

ABSTRACT

Web-enabling the ingestion, archiving, cataloguing, and automated image processing chains for radio- and geometric correction and classification of remote sensing imagery

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Since 1 April 2011, the Satellite Applications Centre, formerly part of the Council for Scientific and Industrial Research, has become a part of the South African National Space Agency (SANSa). The Earth Observation Centre (SANSa EOC) is responsible for (i) the storage and pre-/processing of satellite imagery received at the satellite receiving station at Hartebeeshoek, Pretoria, (ii) the generation of information products and (iii) the distribution of satellite data and products to customers. Cost and time efficient storage, accessibility, and processing require a sophisticated high-performance ICT environment, given the huge data sets involved. Therefore SAC implemented web-enabled ingestion, archiving, cataloguing, and automated image processing chains for radio- and geometric correction and classification of remote sensing imagery. The aim is to provide standardized value-added products leading in the long term to state of the art geoinformation services.

A Data Information Management System (DIMS), developed by the German Space Agency (DLR) and used by various ESA sites, initiates processes and workflows for the generation of higher level products. These are triggered by an order request from the catalogue, which initiates the extraction of raw data from its internal product library. The raw data are moved into a workspace to which in-house developed processes from the South African Resource Management and Expert System (SARMES) have access to. These SARMES processes, customized for high/very high resolution satellite imagery for missions such as SPOT, Landsat, RapidEye, Sumbandilasat, Quick Bird, and TerraSAR-X to name a few, perform the geo- and radiometric correction as well as the classification of the imagery. Products are then packaged by the system as either hard-copy media or distributed via FTP.

The geometric corrections consist of automated ground control point (GCP) collection, GCP refinement, image triangulation, and orthorectification. Radiometric corrections may entail DN to radiance, top-of-atmosphere reflectance, at-surface reflectance (atmospheric correction), and topographic normalization (solar correction). Image classification is undertaken with a spectral rule-based decision tree at a pixel level, using eCognition workflows for an object-based classification.

The system resides on a hardware topology that consists of standard satellite ground segments connected via a LAN and NAS, a Linux cluster, a one Petabyte hierarchical storage system connected via a SAN, and a DMZ hosting software and data components accessible to the public. This topology optimizes access of all system components to the data.

The front end to the system is represented by a catalogue which provides the user with an interface to task satellites for future acquisitions and order image and derived information products at various processing levels. Widely used products are provided via a range of OGC compliant services, ranging from Sensor Planning Service (SPS; to task satellites), Catalogue Service for Web (CSW; to access the catalogue with a third party client such as the GEO Portal), Web Mapping Service (WMS; to serve cosmetic products such as mosaics of imagery), Web Coverage Service (WCS; serving multispectral imagery directly), and Web Feature Service (WFS), which provides vector data to users with the ability to query features and undertake spatial analysis.

BIOGRAPHY

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Wolfgang Lück has been holding the post of Technology Manager of the Earth Observation Service Centre at the CSIR Satellite Applications Centre (SAC), South Africa's satellite ground station in Hartebeeshoek in the proximity of Pretoria since 2006. Since SAC became part of the newly founded SANSA, he is the Research Development and Implementation Manager at the newly founded South African National Space Agency, SANSA Earth Observation Centre.

Wolfgang has been responsible for the development and implementation of automated remote sensing workflows for large volume image processing at the CSIR SAC. He also designed the appropriate hardware architecture to run these automated workflows in a high performance computing environment.

Since the migration of the CSIR SAC to the SANSA EOC from the 1 April 2011, Wolfgang is responsible for the identification of Earth Observation Services of benefit to the South African citizen, and the development and implementation of automated workflows and infrastructure to provide these services in an appropriate manner at no cost to the South African citizen.