Sensornet

A system for collecting and exhibiting sensor data from wells

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System description

As part of the SEAMOUNT project a system for receiving, storing and exhibiting sensor data has been developed.

The system consists of the following parts

1. A JSON-format for representing sensordata
2. A number of rest services for sending and retrieving sensordata
3. A database
4. A HTML/Javascript user interface for querying and displaying sensordata

Exchange format

As part of the system a simple JSON format for sensordata has been defined. The format is defined by the JSON schema available here https://data.geus.dk/sensornet/json/geus_sensor_schema_v1.json

The basic structure of the format is a collection of header fields and an array of measurements.

Header fields can for example be the id of the well where the sensor is located and the name of the company that is responsible for the sensor.

A measurement is defined by a time of measurement and one or more measured values. The supported types of values are: Water level, Atmospheric pressure, Temperature, Chloride, Nitrate and Conductivity

Only a single unit of measurement for each measurement type is allowed and this is defined in the format.

Each measurement have an optional unique identifier (UUID). This makes it possible to correct data by uploading new data to overwrite existing data.

The exchange format makes It possible to have all measurements from a sensor for a period in a single JSON document.

Rest services

Several REST services have been implemented to support the uploading and downloading of sensor data.

The REST services are documented in the Swagger Api documentation page here: https://data.geus.dk/sensornet/swagger-ui.html

A company/person that wants to upload sensor data needs to register with an email address to obtain an API key. This API key is used as a parameter when uploading data.

Sensor data is uploaded in the specified JSON exchange format.

A number of REST service have been made to perform queries on the sensordata, and retrieve data in JSON and CSV formats.

Database

A PostgreSQL database structure has been developed and set up to store sensor data.

When sensor data is uploaded it is stored as raw JSON in a table (report).

A stored procedure that runs every hour takes the newly uploaded sensor data and copies it to more traditional relational tables with a column for each field (ext_boreholes, ext_measurement) for easier use in the distribution REST services.

The database has been set up on the main PostgreSQL installation at GEUS (geusprodextpg: production, geussystextpg: system test and geustestpgsql: test)

User interface

The user interface has three parts.

- A map page that displays wells with sensor data on a map
- A search page that show wells that corresponds to search criteria
- A graph page that shows time series data for a given well, data type and time interval

The map page is set up as a separate map in the existing map infrastructure at GEUS and is available here: https://data.geus.dk/geusmap/?mapname=sensordata
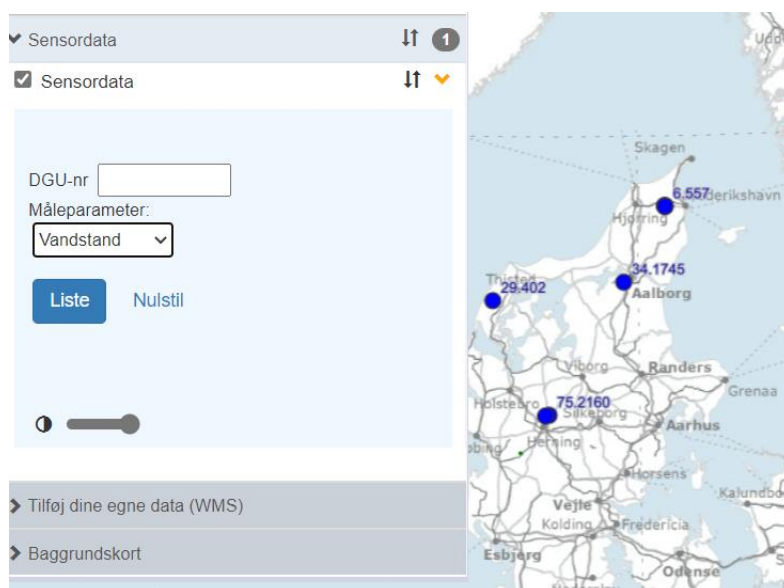
The search page is written in HTML+Javascript. It is available here:
https://data.geus.dk/sensornet/search.html

The graph page is written in HTML+Javscript. It uses an open source Javascript library, dygraph (https://dygraphs.com/), to display the graph. The graph page can be reached either from a click on the map page or the search page. The graph page also has a button that allow download of the displayed data in a CSV format.