

## **geoland2 SDI: A Spatial Data Infrastructure component for the GMES Land Monitoring Core Service**

E. Goor<sup>1</sup>, Y. Coene<sup>2</sup>, T. Nguyen<sup>2</sup>, M. Tinz<sup>3</sup>, D. Langhans<sup>3</sup>, G. Triebnig<sup>4</sup>, S. Meissl<sup>4</sup>, G. Vaitkus<sup>5</sup>

<sup>1</sup>*VITO - Flemish Institute for Technological Research, Mol, Belgium*

<sup>2</sup>*SPACEBEL, Hoeilaart, Belgium*

<sup>3</sup>*Infoterra, Immenstaad, Germany*

<sup>4</sup>*EOX IT Services, Vienna, Austria*

<sup>5</sup>*AGI - Institute of Aerial Geodesy, Kaunas, Lithuania*

Geoland2 intends to constitute a major step forward in the implementation of the GMES Land Monitoring Core Service (LMCS). The three components (Regional, Continental, and Global) of the LMCS are addressed. The architecture of geoland2 is made out of two different geo-information service layers, the Core Mapping Services (CMS) and the Core Information Services (CIS). These form ten service groupings; all together are responsible for the definition, algorithmic evolution and pre-operational generation of some 70 different products (geospatial data set series and algorithmic tools). The processing relies upon availability of space, in-situ, references and other (partially user-provided) input data streams. In most cases an internal value chain is established such that the CIS are building on output products from the CMS. The Spatial Data Infrastructure (SDI) is mandatory for (a) the access to input data, (b) the internal data flows and processing chains, and (c) the dissemination and provision to users.

The Spatial Data Infrastructure (SDI) Task in the project aims to set up a pre-operational service for the discovery, viewing, access, delivery and the support of all products generated in the geoland2 project by the Core Services. For this the SDI task considers INSPIRE as the baseline, to ensure an easy integration of the SDI in the context of the European Spatial Data Infrastructure. In this respect the SDI Task takes into consideration also the recommendations by the support action FP7 GIGAS. The main actors are the CMS/CIS service providers and users (both human users and applications, e.g. GMES downstream services) who consume geoland2 services. As described above a consumer of services will often be a provider of services to other users. This applies both internally and externally of the LMCS.

The SDI establishes first of all the mechanisms for discovery of all dataset series and services provided by geoland2 by means of a centralised point of access to ‘dataset series and services’ catalogue. The SDI provides also distributed access to dataset catalogues residing at the various CMS or CIS service providers. These services are accessible via the CSW ISO Application profile protocol (OGC 07-045) and more in particular its SOAP binding. A BPEL-compliant orchestration engine is used for implementing the distributed catalogue. Metadata is provided in ISO 19139:2007 format. A common metadata profile is agreed amongst all service providers in the project and is promoted for wide adoption by other land monitoring initiatives. The SDI is hence the “single access point” provided by geoland2 allowing clients to discover metadata of any of the connected production centres, without necessarily hosting the metadata at one central place.

The SDI offers online data-access client applications which allow service providers to configure distributed view services as well as download services. A service provider can provide data to a service consumer via service integration into the SDI. More specifically, URLs returned by a CMS service pointing to downloadable data can be passed to a CIS, downstream service or user by an appropriate integration function of the SDI. This way the service consumer can obtain the data. A CIS can equivalently be integrated into the SDI and offer services to its respective users. Note that the data itself is not exchanged via the SDI. The distributed services connected via SDI should be compliant to the INSPIRE draft Implementing Rules for view services or download services. In addition, the SDI implements a satellite multicast infrastructure which allows distribution of products to users in Europe as well as Africa.

An ordering client application is available to connect to ordering services residing at the CMS/CIS service providers. The standardised ordering interface is compliant with OGC 06-141, which allows the service to be accessible to the users of the portal and to other external clients via the SDI.

The authentication interface exposed by the SDI is compliant with OGC 07-118. It uses SOAP over HTTPS to provide a user name and password and to return a signed SAML token and user assertions as defined in the specification. The authentication interface is expected to be compliant with ws-trust. Each production centre may implement user access using a local Policy Enforcement Point (PEP) and associated Policy Store or delegate this access control to the PEP of the SDI. Policies are expressed in XACML.

For the geoland2 Core Service providers, the SDI offers in addition productivity tools to register and connect their services. The SDI allows also to implement service chains, for example two services located at two different production centres can be chained together to generate added values. These features enable the SDI to be an expert tool which supports the service providers to optimize the “logistics” in their production lines, including the dissemination to the users. The SDI can evenly support the space, in-situ and reference data discovery and data access services as needed by the geoland2 partners as input for their respective production lines.

This rich set of functions is available for human interactions from a ‘native’ SDI Geo Expert Portal (<http://www.gmes-geoland.info> → ‘geoland2 Expert Portal’ or directly as <http://www.geoland2.eu>). The portal offers all needed web based client applications for discovery, online data access, ordering, and registration for users of the geoland2 products and services and offers access to experts tools for registered service providers.

As part of a complete SDI technological solution, the SDI Task also offers tools to support the geoland2 service providers in connecting their services to the SDI. This support includes e.g. a web based metadata editor which allows to create metadata records compliant to the agreed profile for geoland2 and a specialized open source server operating system, designed for the easy integration of services into the SDI: it is a remastering of Debian Linux, bundled with the best open source system management tools, spatial data processing libraries, deployment containers, OGC web services (CSW, WMS, WFS, WCS) and web mapping interfaces. The solution offers pre-

configured open source SDI software and spatial databases, which makes it a fully functional "out-of-the-box" solution for powering large-scale SDI networks. On the other hand it's still customizable and includes post-install scripts designed to automate the process of configuration and activation of SDI services with maximum flexibility and minimum input required from the users.