SE4GEO - RASD

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1 Introduction

The purpose of this document is to describe the requirements for the development of an interactive client-server application that enables users to access, query and visualize air quality and weather sensor data retrieved from existing public digital archives. The system consists of three main components: a database to ingest and store the selected data, a web server (backend) to expose a REST API for querying the database, and a dashboard to provide means for requesting, processing (e.g. space-time aggregations), and visualizing data (e.g. maps, dynamic graphs, etc.).

2 General Description

Public authorities collect air quality and weather observations in near-real time from ground sensor stations and store them in digital archives. Ground sensors data are composed of long time series of observations and sensors metadata, including coordinates, type of measured variable, etc. Often, observations from different sensors and/or providers require different patterns for data accessing, harmonization, and processing. Interactive applications and dashboards, capable of facilitating such tasks, are key for supporting both public authorities as well as ordinary citizens in data processing and visualization.

3 Functional Requirements

The following requirements must be met by the system:

3.1 Data Ingestion

- The system should allow data ingestion from public digital archives of air quality and weather sensor data.
- The selected dataset must be uploaded in the application database.
- Strategies for continuous data integration between the selected data archive and the database can be implemented and considered a plus, but they are not mandatory.

3.2 Web Server

- The system should provide a REST API that enables users to query and retrieve data from the database.
- The web server should perform data cleaning and preprocessing before returning the results to users.
- Data must be returned to users using the JSON format.

3.3 Dashboard

- The system should provide an interactive dashboard that enables users to process and visualize data retrieved from the web server using some original manipulation strategy.
- The dashboard should include both geographic content (map-based views) and attributes (interactive graphs).
- The dashboard should enable users to generate custom views of the data.
- Additional base maps and layer can be added to the map-based views and considered a plus, but they are not mandatory.

4 Non-functional Requirements

The following non-functional requirements must be met by the system:

4.1 Performance

- The system must handle a large volume of data, and queries should be processed efficiently.
- The system should provide timely and accurate data retrieval and processing.

4.2 Usability

- The system should have a user-friendly interface that enables users to easily access and interact with data.
- The dashboard should be visually appealing and enable users to easily generate custom views of the data.

4.3 Security

- The system must ensure data privacy and security.
- The system should implement proper authentication and authorization mechanisms.
- The system should enforce access controls to restrict access to sensitive data.

4.4 Scalability

- The system should be designed to scale horizontally and vertically.
- The system should be able to handle an increasing number of users and data sources.

5 Constraints

- The system must comply with data privacy regulations and standards.
- The system should be developed using open-source software.
- The system must be developed using Python programming language.
- The system must be hosted on a cloud platform.

6 Glossary

- Air quality: refers to the degree to which the air is clean, clear, and free from pollutants.
- Ground sensors: refers to the sensors installed on the ground that monitor air quality and weather conditions.
- Public digital archives: refer to online repositories or databases of digital information that are publicly accessible and maintained by governmental or public entities.