Welcome to the 3rd IaaS Sen4CAP webinar

The webinar will last around 1h

The slides will be available on the Sen4CAP website in the coming 48 hrs (http://esa-sen4cap.org/)

Presenters:

Cosmin Udroiu & Laurentiu Nicola from *CS GROUP - ROMANIA*

Sophie Bontemps, Louis Descarpentries & Dries De Bièvre from *UCLouvain*

Pontus Lurcock & Norman Fomferra from *Brockmann Consult Gmbh*

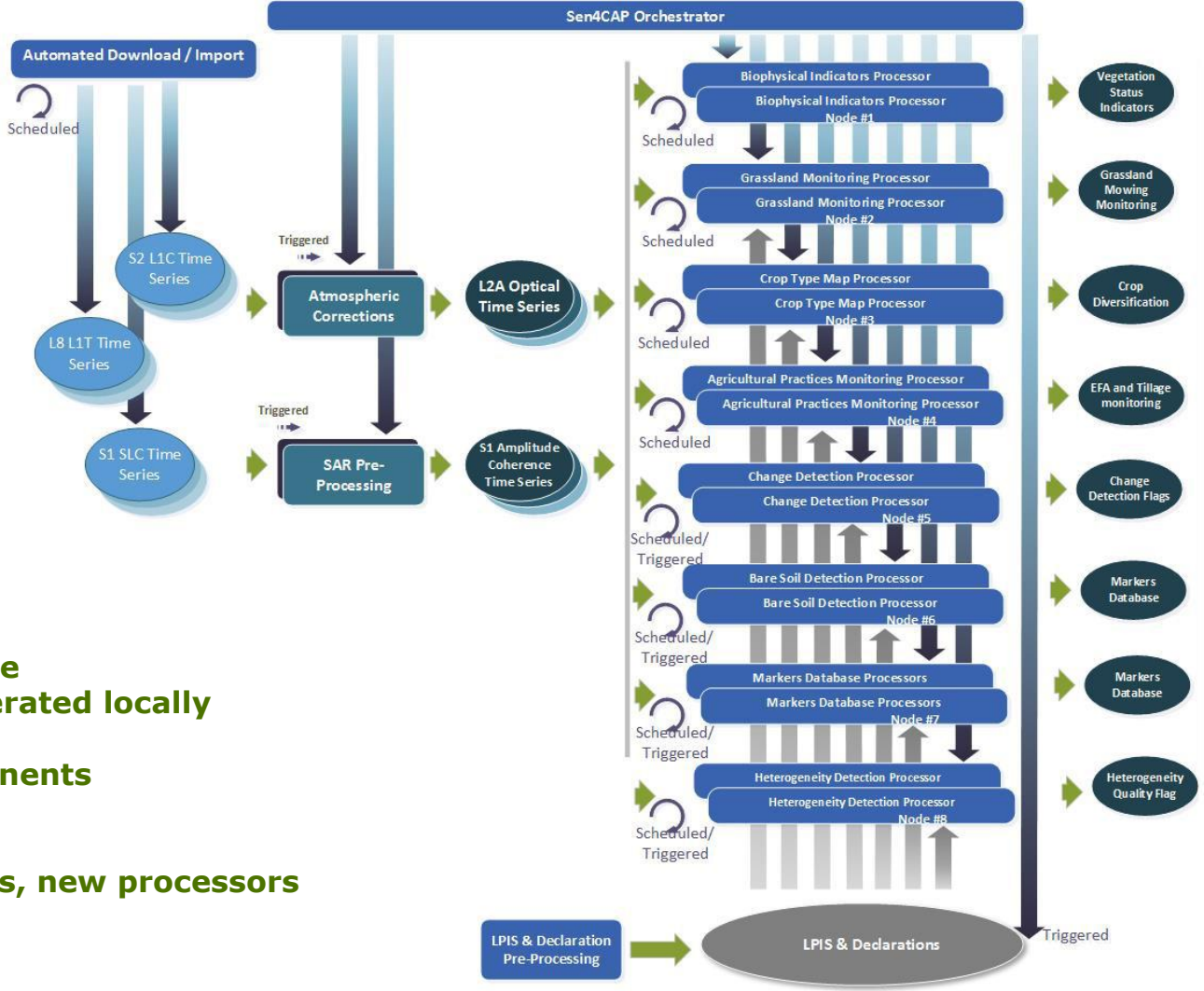
Members of the consortium available to answer your questions

Webinar outline

- **IaaS Sen4CAP overview**
- Demo
- Conclusions and next steps

Sen4CAP
Open-source system

Version 5.0 delivered during June/July



- **Sentinel-1 & -2**
- **Automated and modular**
- **For NRT or off-line production**
- **Demonstrated at national scale**
- **Portable on all DIAS-es or operated locally**
- **User-friendly & API interfaces**
- **Dockerization for main components**

- **New Features:**
  - **S1C, Individual indicators, new processors**

IaaS Sen4CAP Objectives

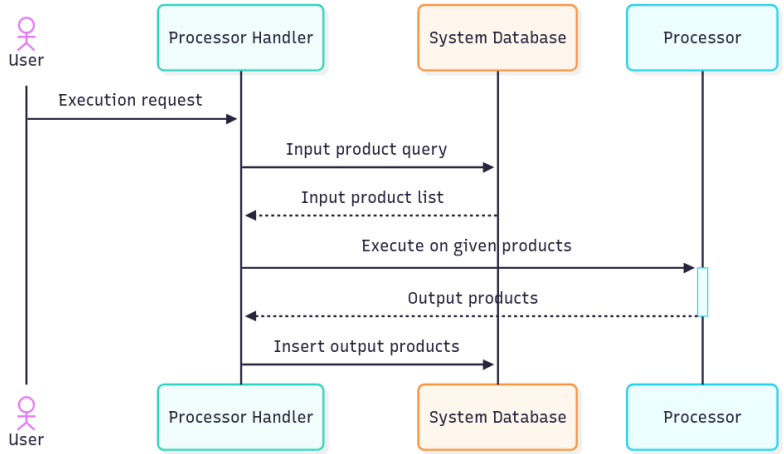
- **Sen4CAP functionality as cloud-based services**
  - Convert the core functionalities of SEN4CAP into cloud-based services
    - refactor into modular cloud-based services exposed via client libraries and API interfaces
  - User access through a Python library and standard RESTData Processing APIs (OGC Processes API standard)
  - Modular design–being able to use individual functionalities independently and decouple them for deployment, scaling and maintenance
  - Containerization and microservices architecture following OGC Application Packaging best practices
  - Allow processing on smaller areas

- **Public cloud deployment and integration**
  - Deploy the services in a public cloud environment (co-located with Sentinel data archives)
  - Onboard the services into the ESA Network of Resources (NOR) service catalogue

Project Objectives -

- **Open-Source development**
  - Release the Sen4CAP code as open-source, but well-structured and fully documented
  - Adhere to open-source development best practices
  - Support community contributions and long-term maintenance

- **Support for STAC**
  - Basically, use STAC: lightweight, extensible, popular, multiple implementations
  - Keep PostGIS, ingest L2As, expose a STAC gateway (PgSTAC, stac-fastapi)
  - Processor handlers can query STAC instead of PostGIS
  - Managing S3 access keys for DIAS buckets (L2A) vs. custom products

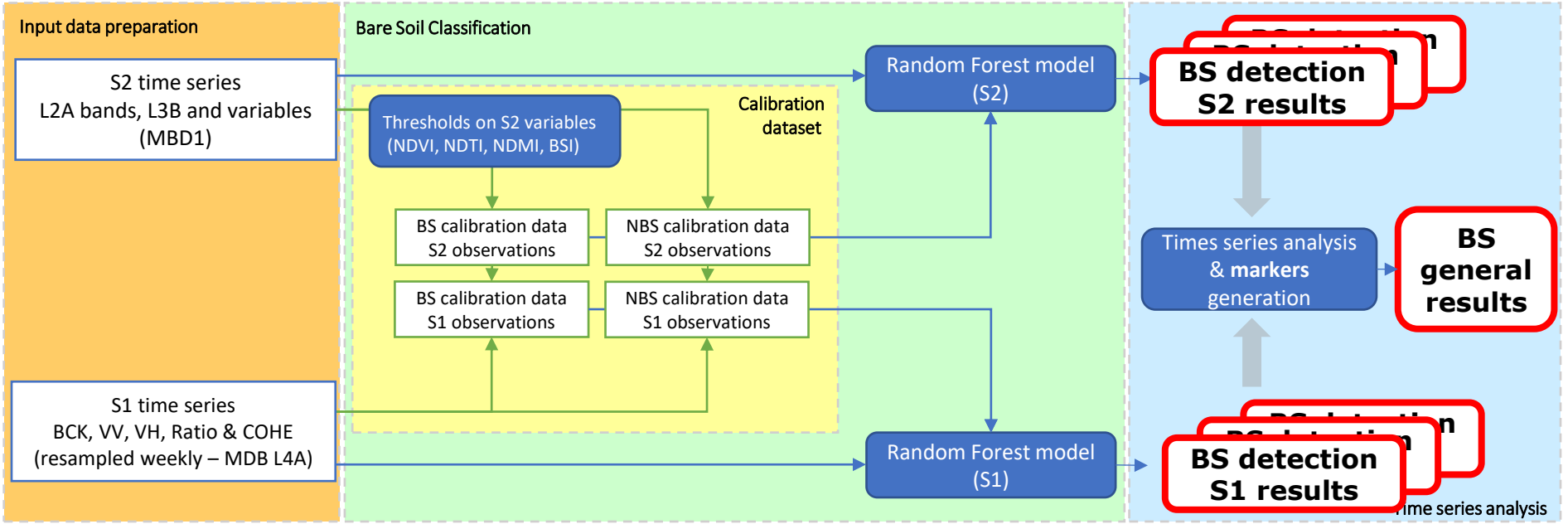


Project Objectives – OGC Application Packages

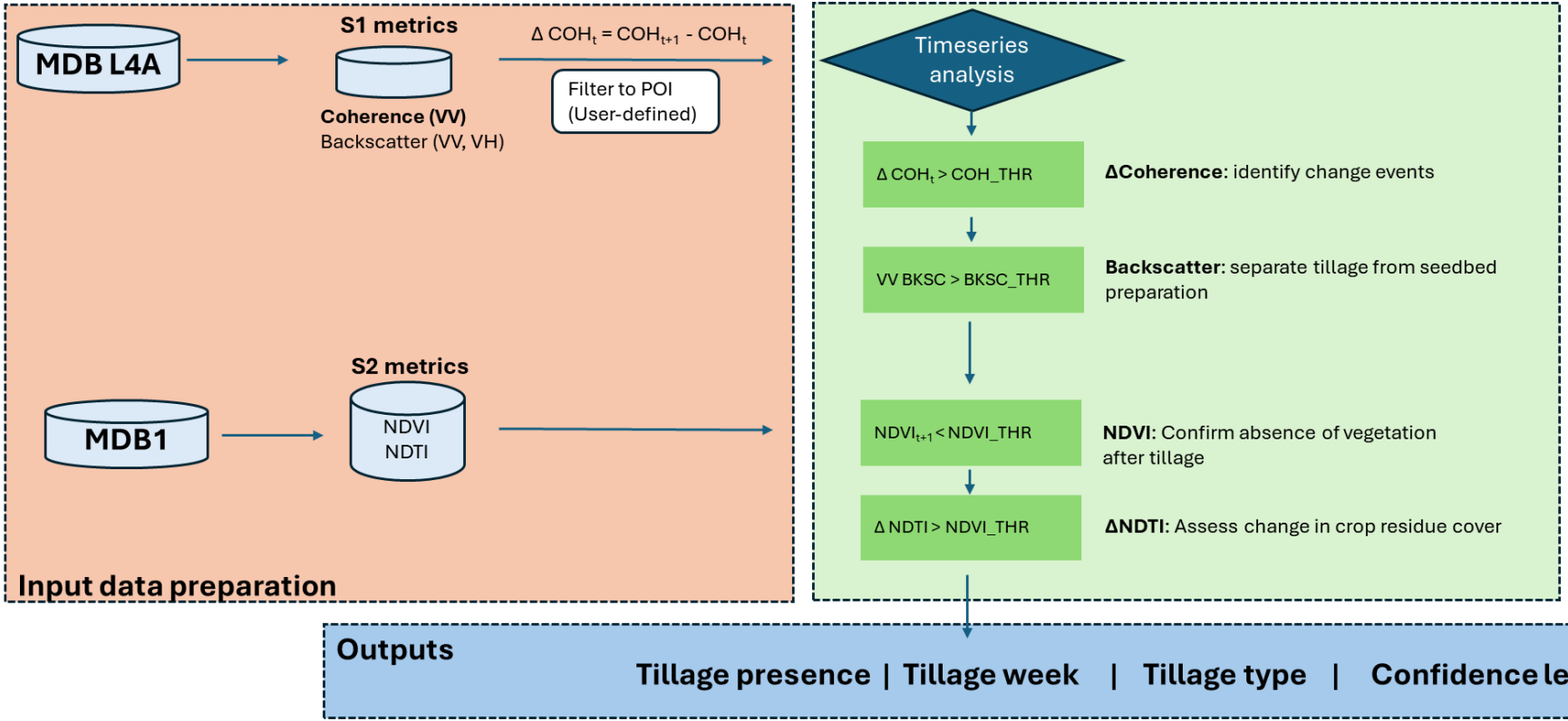
- **Porting to OGC Application Packages**
  - a way to describe, package and share geospatial applications
  - enables workflow and applications portability between systems / platforms
  - enables integration into existing platforms and catalogs (NoR, APEx)

- **Application structure**
  - packaged as OCI images
  - Common Workflow Language / CommandLineTool descriptors
  - command-line tools

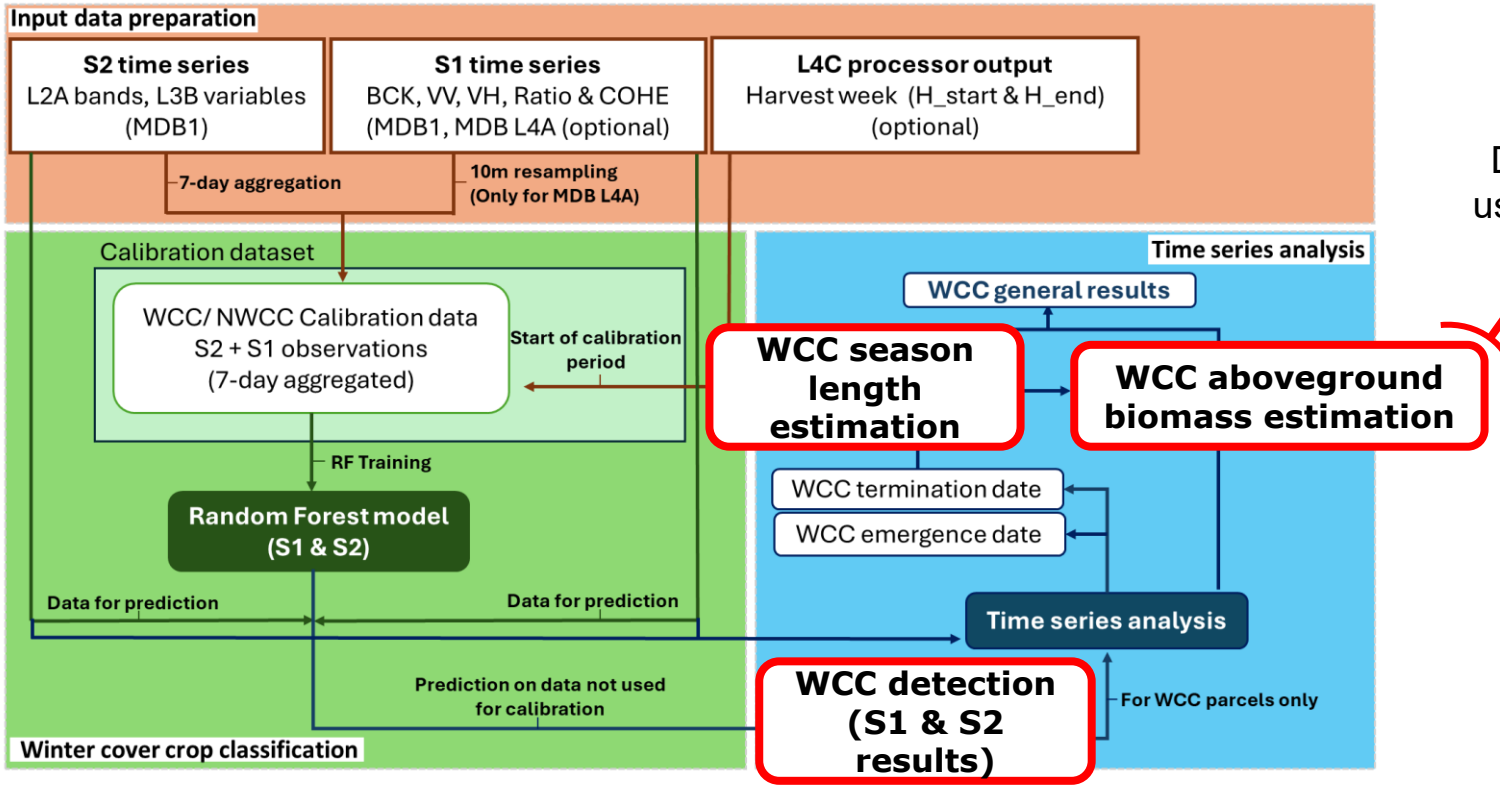
Scientific Enhancements
Bare Soil processor



Scientific Enhancements
Tillage processor



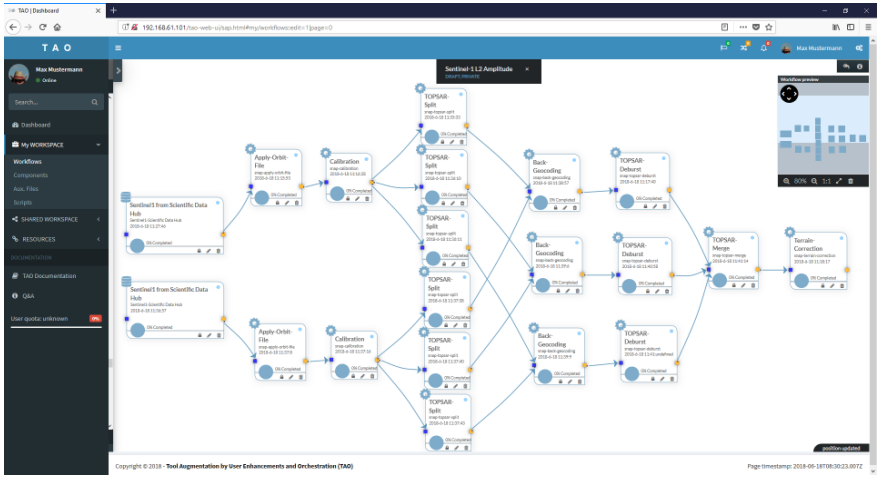
Scientific Enhancements
Winter cover crop (WCC) processor



Determined based on user survey responses

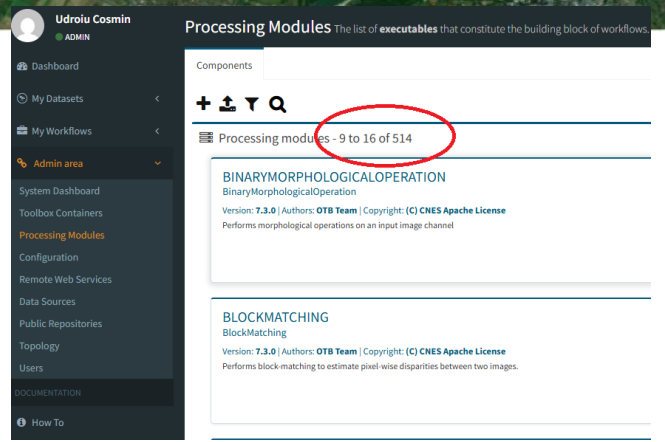
TAO – Tool Augmentation by user enhancements and Orchestration

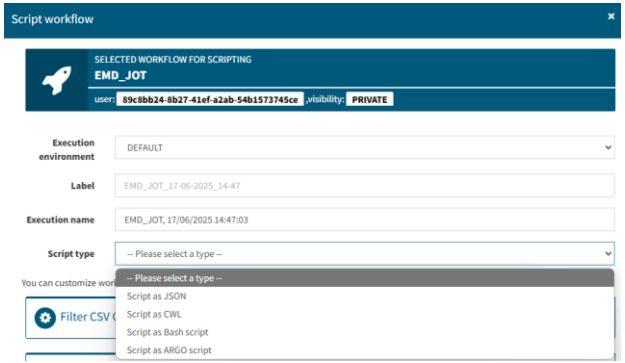
- **TAO** - integration framework for the Sen4CAP processors
  - ✓ orchestration of heterogeneous processing components and libraries to process data
  - ✓ Preparation of resources (including processing components or tools) and data input
  - ✓ Create and save pipelines as execution workflows
  - ✓ Distributed and scaling workflow executions (up from one to as many nodes as made available)
  - ✓ Retrieval / visualization of the results
  - ✓ User management
  - ✓ Multi-user platform, authentication (local user base, LDAP, Keycloak or even single sign-on), user groups
  - ✓ Support for OpenStack API and Kubernetes for vertical and horizontal execution scaling
  - ✓ Export workflows in different formats



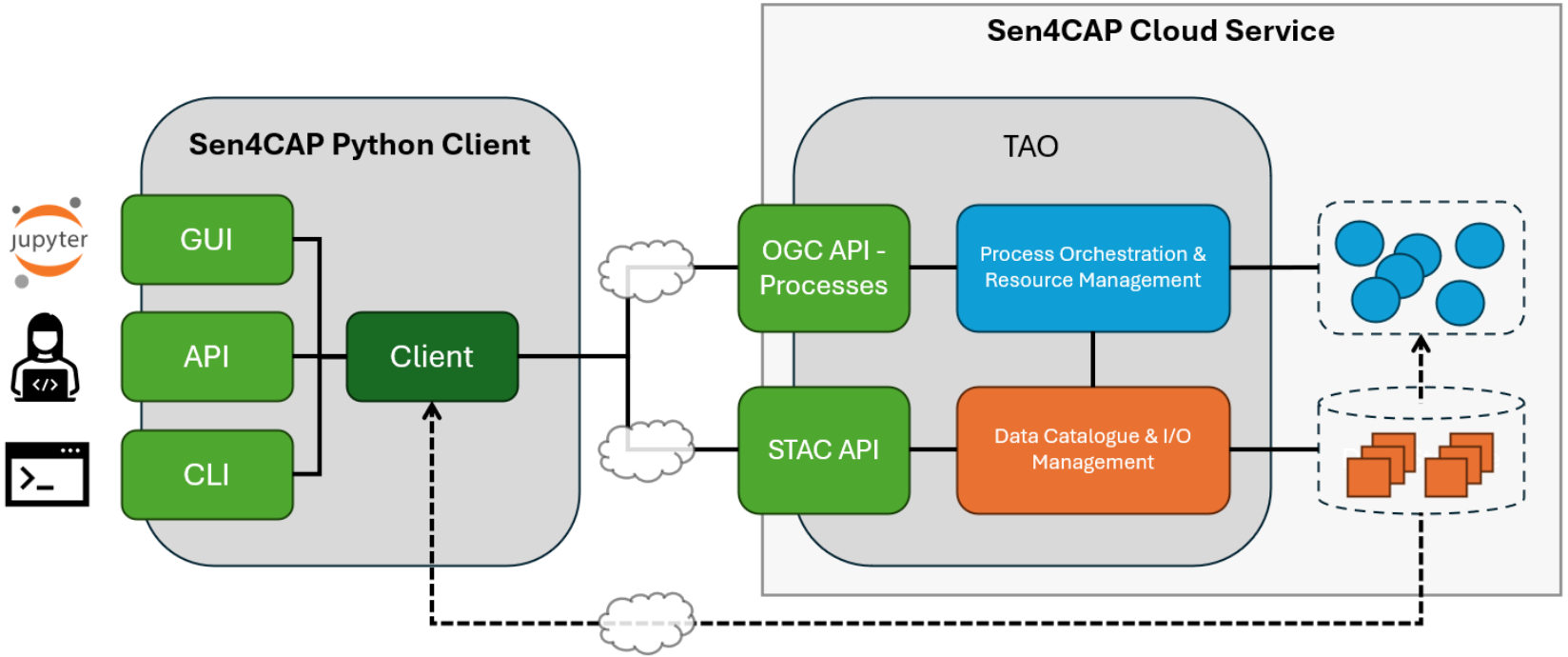
TAO Strenghts

- Integrate hundreds or thousands of tools and data sources
  - ✓ Grouping by category, tagging, filtering, searching tools
  - ✓ Building easily workflows
- Can integrate any tool that can be invoked from the command line
- Services invocation can be performed by adding script wrappers that perform invocation
- Export workflows into other formats (CWL, Argo, shell etc.).
- Exposes a OGC API Processes interface
- Support for S3, STAC and other repository types
- Integration with AI agents





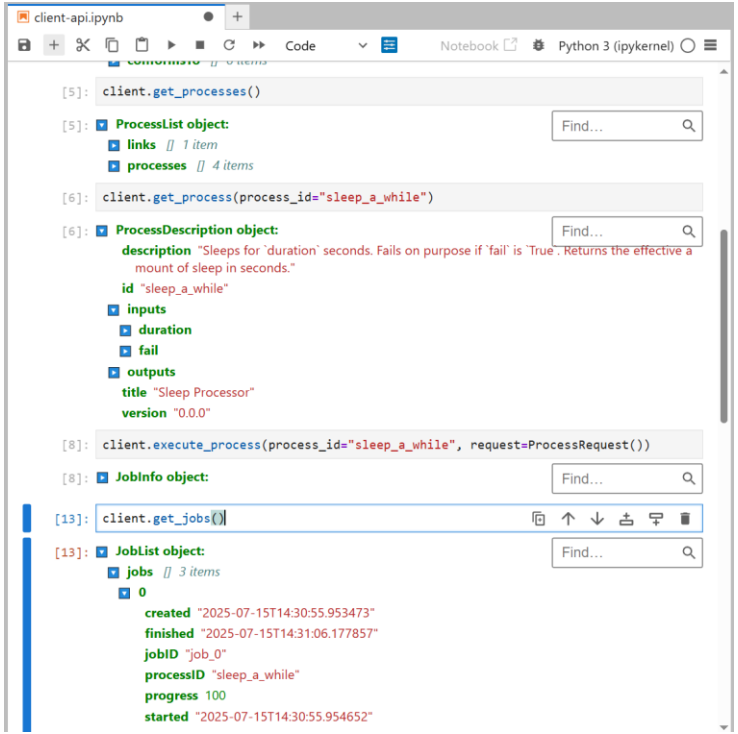
Extended architecture using Python API



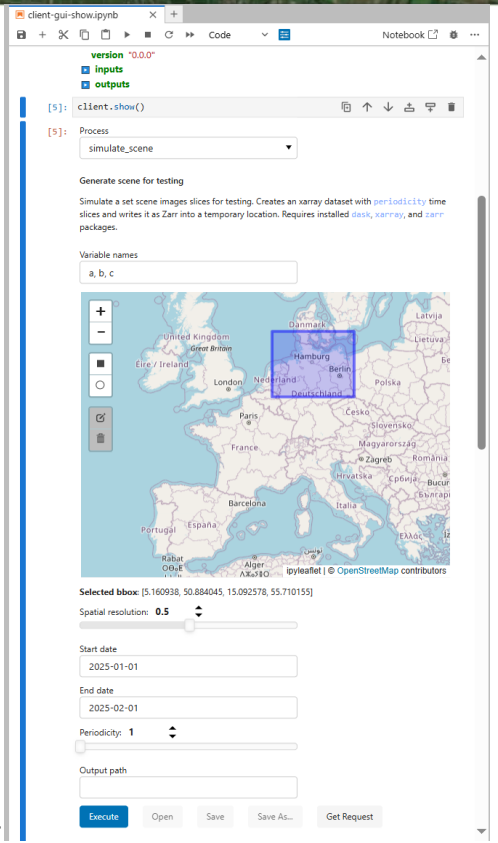
Front-end Design

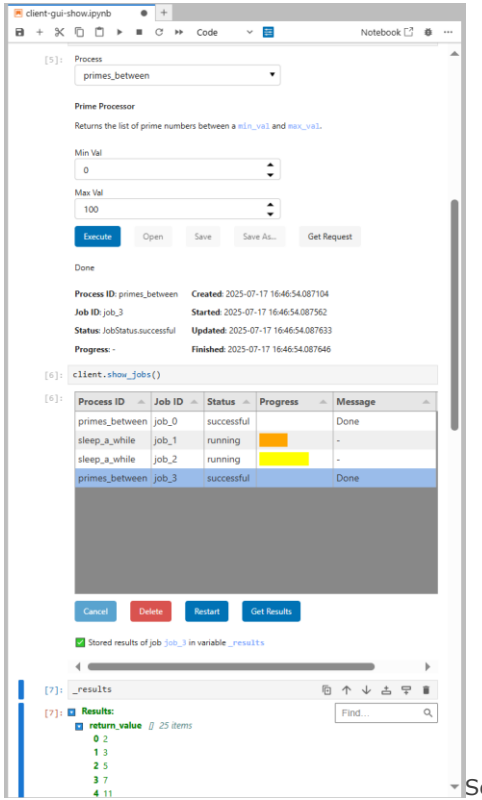
- Client functionality
  - List processes, get process details
  - Submit processing request
  - List jobs, get job details, cancel job
  - Get job results
- Functionality accessible through 3 user interfaces
  - API: for Python scripts and using in own libraries
  - GUI: for convenient use in Jupyter notebooks
  - CLI: for the terminal and in shell scripts
- Implementation assumes a back-end web service compliant to OGC API - Processes - Part 1: Core

Python API in Jupyter Lab



Processing GUI in Jupyter Lab





Processing CLI in terminal emulator

```
Usage: sen4cap-client [OPTIONS] COMMAND [ARGS]...

Client tool for the Sen4CAP service.

The tool provides commands for managing processing request templates, processing requests,
processing jobs, and gets processing results.
You can use shorter command name aliases, e.g., use command name "vr" for
"validate-request", or "lp" for "list-processes".

 Options
 --verbose                -v        Verbose output
 --install-completion               Install completion for the current shell.
 --show-completion                  Show completion for the current shell, to copy it or
                                    customize the installation.
 --help                             Show this message and exit.

 Commands
 version              Show version and exit.
 configure            Configure the client.
 list-processes       List available processes.
 get-process          Get process details.
 validate-request     Validate a processing request.
 execute-process      Execute a process.
 list-jobs            List all jobs.
 get-job              Get job details.
 dismiss-job          Cancel a running or delete a finished job.
 get-job-results      Get job results.
```

Sen4CAP Procesors in APEx and NoR

- APEx

  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_s1_pre_processing
  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_l3b_biophysical_indicators
  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_l3b_spectral_indices
  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_l3_basic_markers
  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_l4a_crop_type
  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_l4b_grassland_mowing
  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_l4c_agricultural_practices
  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_l4d_bare_soil
  https://algorithm-catalogue.apex.esa.int/apps/sen4cap_l4e_parcel_heterogeneity

- NoR

  Registered as DPaaS and as User Algorithm Hosting

  https://portfolio.nor-discover.org/

Webinar outline

- IaaS Sen4CAP overview

- **Demo**

  TAO and use of AI in building workflows

  Python client library

  APEx and NoR

- Conclusions and next steps

Conclusions and next steps

- **Forum** for your questions and exchanges about the Sen4CAP system

- **If you want access to test and evaluate the new Sen4CAP Services:**

  URL:

  sen4x.tao.c-s.ro

  Contact:

  cosmin.udroiu@cs-soprasteria.com

- **Your questions ???**


Thank you for your attention
and your contribution
sen4cap
common agricultural policy