

# ESA Datalabs, and proposals of connectivity to other Platforms

IVOA interoperability meeting, GWS Session

Vicente Navarro, on behalf of the ESA Datalabs Team


21.05.2024, Virtual



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ESA Datalabs [0.7.0-3-G7FECB2D] Log in

ESA Datalabs is available as "Public Moderated Beta"  
If you wish to apply for access, please [submit your request here](#).

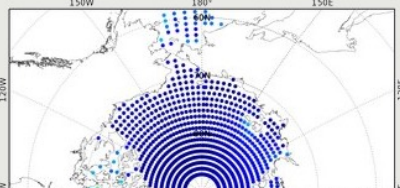


## «YOU CAN EITHER MOVE YOUR QUESTIONS OR THE DATA. [...] OFTEN IT TURNS OUT TO BE MORE EFFICIENT TO MOVE THE QUESTIONS THAN TO MOVE THE DATA.»

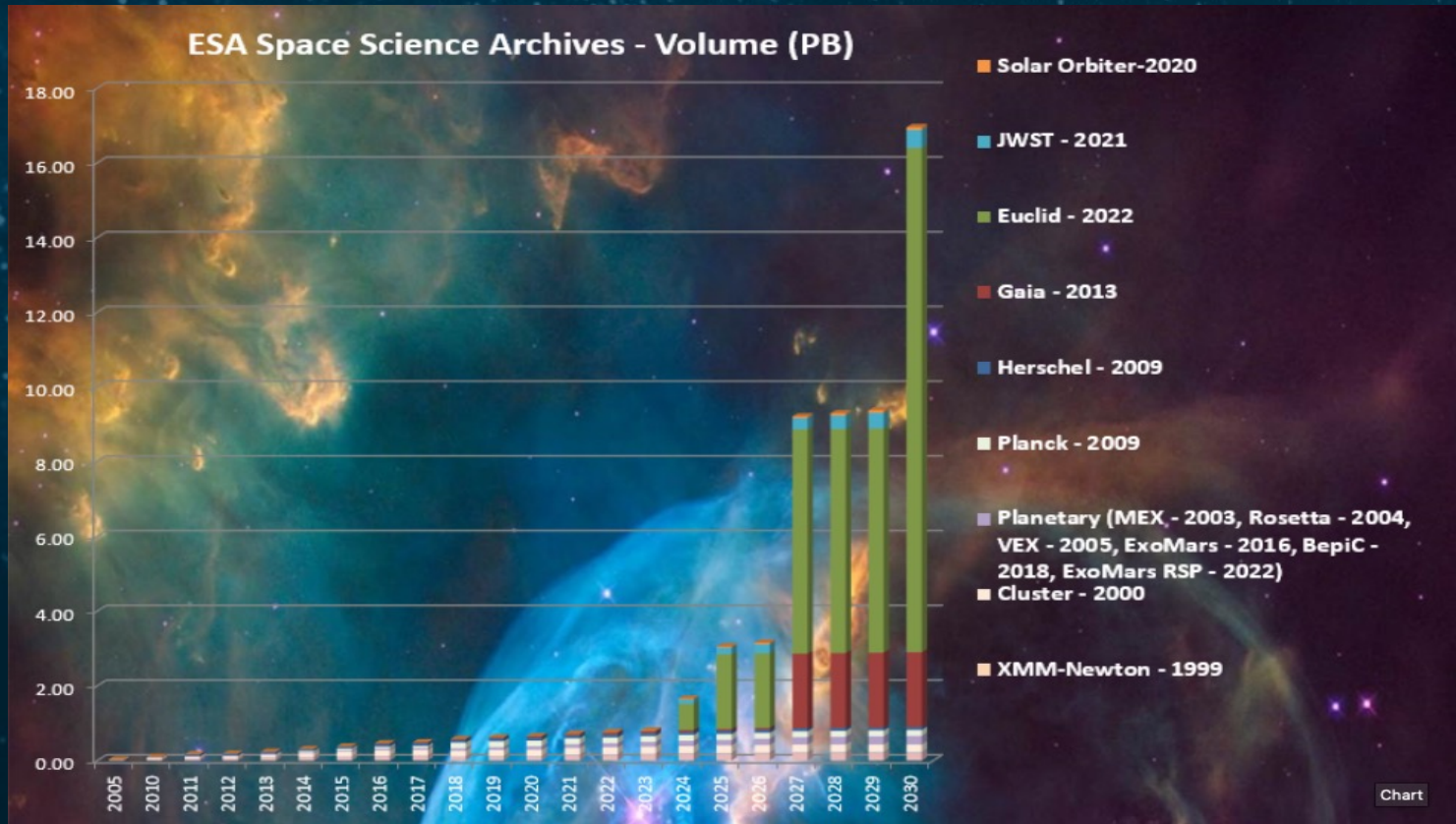
Jim Gray, eScience: A Transformed Scientific Method

## BRING YOUR QUESTIONS TO THE DATA

There is a new paradigm, opening completely new opportunities for discovery – a data-intensive approach to science. In many domains, we have entered what could be called the golden age of surveys, with several large-scale projects, spanning decades, between finished, ongoing, and planned activities. ESA is responsible, or is a major partner, in several of these initiatives.



# Space Data Colocation as a Differential Factor



*From bring the data to the user*

*To bring the user to the data*
















ESAC Science Data Center

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ESA Datalabs [0.3.0/BETA] 🔍 📄 🗂️ 🔔 👤

## Create Datalab

Find a datalab in ESA datalabs catalog

|   |  |   |
|---|--|---|
|  <b>aladin</b><br>Aladin is an interactive sky atlas allowing the user to visualize digitized astronomical images or full surveys, superimpose entries from astronomical catalogues or databases, and interactively access related data and information from the <i>Simbad database</i> , the <i>VizieR</i> service and other archives for all known astronomical objects in the field |  <b>filezilla</b><br>FileZilla   |  <b>fv</b><br>FV - An image display and visualization tool for astronomical data |
|  <b>jl-esdc</b><br>Jupyterlab ESDC   |  <b>jl-euclid-dps</b><br>Euclid DPS JupyterLab   |  <b>jl-herschel</b><br>Herschel JupyterLab                                       |
|  <b>jl-juice</b><br>JupyterLab with JUICE moon coverage tool (0.8.0).  |  <b>jl-pangaia</b><br>PanGaia JupyterLab   |  <b>jupyterlab</b><br>Plain JupyterLab for demonstration of basic functionality. |
|  <b>jl-jwst</b><br>Jupyterlab JWST   |  <b>jl-jwst-miricle</b><br>Jupyterlab JWST Miricle   |  <b>jl-jwst-nips</b><br>Jupyterlab JWST NIPS                                   |
|  <b>jl-jwst-nsrt</b><br>Jupyterlab JWST NSRT   |  <b>qfitsview</b><br>QFitsView - An image display and visualization tool for astronomical data |  <b>theia-python</b><br>Theia Python Editor                                    |

# Pipelines Catalogue : Batch Processing Analysis



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## Pipeline launch

Find a pipeline in pipelines catalog Browse User pipeline

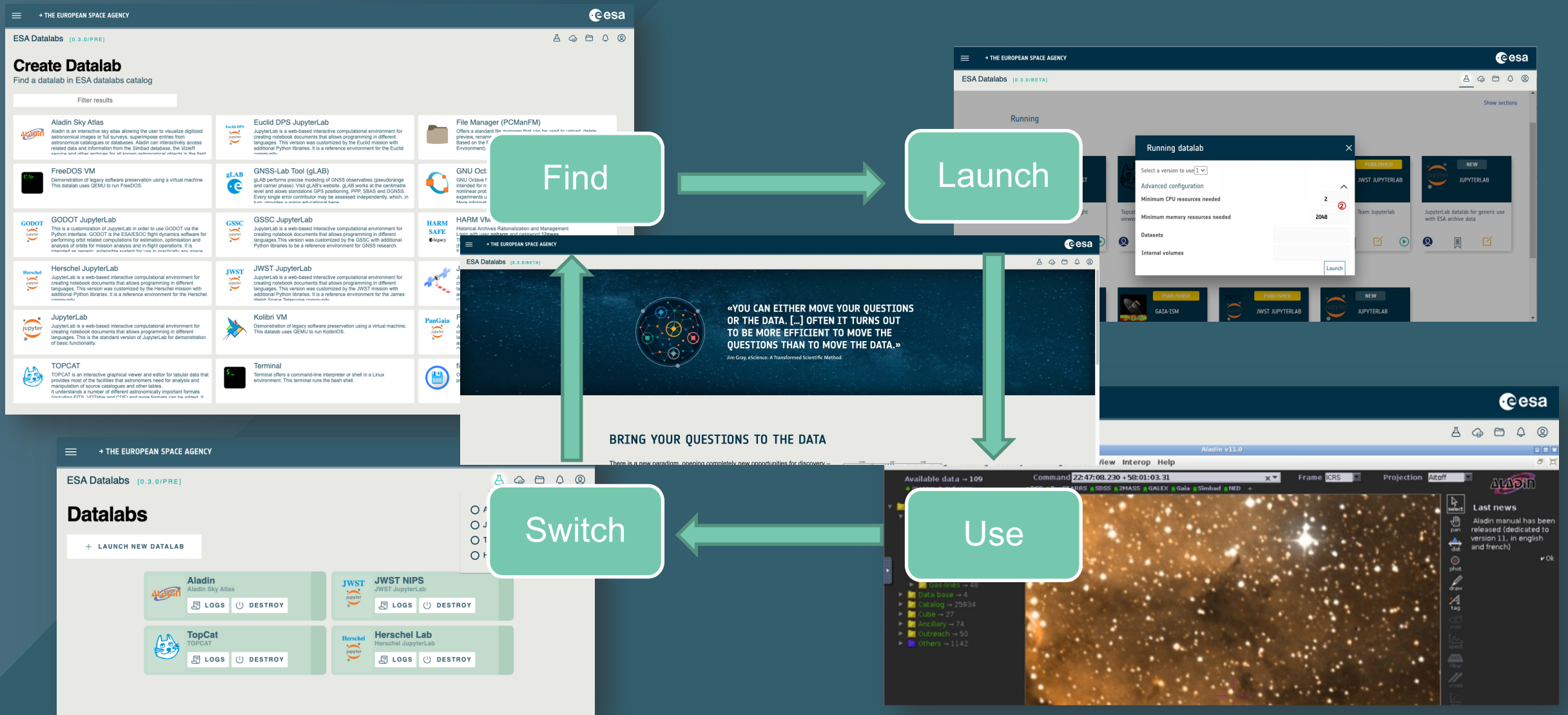
Filter results  Sort by last modified  Steps  Pipelines

### System Pipelines

|   |   |   |
|---|---|---|
| <b>BC_MCAM</b><br>This pipeline contains 2 steps: tm2raw_mcam and pds4_packager.<br><a href="#">bc</a> <a href="#">example</a><br>👤 jkuhi 🕒 Wed May 10 2023   | <b>JWST</b><br>This pipeline runs 'jwst.pipeline.Detector1Pipeline' and then processes the output on 'jwst.pipeline.Image2Pipeline' on 'strun' command.<br><a href="#">example</a> <a href="#">jwst</a><br>👤 jkuhi 🕒 Wed May 10 2023  | <b>Image2</b><br>This pipeline runs 'jwst.pipeline.Image2Pipeline' on 'strun' command.<br><a href="#">example</a> <a href="#">jwst</a><br>👤 jkuhi 🕒 Wed May 10 2023   |
| <b>Detector1</b><br>This pipeline runs 'jwst.pipeline.Detector1Pipeline' on 'strun' command.<br><a href="#">example</a> <a href="#">jwst</a><br>👤 jkuhi 🕒 Wed May 10 2023                                     | <b>timestamp</b><br>This one-step pipeline has two inputs. The first input is a text file. The output of the pipeline is the copy of the input file with current time appended. The second input to the pipeline is an integer that specifies sleep time. The pipeline step sleeps the specified number of seconds.<br><a href="#">example</a><br>👤 jkuhi 🕒 Wed May 10 2023   | <b>scatter-gather</b><br>This pipeline contributed by INTEGRAL demonstrates the CWL scatter feature. In the scattering pipeline a step produces an array output of files and the next step is spawned for each array element. The entry-point file is 'scatter-gather.cwl'. The 'data' input directory takes text files. This is an advanced pipeline.<br><a href="#">example</a> <a href="#">scatter-gather</a><br>👤 jkuhi 🕒 Wed May 10 2023 |
| <b>cdr-demo</b><br>This pipeline chains two 'command' steps. There is intermediate output after the first step and the final output after the second.<br><a href="#">example</a><br>👤 jkuhi 🕒 Wed May 10 2023 | <b>Hello_PIPEMAN</b><br>This pipeline has two steps. The input to the pipeline is a text file. The two steps append "Hello" and "PIPEMAN" in block letters to the copy of the input file. The output of the pipeline is a copy of the input file with the appended "Hello PIPEMAN". This example uses a 'figlet' pipeline step that needs to exist as a step in Pipeline Catalogue. 'figlet' is a unix command that writes text in block letters.<br><a href="#">example</a><br>👤 jkuhi 🕒 Wed May 10 2023 | <b>simple</b><br>Very basic pipeline.<br><a href="#">example</a><br>👤 jkuhi 🕒 Wed May 10 2023   |

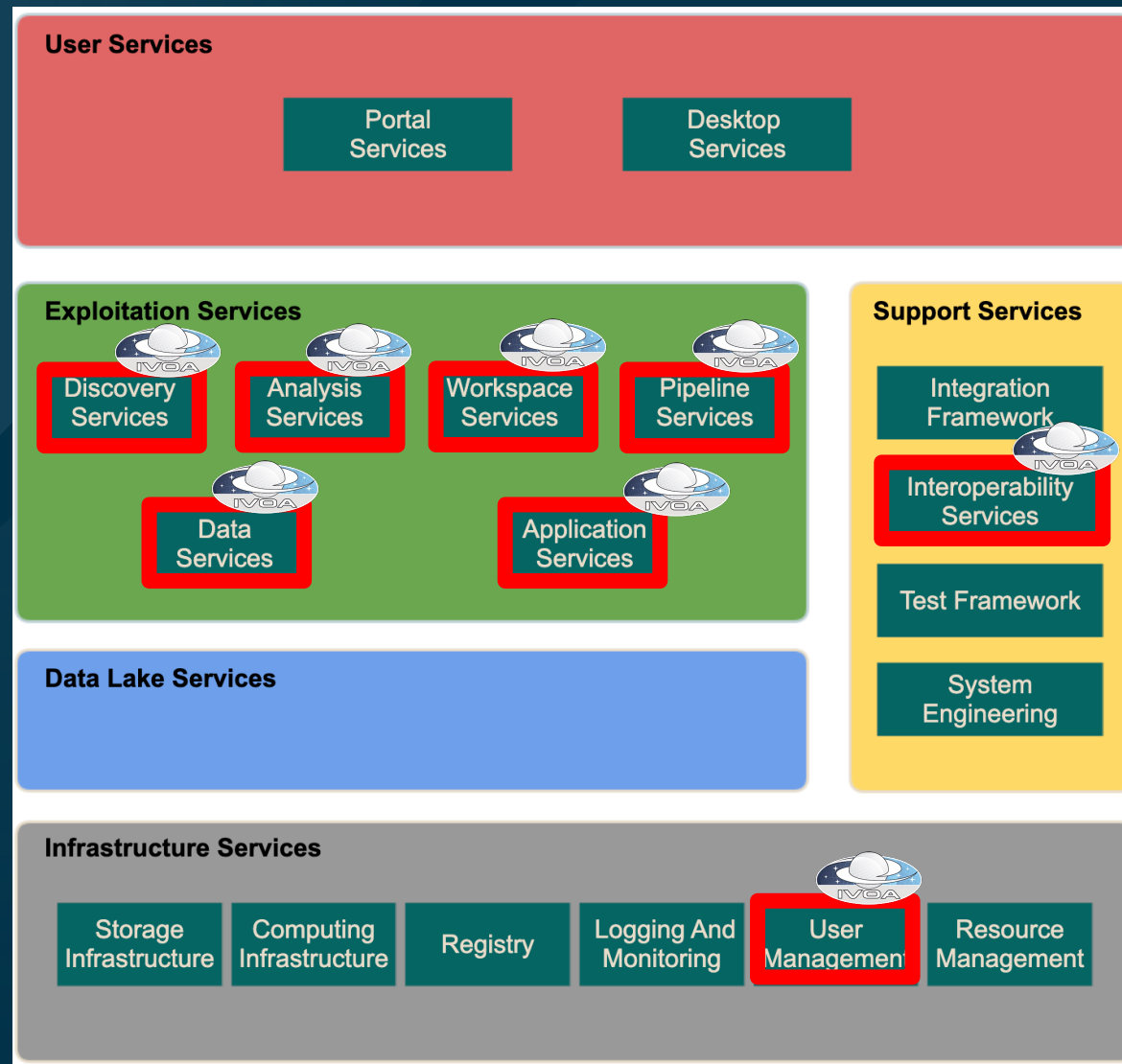


# Datalab / Pipeline – Utilisation Lifecycle



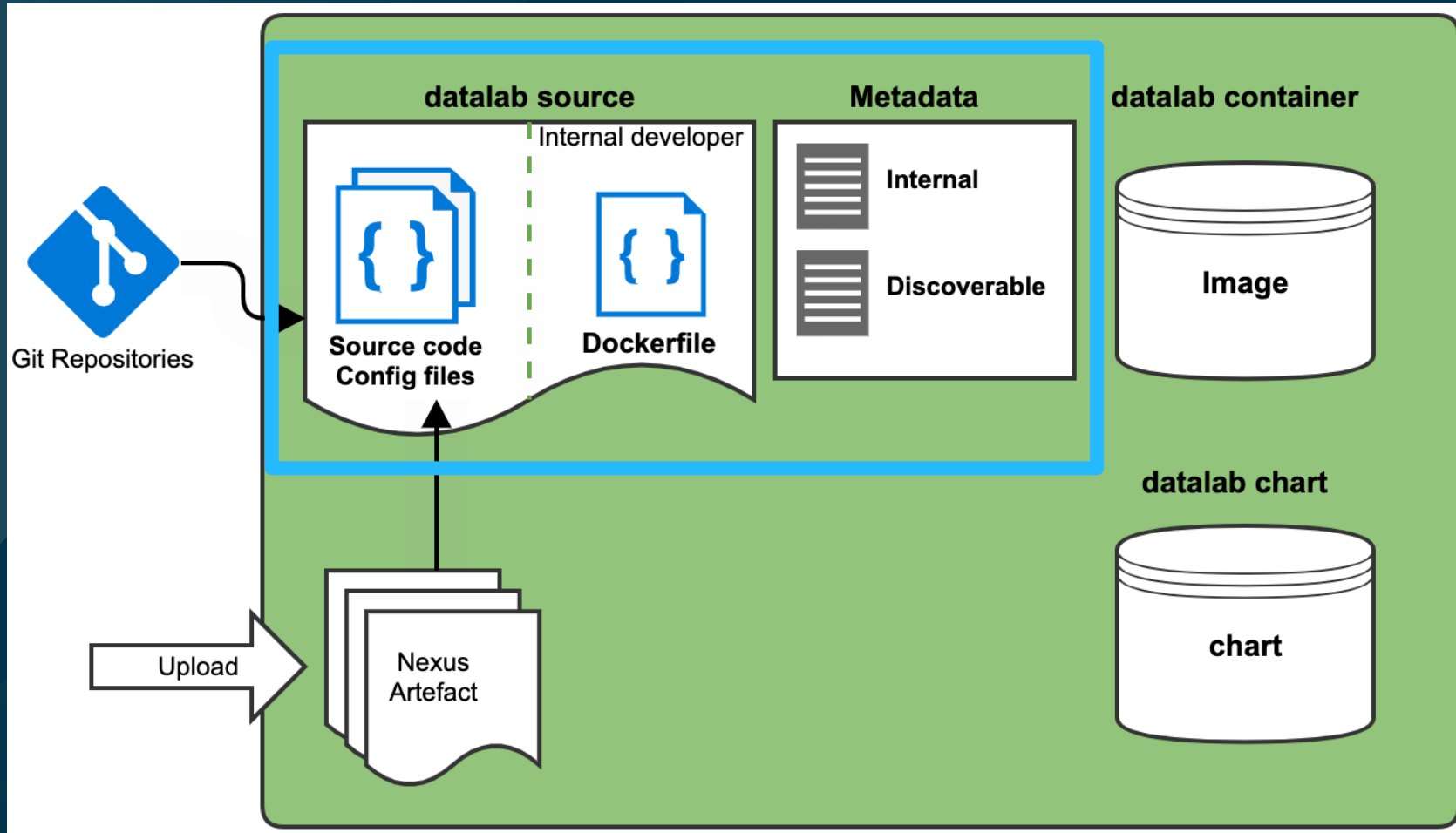


# Interoperability

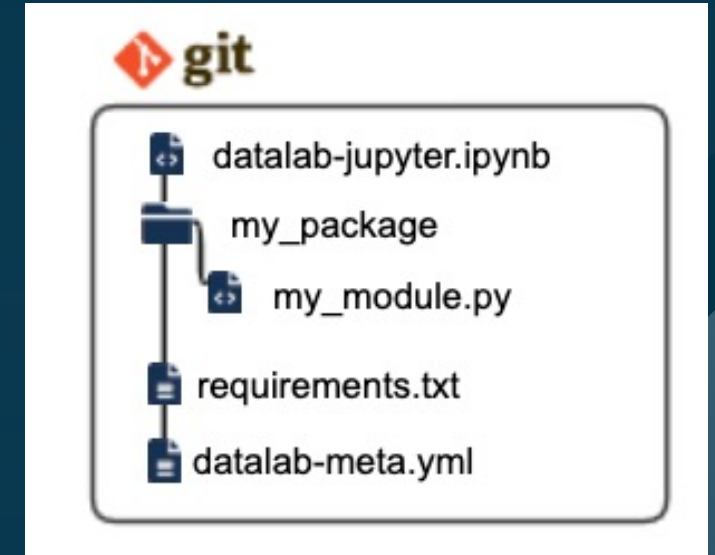
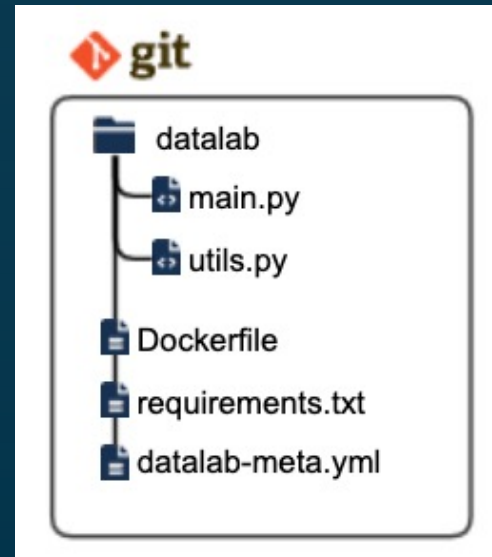
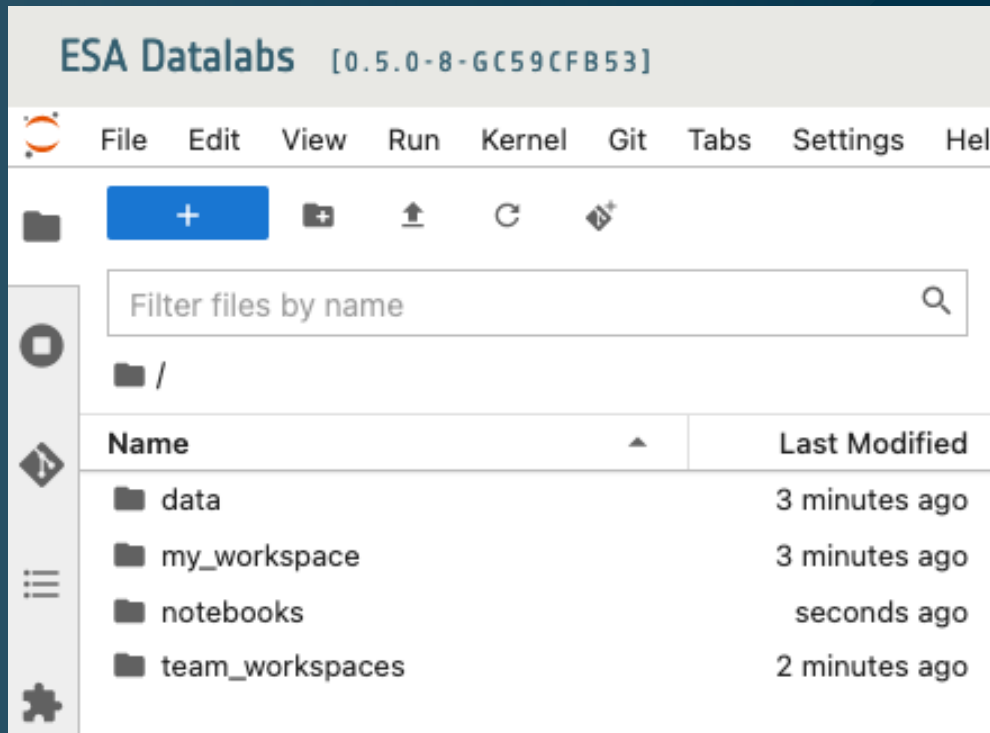




# Application Services: Datalab Package Specification



# Application Services: Datalab Structure



# Discovery Services: Datalab Metadata

| ESA DDP Term                          | Namespace:Term  | Description  | Visibility (private / public) | Write access (developer / moderator / sciapps) | Data type |
|---------------------------------------|---|--|-------------------------------|--|-----------|
| abstract                              | <a href="#">sdo:abstract</a>  | Abstract (a short description)   | <b>PUBLIC</b>                 | <b>DEVELOPER</b>                               | Text      |
| alternateName                         | <a href="#">sdo:alternateName</a><br>( <a href="#">pipeman: displayName</a> ) | Short name or acronym for the <a href="#">datalab</a>  | <b>PUBLIC</b>                 | <b>DEVELOPER</b>                               | Text      |
| associatedFileType                    | <a href="#">esado:associatedFileType</a> (new)                                | List of associated filetypes - if applicable/pertinent (e.g. FITS, VOTable, GeoTIFF, netCDF) | <b>PUBLIC</b>                 | <b>DEVELOPER</b>                               | Text      |
| ESAOfficial                           | <a href="#">esado:ESAOfficial</a>   | flag indicating that the <a href="#">datalab</a> was created by ESA                          | <b>PUBLIC</b>                 | <b>DEVELOPER</b>                               | Boolean   |
| audienceType                          | <a href="#">sdo:audienceType</a>  | Intended audience for the <a href="#">datalab</a>  | <b>PUBLIC</b>                 | <b>DEVELOPER</b>                               | Text      |
| citation                              | <a href="#">sdo:citation</a>  | Citation for the <a href="#">datalab</a> (e.g. article DOI)                                  | <b>PUBLIC</b>                 | <b>DEVELOPER</b>                               | Text      |
| <a href="#">datalabImage.platform</a> | <a href="#">sdo:version</a>   | ESA datalabs platform version  | <b>PRIVATE</b>                | <b>APPLICATIO...</b>                           | Text      |
| <a href="#">datalabImage.id</a>       | <a href="#">sdo:identifier</a>  | Identifier of the <a href="#">datalab</a> image  | <b>PRIVATE</b>                | <b>APPLICATIO...</b>                           | Text      |
| <a href="#">datalabImage.keyword</a>  | <a href="#">dcat:keyword</a>  | Keyword tag of the current <a href="#">datalab</a> image                                     | <b>PRIVATE</b>                | <b>DEVELOPER</b>                               | Text      |
| dateCreated                           | <a href="#">sdo:dateCreated</a>   | Date the <a href="#">datalab</a> was created   | <b>PRIVATE</b>                | <b>APPLICATIO...</b>                           | Date      |

**PUBLIC**

**PRIVATE**

Leveraging on existing vocabularies and ontologies: sdo, dcat, skos, foaf ... esado

# Central Access to an Ecosystem of Digital Platforms



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### ESA Data Discovery Portal [0.7.0/ALPHA]

Type of Asset:  Databab  Dataset

Domain:  Earth Observation (1,811)  Human and Robotic Exploration (15)  Navigation (1)  Space Operations (1)  Space Science (25,131)

Instrument:  Thematic Area:  Mission:  Properties:

Type in your query...

|   |  |
|---|--|
| <b>RO-C-OSIWAC-2-EXT-67PCHURYUMOV-M30</b><br>Dataset Overview This CODMAC level 2 data set contains uncalibrated image data in DN unit, acquired by the OSIRIS Wide Angle Camera on the Rosetta spacecraft during the ROSETTA EXTENSION 2 mission phase, covering the period from 20160531T23:25:00.000 to 20160928T00:00:00.000. All header keywords are defined and described in the header file. | <b>RL-CAL-CIVA-3-PDCS</b><br>Data Set Overview This data set contains the data referred to PDCS Mission Phase Data Both data, scientific and housekeeping, are collected in this data set. They referred to CODMAC Level 3. Processing Only CODMAC Level 3 data are present in this data set Coordinate System he  |
| <b>RO-X-OSIWAC-2-CR4B-CHECKOUT</b><br>Dataset Overview This CODMAC level 2 data set contains uncalibrated image data in DN unit, acquired by the OSIRIS Wide Angle Camera on the Rosetta spacecraft during the CRUISE 42 mission phase, covering the period from 20081006T00:00:00.000 to 20090913T23:59:59.000 All header keywords are defined and described in the header file.                   | <b>RO-C-RSI-1_2_3-ESC2-0684</b><br>Data Set Overview The Rosetta (RO) Radio Science (RSI) Data Archive is a timeordered collection of raw and partially processed data collected during the Rosetta Mission to ChuryumovGerasimenko. For more information on the investigations see the RSI User Manual (RSIUSERMANUAL0001) in the DOCUMENTS\RSI folder. This is a |
| <b>RO-C-RSI-1_2_3-ESC2-0761</b><br>Data Set Overview The Rosetta (RO) Radio Science (RSI) Data Archive is a timeordered collection of raw and partially processed data collected during the Rosetta Mission to ChuryumovGerasimenko. For more information on the investigations see the RSI User Manual   | <b>RO-C-RSI-1_2_3-ESC2-0759</b><br>Data Set Overview The Rosetta (RO) Radio Science (RSI) Data Archive is a timeordered collection of raw and partially processed data collected during the Rosetta Mission to ChuryumovGerasimenko. For more information on the investigations see the RSI User Manual  |

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#### ESAC SCIENCE DATA CENTRE

ESDC Statistics

|                   |                        |                    |
|-------------------|------------------------|--------------------|
| Monthly Users (*) | Monthly downloaded (*) | Archive Total Size |
| 24 876            | 123.1 TB               | 608.0 TB           |

LATEST NEWS

ESDC Statistics

Did you know you have access to more than 1000 background sites (Planetary Progressive Surveys & HPS) and can load any of these in HSA Sky skySim? ? Thanks to the @ESA/OSIRIS HPS Registry! Here's

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#### FEATURED NEWS

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AN OVERVIEW OF THE AELUS MISSION

NEW COLLECTION OPEN TO USERS GREAT HYPERSPECTRAL PRODUCTS

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### Copernicus Open Access Hub

Welcome to the Copernicus Open Access Hub

The Copernicus Open Access Hub (Open Access Hub) provides complete, free and open access to Sentinel-1, Sentinel-2 and Sentinel-3 data products, starting from the 3rd October Commissioning Service (COS) date. In March 2023 a new Copernicus Data Hub (Copernicus Data Hub) has been launched to provide access to Sentinel data with new features for visualization and data processing. Please also head to the news to latest information on the services available and the tools for the full release of all backscattered.

Sentinel Data are also available via the Copernicus Data and Information Access Services (DSIAS) through several channels.

Please visit our User Guide for getting started with the Data Hub. Sentinel Desktop how to use the API and create scripts for automatic search and download of Sentinel Data, with watchlists access to the latest data and application access to historic data via the API and GUI.

For further details or requests of support please send an email to [copernicus@esa.eu](mailto:copernicus@esa.eu)

Reports & Stats

|                           |                           |
|---------------------------|---------------------------|
| 38,892                    | 338,550                   |
| downloads in the last 24h | downloads in the last 24h |

Resources

- ESA Open Access Portal
- Copernicus Sentinel Portal
- Sentinel Data
- Sentinel Open Service

Open Hub API Hub L5P Pre-Proc P08 Hub

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### GSSC Now

Fostering science collaboration in GNS

Our activities

- ESA Open Access Portal
- ESA Open Access Portal
- ESA Open Access Portal
- ESA Open Access Portal

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### HREDA - Human and Robotic Exploration Data Archive

The HRE Data Archive (HREDA) collects information and data of investigations funded or co-funded by ESA's Directorate for Human and Robotic Exploration (HRE) and performed for interplanetary and lunar surface before 2025. This archive is the central data point and platform to plan to support through the working partnerships and the planned crewing. It is a joint effort by ESA's Directorate for Human and Robotic Exploration, the Directorate of Science and the Science Data Centre (SDC) teams.

Enter text to find an investigation (e.g. Planck Flight)

Platforms

|         |           |            |        |        |             |
|---------|-----------|------------|--------|--------|-------------|
| Antares | Blue Bird | Deep Field | Mars   | Moon   | Other Space |
| SEARCH  | SEARCH    | SEARCH     | SEARCH | SEARCH | SEARCH      |
| PROBES  | PROBES    | PROBES     | PROBES | PROBES | PROBES      |



# Proof-of-Concept: ESA Datalabs and GSSC Now



## datalabs.esa.int

## gssc.esa.int



## The ESA Space Science Exploitation Platform

- SCI Data available for researches to work on it, made easy

## Increase Space Science Operations Efficiency

- Reusable for fast implementation of Scientific Processing Pipelines
- Reusable for fast implementation of Scientific Analysis and Visualisation Tools

## Enable Collaboration and Open Science

- Share complex processing tools and data with your team (ala JWST)
- Share your contributions with the community in SCI 's AppStore

# THANK YOU!



Find out more in [datalabs.esa.int](https://datalabs.esa.int)



# Back-Up Slides

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## GSSC Now – Vertical Domain

[gssc.esa.int/now](https://gssc.esa.int/now)

## ESA Datalabs - Multi Domain

[datalabs.esa.int](https://datalabs.esa.int)