IntellinQ
Spatial Data Management

Managing hydrographic data for multiple usage

Mark Terlien

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IntellinQ
Spatial Data Management

Introduction

- Mark Terlien, Director Product Development IntellinQ
- IntellinQ was founded in 2013
- Focus on spatial data management:
  - GeolinQ: Web-based solution for spatial data management
  - C-MAP BathyManager: Bathymetry Management system

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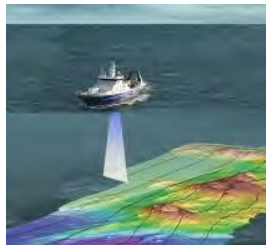
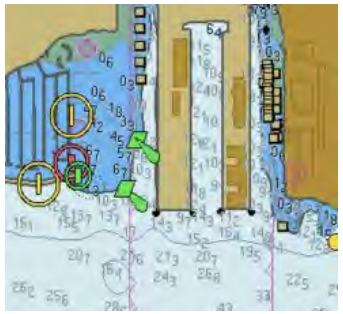
Spatial Data Management

Hydrographic Data Management

Collection



Integration



Distribution

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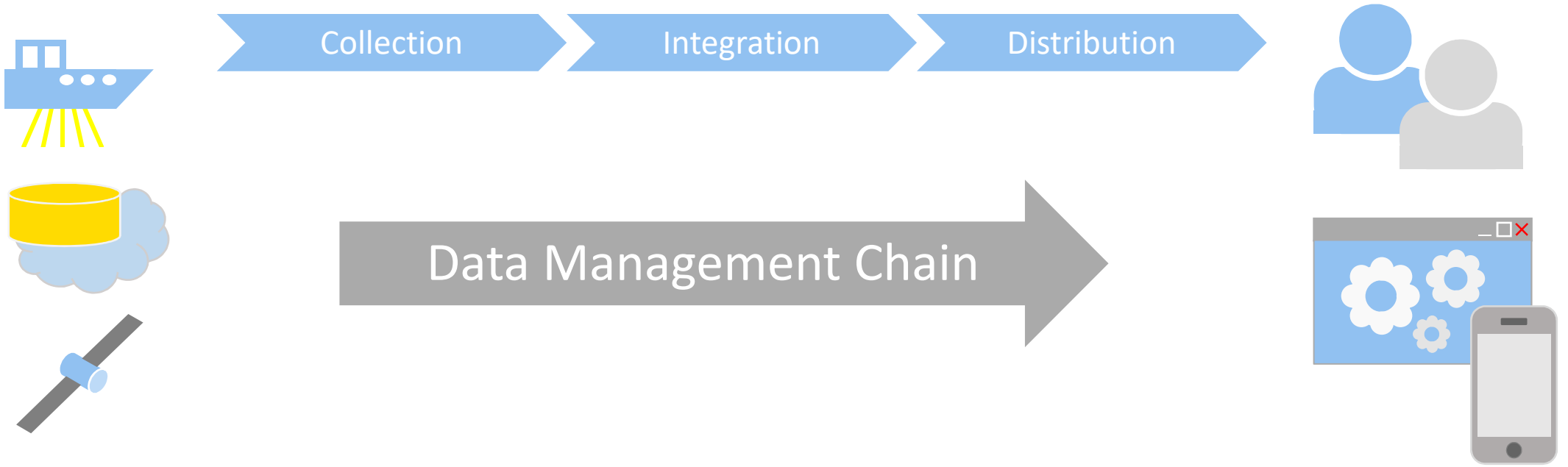
Spatial Data Management

Managing data management chain with GeolinQ



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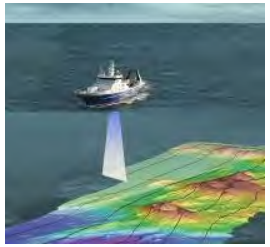
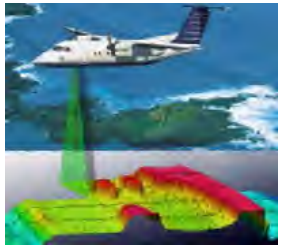
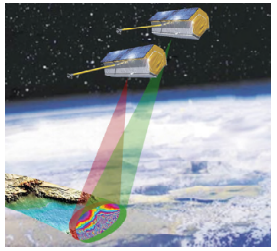
Data collection







PDOK Publieke Dienstverlening op de Kaart

DATA.GOV.UK Opening up Government

POINT CLOUDS
- ASCII
- LAS

Raster
- GeoTIFF

Vector
- Shape
- XML/GML
- WFS
- S-57

Field data collection

Data services

Data formats

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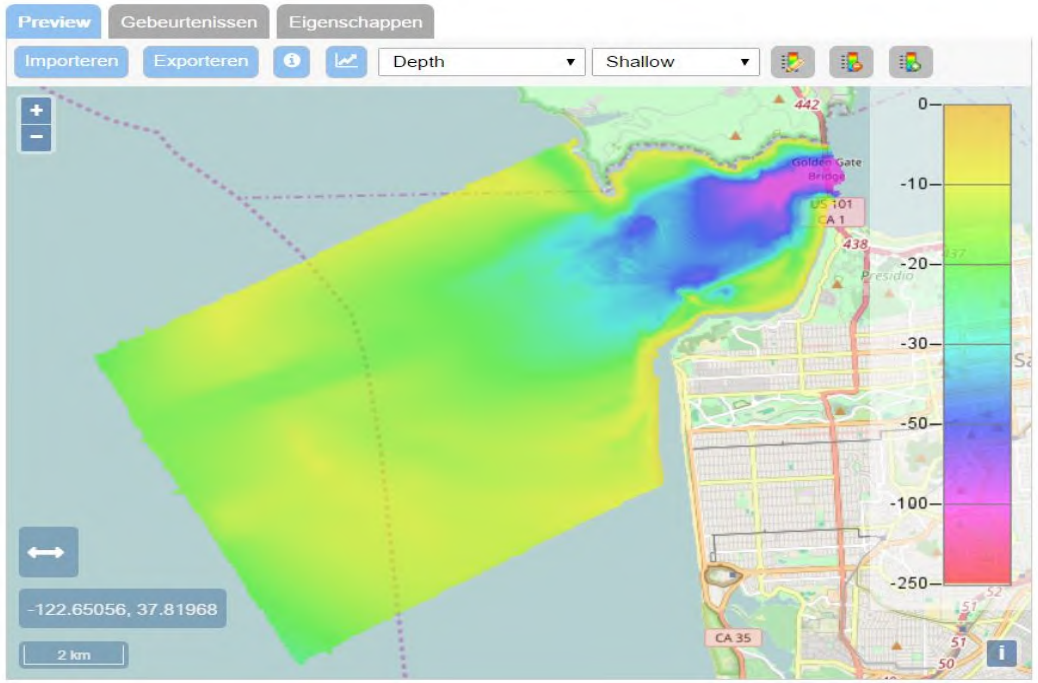
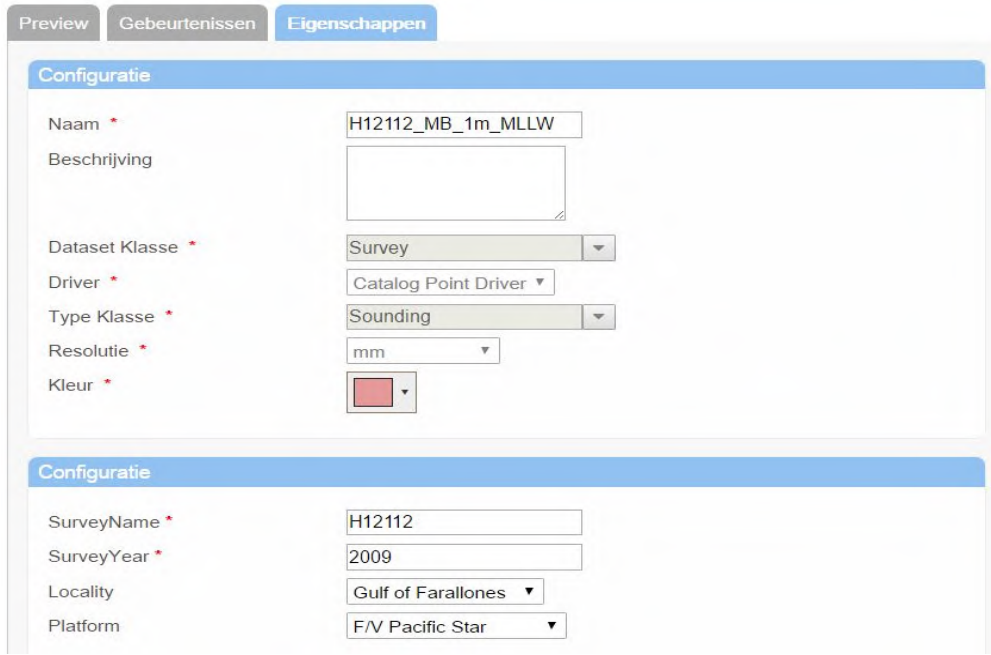
Spatial Data Management

Management of point clouds



Data management



Metadata management

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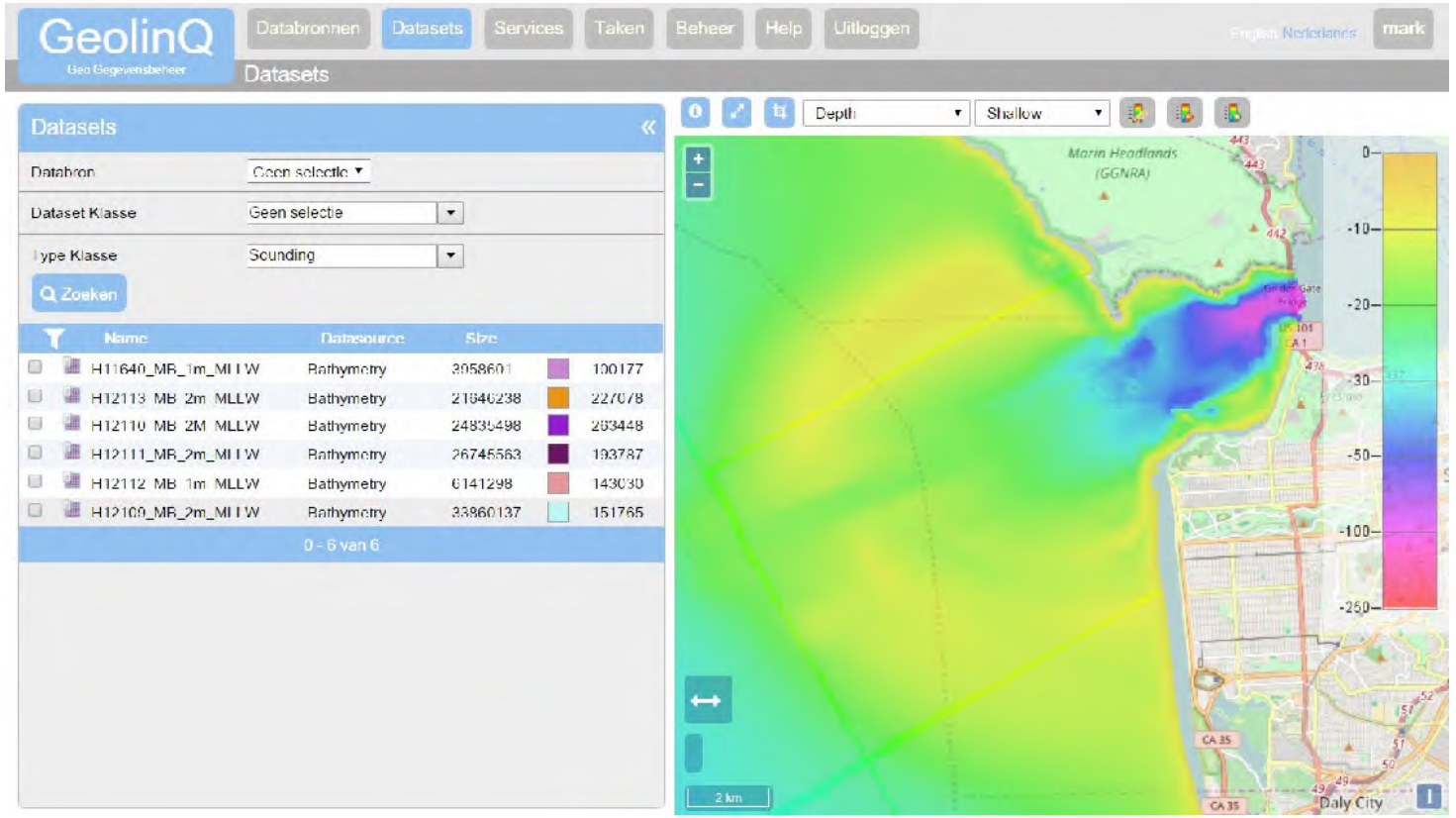
Management point cloud collections

- Archive
- Quality control
- Publication



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Spatial Data Management

Plug-and-play data model (from XSD to data model)

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▼<xs:complexType name="Perceel" abstract="false">
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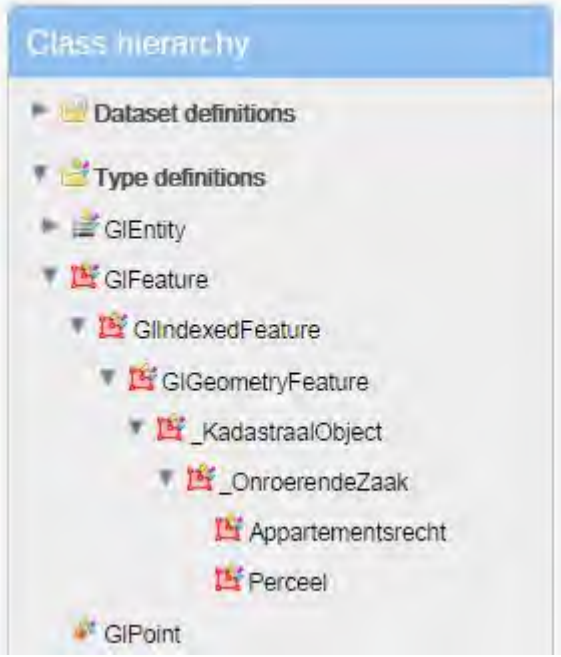

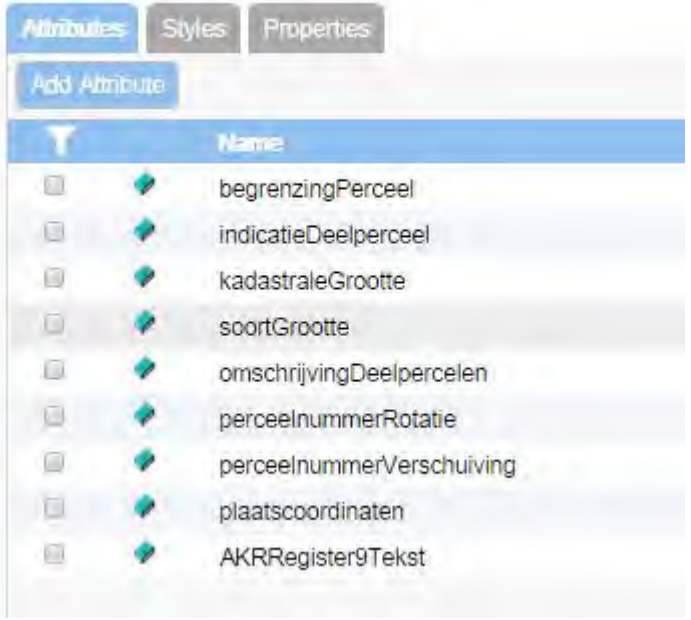

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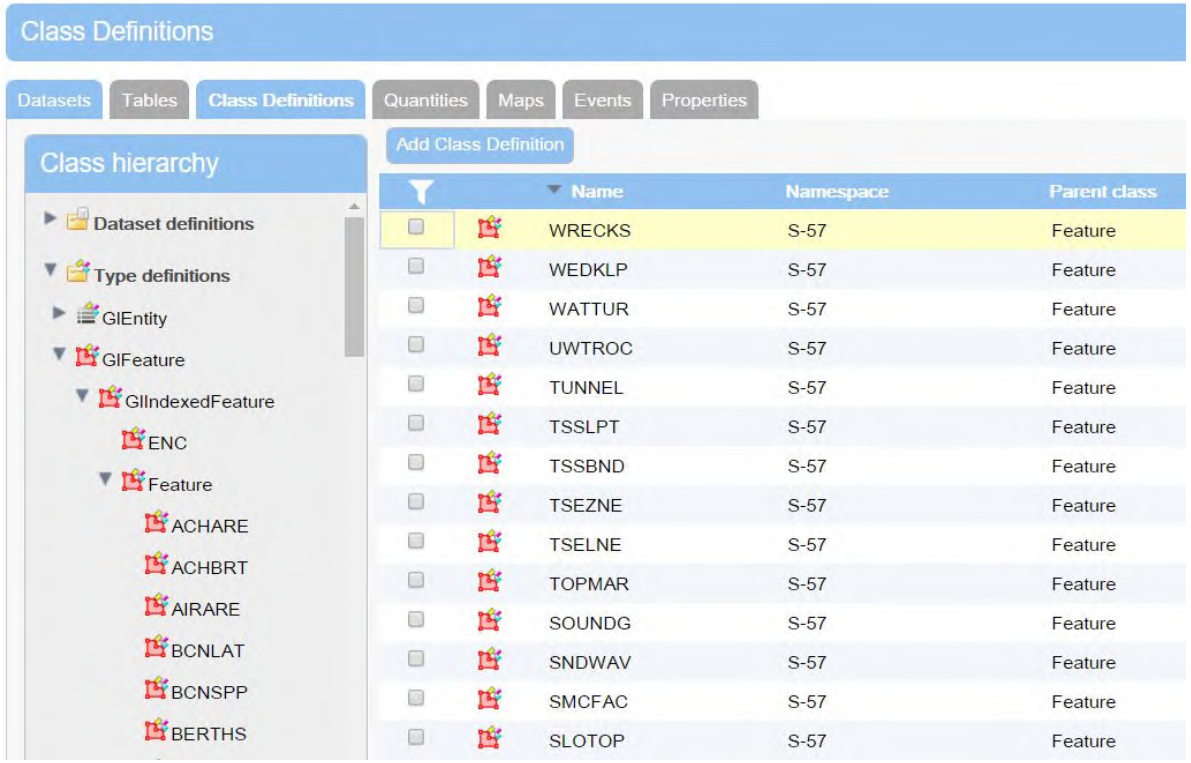
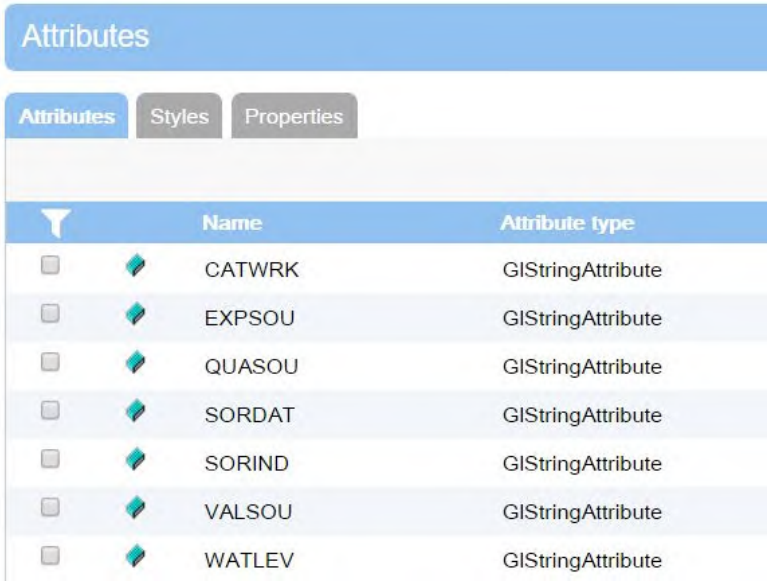
Generated S-57 data model





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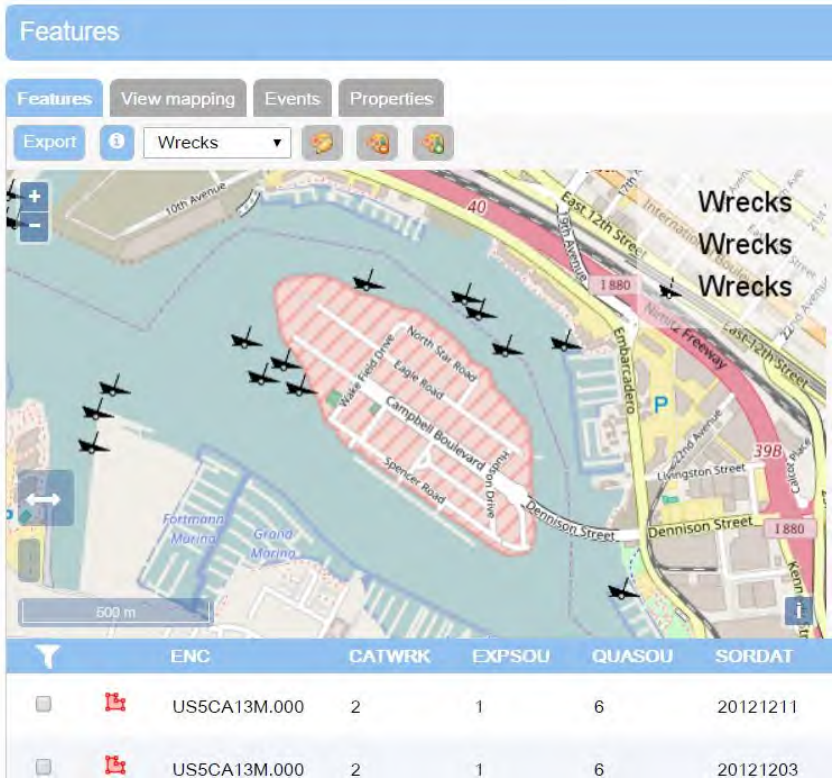
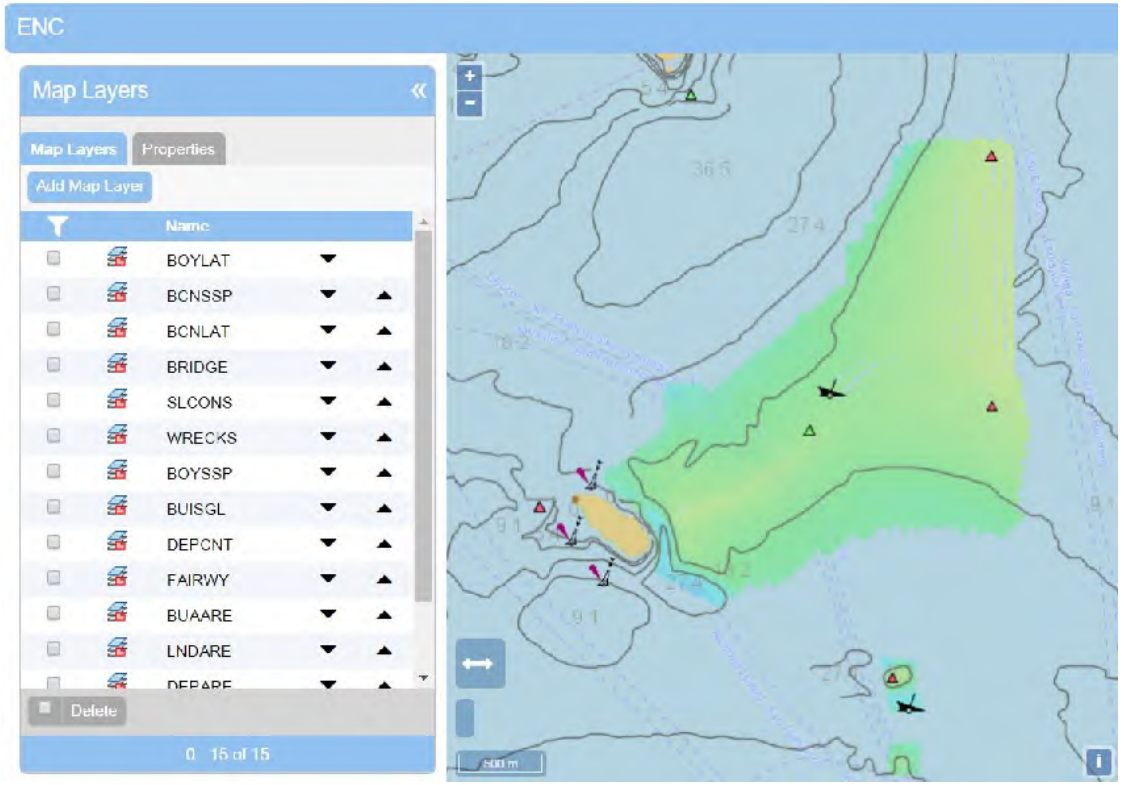
Management of features





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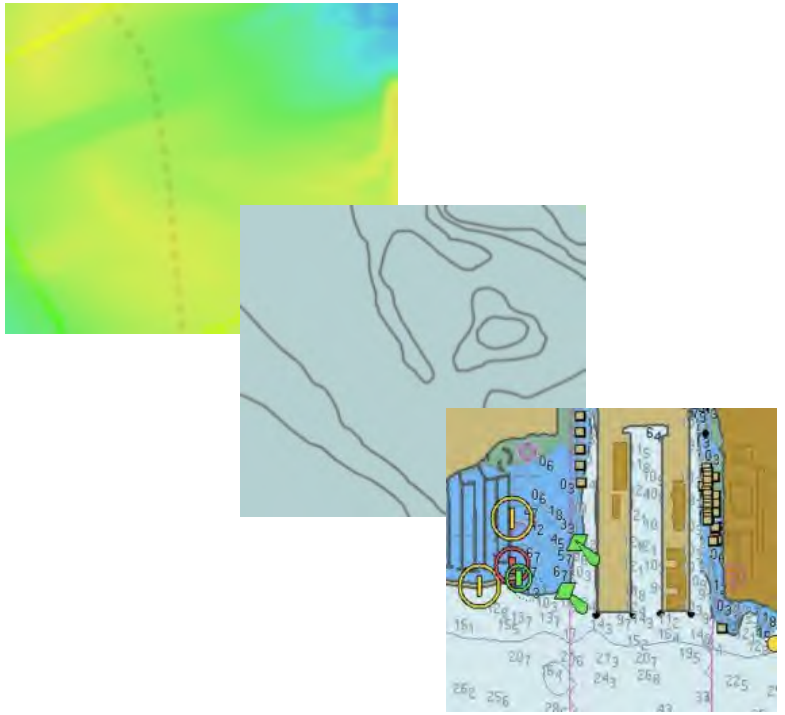
Data integration

Integration



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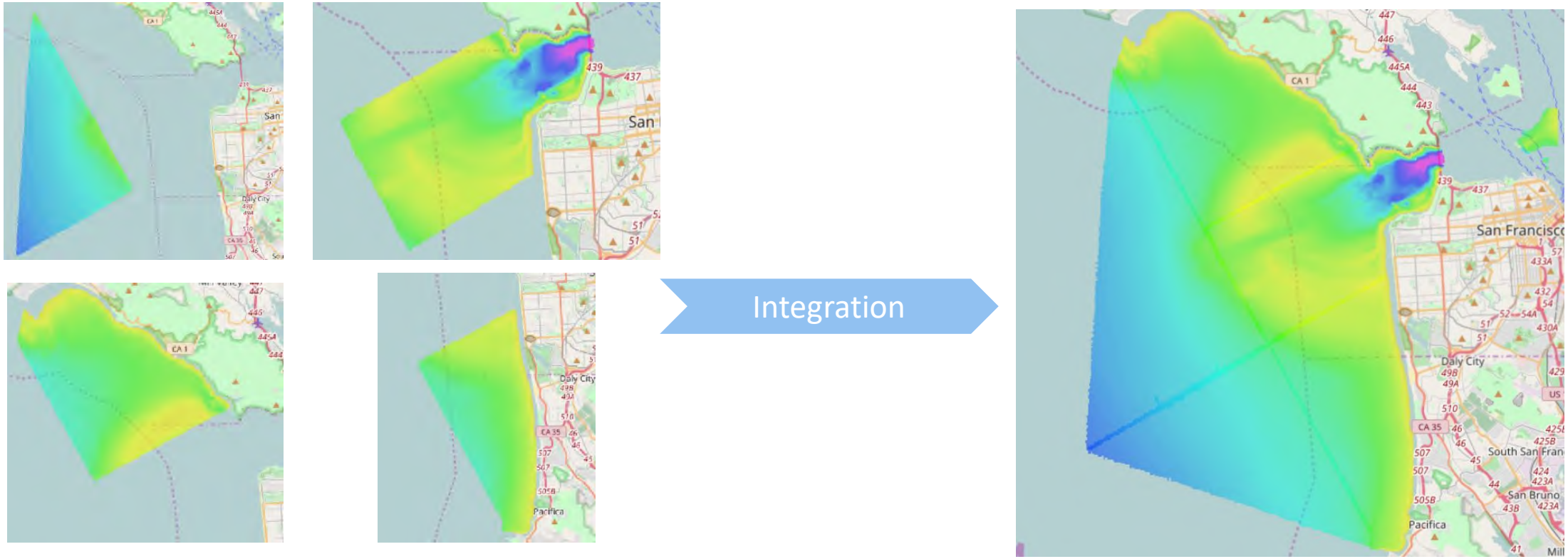
Integration of surveys into seafloor model



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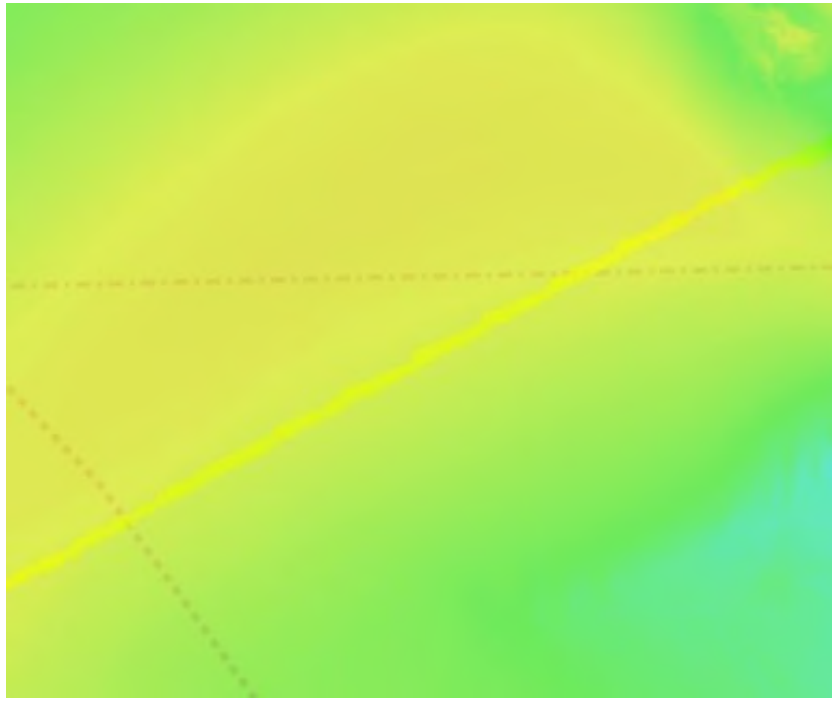
Data processing



Processing

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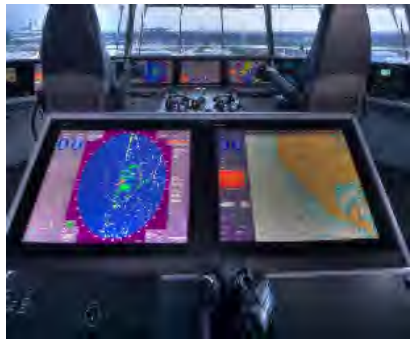
Spatial Data Management

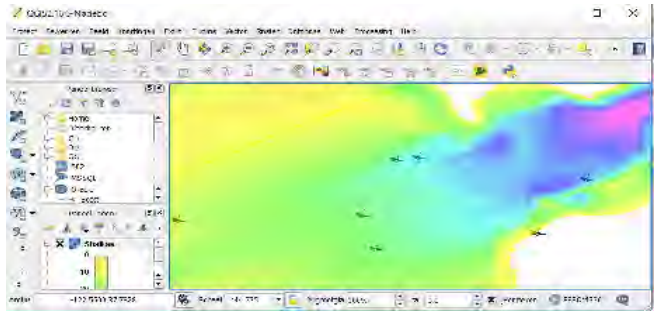
Data Distribution

FILE
- ASCII
- GeoTIFF
- GML
- Shape

OWS
- WMS
- WFS

API
- REST





Usages

Formats/Protocols

Devices

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Spatial Data Management

Different data standards

- IHO:
  - S-52, S-57, S-100, S-101, S-102
- INSPIRE
- OGC:
  - WFS, WMS
- ISO:
  - ISO-19115, ISO19139

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Spatial Data Management

Data model linking

Object: Shoreline construction
Acronym: SLCONS
Code: 122 help

Geometric primitives: P, L, A

Set Attribute_A: CATSLC; COLOUR; (!?)COLPAT; CONDTN; CONRAD; CONVIS; DATEND; DATSTA; HEIGHT; (?)~~HORACC~~; HORCLR; HORLEN; HORWID; NATCON; NOBJNM; OBJNAM; STATUS; ~~VERACC~~; ~~VERDAT~~; VERLEN; WATLEV;

Set Attribute_B: INFORM; NINFOM; NTXTDS; ~~SCAMAX~~; SCAMIN; TXTDSC;

Set Attribute_C: ~~RECDAT~~; ~~RECIND~~; SORDAT; SORIND;

Definition:

A fixed artificial structure in the water and/or adjoining the land. It may also refer to training walls, which are not necessarily connected to, nor form part of the shoreline.

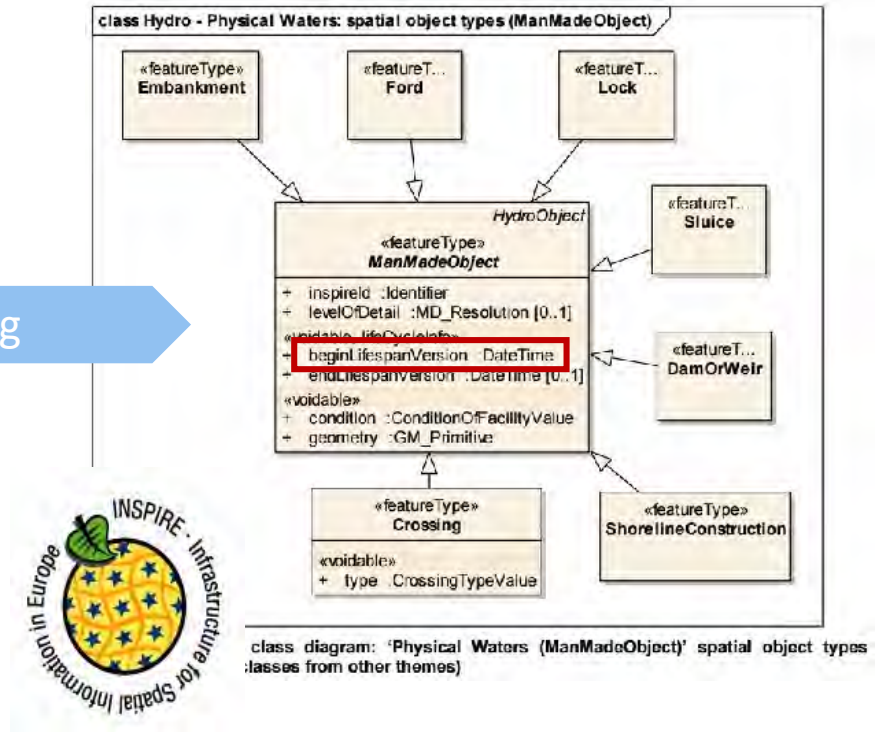
according to MD 3.Co.3)

2, 4, 5, 6, 12-15, 18,23, 33;

13.2, 4; 321.1-4; 322.1-2; 324.1;

ık; coastline; lake shore; land area; pontoon; river bank;

Linking



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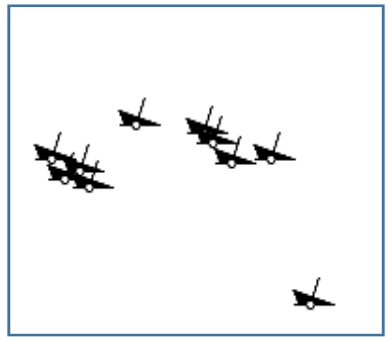
Spatial Data Management

Publish data as OWS (INSPIRE)

WMS (PNG)



VALSOU	SORIND	CATWRK
18.8	US,US,graph,Chart 18649	2
14	US,US,graph,Chart 18649	2
28	US,US,graph,Chart 18649	1
18.8	US,US,graph,Chart 18649	2
US,US,graph,Chart 18649	US,US,graph,Chart 18649	1

WFS (GML)

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Spatial Data Management

Publish metadata via REST API (XML/JSON)

127.0.0.1:8181/geolinq-app/encrest/urn:uuid:f4826811-1429-4d09-b45a-ab51190133d4/datasets/?recursion=2&outputFormat=application/json


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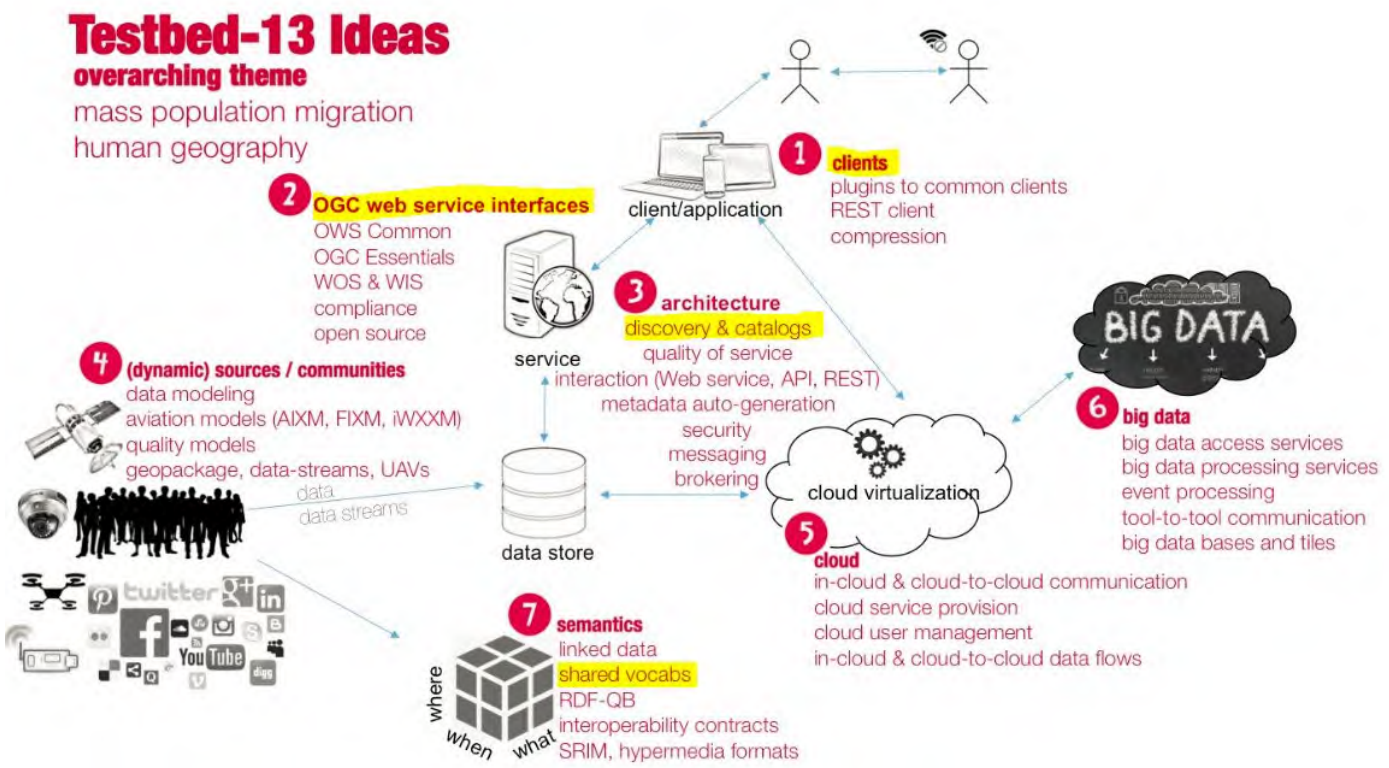
Spatial Data Management

New challenges



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Spatial Data Management

Hydrographic Data Management evolution

- Past:
  - File-based, manual product compilation
- Now:
  - Enterprise database, automatic product generation and single channel distribution
- Future:
  - Virtual database, automatic multiple product generation and multiple channel distribution

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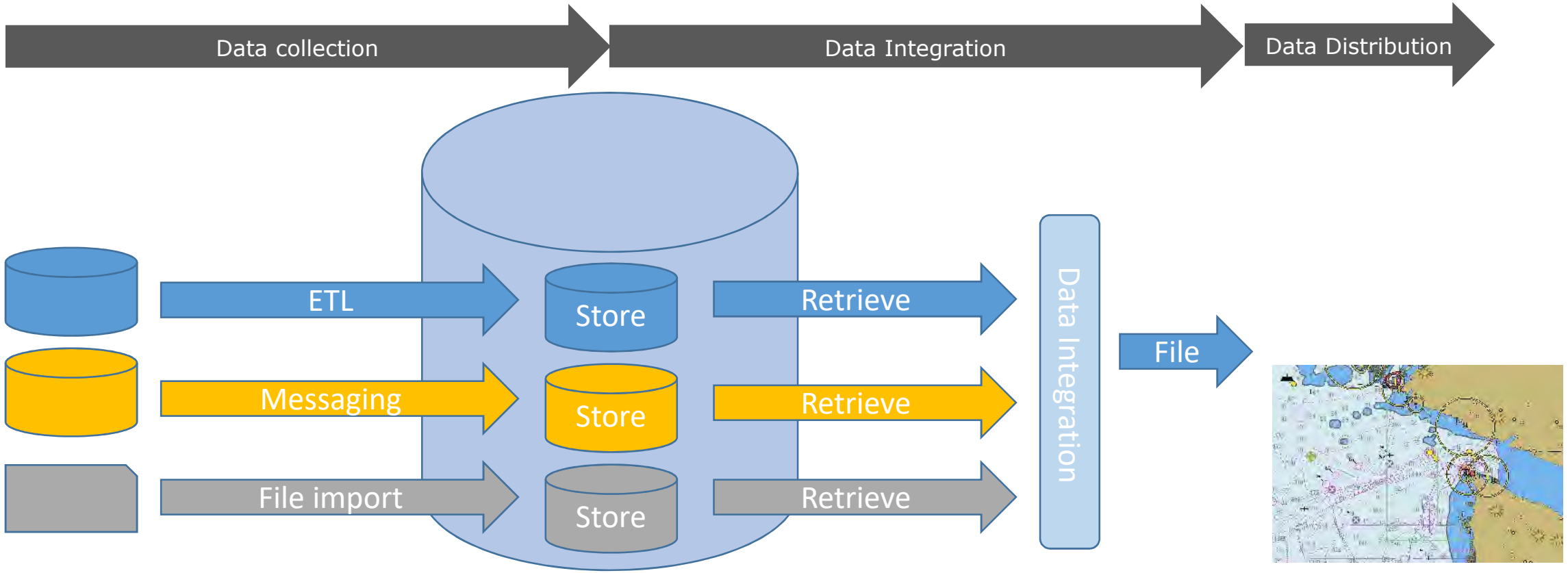
Spatial Data Management

Hydrographic Data Management: Now



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Spatial Data Management

Integration of maritime datasets into information products

- Challenges:
  - Increasing data volumes
  - Variety of internal and external data sources (e.g. open data)
  - Access to data instead of downloading pre-defined products,
  - Different technologies to access and publish data (SOAP, REST, OWS, files)

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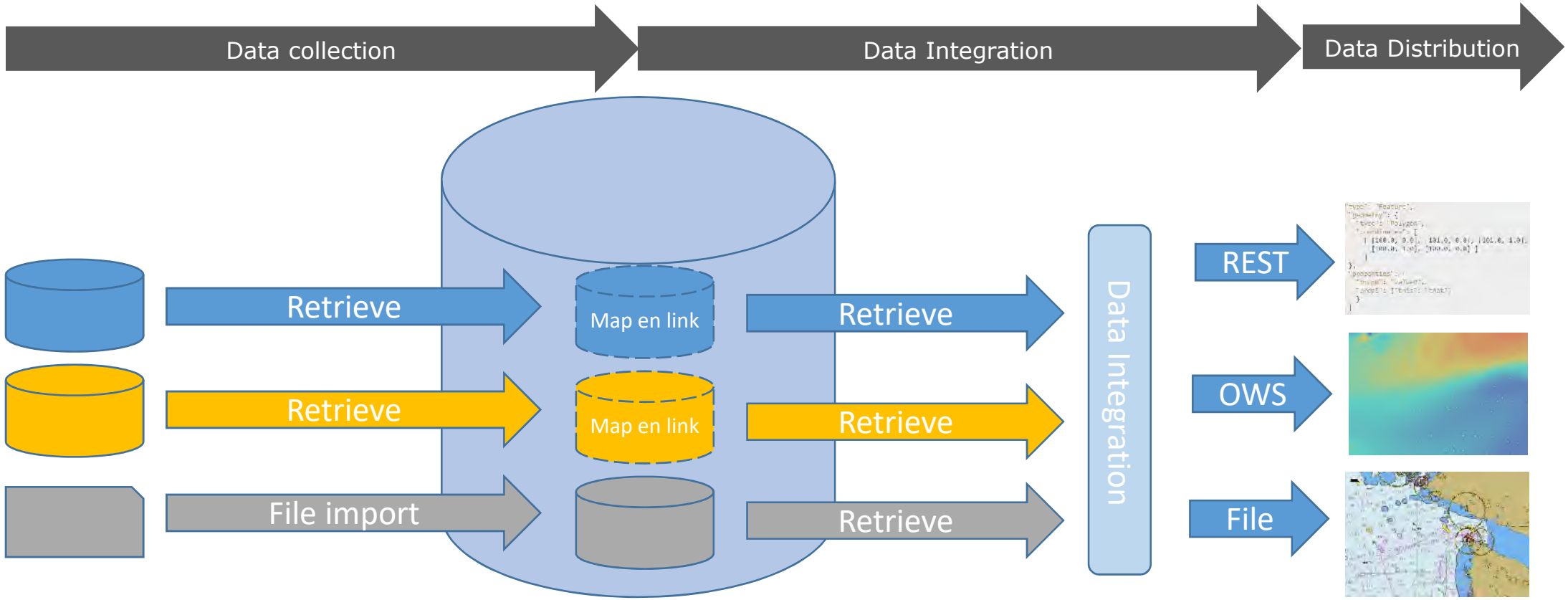
Spatial Data Management

Hydrographic Data Management: Future



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In the future situation:

- Reduction of number of ETL processes
- Real-time data access
- Product generation on-demand
- Data virtualization (get data from source directly)
- Multiple channels for data distribution

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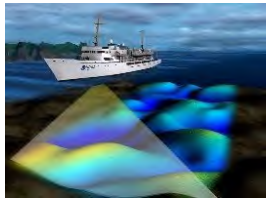
Spatial Data Management

GeolinQ Data Management Concept



XML/GML

WFS

Databases

File Import

Link to Data Sources

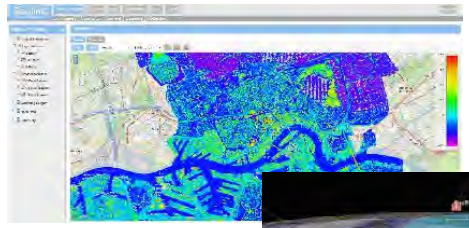
Mapping and Linking

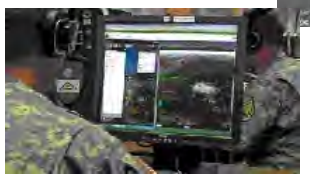
Link to Data Services

Visualisation

Web Services

File Export





Data Sources

Data Models

Data Services

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Spatial Data Management

Hydrographic Data Management software

- Future requirements
  - Multiple datasources
  - No pre-defined data models and changing metadata definitions
  - Data mapping and linking
  - Point cloud management and distribution
  - Importance of metadata (traceability, liability)

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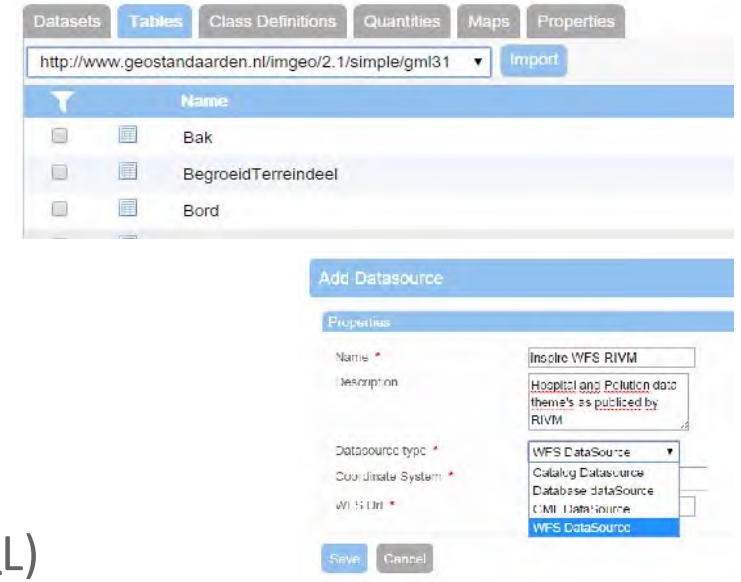
Spatial Data Management

Multiple data Sources: create a data hub

- Catalog Data Source
  - Create model manually
- GML/XML Data source
  - Generate model from GML and XML XSD's
- WFS Data source
  - Generate model from WFS feature type description
- Database Data Source
  - Generate model from external database (Oracle/ PostgreSQL)
- S-57 Data Source
  - Generate model and import features from S-57 file



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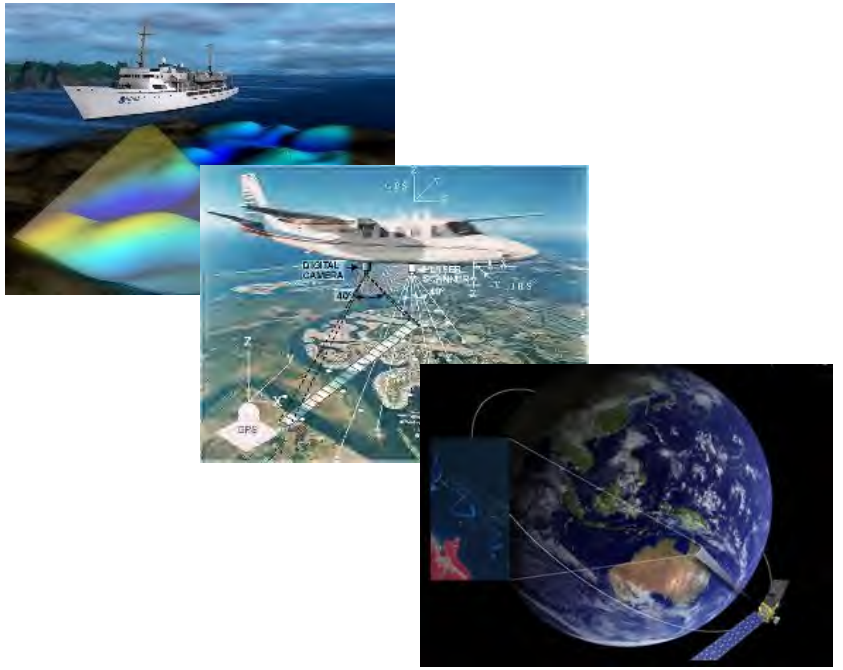
No pre-defined data model

- Changing data definitions on-the-fly:
  - Traditionally:
    - x, y, depth
    - S-57 (fixed set of feature definitions)
  - Nowadays:
    - Additional attributes (e.g. time), backscatter data
    - S-100/S-101/S-102 (plug-and-play data models)
  - Future:
    - More data definitions to come?



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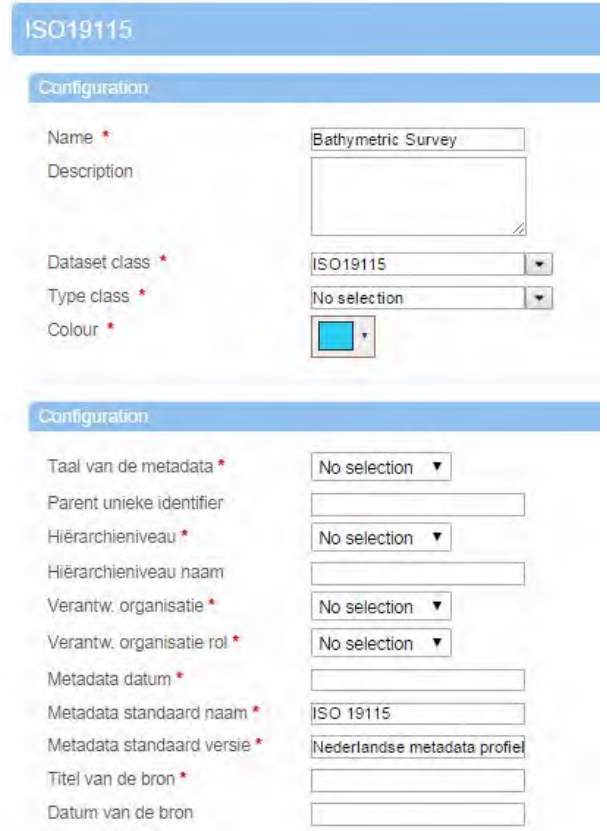
Changing metadata definitions

- Changing metadata definitions:
  - Traditionally:
    - No standardized metadata definitions
    - Metadata for specific domains
  - Nowadays:
    - Metadata standards mostly based on ISO19115 (e.g. S-102)
    - Combination of metadata standards and internal metadata requirements
  - Future:
    - Changing metadata standards and requirements



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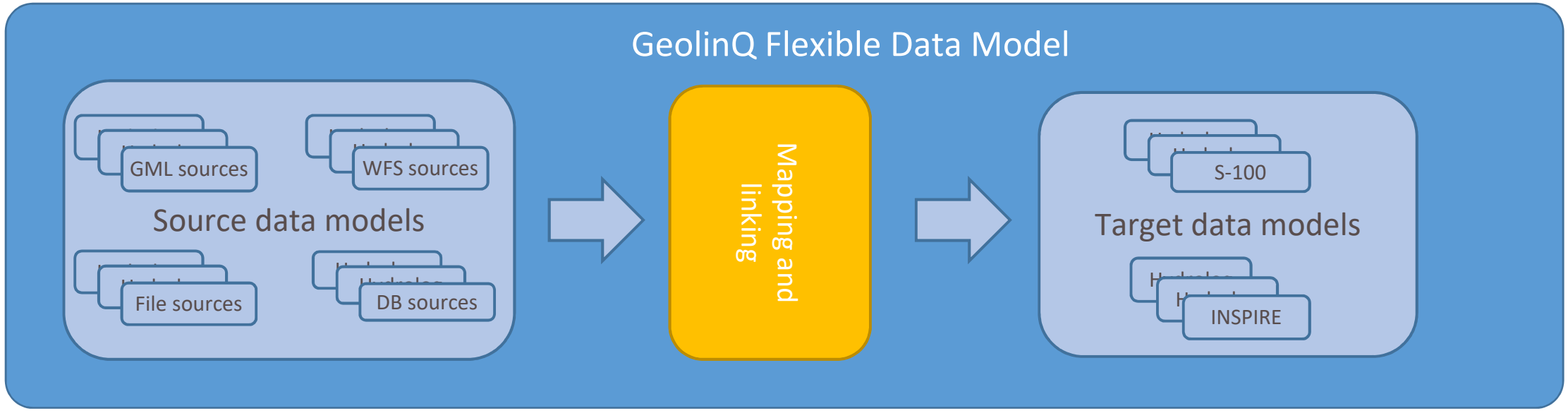
Spatial Data Management

Map and link from source to target data models



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Spatial Data Management

Managing point clouds

- Fast point cloud import, retrieval and visualisation
- Querying on point cloud metadata attributes
- Showing point cloud footprints on chart
- Visualisation of point cloud data on chart

- For integrated quality control of point clouds:
  - Correct coordinate system transformations applied
  - Correct vertical datum
  - Same units for attributes

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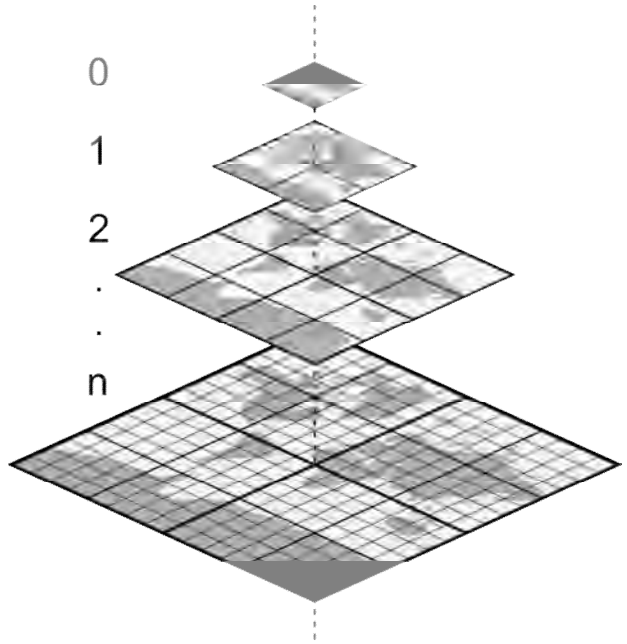
Import algorithm

- No limitions on number of points, point cloud size, physical memory of hard disk size
- Algorithm does not require any prior knowledge about number of points or MBR
- Optimized database storage of data chunks, no proprietary data types (database independent)
- Automatic generation of visualisation pyramid
- Automatic delineation of point cloud foot print (TIN)



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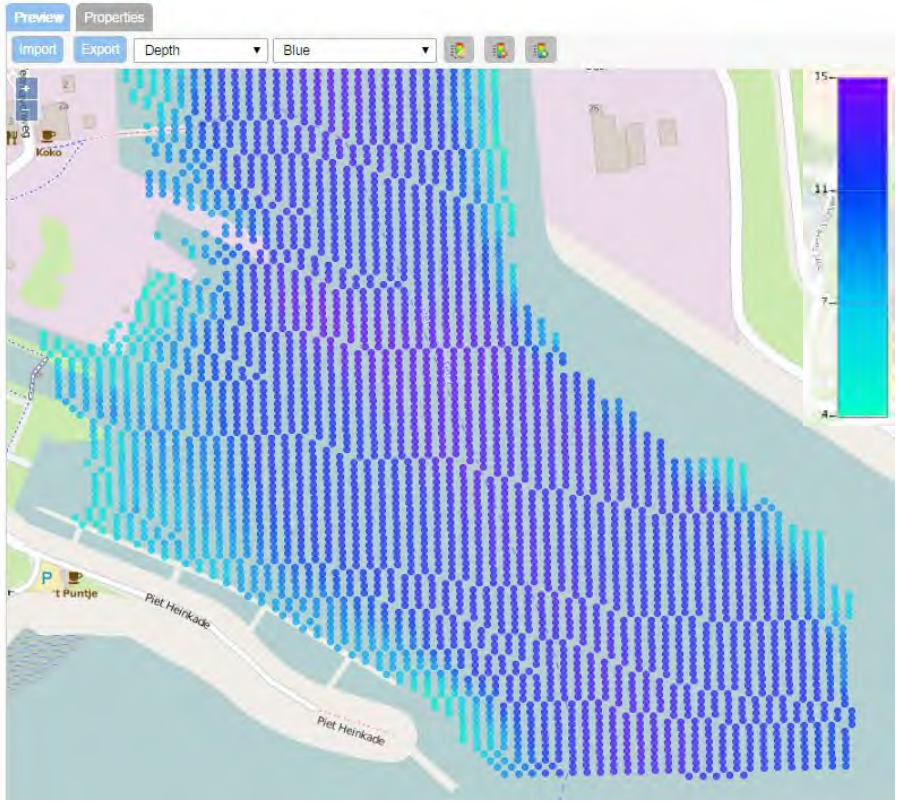
Preview of Point cloud with metadata



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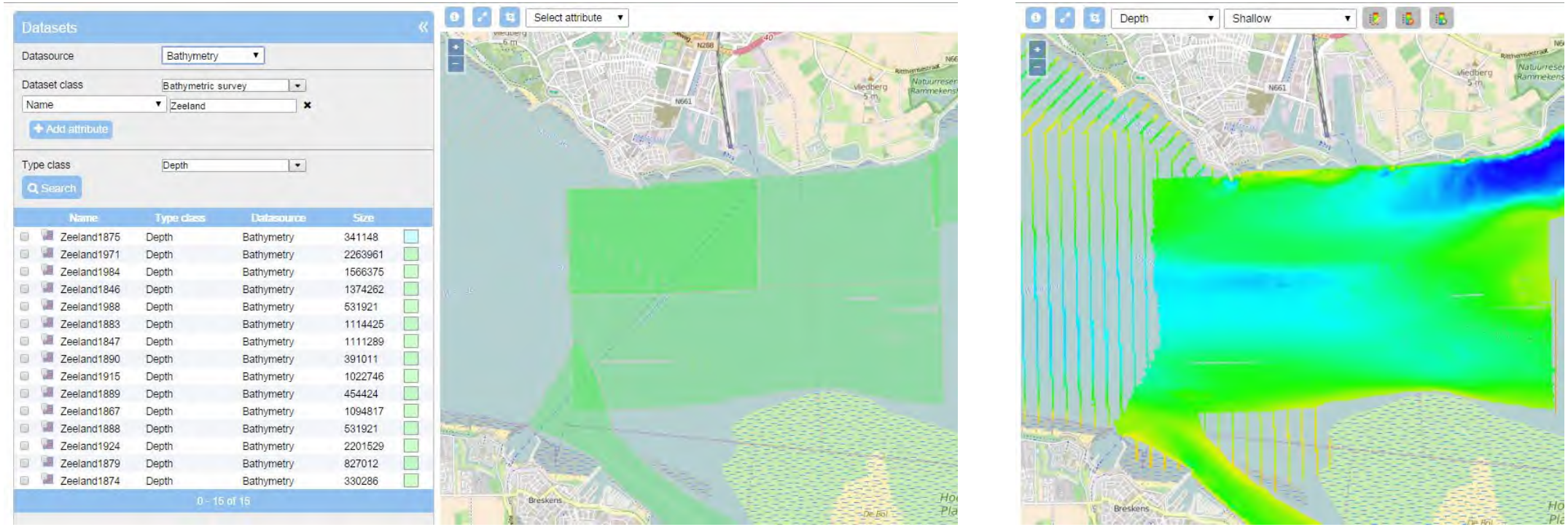
Point cloud footprints and attribute data



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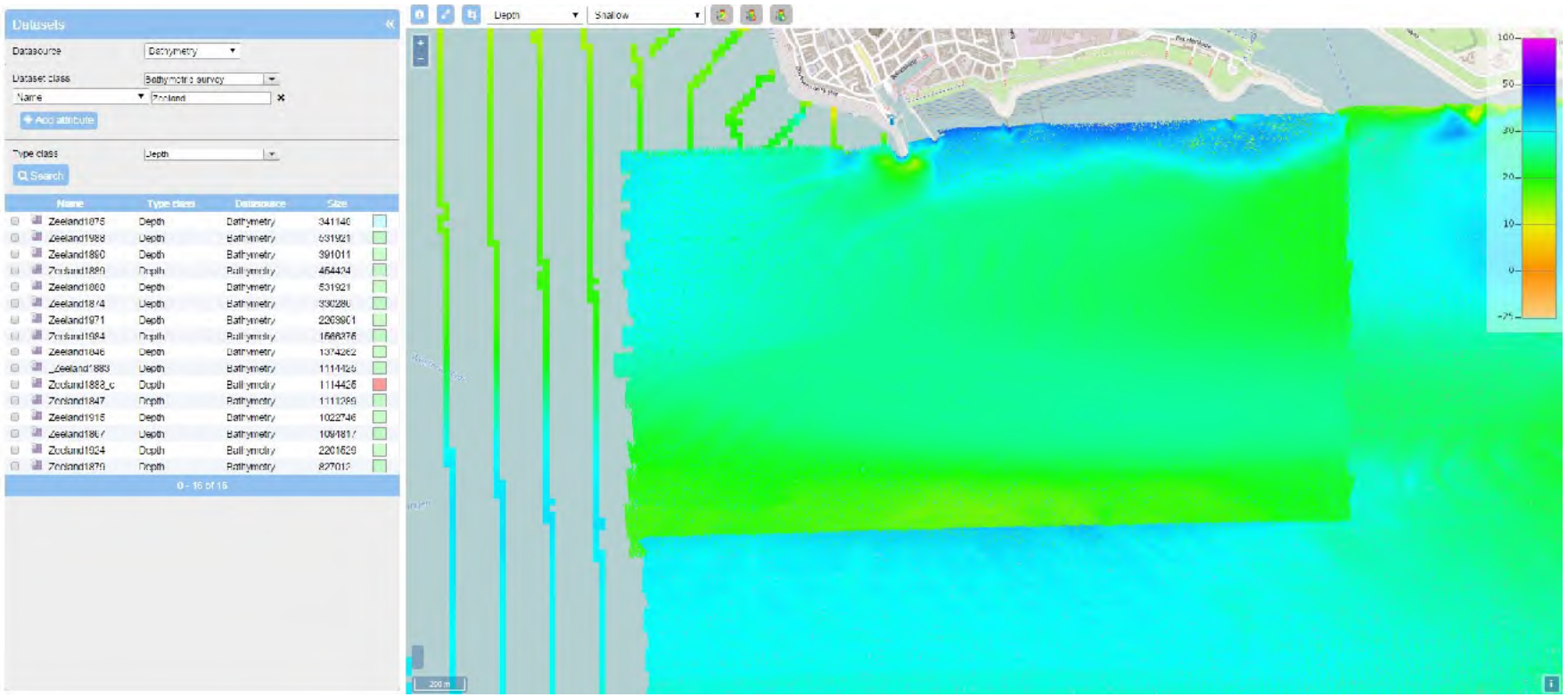
Quality control



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Spatial Data Management

Data publishing: Export, Services and REST

- Export data as files
  - Tabular ASCII, Geotiff, LAS, Shape
  - Other file formats on request.

- OWS web services meet end-user information needs:
  - WMS Services
  - WFS Services

- Authenticated REST services
  - http request to access data structures and data

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Easy sharing of point cloud data

- Web based
- Publishing using different technologies (file as well as web service)
- Open standards and Open data
- Spatial and metadata querying
- User-defined styling

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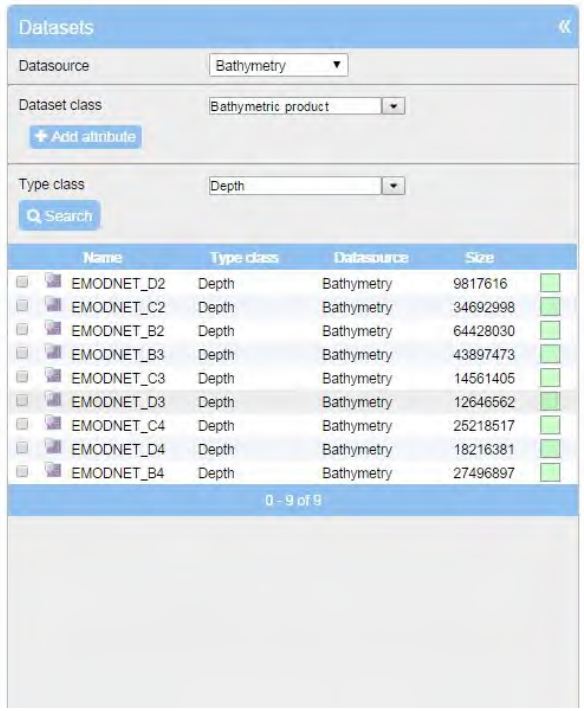
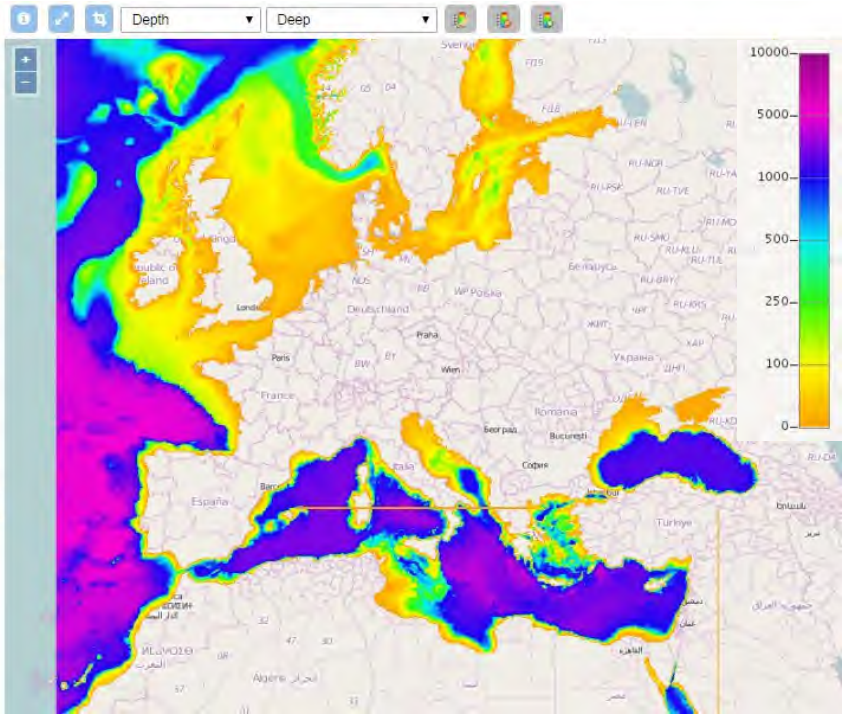
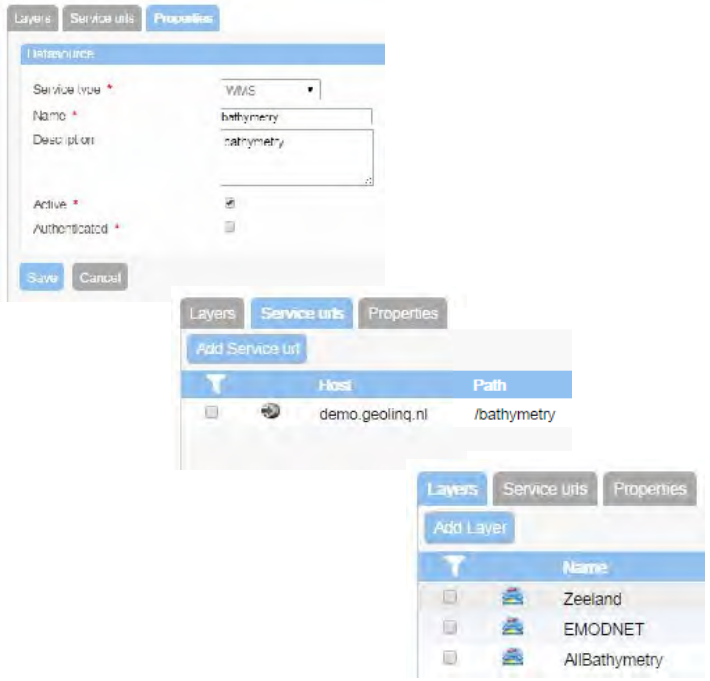
Publishing as service







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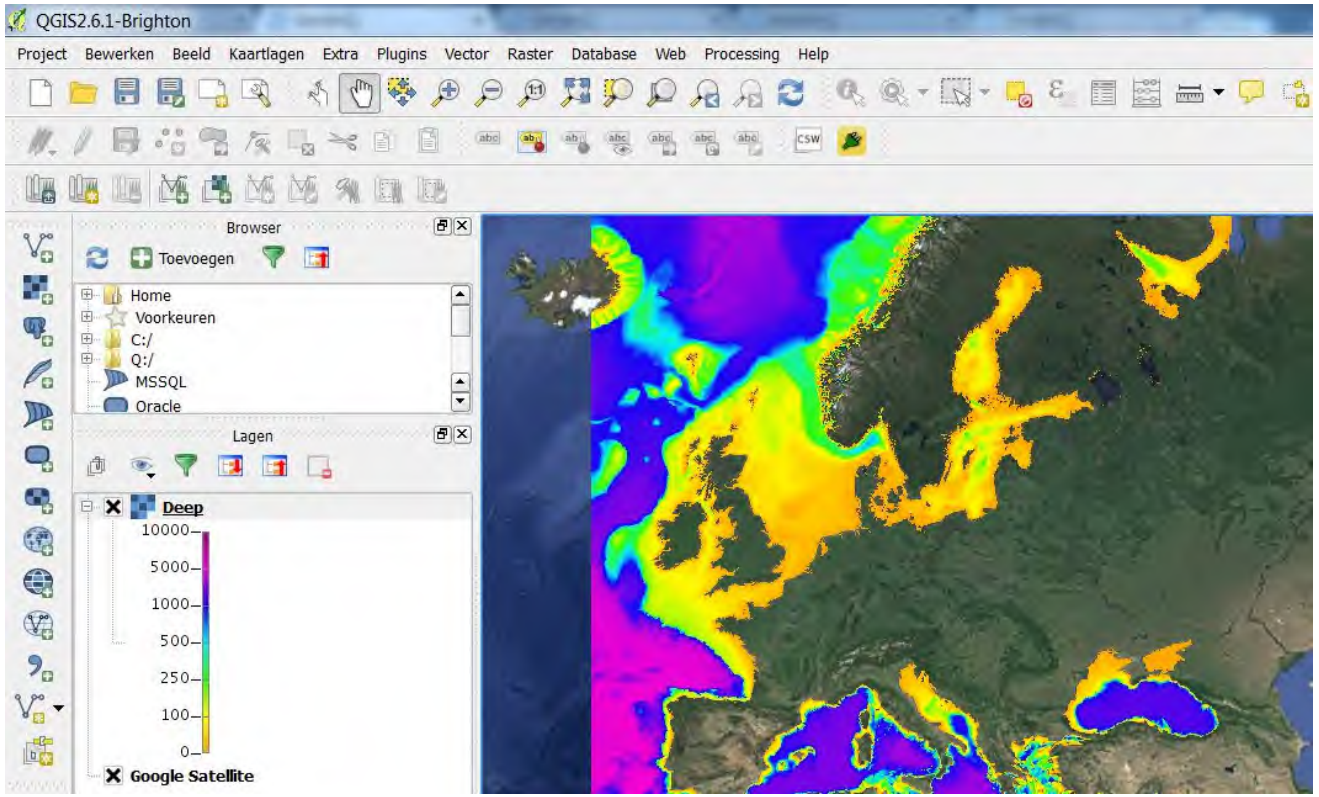
Accessing point cloud WMS or Export to file



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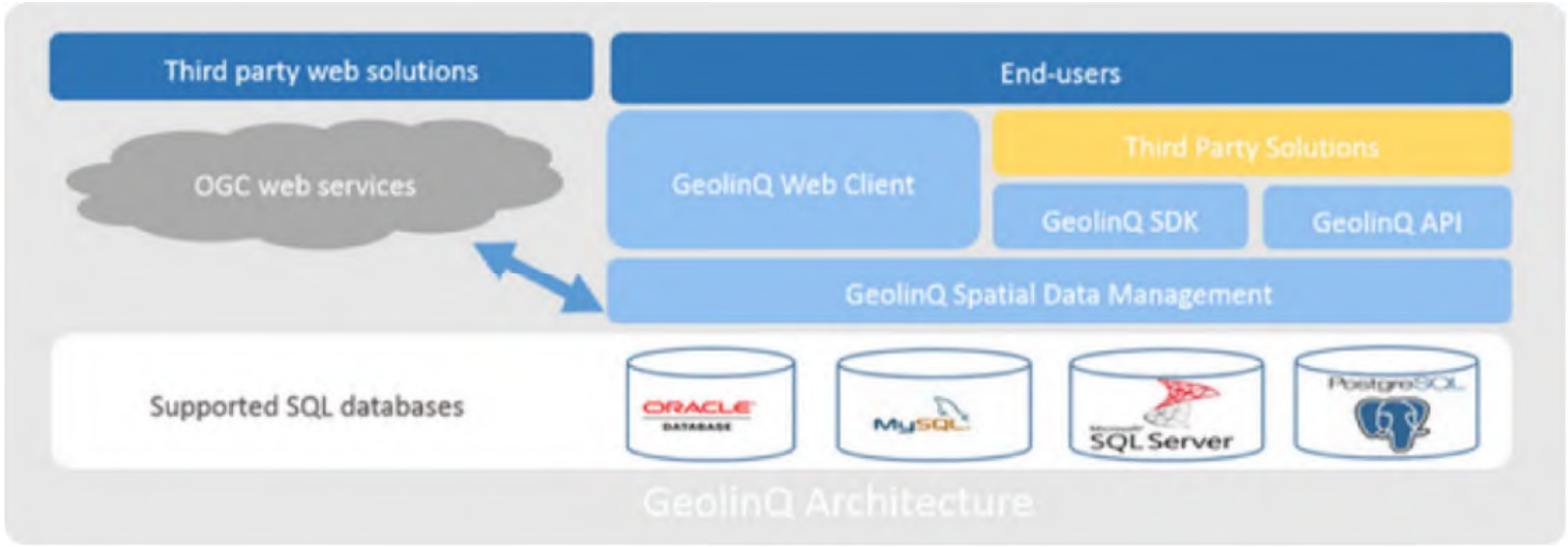
Spatial Data Management

GeolinQ architecture in the cloud

- GeolinQ architecture is optimized for easy implementation and deployment
- Configuration instead of development
- Web-based
- Scalable
- OGC web services
- REST
- Platform independent



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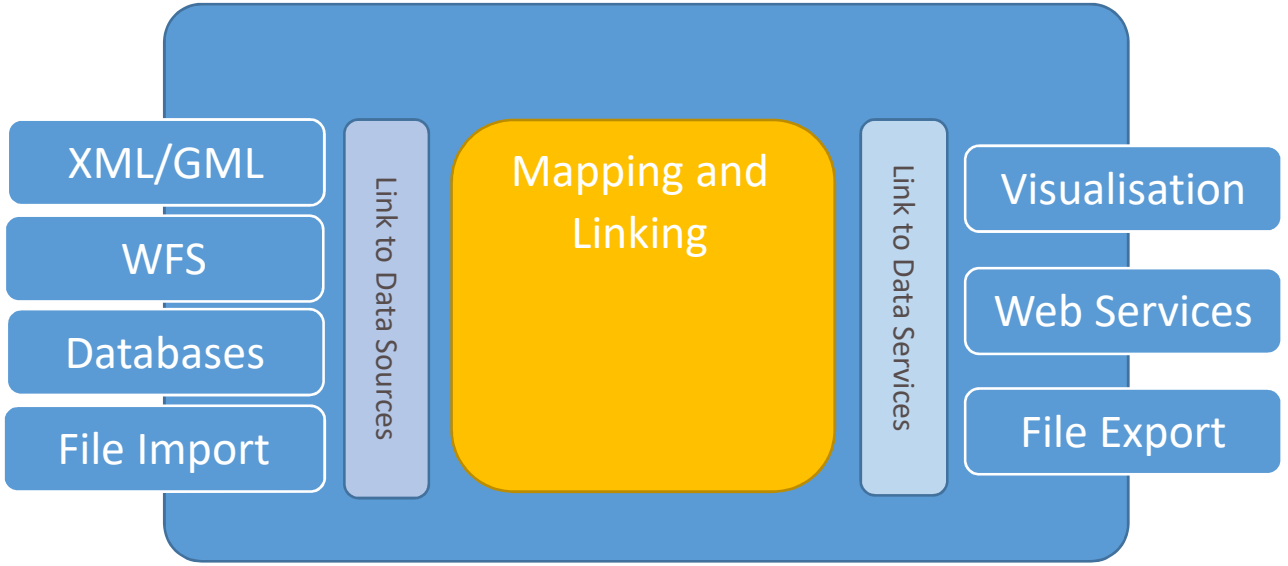
Hydrographic data management in the future

Different data sources
Different technologies
Open data



Data access
On-demand products
Different technologies

Virtual database

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Contact/ Meer informatie

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