

→ SENTINELS COLLABORATIVE GROUND SEGMENT WORKSHOP #13

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European Space Agency

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BACKGROUND

The Sentinel family of satellites is being developed to meet the operational needs of Europe's environment monitoring programme, Copernicus. The firsts in the fleet, Sentinel-1A, Sentinel-2A and Sentinel-3A were launched in April 2014, June 2015 and February 2016 respectively. Sentinel-1A is already accompanied by its' sister satellite Sentinel-1B, launched in April 2016. Sentinel-5P and the B-units of Sentinel-2 and -3 are foreseen for launch in 2017.

Copernicus is the European Union's Earth Observation and Monitoring Programme, headed by the Commission (COM). ESA coordinates the delivery of data from upwards of 45 satellites, comprising the Copernicus dedicated missions (Sentinels) and the Copernicus Contributing Missions. The Commission is responsible for the overall initiative, setting requirements and managing the Copernicus services.

The Copernicus Space Component (CSC) – coordinated by ESA – includes the development and operations of the Sentinel satellites, as well as the distribution of the acquired Earth observation data. All Sentinel products are freely accessible online for the worldwide user community at www.copernicus. eu and sentinels.copernicus.eu

In addition to that, and in close coordination with the Commission, ESA facilitates cooperation activities with Participating States to the Copernicus and the GMES Space Component Programme (including Canada) for direct and efficient access to Sentinel data. In the framework of the Sentinels Collaborative Ground Segment, potential activities of those countries are the set-up of a national mirror site, employment of own local passive receiving stations, development of innovative data processing tools and applications and complementary calibration/ validation activities. In any Participating State, various initiatives and entities can be involved in the cooperation. Therefore a National Point of Contact bundles the flow of information between the national entities and ESA.

Under the lead of the Commission, ESA implements a similar cooperation scheme also with further European countries and international partners.

WORKSHOP CONTEXT

The Sentinels Collaborative Ground Segment (CollGS) workshops provide a platform for information and discussion between ESA, the National Points of Contact, national entities involved in the cooperation and COM. The workshop succeeds the yearly meetings of the "GMES Operations Consultation Group", which started in 2010. In order to foster coordination among the CollGS initiatives, workshops are organised by ESA twice a year.

The workshop #13 objectives were to:

- Summarise the activities of the Copernicus Integrated Ground Segment Task Force lead by the Commission. In particular provide a status update as concerns the Copernicus Data and Information Access Services (DIAS) initiative
- Report on the latest Copernicus Space Component (CSC) developments: programmatic and technical
- Update on the latest status of the various Collaborative initiatives established by GMES Space Component (GSC) and Copernicus Participating States
- Promote the coherence between the CSC Ground Segment and Participating States collaborative initiatives
- Provide a forum for participants to harmonize their plans
- Address specific issues in the areas of:
 - Latest status and upcoming enhancements of data distribution services
 - Deployment of Collaborative GS services on DIAS
 - On-going and planned projects and operational services at national and regional level

The workshop took place on 15 December 2016 at the DLR premises in Oberpfaffenhofen, Germany. 41 external participants attended the workshop, representing 19 countries. The European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the European

Maritime Safety Agency (EMSA) were also represented as per previous workshops.

Prof. Stefan Dech, Director of DLR's German Remote Sensing Data Center, welcomed the workshop participants, highlighting the relevance of CollGS workshops in view of fostering the Copernicus Sentinel and information exploitation. ESA introduced the workshop objectives and reported on the status of implementation of the recommendations from the CollGS workshop#12.

The Commission presented the overall programmatic status of the Copernicus programme, including in particular the status of the Copernicus IGS and an outlook on the planned procurement of Copernicus Data and Information Access Services (DIAS). ESA provided an overview of the latest status and prospect of the Copernicus Space Component, including the overall technical implementation status and the status of the Sentinels missions. The Sentinel data access including details of the upcoming DIAS procurement were presented.

The second part of the workshop was dedicated to 11 presentations from Member States and Copernicus Participating countries, addressing the progress of national CollGS initiatives.

The final round table focused on the coherence and complementarity between CollGS national initiatives and the planned DIAS. Also the potential integration of national EO data and services in the DIAS concept was discussed.

WORKSHOP HIGHLIGHTS

Participants perceived the workshop as very useful to ensure coherence between the CSC development and national CollGS initiatives, in particular with regard to the initiatives being conducted in the frame of the Copernicus Integrated Ground Segment (e.g. DIAS procurements, data distribution enhancements). The main highlights of the workshop are summarized below.

The status of the recommendations from CollGS workshop #10, 11 and12 was reviewed. Most actions have been implemented; five recommendations are in progress and are planned to be completed by end 2017.

COM highlighted the big data challenge facing the Copernicus programme. In this context, the Integrated Ground Segment Task Force, established in March 2015 made significant progress leading to the establishment of a roadmap addressing the further evolution of the CSC ground segment. Based on this roadmap, the IGS functional requirements specification was defined, which comprises high level requirements for both the data distribution as well as the Data and Information Access Services (DIAS) activities. COM clarified that the DIAS service providers will be requested to provide hosted processing capacities alongside with Sentinel data and Copernicus Services information. Third parties users will be able to procure DIAS resources in support to their value adding services towards end-users. In this respect DIAS acts as an enabler for those third parties.

Both the Copernicus Space Component ground segment and the national Sentinel CollGS initiatives have undergone further major developments over the last months.

The CSC ground segment operates nominally and serves the different user typologies through dedicated data access hubs. With Sentninel-1B in orbit, the observation coverage of Sentinel-1 constellation generates now approximately 8 TB of core products daily. An increase in Quasi-Real-Time observations is planned to be gradually implemented over the coming months, thanks to the additional downlink resources available via the EDRS service. An important ground segment enhancement was introduced with the publishing of Sentinel-2 core products in TILE and RGB format. Level-2A products generation for Sentinel-2 has successfully been assessed and will become pre-operational in 2017. Sentinel-3 is expected to complete its operational ramp-up phase in spring 2017.

In January 2017 ESA will release the open invitation to tender to procure several DIAS platforms as service contracts. These platforms are planned to start their initial operations in early 2018. The DIAS service will operate complementary and in parallel to the current data access hubs.

CollGS agreements between ESA and eleven Participating States have been signed to date. Further signatures are planned during the coming months. Furthermore, as a first European country not participating to the ESA GSC programme, Estonia signed a Technical Arrangement document with ESA for the Sentinel data access cooperation. Additional countries are currently assessing the establishment of cooperation agreements with ESA. As concerns international partners, ESA is implementing the cooperation based on Technical Arrangements; four of them have been signed to date (i.e. NASA, NOAA, USGS and Geoscience Australia).

Many national activities, in particular Sentinel data mirror sites, and generation of high-level products and services are operational. Provided services offer in some cases Sentinel data along with other mission data and hosted processing capacities. In particular, the following highlights were presented:

Austria CollGS: the national mirror site, operated by ZAMG, was opened in June 2016 and counts already 860 registered users, most from the research domain. Furthermore, EODC also provides access to EO data archives accessible in a hosted processing infrastructure. Pre-processed Sentinel-1 data is available as well as Sentinel-2 data processed on demand. Hackathons are organized to attract new users.

- Belgium CollGS: Belgium intends to set-up a CollGS. It will be closely linked to the Proba-V ground segment and the ProbaV Mission Exploitation Platform.
- Finland CollGS: The national mirror FINHUB is operational since May 2016 offering Sentinel-1 and -2 data, including hosted processing and higher products generation e.g. for water quality and snow cover. 126 users are currently registered. The local passive X-band station in Sodankylae was upgrade by installing a new antenna and will now start receiving Sentinel-1 data in support of the Baltic area monitoring. Several operational applications are already supported, e.g. Baltic sea ice monitoring service, flood detection. Aerosol products are being generated from Envisat's AAstSR data. This will be continued now with Sentinel-3 data. OLCI data will be used for alga bloom monitoring in the Baltic.
- France CollGS: PEPS mirror site platform was opened in September 2015 with approx. 700 registered users in March 2016. Its continuation is foreseen on CNES infrastructure until 2020. A possible utilisation of resources provided by the future DIAS platforms will be assessed over the coming months.
- German CollGS: includes a Sentinel data mirror with a focus on national needs. The CODE-DE will provide online data archive, hosted processing, processing tools and additional products. Its operations will commence in February 2017. Sentinel-1 direct data acquisition at the Local passive X-band station in Neustrelitz is operational.
- Greece CollGS: The Hellenic Sentinel data mirror is included in the BEYOND initiative for access to various EO data and services, and is operational. The service counts 109 new users over the last 6 months. Several applications are supported e.g. the monitoring of floods, smoke dispersion and fires. Federated single sign on as well as hosted processing are additional functions of the portal.

- Norway CollGS: Sentinel data is distributed via national mirror site at satellittdata.no. Main users are national institutions. As those institutions process Sentinel data in their infrastructure together with other EO data, a focus is on reducing data volumes for data distribution (e.g. bands extraction etc.). The CollGS will also provide Sentinel-2 data in alternative formats (e.g. netcdf) to support end users.
- Slovenia CollGS: Synergise presented their "Sentinel playground" giving online access to Sentinel-2 data together with geo applications. Users can also apply own algorithms. End users can download information extracted.
- Sweden CollGS: the National Sentinel data mirror site (SWEA), operated by Spacemetrics, is being procured for an initial period of 12 months with option for 3 further years. It is target to open in Q1 2017. The coverage focuses on Swedish territories and the Baltic sea.
- UK CollGS: UK is currently developing an EO data access and exploitation scheme, serving institutional, public, commercial and scientific users. This will include a market place to commercialize data and products. Currently SeDAS, operated by Catapult serves commercial users while JASMIN-CEMS, operated by STFC-RAL provides academic data access.

Beyond the presentations, it was noted that several plans for new CollGS by additional Participating States are being refined.

Participants to the workshop focus their discussion on the upcoming DIAS procurement and the coherency and complementarity with respect to on-going national CollGS activities. In this respect the following was noted:

- The envisaged DIAS resources (e.g. data storage, network, ICT) will be accessible to Collaborative GS to support their national initiatives;
- Collaborative GS will be able to establish a direct agreement (e.g. contract) with the DIAS providers to access their resources;
- Several participants indicated their interest to test the

utilisation of DIAS resources to complement their own ColLGS activities;

- Participants highlighted the importance of the free and open Copernicus data and information policy. Hence the need to ensure that both the DIAS initiative as well as the 'traditional' data distribution mechanism will continue to serve users in the future;
- Some participants mentioned the usefulness and importance of the data hub relays, which are currently in pre-operations, to contribute to the Sentinel data distribution. These activities are currently implemented by ESA via GMES Segment-3 and funded until early 2018. A possible extension beyond this date could be envisaged provided funds are available.

The COM and ESA confirmed that the approach between DIAS and CollGS initiatives will continue to be elaborated in early 2017 via a series of bilateral meetings as well as dedicated workshops.

WORKSHOP RECOMMENDATIONS

It was noted that implementation of seven recommendations from the workshops #10, #11 and #12 are in-progress, and should thus be further tracked, namely:

- It should be possible to access Sentinel-3 Marine L2 products from the Collaborative data hub;
- The management of configuration control and versioning of core and collaborative products should be consolidated and standardized;
- It is recommended to test federated user management (Single Sign On) in the context of core/collaborative GS integrated GS;
- It is recommended to extend the attendance to GOCG workshops to International partners (once every 2 years suggested);

- It is recommended to assess the use in Sentinel-2 of specific DEM addressing national needs. Furthermore it is recommended to assess the release of Level-1B core products in order to respond to the needs expressed by relevant Participating States;
- It is recommended to assess the potential coordination/ combination of meetings between CollGS workshops and the Copernicus Integrated Ground Segment Task Force in order to maximize synergies and promote efficiencies.

The following new recommendations were identified:

- ESA, together with CollGS partners and COM should assess the need and possibility to continue the pre-operations of the data hub relays.
- ESA should establish a dedicated maintenance support for the CollGS data hub (colhub.copernicus.eu) as a way to enhance the response time to specific issues
- ESA together with CollGS partners should assess the development of EO "data cubes" to be deployed on future platforms.

- ESA and COM should carry forward the current initiative to harmonise licences among EO data providers.
- The next CollGS workshop in summer 2017 should be extended to participants also from international partners in Copernicus. Duration of the workshop should be extended accordingly.
- ESA should consider providing a mechanism for users to query the complete data hub catalogue in order to easily identify new products
- ESA should distribute to the workshop participants the presentations provided at the DIAS Industry Day

ESA, in close coordination with the Commission, will follow up these recommendations and report on the status of their implementation at the next Sentinel CollGS workshop #14, planned for summer 2017.

