RASD

Requirement Analysis and Specifications Document

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1. INTRODUCTION

1.1 PURPOSE:

The current RASD document reports the Requirement analysis of *app_name*. The application is projected to be a support for users in querying and visualizing data retrieved from Dati Lombardia air quality sensor dataset. This is offered in a client-server system, that integrates and process both real-time data and historical air quality measurements in order to provide insights into pollution distribution, trends and exposure risks.

1.2 SCOPE

Develop a client-server application that supports users in querying and visualizing data retrieved from the Dati Lombardia air quality sensor dataset. The system should integrate and process real-time or historical air quality measurements to provide insights into pollution distribution, trends, and exposure risks at different administrative levels within Lombardy.

2. REQUIREMENTS

2.1 STAKEHOLDERS:

The application will be a support for decision-makers, such as environmental agencies and public health organizations. It will be a support also for regional and local (provinces, municipalities) administration.

It can be accessed also by citizen interested in knowing the quality of the air in their cities or by students/teachers for educational purposes.

2.2 ACTORS:

The application will be a support for regional and local (provinces, municipalities) administration.

It can be accessed also by citizen interested in knowing the quality of the air in their cities or by students/teachers for educational purposes.

The user can be:

- Standard user: he/she can choose from a preselected options and visualize the data accordingly.
- Expert user: he/she can do the same things as a standard user. Plus he/she has the ability to input some thresholds and areas and get a more personalized visualization of the selected data.

2.3 DOMAIN ASSUMPTION:

The application uses air quality data retrieved from “Dati Lombardia” and sensor data from “Sensor Data” both given and belonging to “Arpa Lombardia”.

The system, consequently, acts under the assumption that the data will remain free and available, in fact the stability of the data source is an essential asset for proper functionality.

2.4 FUNCTIONAL REQUIREMENTS

DATA INTEGRATION:

Requirement ID: DI-1

Title: Air quality data
Description: The system should retrieve and store in the database air quality data from Dati Lombardia.

Requirement ID: DI-2

Title: sensor data
Description: The system should retrieve and store in the database sensor data from Sensor Data.

Requirement ID: DI-3

Title: connection between data
Description: The system should combine air quality data with sensor data through the sensor ID.

Requirement ID: DI-4

Title: valid data
Description: The system should filter invalid data and let the user process and visualize only valid data.

Requirement ID: DI-5

Title: data update
Description: The system should update his database if new data are uploaded to Dati Lombardia and Sensor Data.

DATA PROCESSING

Requirement ID: DP-1

Title: database query
Description: The system should query the database and returns to the client only the requested data, correctly processed and aggregated.

Requirement ID: DP-2

Title: statistical analysis
Description: The system should be able to perform data aggregation and statistical analysis, for example by computing the mean over a period of time and over a given area.

[separare implementazione da requisiti (= non mettere server/client qui)]

DATA VISUALIZATION

Requirement ID: DV-1

Title: Introduction to the available data
Description: The system should have an introductory part in which it explains to the user which data are available and which options he has for visualizing and analysing the data.

Requirement ID: DV-2

Title: user selection
Description: The system should let the user choose which profile he/she prefers between standard or expert user.

Requirement ID: DV-3

Title: map visualization
Description: If there is a map, the system should allow the user to choose between different basemaps and to select only the layers he is interested in.

Requirement ID: DV-4

Title: data availability
Description: The system should alert the user if no data is available for the visualization he selected.

Requirement ID: DV-5

Title: Single sensor time series
Description: The system should allow the user to select one sensor and visualize the time series of the specific pollutant measured by the selected sensor.

Requirement ID: DV-6

Title: sensor location
Description: The system should allow the user to select one or more pollutants and visualize on the map where the relative sensors are located.

Requirement ID: DV-7

Title: pollutant comparison over same area
Description: The system should allow the user to select one province or one municipality and visualize the time series of each pollutant, the time series will be obtained calculating for each pollutant the daily average over the selected area.

Requirement ID: DV-8

Title: average concentration – map
Description: The system should allow the user to choose a pollutant and a time window and visualize on the map the average concentration of the selected pollutant over the selected time

for each province. The administrative areas should have different colours accordingly to the computed average.
[Optional: different layer the same average but for each municipality]

Requirement ID: DV-9

Title: average concentration – histogram
Description: The system should allow the user to choose a pollutant and a time window and visualize in a histogram the average for each province (along with the global average) concentration of the selected pollutant over a selected time period.
[Optional: same average but for each municipality]

Requirement ID: DV-10

Title: correlation with altitude – map
Description: The system should allow the user to select a pollutant and visualize a topographic map in which each contour line has a different colour accordingly to the pollutant concentration.

Requirement ID: DV-11

Title: correlation with altitude – graph
Description: The system should allow the user to select a pollutant and visualize a graph that highlights the correlation between a selected pollutant and the altitude of the sensors.

EXPERT USER DATA VISUALIZATION

Requirement ID: EU-DV-1

Title: polygon definition
Description: The system should allow the expert user to define a polygon and visualize if the area selected contains sensors, which measurements are available and the mean of the data.

Requirement ID: EU-DV-2

Title: threshold definition – time-series
Description: The system should allow the expert user to define a threshold and select a pollutant, a time window and a province and visualize a time series showing which days the threshold has been exceeded and a percentage (exceeded days/total days).

2.5 TECHNICAL REQUIREMENTS

DATA INTEGRATION:

Requirement ID: TDV-1

Title: database
Description: the systems database should be PostgreSQL / PostGIS

CLIENT-SERVER:

Requirement ID: TCS-1

Title: Query

Description: the system should have a REST API (from web server point of view) to query and retrieve data from the database.

Requirement ID: TCS-2

Title: Data format

Description: the system should return data to the client using the JSON format

Requirement ID: TCS-3

Title: Data format

Description: the system should have an interactive dashboard (interactions with the server) developed using Jupiter Notebook

3. USE CASE DIAGRAM

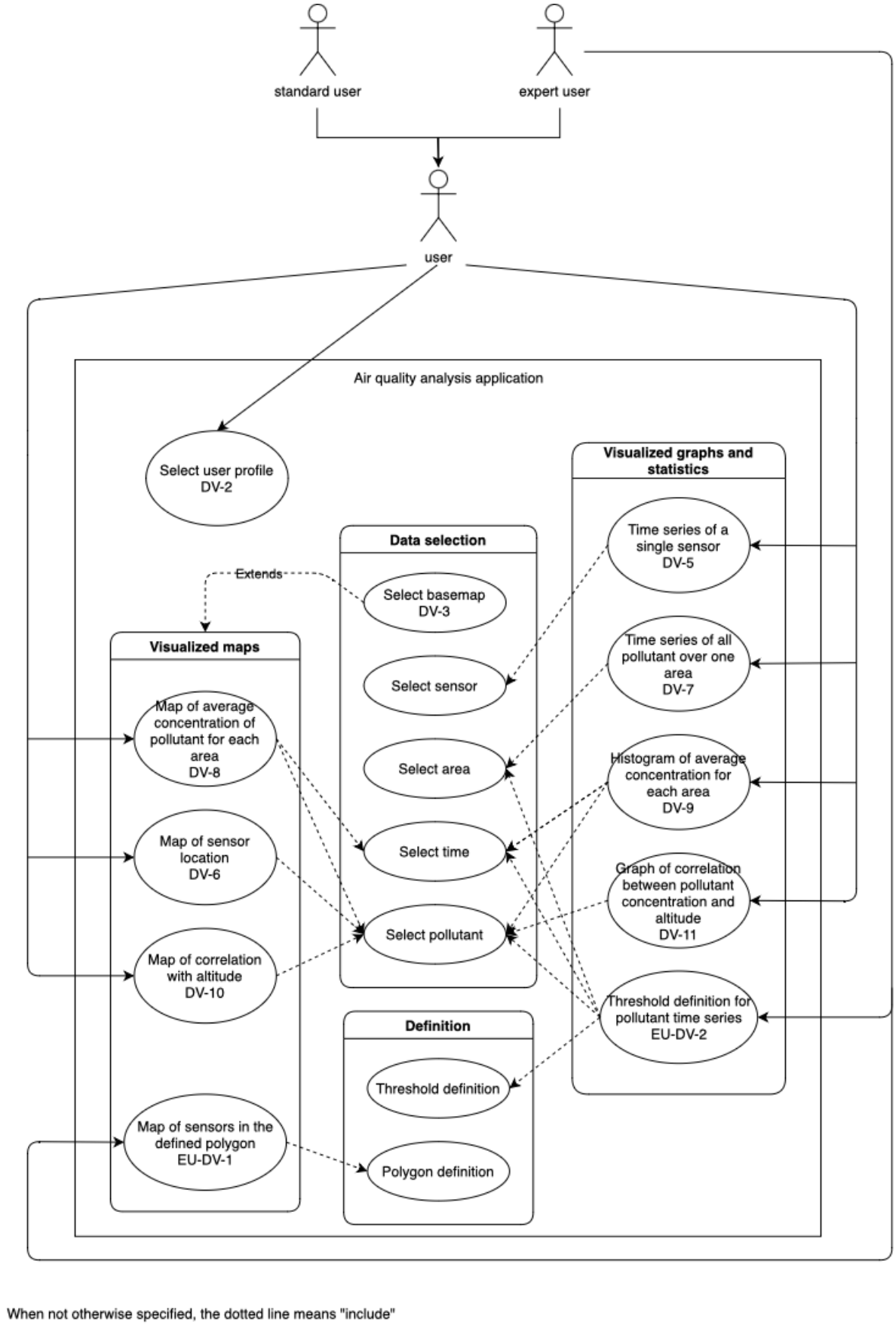

Figure 1: user case diagram

4. USER STORIES

	USER SELECTION	MAP VISUALIZATION	GRAPH VISUALIZATION
GENERIC USER PARAMETERS SELECTION AND VISUALIZATION	As a user I can select to be a standard/expert user, so that I can decide to personalize or not my future visualization [DV–2]	As a user I can select one or more pollutants, so that I can visualize on the map where the relative sensors are located [DV–6]	As a user I can select a sensor, so that I can visualize the time series of the specific pollutant measured by the selected sensor [DV–5]
			As a user I can select one province or one municipality, so that I can visualize the time series of each pollutant [DV–7]
		As a user I can choose a pollutant and a time window, so that I can visualize on the map the respective average concentration for each province [DV–8]	As a user I can choose a pollutant and a time window, so that I can visualize the histogram of the respective average concentration for each province (along with the global average) [DV–9]
		As a user I can choose a pollutant and a time window, so that I can visualize on the map the respective average concentration for each municipality [DV–8]	As a user I can choose a pollutant and a time window, so that I can visualize the respective average concentration for each municipality [DV–9]
		As a user I can select a pollutant, so that I can visualize a topographic map where each contour line has a different colour accordingly to the pollutant concentration [DV–10]	As a user I can select a pollutant, so that I can visualize a graph that highlights the correlation between the selected pollutant and the altitude of the sensors [DV–11]
EXPERT USER PARAMETERS SELECTION		As an **expert user** I can define a polygon, so that I can visualize if the area	As an **expert user** I can define a threshold and select a pollutant, a time window and a province, so that I can

AND VISUALIZATION		selected contains sensors, which measurements are available and the mean of the data [EU–DV–1]	visualize a time series showing which days the threshold has been exceeded [EU–DV–2]
			As an **expert user** I can define a threshold and select a pollutant, a time window and a province, so that I can get a percentage of which days the threshold has been exceeded with respect to the total days considered [EU–DV–2]
OPTIONAL		As a user I can choose what basemap will be put in the visualization [DV–3]	

Table 1: user stories