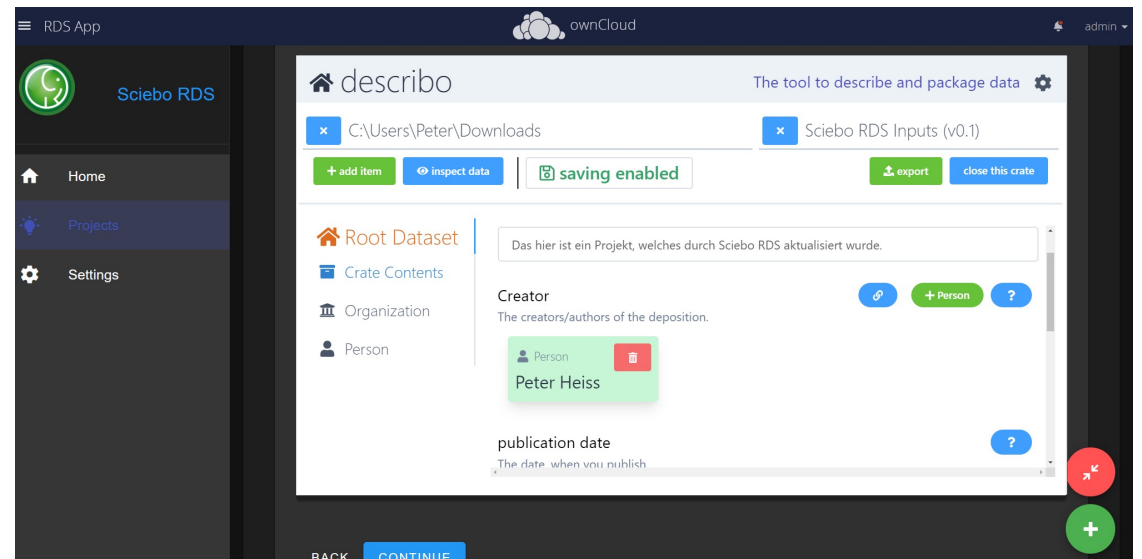
- # Integrated workflow, from creation to publishing
- # Create, collaborate, annotate and publish
- # Based on battle-tested tools





## Open Data Workflow

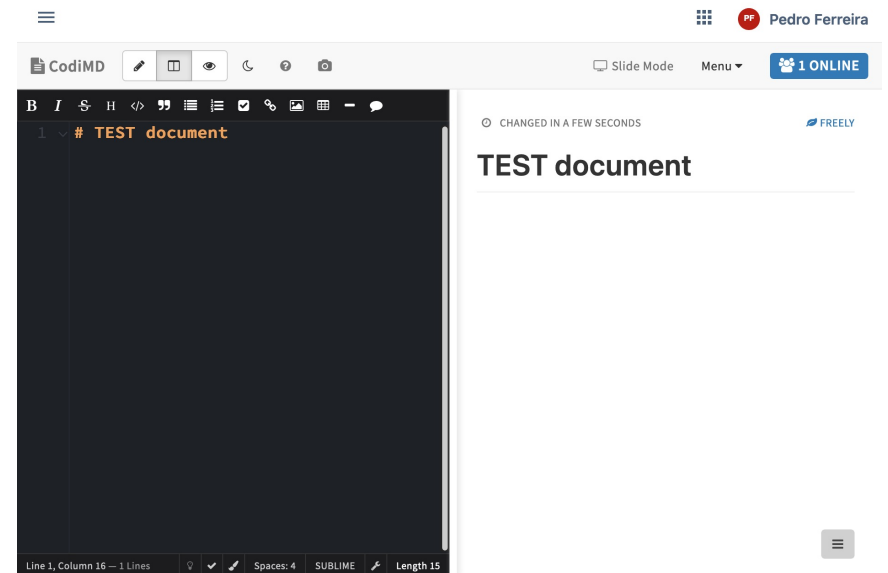
- # Proof of Concept successful
- # Working on bringing it to test users
- # Beta version: March 2022





## Markdown Editor

- # Open-source product (CodiMD)
- # Collaborative editing within teams
- # EFSS-centric storage of notes
- # beta: April 2022

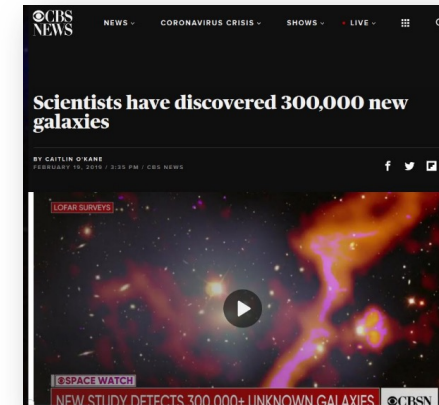
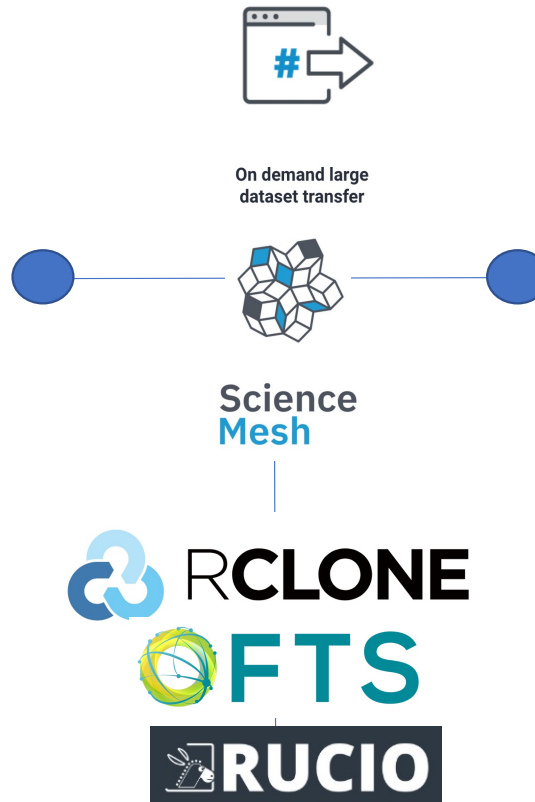




## Data Transfers



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



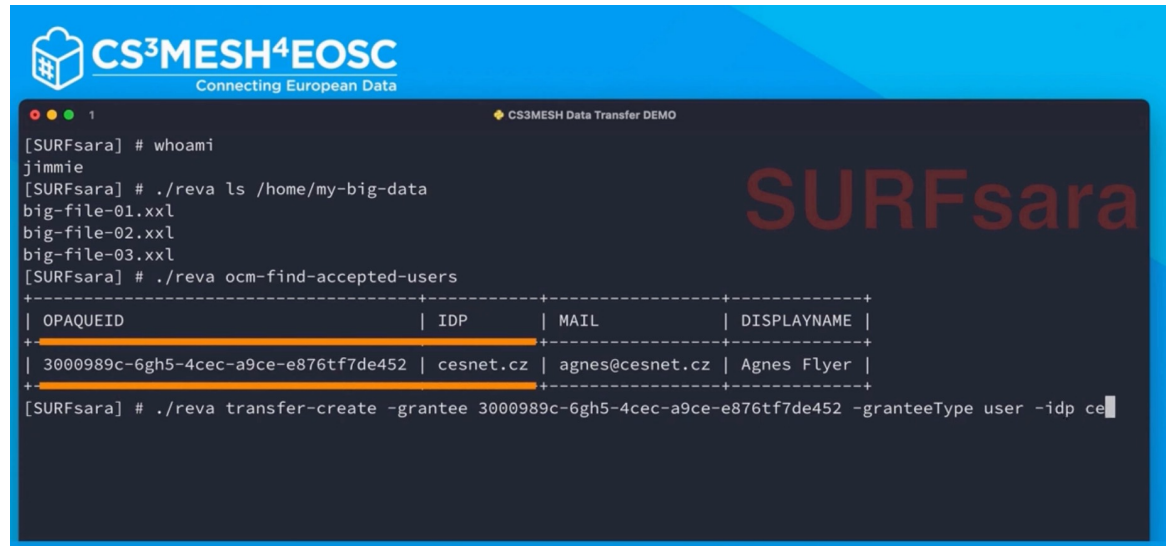
*Data shipped to Kraków  
for creating science quality images*





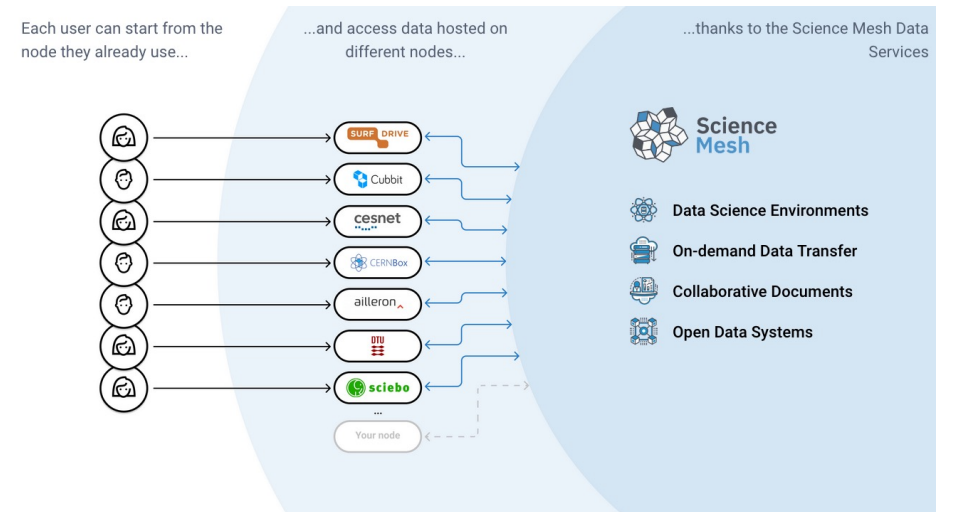
## Data Transfers

- # Proof of Concept successful
  - # Rclone use case
- # Direct contribution to Rclone
- # Working on user interface
- # MVP: April 2022



```
[SURFsara] # whoami
jimmie
[SURFsara] # ./reva ls /home/my-big-data
big-file-01.xml
big-file-02.xml
big-file-03.xml
[SURFsara] # ./reva ocm-find-accepted-users
+-----+-----+-----+-----+
| OPAQUEID | IDP | MAIL | DISPLAYNAME |
+-----+-----+-----+-----+
| 3000989c-6gh5-4cec-a9ce-e876tf7de452 | cesnet.cz | agnes@cesnet.cz | Agnes Flyer |
+-----+-----+-----+-----+
[SURFsara] # ./reva transfer-create -grantee 3000989c-6gh5-4cec-a9ce-e876tf7de452 -granteeType user -idp ce
```

- # Bringing applications to user groups
  - # Some identification work done, more to be done
- # Onboarding of first “early adopters”
- # ScienceMesh as a federated data + application layer for EOSC



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



**EUROPEAN OPEN  
SCIENCE CLOUD**

- # EGI-ACE – integration of compute resources on ScienceMesh nodes
- # Discussions with Research Infrastructures
  - # ENVRI-FAIR, SSHOC, PANOSC, EOSC-Life, ...
- # HIFIS – bridging the two federations

- # Essential part of the **CS3MESH4EOSC** initiative
- # **Leveraging on the community**
- # **Everyone** is welcome to join this collective effort!
- # For the **CS3 community**: a **gateway** to EOSC
- # For **EOSC**: new tools for Research Infrastructures, new and existing communities



# Join our testbed!

## How to join Science Mesh

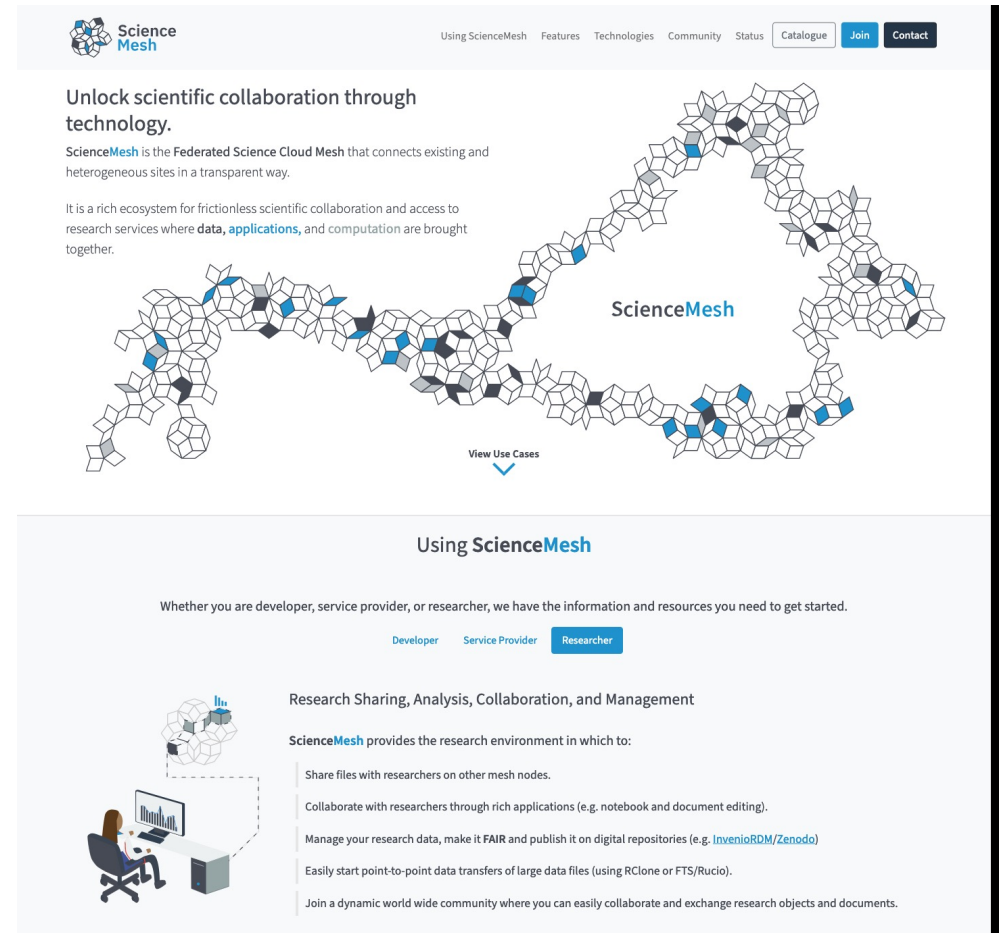
The steps to join the Science Mesh

To join the Science Mesh, there are several formal and technical steps. If you encounter problems during this process or have some general questions, feel free to [contact](#)



<https://sciencemesh.io>

- General information about platform
  - *for different audiences*
- Application Catalogue
- Documentation resources
  - *e.g. how to set up?*



The screenshot shows the ScienceMesh website homepage. At the top, there is a navigation bar with the ScienceMesh logo and links for 'Using ScienceMesh', 'Features', 'Technologies', 'Community', 'Status', 'Catalogue', 'Join', and 'Contact'. The main heading reads 'Unlock scientific collaboration through technology.' Below this, a paragraph explains that ScienceMesh is the Federated Science Cloud Mesh connecting existing and heterogeneous sites. A large graphic of a network mesh is visible, with the text 'ScienceMesh' overlaid on it. A 'View Use Cases' link with a downward arrow is positioned below the mesh. The lower section is titled 'Using ScienceMesh' and includes a sub-heading 'Research Sharing, Analysis, Collaboration, and Management'. It lists several capabilities: sharing files, collaborating through applications, managing research data, and joining a community.

ScienceMesh

View Use Cases

Using ScienceMesh

Whether you are developer, service provider, or researcher, we have the information and resources you need to get started.

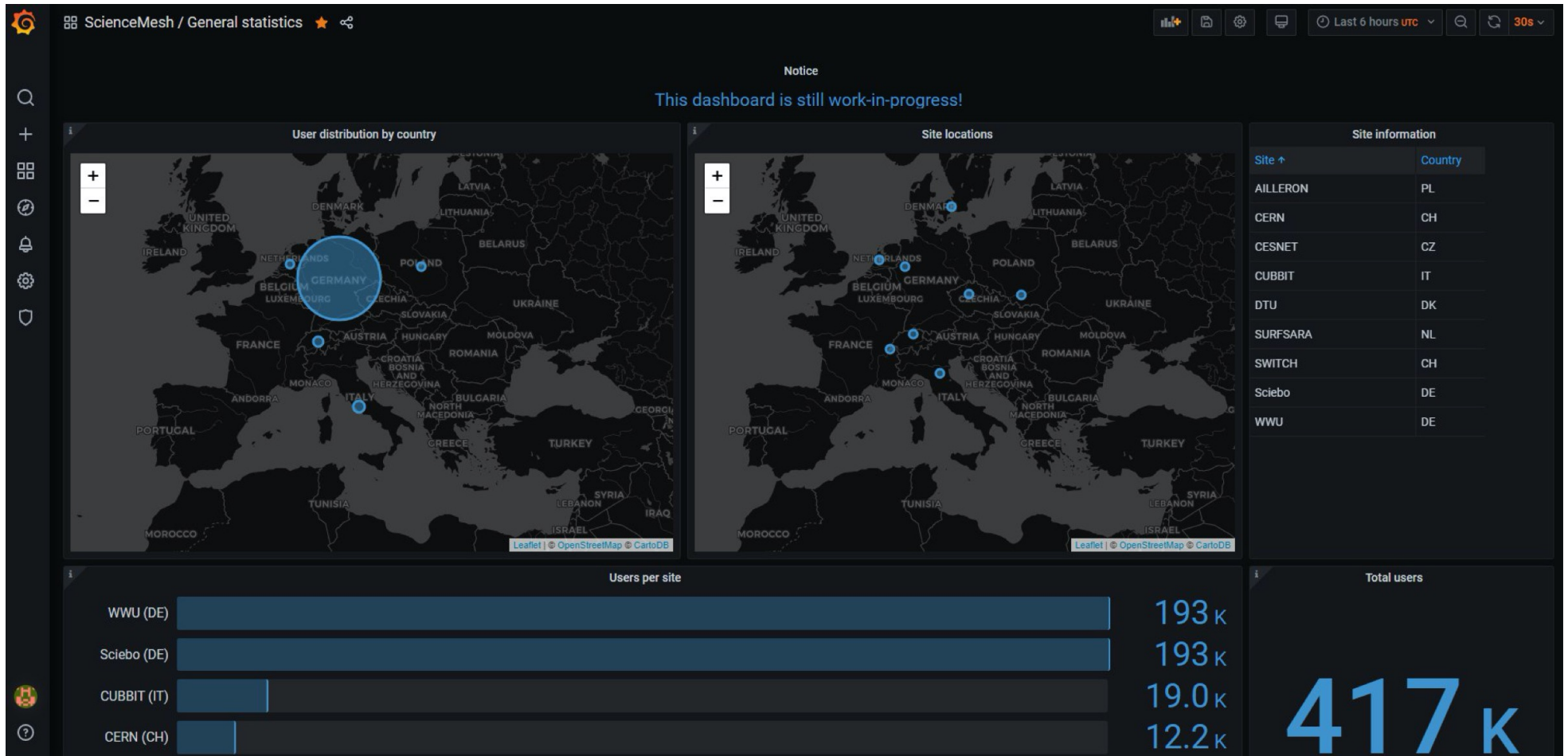
Developer Service Provider **Researcher**

Research Sharing, Analysis, Collaboration, and Management

ScienceMesh provides the research environment in which to:

- 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).
- Join a dynamic world wide community where you can easily collaborate and exchange research objects and documents.





- # Open, practical, bottom-up approach
  - # working closely with user communities we take existing best practices, services and technologies, improve them and open up for other scientific communities
- # Leverage open-source community effort
  - # Build and extend existing services and infrastructures

Expected outcome of Science Mesh

- # **Enable frictionless collaboration on research objects for users**
- # **Increase the value of each individual service node for providers**

Want to know more?  
**Let's talk!**



**Science Mesh  
Global Platform for  
Scientific Collaboration**

**26th Jan 2022**  
WORKSHOP 2:00 pm CET

Co-located with  
 **CS<sup>3</sup>**  
Conference

 **Science  
Mesh**

 **CS<sup>3</sup>  
MESH<sup>4</sup>  
EOSC**  
Connecting European Data



<https://sciencemesh.io>

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

<https://github.com/sciencemesh>



**CS<sup>3</sup>  
MESH<sup>4</sup>  
EOSC**

**Connecting** European Data

**Thank you!**  
Discover more on...

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 [company/cs3mesh4eosc](https://company/cs3mesh4eosc)

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



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



### # Icons:

# “Connection” by **Eucalyp** from the Noun Project

# “Connection” by **Doub.co** from the Noun Project

# “Platform” by **Eucalyp** from the Noun Project

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