Dipartimento di Ingegneria e Scienza dell'Informazione

– KnowDive Group –

Knowledge Graph course 2025 - Project Report

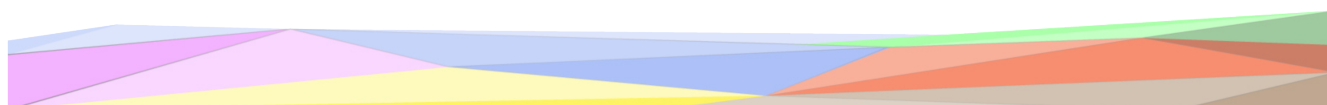| Document Data:	Reference Persons:
November 10, 2025	Mattia Santaniello, Mattia Maci

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Revision History:

Revision	Date	Author	Description of Changes
1	November 10, 2025	Mayukh Bagchi	Document created

1   Introduction

Reusability is one of the main principles in the Knowledge Graph (KG) development process defined by iTelos. The KG project documentation plays an important to enhance the reusabiltiy of the resources handled and produced during the process. A clear description of the resources, the process (and sub processes) developed and evaluation at each step of the process provides a clear understanding of the project, thus serving such an information to external readers for the future exploitations of the project's outcomes.

The current document aims to provide a detailed report of the project developed following the iTelos methodology. The report is structured, to describe:

- Section 2: Definition of the project's purpose and related information gathering.

- Sections 3, 4, 5, 6: The description of the iTelos process phases and their activities, divided by knowledge and data layer activities, as well as the evaluation of the resources produced in terms of fit for the chosen purpose.

- Section 7: The description of the metadata produced for all (and all kind of) the resources handled and generated by the iTelos process, while executing the project.

- Section 8: Conclusion and open issues summary.

2   Project Design

The purpose of this project is to engineer a Knowledge Graph which models various meteorological facilities, and, thereby, models the climate in the Trentino region during the decade 2015-2025 in order to get a complete view of the following informations: what are the most impacted area by the climate change where the major weather stations are located and how the wheater and the temperature distributions evolved

3   Purpose Definition

From the Project design it is possible to derive a formal description of the situation by first illustrating the possible scenarios:

- **Mario Rossi** is performing a research on the effects of climate change, which could be useful for some supervisor agencies specialized on the theme (e.g ESA). He needs to retrieve some data about the weather of the territory, analyzing how the temperature has evolved over the years and how much it has drifted from the natural trend.

- **Laura Rosa** is planning a long journey on the mountains with her friends, and she needs to know the metheorogical data of the locations they are going to visit, especially the rainfall events and the sunny days of the previous years in order to make decision on the logistics

- **Luigi Verdi** is worried about how the climate events of the last years could affect his farming activities and damage his products.Agriculture is one of the sectors which has been mostly affected negatively by the climate change, so he wants to be prepared

3.1   Personas

Now that the scenarios have been defined it is time to see the profiles of the users mentioned above:

- **Mario Rossi** is a 26 years old researcher at the Trento university, specialized in ecology and enviromental research

- **Laura Rosa** is a 30 years old woman who is also planning a trip on the mountains of the Trentino region, however in her case the main activity is a trekking exursion with her friends

- **Luigi Verdi** is a 56 years old farmer, with a small field nearby Trento. His main products are potatoes and grape, the latter one especially is cultivated in summer and gathered during grape harvest period

3.2   Competency Question

Each Persona has to deal with different scenarios, which could be incapsuleted in the definition of Competency Questions(CQ). Some of them could be formalized in the following table

Person	Question
Mario Rossi	What is the trend of the temperature values in Trentino during the decade 2015-2025?
Mario Rossi	How the metheorogical facilities are distributed in the territory?
Mario Rossi	Which areas in Trentino have seen the highest increase in temperature over time?
Laura Rosa	How was the temperature on the Trentino mountains during the winter of the last three years?
Laura Rosa	What are the locations where rainfalls most frequently happen?
Laura Rosa	What are the periods of the year where there are sunny days?
Luigi Verdi	Did the number of extreme climate events increased in the area around my field?
Luigi Verdi	What is the trend of humidity in the summer of the last three years?
Luigi Verdi	Did the number of rainfalls decreased over the last five years?

Table 1: Competency Questions

3.3 ER Diagram

At this point the next step of the formalization procedure is to produce a first bone structure which allows us to define the involved entities more clearly. Lets first define their schemas:

Etype	Properties
Location	*location_ID*,*gps_coordinates*,*name*
Coordinates	*latitude*,*longitude*
Weather	*temperature*,*humidity*,*date*, *wind speed*,*is_sunny*
MetheorogicalFacility	*facility_ID*,*name*,*gps_coordinates*, *inauguration_date*,*still_active*
ClimateEvent	*event_ID*,*location*,*weather_status*,*event_date*

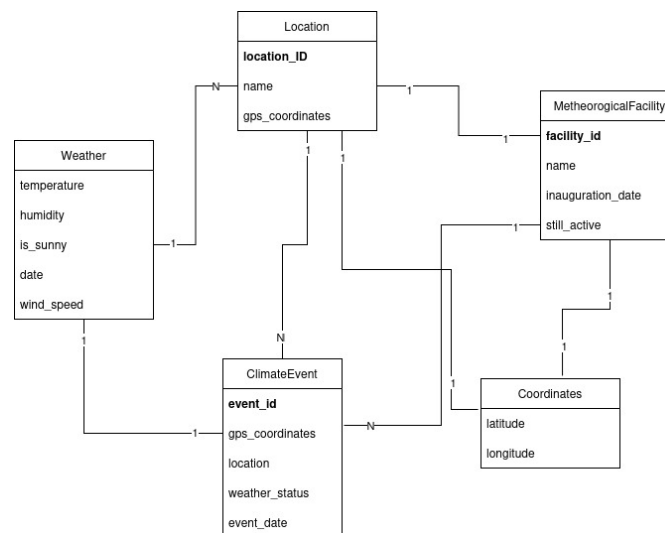Table 2: Informal definition of the entities

Figure 1: ER diagram

As we can see, in the table 3.3 there are some entities with a more general use, like *Location* and *Coordinates*, which represents respectively the place where a specific event happens and the gps coordinates of a certain position. Next we find the weather conditions associated to a location, which includes the temperature and the humidity, the wind speed, wheter the day was sunny or not and in the end the date timestamp of those specific metheorogical configuration. Last we have the metheorogical facility, which include its foundation date togheter with its position, and the dangerous climate event happened at a specific location and it is associated with the weather conditions of that day. Notice how in this latter case we also store a further date timestamp since we want to keep track of when the catastrophe happened, which does not necessary match the time memorized in the Weather entity (maybe because the weather conditions are sampled every 24 hours, and the climate event happen in the meantime). With the definition of the entities (although informal) done it is possible now to define the ER diagram that declares the relationship between the subjects involved, as in figure 1. It is interesting to notice how there is a one-to-one relationship between MetheorologicalFacility entity and Coordinates

while it could be sufficient to identify a facility through the location. The main reason why such decision has been made is because it is possible that a metheorological station is not exactly placed inside a specific location but it could be in the nearby.

3.4   Information Gathering

3.5   Evaluation - Purpose Definition

4   Language Definition

5   Knowledge Definition

6   Entity Definition

7   Evaluation

8   Metadata Definition

9   Open Issues