

Final User Workshop

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Focus on the new system design based on the Markers Database

Presenters:

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Members of the consortium available to answer your questions











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Sen4CAP system – Markers Database





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• Sentinel-1 & Sentinel-2

- Object-based
- Markers DB
- User-friendly with web interface
- Open source
- Automated
- Modular
- Demonstrated at national scale
- NRT or off-line
 production
- Locally or in the cloud

Markers Database – Overview





- > New markers products are generated:
 - ✓ MDB processor: s4c_mdb1 and s4c_mdb2
 - ✓ L4C processor: s4c_mdb3
 - ✓ L4A processor: s4c_mdb_l4a_opt_main, s4c_mdb_l4a_opt_re, s4c_mdb_l4a_sar_main, s4c_mdb_l4a_sar_temp
- Access via **REST API** provided by Sen4CAP Services
- Or, read markers directly from Arrow IPC files

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Markers Database Products – MDB1 and MDB2 (s4c_mdb1 and s4c_mdb2)



- > The Marker Database MDB1 contains the basic single date markers:
 - NDVI: mean and standard deviation values by parcel; calculated for each L3B NDVI product
 - LAI: mean and standard deviation values by parcel; calculated for each L3B LAI product
 - **FAPAR**: mean and standard deviation values by parcel; calculated for each L3B FAPAR product
 - FCOVER: mean and standard deviation values by parcel; calculated for each L3B FCOVER product
 - Amplitude: mean and standard deviation values by parcel; calculated for each amplitude product
 => with orbit and polarization info
 - **Coherence**: mean and standard deviation values by parcel; calculated for each coherence product => with orbit and polarization info
- > The Marker Database MDB2 contains the ratio single date markers:
 - **Amplitude VV/VH ratio**: mean and standard deviation values by parcel; for each amplitude product => with orbit info

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Markers Database Products – MDB3 (s4c_mdb3)



- M1: Presence of vegetation based on NDVI time series (binary)
- M2: Loss of vegetation based on NDVI time series (binary)
- M3: Loss of vegetation based on amplitude VV/VH ratio time series (binary)
- M4: Low/no vegetation after based on amplitude VV/VH ratio time series (binary)
- M5: Loss of vegetation based on coherence time series (binary)

MARKERS FOR HARVEST						
M1	Presence of vegetation in the main vegetation season	High values of NDVI				
M2	Loss of vegetation	Break in NDVI (decrease)				
M3	Loss of vegetation	Break in backscatter ratio (increase)				
M4	Low/no vegetation	High values of backscatter ratio				
M5	Low/no vegetation (stable conditions)	Break in VV Coherence (increase) or high values of VV Coherence				

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(vs BASE markers)

=> PRACTICE markers



Markers Database Products – MDB L4A Optical Main and Red-Edge (s4c_mdb_l4a_opt_main and s4c_mdb_l4a_opt_re)



- The Marker Database MDB L4A Optical Main is the results of a temporal resampling, every 10 days, based on 10-meters resolution data:
 - NDVI: mean and standard deviation values by parcel
 - NDWI: mean and standard deviation values by parcel
 - Brightness: mean and standard deviation values by parcel
 - Green B3: mean and standard deviation values by parcel
 - Red B4: mean and standard deviation values by parcel
 - NIR B8: mean and standard deviation values by parcel
 - SWIR1 B11: mean and standard deviation values by parcel
- The Marker Database MDB L4A Optical Red-Edge is the results of a temporal resampling, every 10 days, based on 20-meters resolution data:
 - Red-Edge B5: mean and standard deviation values by parcel
 - Red-Edge B6: mean and standard deviation values by parcel
 - Red-Edge B7: mean and standard deviation values by parcel
 - SWIR2 B12: mean and standard deviation values by parcel

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Markers Database Products – MDB L4A SAR Main (s4c_mdb_l4a_sar_main)



- The Marker Database MDB L4A SAR Main is the results of temporal mean calculation, by week (7 days period), based on 20-meters resolution data :
 - Amplitude Ascending VV: mean and standard deviation values by parcel
 - Amplitude Ascending VH: mean and standard deviation values by parcel
 - Amplitude Descending VV: mean and standard deviation values by parcel
 - Amplitude Descending VH: mean and standard deviation values by parcel
 - Amplitude VV/VH ratio: mean and standard deviation values by parcel
 - Coherence Ascending VV: mean and standard deviation values by parcel
 - Coherence Ascending VH: mean and standard deviation values by parcel
 - Coherence Descending VV: mean and standard deviation values by parcel
 - Coherence Descending VH: mean and standard deviation values by parcel
 - => Amplitude values separated by direction and polarization
 - => Amplitude ratio VV/VH
 - => Coherence values separated by direction and polarization

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Markers Database Products – MDB L4A SAR Temporal (s4c_mdb_l4a_sar_temp)



The Marker Database MDB L4A SAR Temporal is the results of temporal statistics calculation, based on different periods, based on 20-meters resolution data :

Every month, mean and **quantile 10**:

- Coherence VV: mean and standard deviation values by parcel
- Coherence VH: mean and standard deviation values by parcel

Every 2 months, mean and **coefficient of variation**:

- Amplitude Ascending VV: mean and standard deviation values by parcel
- Amplitude Ascending VH: mean and standard deviation values by parcel
- Amplitude Descending VV: mean and standard deviation values by parcel
- Amplitude Descending VH: mean and standard deviation values by parcel
- Amplitude Ascending VV/VH ratio: mean and standard deviation values by parcel
- Amplitude Descending VV/VH ratio: mean and standard deviation values by parcel

Over the whole monitoring period, standard deviation:

- Coherence VV: mean and standard deviation values by parcel
- Coherence VH: mean and standard deviation values by parcel

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Markers Database – Accessing Markers



How to access markers?

- Access via REST API provided by Sen4CAP Services for:
 - $\checkmark\,$ Retrieving the list of markers names
 - $\checkmark\,$ Retrieving the markers values
- Read markers directly from Arrow IPC files

Advantages:

- HTTP GET requests with filters for time intervals, parcels ids, marker types or ROI
- Simple JSON response providing requested markers for each parcel
- > Arrow IPC files are:
 - $\checkmark\,$ Faster to read and smaller size than CSV files
 - ✓ Widely supported (C, C++, Java, Python, R)
 - $\checkmark\,$ Can be indexed for faster random access



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Access the markers through the **API service**: Request the list of **marker names**



- > Model: GET http://<host_or_ip:port>/markers/names?site=<short_name>&productType=<product_code>&year=<yyyy>
- Example: GET http://<host_or_ip:port>/markers/names?site=ltu_2020&productType=s4c_mdb1&year=2020

> Output:

{"data":["mean_FAPAR","mean_FCOVER","mean_LAI","mean_NDVI","stdev_FAPAR","stdev_FCOVER","stdev_LAI","stdev_NDVI","mean_A MP_VH_131","mean_AMP_VV_131","mean_COHE_VH_131","mean_COHE_VV_131","stdev_AMP_VH_131","stdev_AMP_VV_131","stdev COHE_VH_131","stdev_COHE_VV_131","mean_AMP_VH_051","mean_AMP_VV_051","mean_COHE_VH_051","mean_COHE_VV_051","stdev_AMP_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_COHE_VV_051","stdev_051"

motors	Parameter	Description	Mandatory
meters	site: String	The site short name as it appears in the sites tab	Yes
SUM	productType: ProductType	The markers product type identifier. Available marker product types: s4c_mdb1 – basic single date markers s4c_mdb2 – ratio single date markers s4c_mdb3 – harvest detection markers s4c_mdb_l4a_opt_main - L4A optical main markers s4c_mdb_l4a_opt_re - L4A optical red-edge markers s4c_mdb_l4a_sar_main - L4A SAR main markers s4c_mdb_l4a_sar_temp - L4A SAR temporal markers	Yes
	year: int	The year of the product	Yes

=> Request parameters described in the SUM

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Access the markers through the **API service**: Request the **markers values**



> Model: GET

http://<host_or_ip:port>/markers?site=<short_name>&productType=<product_code>&year=<yyyy>&markers=<markers_name>

+ &from=<yyyy-mm-dd> -

+ &parcels=<parcel(s)_id>

- + &to=<yyyy-mm-dd>
- Not mandatory

- + &roi=<WKT>
- > Example: GET

http://<host_or_ip:port>/markers?site=ltu_2020&productType=s4c_mdb1&year=2020&markers=mean_NDVI,mean_LAI&parcels=15789, 5868&from=2020-06-01&to=2020-07-31

> Output:

{"data":{"dates":["2020-06-01","2020-06-02","2020-06-04","2020-06-05","2020-06-06","2020-06-07","2020-06-08","2020-06-10","2020-06-11","2020-06-13","2020-06-14","2020-06-14","2020-06-15","2020-06-26","2020-06-26","2020-06-27","2020-06-23","2020-06-24","2020-06-25","2020-06-26","2020-06-27","2020-06-28","2020-06-28","2020-06-28","2020-06-28","2020-06-28","2020-06-28","2020-06-28","2020-06-28","2020-07-01","2020-07-03","2020-07-04","2020-07-06","2020-07-08","2020-07-09","2020-07-11","2020-07-13","2020-07-15","2020-07-15","2020-07-08","2020-07-09","2020-07-11","2020-07-13","2020-07-15","2020-07-15","2020-07-28",

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Access the markers through the **API service**: Request the **markers values**

=> Request parameters

described in the SUM

Not mandatory



> Model: GET

http://<host_or_ip:port>/markers?site=<short_name>&productType=<product_code>&year=<yyyy>&markers=<markers_name>

- + &from=<yyyy-mm-dd> -
- + &to=<yyyy-mm-dd>
- + &parcels=<parcel(s)_id>
- + &roi=<WKT>

> Example: GET

http://<host_or_ip:port>/markers?si 5868&from=2020-06-01&to=2020-0

> Output:

{"data":{"dates":["2020-06-01","2020-06-02", 06-15","2020-06-16","2020-06-17","2020-06-1 27","2020-06-28","2020-06-30","2020-07-01", 07-16","2020-07-17","2020-07-18","2020-07-1 29","2020-07-

30"],"parcels":[{**"id":15789**,"markers":{"mear 0,0.0,0.0,0.0,0.0,0.0,575.38776,0.0,357.6055,

Parameter	Description	Mandatory
site: String	The site short name as it appears in the sites visualization tab	Yes
productType: ProductType	The markers product type identifier	Yes
year: int	The year of the product	Yes
markers: String	Comma separated list of markers names obtained with a /marker/names query	Yes
from: String	Filtering start date for markers values retrieval	No
to: String	Filtering end date for markers values retrieval	No
roi: String	ROI as WKT for filtering parcels	No
parcels: String	Comma separated string for filtering parcels (NewID)	No

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Read the markers directly from the Arrow IPC files



> Markers are also stored as Arrow IPC files in:

s4c_mdb1:

/mnt/archive/<site_short_name>/s4c_mdb1/SEN4CAP_MDB1_SXX_V<start_date>_<end_date>_<creation_time>
s4c_mdb2:

/mnt/archive/<site_short_name>/s4c_mdb1/SEN4CAP_MDB2_SXX_V<start_date>_<end_date>_<creation_time>
s4c_mdb3:

/mnt/archive/<site_short_name>/s4c_l4c/SEN4CAP_MDB3_SXX_V<start_date>_<end_date>_<creation_time>
s4c mdb l4a opt main:

/mnt/archive/<site_short_name>/s4c_I4a/SEN4CAP_MDB_L4A_OPT_MAIN_V<start_date>_<end_date>_<creation_time>

s4c_mdb_l4a_opt_re:

/mnt/archive/<site_short_name>/s4c_l4a/SEN4CAP_MDB_L4A_OPT_RE_V<start_date>_<end_date>_<creation_time> s4c mdb l4a sar main:

/mnt/archive/<site_short_name>/s4c_l4a/SEN4CAP_MDB_L4A_SAR_MAIN_V<start_date>_<end_date>_<creation_time>
s4c_mdb_l4a_sar_temp:

/mnt/archive/<site_short_name>/s4c_l4a/SEN4CAP_MDB_L4A_SAR_TEMP_V<start_date>_<end_date>_<creation_time>

=> Described in the SUM

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Markers Database – Launch the processor



As the other processors, 2 ways to launch the MDB processor using the web interface:

> Via DASHBOARD: scheduled job, using all data until the scheduled date

s products sy	stem overview	dashboard	custom jobs	monitoring	users data	sources s	tatistics	logo
B Vegetation Status	LPIS/GSAA	L4A Crop Type	L4B Grassland N	lowing L4C Ag	ricultural Practices	S4C Marke	r Database PR	1 🗶
Resource Utilization				Default Configur	ation			
Last Run On	202	1-03-03 08:16:20		ndvi enat	oled true			
Average Duration	00:1	00:00276		amp enat	oled true			
Average User CPU 00:00:01.965				cohe_ena	bled true			
Average System CF	U 00:	00:02.194		lai_enable	d true			
Average Max R\$\$	0.0) MB		fapar_ena	bled true			
Average Max VM		MB		fcover_en	abled true			
Average Disk Read 0.0) MB		data_extr	_dir /mnt/archive/mark	er_database_files/n	ndb1/{site}/{year}/dat	a_extraction
Outout								
Number of Product	s 0							
Average Tiles per P	roduct 347							
Average Duration p	er Tile 00:	00:00.000						
Add New Job								
leb name	Site name	Season name	Schedule type	First run time	Repeat		Action	

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Markers Database – Launch

- As the other processors, 2 ways to launch the MDB processor using the web interface:
 - Via DASHBOARD: scheduled job, using all data until the scheduled date
 - Via CUSTOM JOBS: triggered directly, can select input data (tiles and dates)

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Markers Database – Launch the processor

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products

sentinel for common agricultural policy

dashboard

- As the other processors, 2 ways to launch the MDB processor using the web interface:
 - Via DASHBOARD: scheduled job, using all data until the scheduled date
 - Via CUSTOM JOBS: triggered directly, can select input data (tiles and dates)
- When the process is finished, the MDB products appear in the **PRODUCTS** tab



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ecs:

Markers Database – Retrieve the markers values



> Example: integrated in a R script

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Thank you for your attention and your contribution

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common and cultural policy

