**New Emergency Management in a Resilience Era Facing Health, Climate and Energy Challenges**

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SESSION 13 IMPETUS
PRESENTATIONS

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# Emergency Decision Support System Platform: E-CITIJENS project

*Civil Protection **E**mergency DSS based on **CITI**zen Journalism to E**N**hance **S**afety of Adriatic Basin*

1. About the project
2. Emergency Decision Support System Platform (EDSS) -  functionalities
3. Social media component
4. Semantic analysis of social-media posts

# E-CITIJENS project

- Project attempts to overcome the problems in use of social media in disaster and emergency situations and proposes **a solution which includes citizens through their social media posts** and use them as a valuable information for creation of the comprehensive operational picture of emergency situations in the case of a disaster.

- The newly establish **communication channel will be updated in real time** by collecting and using citizens' information voluntarily provided via social media to report hazardous situations and events as well as their progress.

- Besides **research organisations**, the project involves Italian and Croatian **civil protection organizations** and bodies, which will be the crucial actors in creation and implementation of the solution.

- The project is funded under the Cross-border Cooperation Program INTERREG V-A Italy - Croatia 2014-2020.

- The total value of the project is EUR 2,846,100.00, of which 85% is financed from the European Regional Development Fund.

- The project is expected to last until June 30, 2022.

**Partners:**

Molise Region - Civil Protection (lead partner)

Split-Dalmatia county

Veneto region

Faculty of Civil Engineering, Architecture and Geodesy, University of Split

EEIG Eurelations

Alma Mater Studiorum - University of Bologna

Municipality of Pescara

Adriatic-Ionian Euroregion

Zadar County Rural Development Agency - AGRRA

City of Dubrovnik

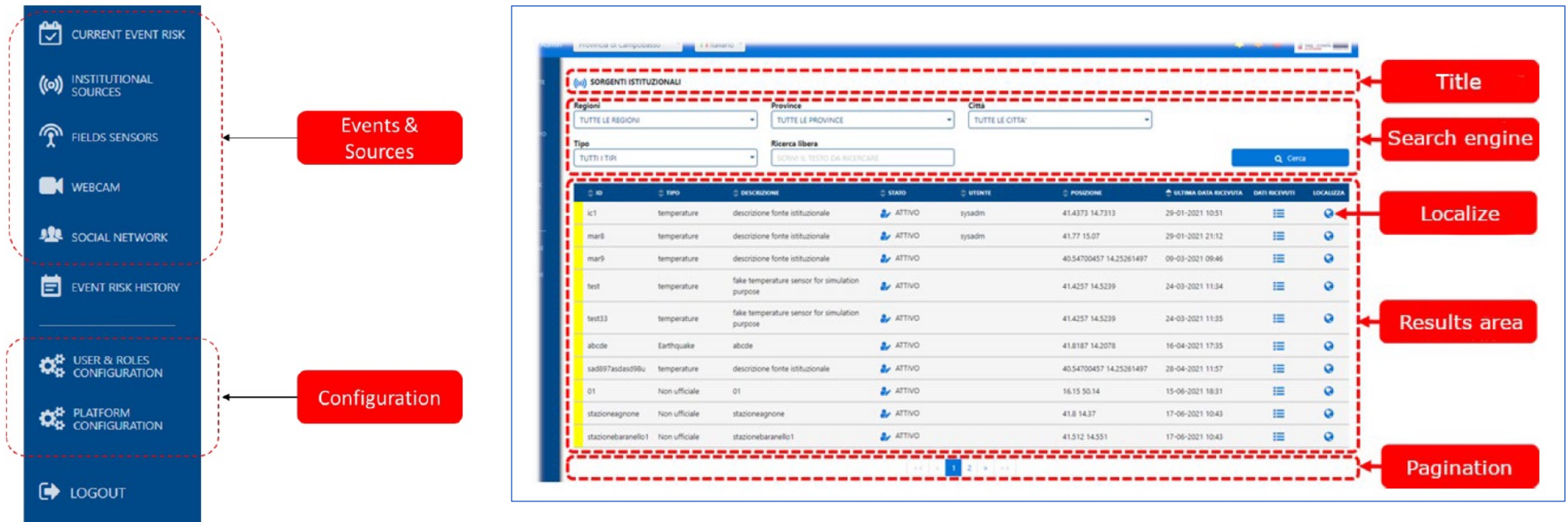# EDSS platform functionalities

Unified display of information on the map collected from:

- citizens through social networks;

- sensors (eg meteorological data);

- by developing a scenario of crisis development with potential risks.

The Dashboard is divided into four workspaces.

# EDSS platform functionalities

# EDSS platform functionalities for event detection

- Graphical notification about potential emergency event

- A widget for synthesis of potential events which are broken down according to the event's gravity and probability

- Details about potential event

- List of potential actual events stored in the Platform

- Geo location of possible events and sources recorded on the platform with access to the latest input directly, using the map.
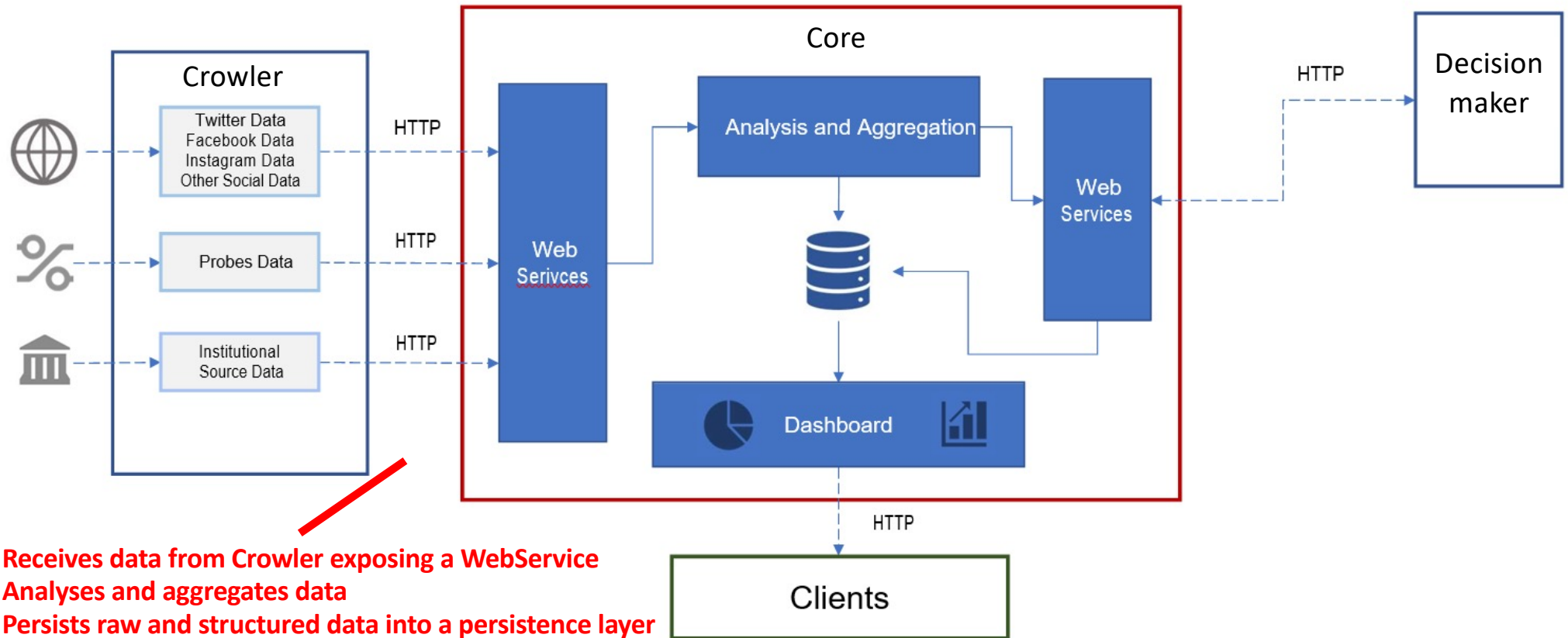
# EDSS architecture
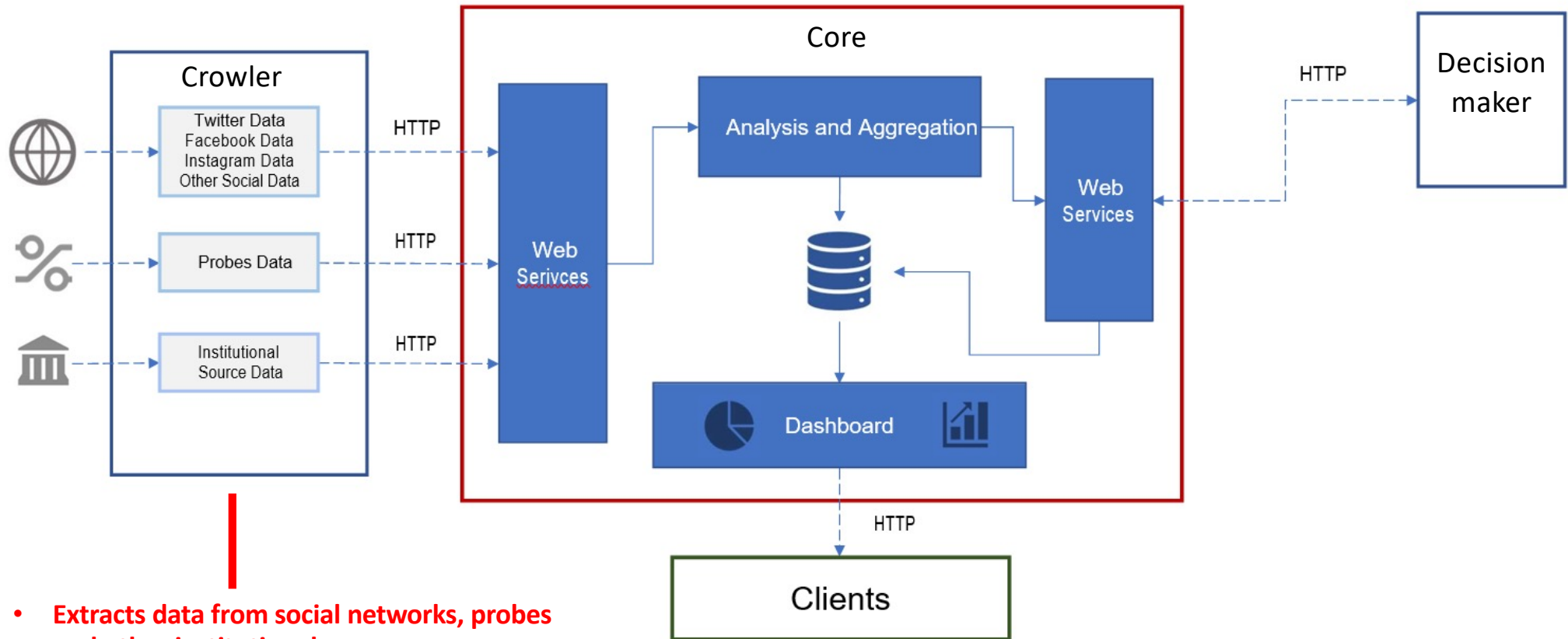


- **Extracts data from social networks, probes and other institutional sources**
- **Sends data to Core via Web Services**

# EDSS architecture



- **Receives data from Crowler exposing a WebService**
- **Analyses and aggregates data**
- **Persists raw and structured data into a persistence layer**
- **Exposes Web Services for sending bulks of aggregated data to Decision Maker**
- **Exposes Web Services for receiving elaborated data produced by Decision Maker**
- **Populate a web based dashboard - visualise features to all clients connected**
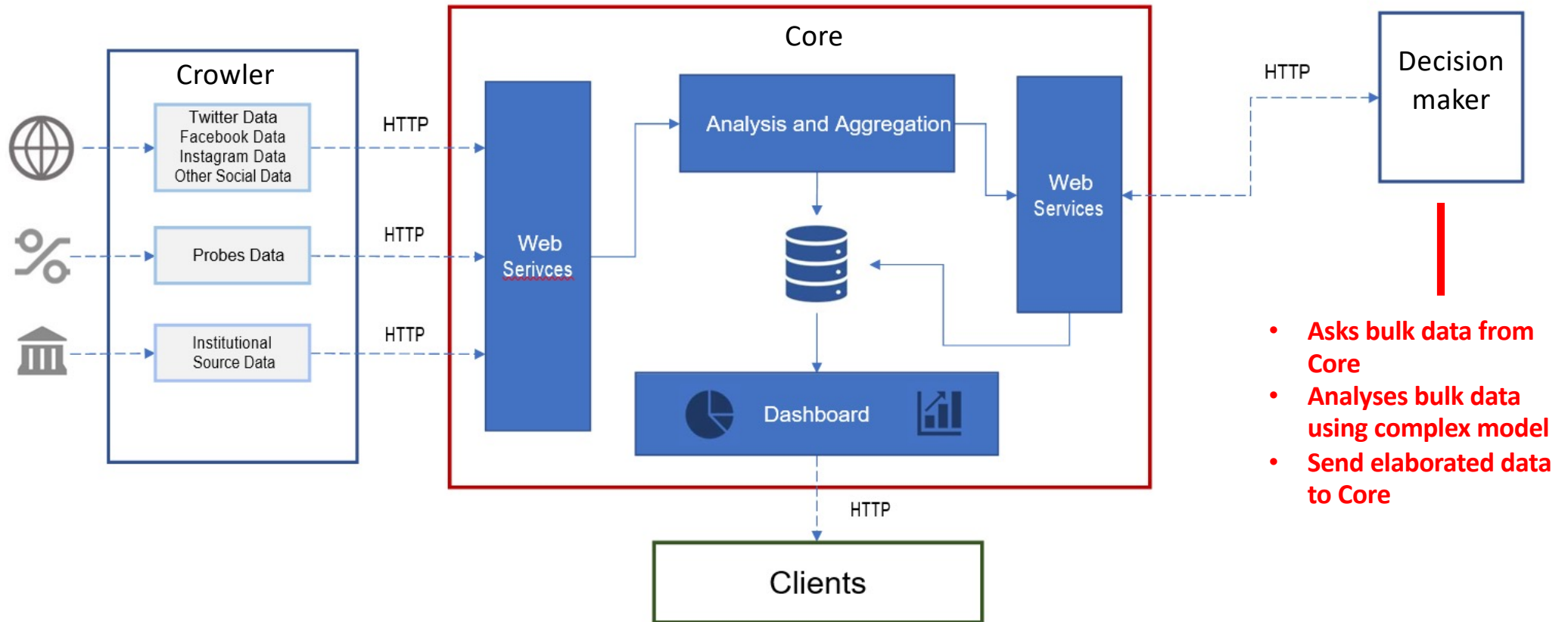
# EDSS architecture

# Social media component

- provide social network emergency miners that will use available software development kits (web APIs) or crawlers to **collect and store non structured data from social networks**;

- **semantic analysis engine** to streamline and normalize heterogeneous data collected from social networks to individuate, extract and classify information relevant for the emergency situations using developed thesaurus;

- decision maker **engine that evaluates gathered information against set of defined criteria and alerts** in the case defined thresholds are exceeded, which may indicate a critical situation;

- **"GIS mapping" engine** to monitor the situation

(specifying for example, typology, alert level or affected areas by the emergency event and scheduling the search of social networks, providing start date/time, radius of the area in which the citizens' posts has to be located to be relevant for the analysis, any keywords / hashtags to be taken into consideration when extracting data from social media, showing on the maps geo-referenced posts used for the analysis and classification of the emergency events and their evolvement over time).

**Information flow from citizens to Civil Protection**
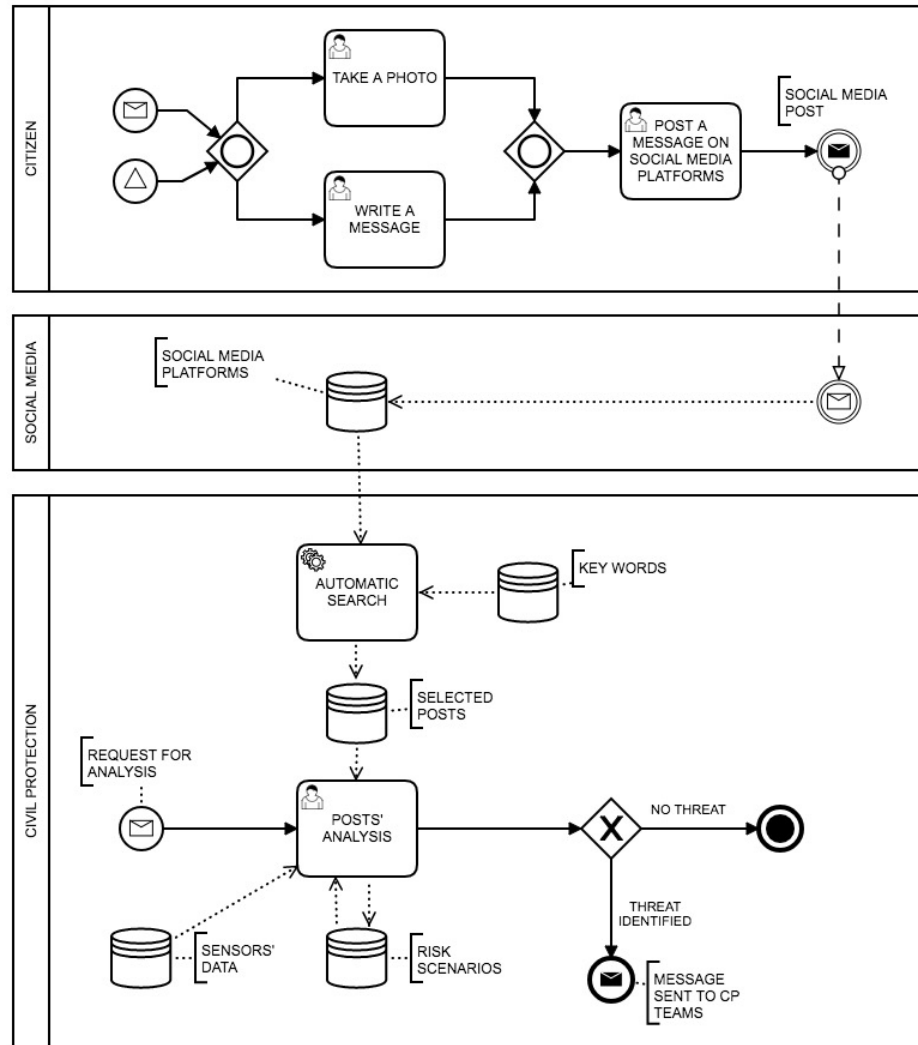
## Sources of semantic heterogeneity in the E-CITIJENS platform

| Sources of semantic heterogeneity – varios domains and languages | | | |
|---|---|---|---|
| **Data sources** | **Risks** | **Operations** | **Languages** |
| **Sensors data** meteo seismic | **Floods** | **Early warning** | **Italian** |
| **Citizens data** social media, crowdsourced | **Forest fires** | **Situational awareness** | **Croatian** |
| **Institutional data** topography, forecast | **Eartquakes** | **Relief operations** | **English** |
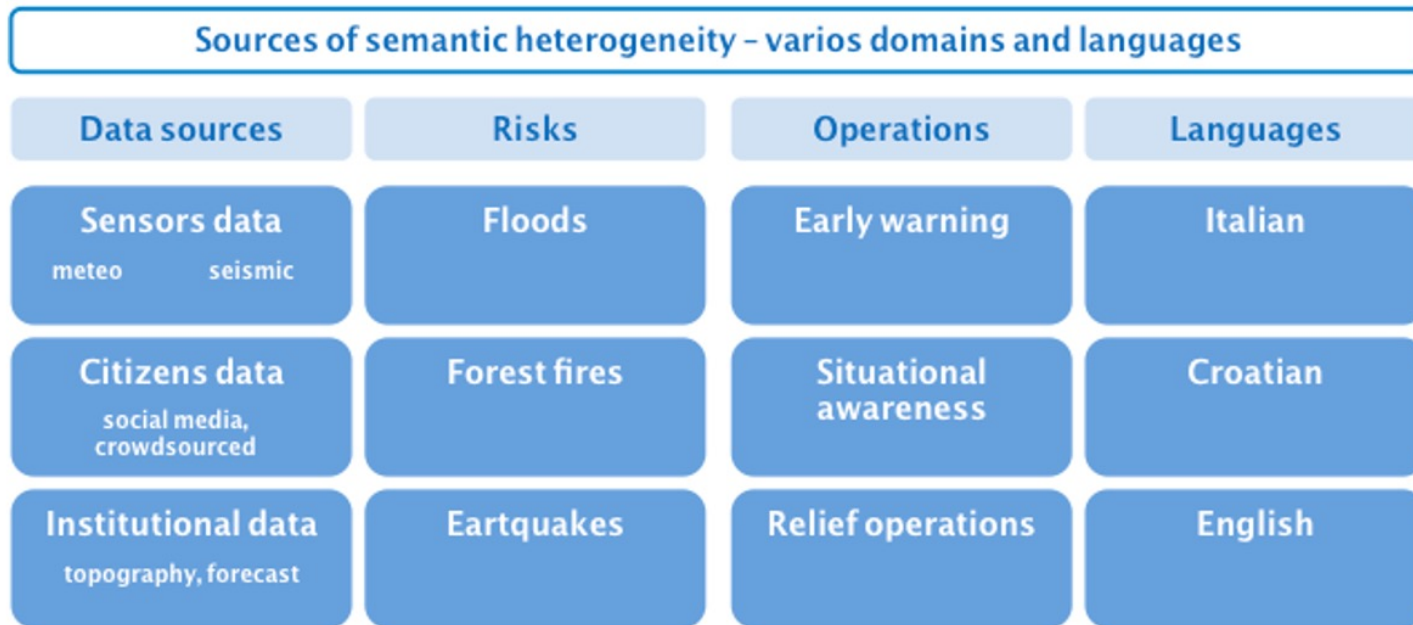
The best approach is to define a set of scores that will be applied to all the three risk typologies addressed by the project (i.e., the severity scales for floods, forest fires and seismic risk are identical).

| Score | Description |
|---|---|
| 0 | No relevance, the term has no relation to the risk typology addressed. |
| 0.25 | Low relevance, this term cannot be considered an indicator of a potential hazard concerning the risk typology addressed but can be essential to contextualise the post. |
| 0.50 | Medium relevance, this term can indicate a potential hazard concerning the risk typology addressed. |
| 0.75 | High relevance, this term explicitly indicates a potential hazard concerning the risk typology addressed. |
| 1 | This term unquestionably indicates potential and significant hazard concerning the risk typology addressed. |

# Examples of score attribution to the initial terminology terms

| Risk | Operation | Term (ENG) | Term (IT) | Term (HR) | Score Floods | Score Forest Fires | Score Seismic |
|---|---|---|---|---|---|---|---|
| Common | Common | DANGER | PERICOLO | OPASNOST | 1.00 | 1.00 | 1.00 |
| Flood | Common | FLOOD | ALLUVIONE | POPLAVA | 1.00 | 0.00 | 0.00 |
| Forest fires | Common | FIRE | FUOCO | VATRA | 0.00 | 0.25 | 0.00 |
| Seismic | Common | EARTHQUAKE | TERREMOTO | POTRES | 0.00 | 0.00 | 1.00 |

## Social media data processing

- pre-selection of the geographical area of interest (by the User)

- identification of the posts containing one or more initial terminology keywords (including their morphological variants);

- classification of each post according to the scores attributed to each key term contained;

- geolocation of the selected posts.

- The approach chosen is to calculate **the total score of a post (*S*)** as the sum of the scores attributed to the key terms therein contained for each risk typology:

$$S_j = \sum_{j=1}^{n} S_{ij}$$

where $S_i$ is the post's total score for a specific risk typology, *i* represents the risk typology addressed (floods, forest fires, seismic), *n* is the number of keywords in the post, and $s_{i,j}$ is the keyword score (0, 0.25, 0.50, 0.75, 1) for keyword *j* and risk typology *i*.

## Prioritisation rules for social media posts

- *S* **in absolute value indicates the post's relative importance** compared to the other posts selected for a given risk typology. The higher the total score, the higher the potential hazard.

- **A higher priority should be given to post containing any multimedia** (e.g. photos, videos) as they are more likely to contain additional information potentially useful for the analysis. To clarify, if two posts have the same total score, but just one contains a photo, the higher priority is given to the last one.

- In general, **the higher priority should be given to the posts that contain the project-specific hashtags** since they should be the ones addressed directly to the platform.

#EDSS

# Data input for Italian use case

#EDSS
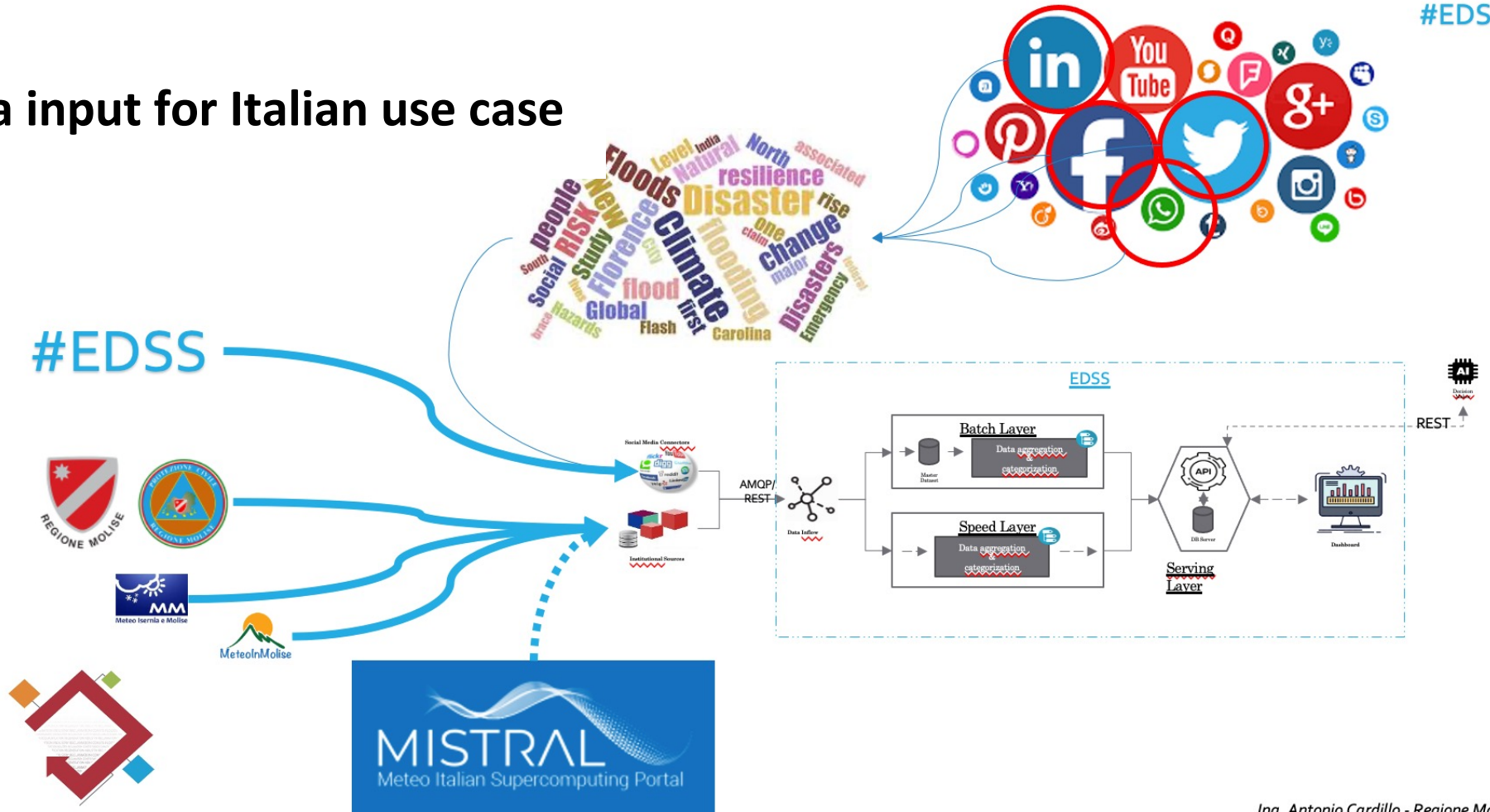
# Next phase
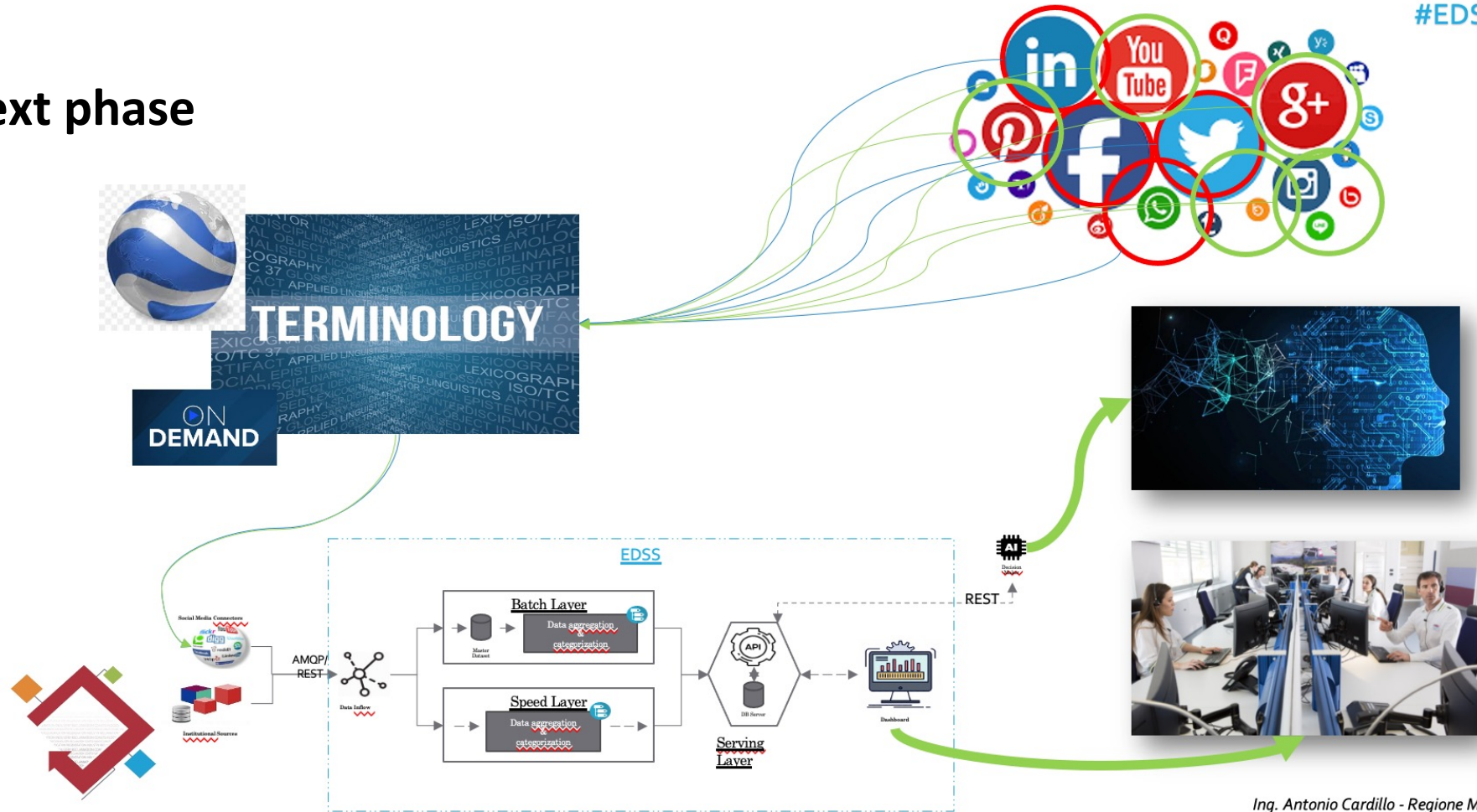


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