Welcome to the 7th 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
David Kolitzus from GeoVille & Gerhard Triebnig from EOX
Grega Milcinski from Sinergise

Members of the consortium available to answer your questions
Webinar outline

• Sen4CAP overview
• EO-WIDGET Project (GeoVille and EOX)
• Expert Judgement Application (Sinergise)
• Sen4CAP system evolution
  o Plan for version 3.0
  o Question & Answers for version 2.0
• Next events
Webinar outline

- **Sen4CAP overview**
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Sentinel-derived markers and products assessed through selected use cases

Large dataset of metrics and crop markers from Sentinel-1, Sentinel-2 and Landsat8 processed along the season for each parcel and stored in a database.

Use cases

- Crop diversification
- Perm. grassland monitoring
- EFA-Land lying fallow
- EFA-Catch crops
- EFA-Nitrogen-fixing crops
- Land abandonment
- Interactive visualization

And many more!
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 ...

- 330 downloads and 20+ Paying Agencies testing the system on CREODIAS
- Training with 44 participants from 20 different countries
- Webinars every month
- Support to users
- System evolution
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 2.0 delivered on 8 Feb. 2021
Markers and products assessed through selected use cases but available for many other applications.

- **S2 reflectance and VIs**
- **S2 biophysical indicators**
- **S1 amplitude**
- **S1 coherence**

**Markers DB**

- **Crop type map**
- **Grassland mowing product**
- **Agri. Practices monitoring product**

**Subsidy applications**

**New schemes**

**API interface**

Markers and products assessed through selected use cases but available for many other applications.
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

**Sen4CAP system: main parameters settings**

- **Area of Interest**: Shapefile to be uploaded
- **Monitoring period**: Start and end dates to be defined
- **S1+S2 / S1+S2+L8**: L8 to be selected

**Sen4CAP system: 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

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**Subsidy application**

- **Upload data**

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**Tables and config files**

- **System initialization**

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**Before the monitoring period**

**Monitoring period**

**Start of the season**

**End of the season**
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/

Webinars and Q&A sessions
Hands-on & online trainings
All ressources online
http://esa-sen4cap.org/content/presentations

Sen4CAP Webinar, 18 May 2021
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EO-WIDGET
Building on Sen4CAP

Checks by Monitoring via commodity services/products

EO-WIDGET @ 7th Sen4CAP Webinar
2021.05.18
The Project EO-WIDGET
for Evolution and Commercialization of
Satellite information services supporting the CAP Checks by Monitoring System

Data as a Service  Widgets  Hosting  Marketplace

GeoVille  EOX  esa  in³
Data as a Service

On-demand Managed Services for:
- EO satellite data discovery & ingestion
- pre-processing
- generation of signal-based monitoring products
- wall-to-wall, whole season, coverage

Widgets

Mini-applications for:
- visualization of monitoring products (expert judgment)
- quality assessments
- building of Web Apps
- re-use (open source software) and customization
Hosting

Protected cloud workspace - individualized per Paying Agency:

- deployment of Apps & tools
- storing of
  - declaration data
  - configurations
  - monitoring products

Marketplace

Business application:

- catalogue of vendor offerings
- self-service quote generation
- subscription activation
- billing management online
- production progress monitoring
Signal-based Monitoring Products

The initial set of data products (Data as a Service) is build on the foundation of Sen4CAP Algorithms and specifications.

- Signal/Marker as a Service
- Vegetation Status indicator
- Cultivated Crop Type Map
- Grassland Monitoring
- Agricultural Practice Monitoring - summarizing individual services for:
  - Harvest Detection
  - Fallow Land Detection
  - Catch Crop / Nitrogen Fixing Crop
  - Permanent green cover
  - and similar

Strong focus is on continued product development - > Sen4CAP Plus
From a tool to a service
From a tool to a service

Signal/Marker as a Service

LPIS & Declaration Management
From a tool to a service

- Managed IT-Service
- Automated, monitored delivery of ready to use signal/makers
- Not limited to Sentinel-1 and S2 (e.g. Planet, Kappazeta)
- Marker specific band combinations, indexes - cloud free coverages for dedicate time periods
From a tool to a service

- **Managed IT-Service**
- **Automated**, monitored delivery of ready to use signal/makers
- Not limited to Sentinel-1 and 2 (e.g. Planet, Kappazeta)
- Marker specific band combinations, indexes - cloud free coverages for dedicate time periods
Checks by Monitoring (CbM) and Area Monitoring System - as a Service
Checks by Monitoring (CbM) and Area Monitoring System - as a Service

- Products generated by contractor of choice with local GSAA data and local configuration (or by Paying Agency itself)
- Support for specific national regulations
- Various data suppliers supported
Widgets - Parcel Explorer App
Quality Assessment Tool

- Model Name: MAB_PF_SVM_100_1000
- Configuration Date: 2021-02-18
- Parcel Reference Date: 2020-06-30

- Small Parcel: include, exclude, only
- Training Parcel: include, exclude, only

- Total Area: 130,719 ha
- Overall Accuracy: 91.44%
- F1 Score: 92.02%
- Kappa: 90.38%

- Confusion Matrix
- F1-Scores
- Omission-Agreement-Commission
Quality Assessment Tool

Confusion Matrix

F1-Score

True Positives, False Negatives
Inconclusive / Small Parcels
LPIS and Declarations (GSAA)

- GSAA / Declarations Handling
  - by service provider of choice
  - only essential information is exchanged (compliance check not necessarily at product level, but within PA)

- Enrichment (e.g. small parcel identification)
- Configuration
- Parcel Explorer GUI
- Quality Assessment Tools

Explicit data transfer process

Configuration on external VM

Automated data pipeline

UI support

Cloud-based hosted workspace

GT
Benefits of approach - technical

Technical benefits

- Offers a combined and flexible solution for the recent technological challenge of Paying Agencies
- Alleviates the burden of costly satellite data ETL/management and signal processing
- Thoroughly satisfies IACS information requirements by
  - straightforward configuration of signal and markers according to individual strategic plans
  - best-practice optimization and quality assessment
  - digital products for monitorable agricultural land (parcel digital twins)
- Managed IT-Service
  - No on-premise installation needed
  - Building on Sen4CAP - encapsulated algorithms
Benefits of approach - organisational level

Organisational and legal aspects

- Adaptive to the existing IACS infrastructure
- Simplified **procurement process with various providers possible**
- **Outsourcing of Checks-by-Monitoring**
  - Marketplace: “one-stop” shop for CbM
    - various data providers and service providers **within one hemisphere**
    - integration of **legacy & heritage supply chains**
- all following **GDPR and national legislations** and PA’s data protection policies
- Multi annual archiving

One-stop shop and subscription plans for vendor offerings to Paying Agencies, including self-service quote generation, ordering, billing and monitoring product activation
Activity Status

Accomplished so far:

Initialization phase close to finished:

- Pre-processing for S-1 and S-2 data for Austria use case
- Monitoring products
  - for test sites successfully end-to-end integrated
  - wall-to-wall production ready very soon
- Proof of concept achieved:
  - Outsourcing of monitoring
  - Split in data products and widget visualisation
  - Configuration and exchange of declaration data in a cloud environment

Next step: Generalization

- Optimization and quality improvements
Open Value Chain - join as you like!

**Interoperability** via common workflows and **complementary roles** of stakeholders for optimum adjustment to Paying Agencies’ policies
A proposition to Paying Agencies and/or their incumbent suppliers

- New ways of implementing Checks by Monitoring via commodity services/products
- Managed IT environment incorporating/evolving Sen4CAP specifications and algorithms
- Implementation of local CAP strategies and SLA-based outsourcing becomes reality
- Proof-of-concept achieved
- full-country beta operations of 2021 growing season in Austria is ongoing

Checks by Monitoring - as a Service (CbM-aaS)
Further Info

Project Web Site:

https://eowidget.services

Help and Stakeholder Liaisons:

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Expert judgement application

Grega Milcinski
Sinergise
grega.milcinski@sinergise.com
Objectives

Eases the decision making on examples where it is impossible to make automatic judgement
Objectives

- Eases the decision making on examples where it is impossible to make automatic judgement
- Tool for confidence validation of specific markers
- Gathering of ground truth data for machine learning purposes
Prerequisites

GSAA, LPIS

Satellite data

Markers

Orthophoto

Signals

Traffic Light System
Expert app
Task management
Simple overview of available data
Observations during the year
Marker result visualization
Detailed insight in marker results/edit
Detailed insight in marker results/edit
Traffic Light System
Mowing
Mowing
Bare soil
Bare soil
Similarity marker
Similarity marker
Similarity marker
Similarity marker
Further improvements

• Management of communication with farmers
• Integration with Geotagged photo
• On-demand order of satellite imagery (archive VHR, PlanetScope)
Summary

• Optimized for fast review cycles (30 second per FOI)
• Integrated with various sources

https://medium.com/sentinel-hub/area-monitoring/home
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Version 2.0 released on the 8th February 2021

**Version 1.0**
Release candidate
- Only available for the PAs
- Open-source
- Possibility for the PAs to access a test machine with the system

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

**Version 1.2**
Mainly corrections, adaptations and improvements based on project and user’s experience
- ...

**Version 1.3**
Mainly corrections, adaptations and improvements based on project and user’s experience
- ...

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

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ESA UNCLASSIFIED - For Official Use

7th Sen4CAP Webinar, 18 May 2021

European Space Agency
Version 3.0 planned for July 2021

- Added
  - **New web interface**
    - Fully implemented in HTML5 and JavaScript (no server-side rendering)
    - Visualization of parcels and markers in the web interface
    - Improved raster visualization in the web interface
    - Web interface configurator
  - **More comprehensive markers DB** - users will have the option to extract also:
    - The reflectance markers for the S2 bands; the bands for which the markers are extracted will be configurable (none by default)
    - The number of valid pixels that were used for computing the mean and stddev for each parcel, for each acquisition
  - **Secured Sen4CAP services** via HTTPS and authentication tokens usage

Version 3.0

Big evolution:
- new web interface
- more comprehensive markers DB
Version 2.0 Q&A

• Main messages from your feedback (forum)
  o SciHub change in the URL for apihub
  o How to change location of the pre-processed products if you mount a bigger disk
    https://forum.esa-sen4cap.org/t/change-destination-for-processed-products/324/2
  o How to change the DEM to AsterDEM in sen4cap services
    https://forum.esa-sen4cap.org/t/change-dem/380
  o MAJA gipp configuration files not copied during installation on some platforms
  o How to see the input parameters that were used during the execution of an L4A job
    https://forum.esa-sen4cap.org/t/l4a-how-to-see-input-parameters-after-calculation-e-q-which-mode-both-s1-only-s2-only/352/3
  o Generating the Cloud Free Composite into Sen4CAP
    https://forum.esa-sen4cap.org/t/monthly-cloud-free-product/363

• Your questions ?
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Next events

- **System 3.0** released in July 2021 (you will be informed by email)

- Next **webinar** on 6 or 20 July 2021 (TBC)

- **Your questions ???**
Thank you for your attention and your contribution