Welcome to the 10th 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:
Sophie Bontemps & Diane Heymans from UCLouvain
Cosmin Udroiu & Laurentiu Nicola from CS GROUP - ROMANIA

Members of the consortium available to answer your questions
Webinar outline

- Sen4CAP overview
- New use cases for 2022
- System evolution – New version 3.0
  - New web interface
  - Issues and solutions
- Questions & Answers
- Next events
Webinar outline

- **Sen4CAP overview**
- New use cases for 2022
- System evolution – New version 3.0
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Sen4CAP: from an ESA project to a toolbox

**Design and prototyping**  
2017 – local sites

- Use cases selection
- Products Specifications
- Benchmarked Methods
- Algo & System design
- Prototype products
- Validation

**Demonstration and validation**  
2018 & 2019 – national NRT

- Use cases demonstration
- National scale
- Continuous monitoring
- Validation & Fitness-to-use assessment
- Capacity building and training
- System qualification

**User uptake and system evolution**  
2020, 2021, 2022

- 330 downloads and 20+ Paying Agencies testing the system on CREODIAS
- System evolution with new use cases to be defined (open call) – moving towards performance
- Training and webinars
- Support to users
Markers and products assessed through selected use cases but available for many other applications
**Sen4CAP – An open-source system**

- 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

Version 3.0 delivered on 18 Nov 2021
Sen4CAP is free and open source
Based on open source existing software

Under GNU-GPL License

Based on **Orfeo ToolBox** framework

Cluster-ready architecture for distributed processing

Integration of **SNAP** tools and processing chains

Operational system required: **CentOS7** (GNU/LINUX)

**PostgreSQL** and **PostGIS** implementation
**Sen4CAP system: simple parametrization and subsidy application upload**

### Main Parameters Settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of Interest</td>
<td>Shapefile to be uploaded</td>
</tr>
<tr>
<td>Monitoring period</td>
<td>Start and end dates to be defined</td>
</tr>
<tr>
<td>S1+S2 / S1+S2+L8</td>
<td>L8 to be selected</td>
</tr>
</tbody>
</table>

### Data from PA

- **Subsidy application (shp)**: Subsidy application layer (shapefile)
- **Tables and config files (csv)**:
  - L4A crop code LUT
  - L4B config file
  - L4C config file + agri practices tables

### System Initialization

- **Before the monitoring period**
- **Monitoring period**
- **End of the season**

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**Upload data**

**Subsidy application**

**Tables and config files**
User community & Support

**370 downloads** since November 2019

20+ Paying Agencies accessing **test Virtual Machines** on CREODIAS

**Online forum**
492 posts – 100 users

[https://forum.esa-sen4cap.org/](https://forum.esa-sen4cap.org/)

**Webinars and Q&A sessions**
Hands-on & online trainings
All ressources online

[http://esa-sen4cap.org/content/presentations](http://esa-sen4cap.org/content/presentations)

**44 CAP Webinar, 15 February 2022**
Webinar outline

- Sen4CAP overview
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Markers DB evolution towards the new CAP regulations – From compliancy to performance

New use cases

- **Focus:**
  - Key use cases missing in the current Sen4CAP
  - Supporting the transition towards performance regulations

- **Active participation of Paying Agency:**
  - Sharing in situ data to perform R&D and validation
  - Contributing to the validation / fitness-to-use assessment

- **R&D and implementation feasible in 6 months**
- **Of interest for more than one region / country**
- **No budget for Paying Agency, only manpower from the Sen4CAP consortium**

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**Nov 2021:** Call for new use cases

**Jan 2022:** 3 to 5 use cases selected by consortium and ESA

**Jan-Jun 2022:** Benchmarking, including assessment (consortium and Paying Agency)

**Jul-Oct 2022:** Implementation in Sen4CAP and documentation
Use Case 1. Sub-parcel heterogeneity marker(s)

- Spatial non-congruency

*Purpose is to determine the presence of a spatially continuous cluster of pixels that exhibits a different signature from the expected scenario within the declared parcel.*

**Ex.** Disparate crop types or management within the same parcel boundary

*Part of the “Baseline Phenomenon”*

**New analysis – Per pixel**

- Germany - Saxony
- Germany – Schlewig-Holstein
- Danish
- Greece – Opekepe
- Luxembourg
- Latvia (TBC)
Use Case 2. Change in categories between years (AL, PC, PG)

- Part of the “Baseline Phenomenon”
- Change detection based on:
  - Time series changes
  - Degree of similarity
  - Agricultural Activities
  - ...

New analysis – Multi-annual

- Germany - Saxony
- Luxembourg
Use Case 3. Bare soil markers

- Presence of vegetation during all year, including during winter when less S2 images are available

Ex.
- **Long cover** (or Catch Crop destruction)
- Permanent Grassland Ploughing
- Indicator of erosion

New analysis – SAR Indices

- Belgium – Walloon Region
- Luxembourg
- Sweden
Sen4CAP system improvements

- Possibility for external users to add his own **indices**
  - New “basic” markers will be implemented in the system
    - E.g.: **median** for the S2 bands will be implemented (slower than mean, thus not implemented by default but as an option to activate)
    - Other “basic” markers” to propose? **Inform us before 31st March!**
  - Possibility for users to create now indices (ratio, sum, differences, etc.) based on implemented “basic”

- Information on selected training parcels (L4A)
  - Charts of time-series (mean & stdev)
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Sen4CAP versions

- **BETA version**
  Only available for the PAs
  - Open-source
  - Possibility for the PAs to access a test machine with the system

- **Version 1.0 release candidate**
  - 1st consolidated version
  - Big evolutions:
    - Corrections in the advanced processors
    - Sen2Cor L2A compatible
    - Move of the system database to a docker container
    - ...

- **Version 1.1, 1.2, 1.3**
  - 1st consolidated version
  - Big evolutions:
    - Corrections in the advanced processors
    - Sen2Cor L2A compatible
    - Move of the system database to a docker container
    - ...

- **Version 2.0**
  - Big evolutions:
    - Markers database
    - Tillage processor
    - Dockerization
    - ...

- **Version 3.0**
  - Big evolutions:
    - Web interface (system configuration)
    - Products visualization
    - Additions in MDB
    - Secured services
    - Dockerization
    - ...

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ESA UNCLASSIFIED - For Official Use

10th Sen4CAP Webinar, 15 February 2022
New web interface

The system is accessible now from: http://localhost:8080/ui/login.html
More comprehensive markers DB

MDB 1 : Single dates markers (values directly derived from Sentinel-1 and Sentinel-2 time series), also **for each Sentinel-2 band (mean +stddev)**

MDB 3 : PRACTICE markers (from Sentinel-1 and Sentinel-2) corresponding to the “HARVEST” markers of the L4C Agricultural Practices processor

+ **Secured Sen4CAP services via HTTPS and authentication tokens usage**
Known issue 1: S2 L1C change format

Format of Sentinel-2 L1C product changed on the 25th of January 2022

How to deal with this new format in Sen4CAP?

1. A new version of MAJA is available for update and a docker with this version will be created

   https://labo.obs-mip.fr/multitemp/maja-4-5-is-now-available/

2. Use the ESA L2A images (processed with Sen2COR)
1. Soon, a new version of MAJA will be available for update and process S2 data
   - Only change in the docker within the system (and download the GIPP)

2. Use the ESA L2A images (processed with Sen2COR)
   
   If download with the system (possibility to be site specific)
   - The full time series must be pre-processed with the same algorithm (MAJA or Sen2COR) – don’t change within the season
   
   When Using local root – change for the full machine
Know issue 2: absence of Sentinel-1B

No certainty that past data will be recovered

How to deal in Sen4CAP?

1. Work only with S2 data for “Crop Type map” and “Grassland mowing”, but not advised for “EFA practices”

2. Possibility to create 12 days coherence using only S1A
   - processing OK
   - likely impact on results

https://sentinels.copernicus.eu/web/sentinel/-/copernicus-sentinel-1b-anomaly-4th-update
Know issue 2 : absence of Sentinel-1B

1. Work only with S2 data :
   - “Crop Type map” :
   - “Grassland mowing” :

2. Possibility to create 12 days coherence using only S1A
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Problem to login to website interface


→ The website is accessible through the port 8080. It needs to be opened (ex. http://localhost:8080/ui/login.html)

→ Other port such as 8082 or 8083 are only used internally by the sen4CAP services and do not need to be open

→ It is also possible to create an https (and authentication token usage) by manually change the file:

'/usr/share/sen2agri/sen2agri-services/config/application.properties'

```properties
# HTTPS Configuration
# The server.port value defined here has precedence over the one set in services.properties
server.port = 8443
server.ssl.enabled = true
server.ssl.key-store = </your/SSL/certificate/path/here>
server.ssl.key-store-password = <your_SSL_certificate_password_here>
server.ssl.keyStoreType = PKCS12
server.ssl.keyAlias = Sen2Agri-Services
```
S1 Pre-processing stops/errors

When running on Creodias:

- preferred fetch_mode for datasources is “Direct link to products” and not “Symbolic link”

  ```
  psql -U admin sen4cap -c "delete from l1_tile_history where satellite_id = 3"
  psql -U admin sen4cap -c "delete from downloader_history where satellite_id = 3"
  sudo systemctl restart sen2agri-services
  ```

- “processor.l2s1.copy.locally” to be set on true

  ```
  psql -U admin sen4cap -c "update config set value = true where key = 'processor.l2s1.copy.locally'"
  sudo systemctl restart sen2agri-services
  ```

How to re-launch the S1 pre-processing (ex. In case of errors like “Not enough disk space”)

  ```
  psql -U admin sen4cap
  sen4cap=# delete from l1_tile_history where downloader_history_id in (select id from downloader_history where satellite_id = 3 and status_id = 6);
  sen4cap=# update downloader_history set status_id = 2 where satellite_id = 3 and status_id = 6;
  sen4cap=# \q
  sudo systemctl restart sen2agri-services
  ```
L3B vegetation status not working

https://forum.esa-sen4cap.org/t/l3b-vegetation-status-not-working-v3-0/457

→ First check that sen2agri-services are running and try to restart them if inactive:

```bash
sudo systemctl status sen2agri-executor sen2agri-orchestrator sen2agri-scheduler
sudo systemctl restart sen2agri-executor sen2agri-orchestrator sen2agri-scheduler
```

→ Slurm installed and running correctly?

→ First check: are SLURM services running

```bash
sudo su -l sen2agri-service
srun ls -al
```

→ In case a list of files is not displayed, then try restarting SLURM services:

```bash
sudo systemctl restart slurmd
```

→ In case of “srun command not found” errors, re-installation of slurm should be considered

```bash
sudo yum -y install slurm slurm-slurmctld slurm-slurmd slurm-devel slurm-pam_slurm slurm-pplapi slurm-slurmdbd slurm-torque slurm-libs
```
Uploading files not working

https://forum.esa-sen4cap.org/t/uploading-files-not-working-in-v3-0/459

- For the moment the upload does not work with a site with two seasons

- And also when one season covers 2 years - start of the season is in one year and the middle of the season in the next year:
  
  → Change the year it manually in the db:

  ```
  psql -U admin sen4cap -c "update site_auxdata set year = '<year>' where site_id = <site_id>"
  ```
L4A has NULL values (1%)  

https://forum.esa-sen4cap.org/t/l4a-has-null-values-1/442

→ There could be various reasons for which the parcel is not classified:

1. too small parcels (less than 1 S1Pix and 3 S2Pix after the buffer)
2. small crop type with less than 30 parcels (importance of good Crop Code LUT)
3. Land cover not in the classified one  
4. parcels that has problem in their geometries (those parcels are not presents in the results of the classification):
   
   GeomValid = 0 (invalid geometry)
   Duplic = 1 (duplicated parcel)
   Overlap = 1 (parcel overlapping another parcel)

+ Problem in the pre-processing of S1 (or S2) ?
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Next events

- **Forum** for your questions about the system 3.0 (and other)
- Your **propositions for new « basic » markers** to be implemented in the Markers Database by email (info@esa-sen4cap.org) until 31st March 2022
- Next **webinar** planned for early May 2022
- **ESA Living Planet Symposium (23-27 May 2022, Bonn - Germany)**
  
  https://lps22.esa.int/frontend/index.php
  
  Sen4CAP presentation and demo (more information to come)
- Workshop during the next **Panta Rhei conference** (June 22, Germany) – to be confirmed
- **Your questions ???**
Thank you for your attention and your contribution