

## AUTOMATED VERSIONED BATHYMETRIC DATABASE

NACKAERTS KRIS <sup>(1)</sup>, KEMPENAERS STEPHEN <sup>(2)</sup>, DERONDE BART <sup>(3)</sup>, BLOMMAERT NATASHA <sup>(4)</sup>, ROOSE FREDERIK <sup>(5)</sup> & YOURI MEERSSCHAUT <sup>(6)</sup>

<sup>(1)</sup> dr. ir., Vlaams Instituut voor Technologisch Onderzoek,  
Boeretang 200, Mol, B2400, Belgium. Kris.Nackaerts@vito.be

<sup>(2)</sup> Vlaams Instituut voor Technologisch Onderzoek,  
Boeretang 200, Mol, B2400, Belgium. Stephen.Kempenaers@vito.be

<sup>(3)</sup> dr., Vlaams Instituut voor Technologisch Onderzoek,  
Boeretang 200, Mol, B2400, Belgium. Bart.Deronde@vito.be

<sup>(4)</sup> Departement Mobiliteit en Openbare Werken,  
Tavernierkaai 3, Antwerpen, B2000, Belgium. natasha.blommaert@mow.vlaanderen.be

<sup>(5)</sup> ir., Departement Mobiliteit en Openbare Werken,  
Tavernierkaai 3, Antwerpen, B2000, Belgium. frederik.roose@mow.vlaanderen.be

<sup>(6)</sup> ir., Departement Mobiliteit en Openbare Werken,  
Tavernierkaai 3, Antwerpen, B2000, Belgium. youri.meersschaut@mow.vlaanderen.be

### 1. Introduction

The Flemish hydrological service conducts daily surveys of the Scheldt estuary and the Belgian Continental Shelf. These surveys provide bathymetric data for the coordination of dredging and morphological analysis within the Maritime Access Division of the Flemish Ministry of Mobility and Public Works. This is done by means of depth maps that are generated on the basis of the raw bathymetric data. However, the current method of (digital) map generation follows a labor intensive workflow and only allows the end user to see a single snapshot in time of depth soundings. The goal of the presented work is to fully automate the map generation workflow, support versioning of the bathymetric data and provide an open webinterface to widely used data operations. This allows for a more efficient exploration of bathymetric data and integration in the actual workflows within the organization.

### 2. Materials & methods

The main challenges for this project are the vast amount of raw input data, high performance visualization and support for versioning given the fact that new data will not necessarily be uploaded in the correct time sequential order. To allow for efficient data storage a specific versioning engine was developed. The engine minimizes long term data storage, allows on the fly reconstruction of a seamless bathymetric data layer for any date and insertion or deletion of new raster data at any moment in time.

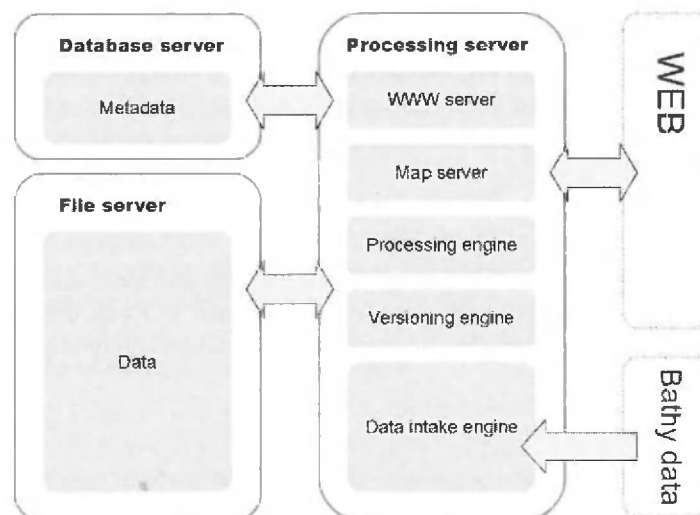


Figure 1. System architecture overview.

Figure 1 provides a system architecture overview. The custom developed map server which is tightly integrated with the versioning and processing engine provides the core functionalities towards the end user. It publishes an OGC Web Map Service (WMS; <http://www.opengeospatial.org/standards/wms>). Open REST (Representational State Transfer) interfaces published by the WWW server are used to communicate with the system. Since visual data exploration is a significant part of the everyday's work of the end-users, high performance visualization and data analysis is important. Moreover, providing derivative products such as difference images and contour lines as real-time seamless visual products instead of pre-rendered/processed data, local disc storage can be reduced significantly. This approach was made possible by offloading highly CPU intensive processing to a GPU (Graphical Processing Unit), optimized for such calculations.

Multi-beam and single-beam data are acquired daily within specific survey areas by the Flemish hydrological service and made available internally. An automated process uploads the project survey data with raw GSF (Generic Sensor Format; <http://www.saic.com/maritime/gsf/>) files onto the processing server. The data intake engine detects new data and starts processing. Figure 2 provides an overview of the fully automated intake workflow.

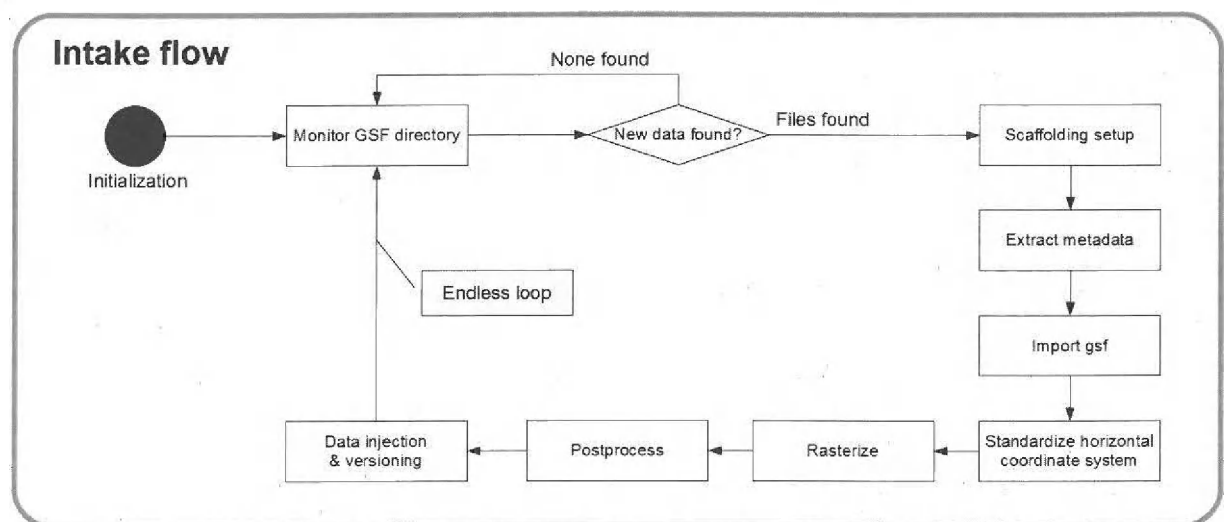


Figure 2. Context diagram of the data intake engine.

### 3. Results and discussion

The result of the data intake is an updated metadata database and versioned raster tiles on the file server, which allows for efficient querying, visualization and processing via standard OGC services and open REST interfaces.

A specific characteristic of the proposed data handling is the fact that data can be uploaded to the server in a non-time sequential order. The versioning and processing engine are capable of reconstructing seamless raster layers and derivative products on the fly for any given datum, without the need for storage-intensive caching. Automation of the data intake reduces data delivery times from several weeks to maximum several days.

### 4. Conclusions

The presented work illustrates that by using the right technology and tools, data processing can be optimized and data available simplified. Because open standards are used this has only a limited impact on actual workflows. Data becomes rapidly available as a seamless data layer, completely hiding the complexity of the data management from the end user.