

Project Overview

WFRM Clustering Event

21/11/2023

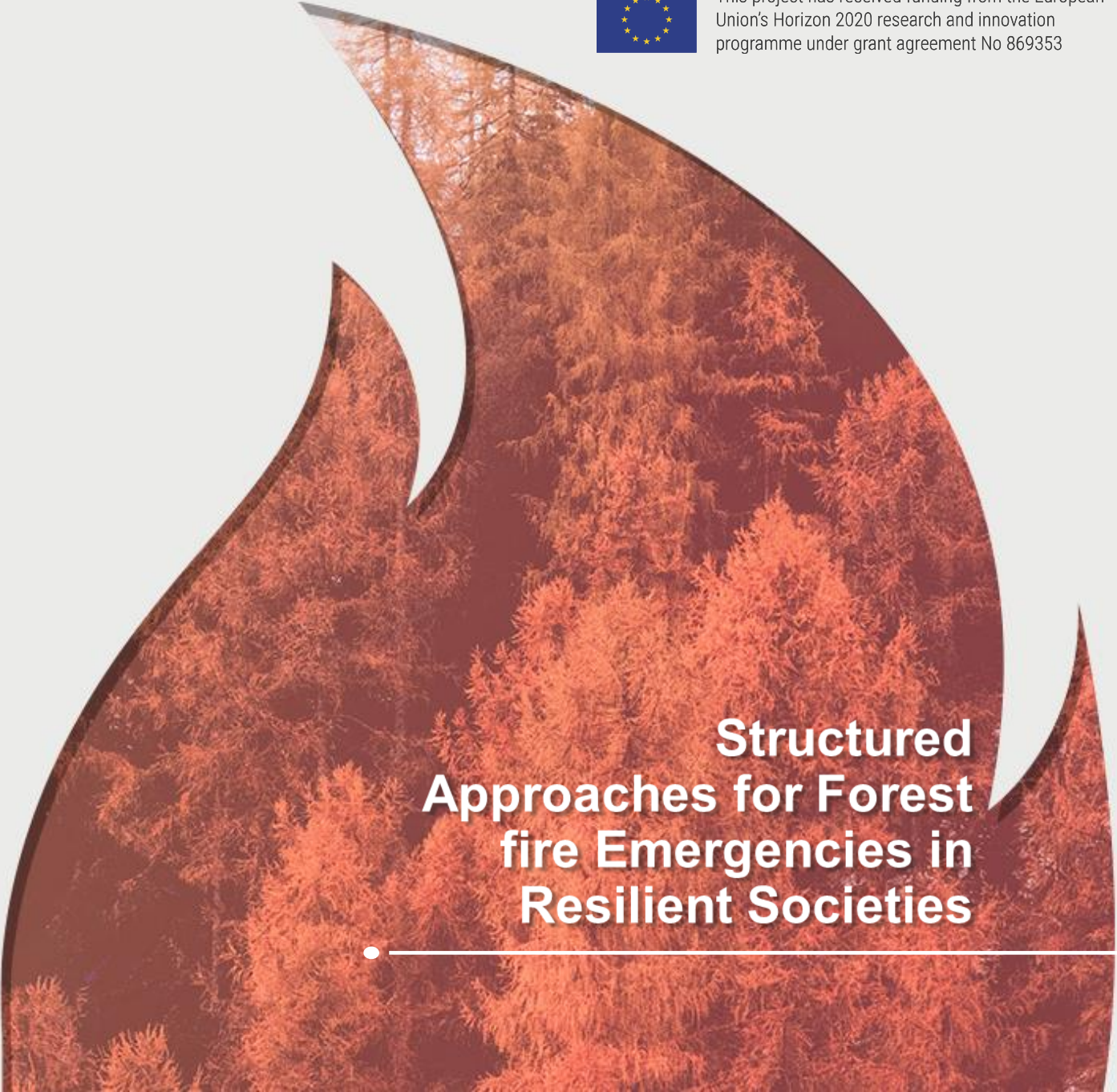
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FONDAZIONE
links
PASSION FOR INNOVATION



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869353



**Structured
Approaches for Forest
fire Emergencies in
Resilient Societies**

Structured Approaches for Forest fire Emergencies in Resilient Societies (SAFERS)

SAFERS project started in October 2020 for a period of 3.5 years (Oct 2020- Mar 2024) and with a budget of 3.25 million euros. It is coordinated by LINKS foundation and brings together 14 partners coming from 7 European countries.



3 years
(2020-2023)



3.25M
(H2020)



14 partners
(7 countries)



1 open platform
(for forest fire management)



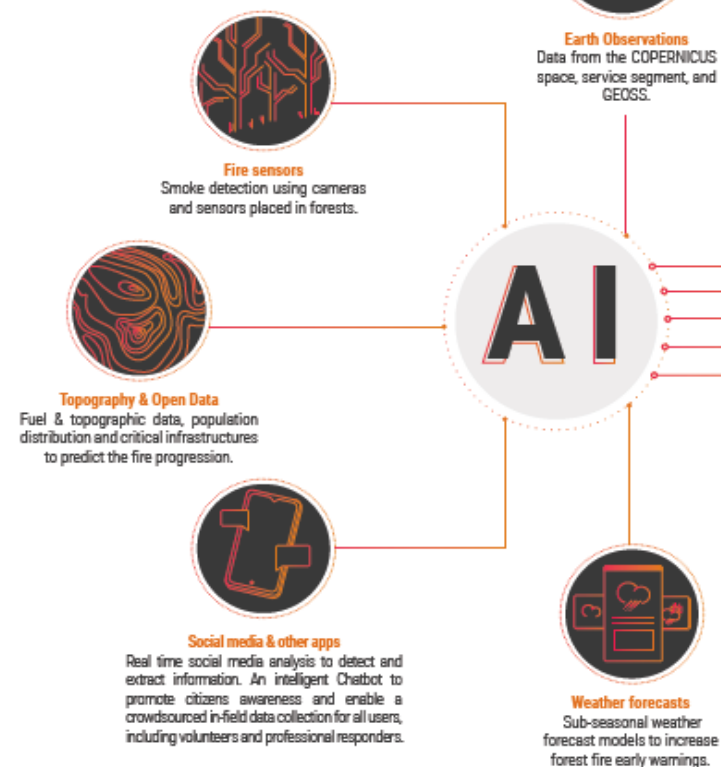
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Structured Approaches for Forest fire Emergencies in Resilient Societies

This project aims to create a **novel forest fire emergency management system** capable of acting along the whole emergency cycle. It will couple heterogeneous **Big Data** such as Earth Observation, in-field data and social media with advanced models based on Artificial Intelligence to make citizens, first responders and decision makers more **resilient against forest fires**.



The project in numbers



3 years
From 2020 to 2023



3.25 M
Total cost



14 partners
7 countries



4 demo sites
Italy, France, Spain & Greece



1 open platform
For forest fire management

SAFERS Open Platform

The open source SAFERS Platform is a **Big Data Emergency Management System** that uses AI and the outputs of the intelligent services to provide decision support.



Earth Observations
Data from the COPERNICUS space, service segment, and GEOS.



Risk maps
To detect fire-prone areas.



Early warnings
Early fire detection thanks to fire sensors and cameras.



Fire delineation and propagation
Coupling EO, weather forecasts, in-situ and crowdsourced data for generating delineation and propagation maps, enabling a better decision-making in the response phase.



Habitat recovery monitoring
Assess impacts on ecosystems in terms of soil and biodiversity to better plan restoration actions.



Impact assessment
Impact estimation in terms of economic losses for better decision-making.

PHASE A

Prevention and Preparedness

SAFERS creates an **early warning system and risk maps** to allow all stakeholders to be ready for a possible forest fire as well as to inform citizens. It integrates information extracted from **different sources**, including social media and mobile apps.



Citizens and volunteers play an active role in the emergency cycle



PHASE B

Detection and Response

SAFERS uses **multiple data sources** with advanced **AI** to map the fire status and to predict its propagation, **creating actionable information** for first responders and decision makers. It allows in-field citizens, volunteers, and professional responders to **provide situational updates** via an Intelligent Chatbot.



First responders have accurate information about the forest fire status and its evolution



PHASE C

Restoration and Adaptation

To **assess the impacts** of forest fires, SAFERS monitors the regeneration of **damaged ecosystems** and computes the economic losses resulting from burned areas, suggesting strategies to reduce the impacts of future emergency events.



Authorities have support for decision-making



Find out more



www.safers-project.eu



@SAFERS_H2020



SAFERS project



/SAFERS project

Coordinated by: **LINKS**

Partners:

Protezione LINKS - Fondazione CIMA - CERN
Belgian Link - Progettazione GMA - Biosens
Autosens Limited - Waterline SLR - Alpha
Carabinieri - Pao Costa Foundation - CSE Piemonte
- S.I.S. SP - Orla Onella Scientifico Sperimentale
Ministry of National Defence, Greece



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101019333

T5.1 Demonstration and training methodology

- 1 – Italy (Piedmont)** **2 – France (Corsica)**
3 – Spain (Catalonia) **4 – Greece (Thessaloniki)**



Definition of the overall structure of the demonstration activities as well as to the definition of the training of local stakeholders in testing the SAFERS ISs developed.

In SAFERS, **4 demonstrations** are executed **involving all the key actors of the emergency management cycle**, namely first and second responders, local authorities, volunteers, technical entities, and citizen.

The demonstration and training methodology is aimed at:

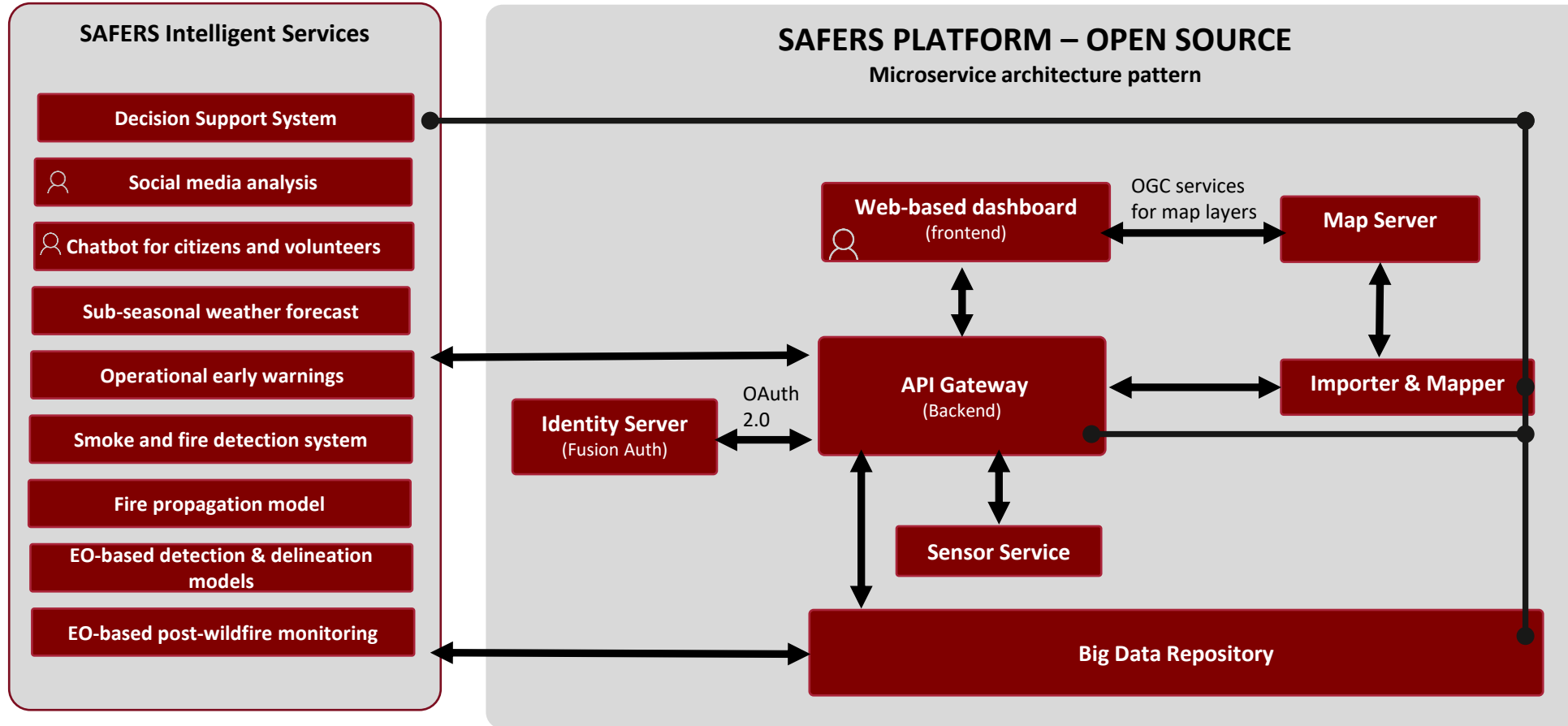
- 🔥 **Testing the functionalities of the SAFERS ISs in a controlled environment** with data and information of well-known events of the recent past and already available to local stakeholders.
- 🔥 Gather information on the **adaptability, reliability and usefulness** of the ISs in simulated in-field scenarios.
- 🔥 **Showing to the local Stakeholders** (first and second responders, volunteers, local associations, citizens) **the new technological development designed to increase their safety.**



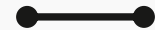
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Architecture



HTTPS REST APIs with JSON payload.
B2B authentication through API key.
User authentication through OAuth 2.0 (user will provide user and password and the AA Server will release a Token to be used in each API call)



Asynchronous Messaging System:
Publish/Subscribe Bus



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Intelligent Services – Operational Layers

Services that autonomously provide periodical updates for a given datatype (or multiple datatypes). Notifications are sent on the bus for every data delivered to the SAFERS platform.

1. Weather forecasts

- Deterministic (short term) & probabilistic forecasts (mid-term, sub-seasonal) derived from ECMWF

2. Early warning risk

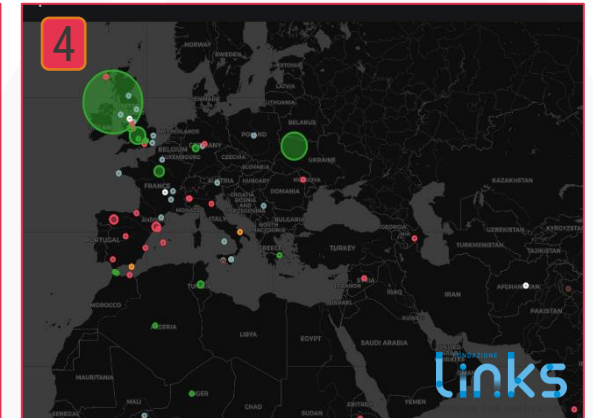
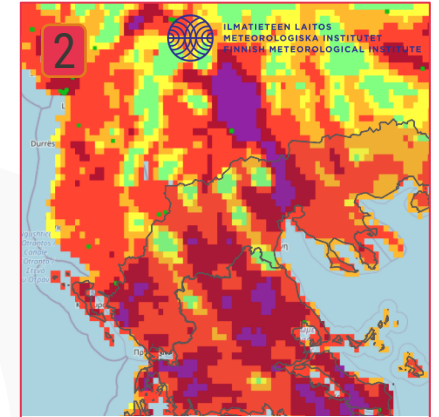
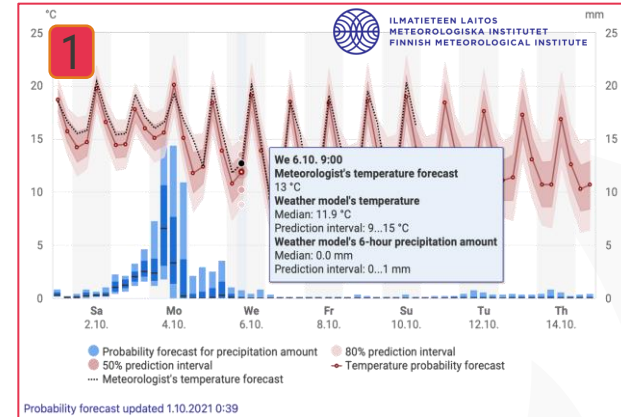
- FWI: deterministic and probabilistic with subindexes and anomalies. Raw data and aggregated at fire management unit

3. Smoke and fire detection system

- Images from in-situ cameras
- Smoke and fire detection alerts

4. Events from social media

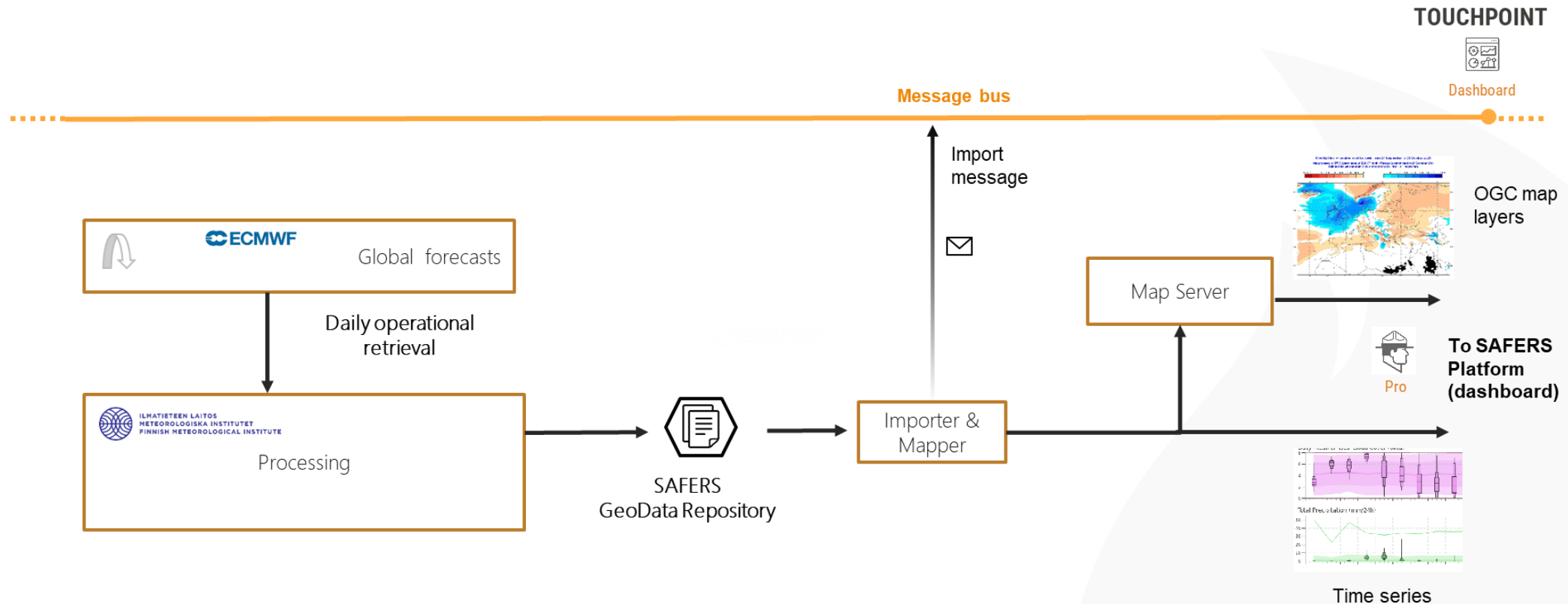
- Location and time of the event, relevant media
- affected people and infrastructures



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Operational Layers: subseasonal weather forecasts

TRIGGER: Automatic with periodic updates. Twice a day for short term, weekly for extended range, daily for FWI.



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Intelligent Services – On-demand Layers

Services that communicate through the **async message bus**. Triggered by a **map request**, containing a time interval, an area of interest and a specific datatype (or multiple datatypes). Once the requested data is available, the other services are notified through the bus.

1. On-demand wildfire nowcasts and forecasts

- Stochastic simulations of wildfire propagation (RoS model) based on vegetation type, slope, wind direction and speed, and fuel moisture content.

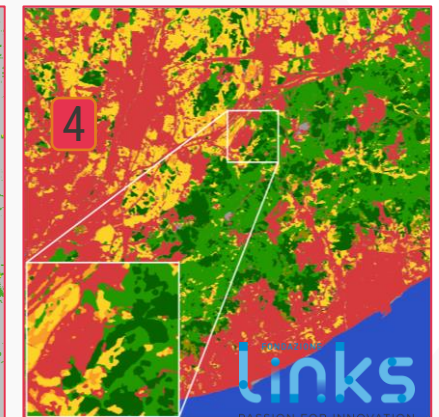
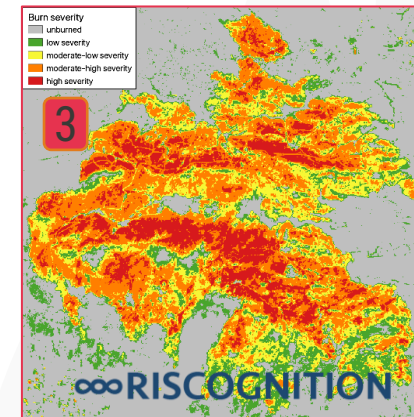
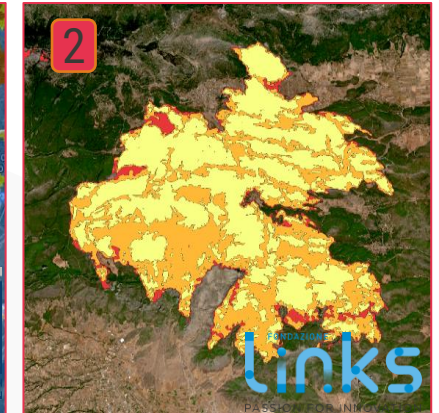
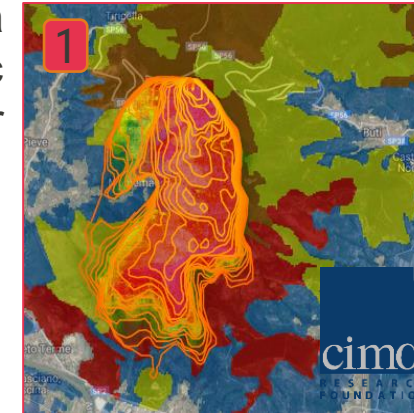
2. EO-based fire and burned area delineation

- Burned area delineation, burn severity estimation
- Fire front and smoke detection,
- Quantification of the impacted elements (land cover, infrastructures, people)

3. Post-event monitoring

- Long-term NDVI
- Long-term dNBR

4. Fuel maps



Montello et al. "MMFlood: A Multimodal Dataset for Flood Delineation From Satellite Imagery." *IEEE Access* (2022)

Trucchia et al. "PROPAGATOR: An operational cellular-automata based wildfire simulator." *Fire* 3.3 (2020)

Galatola et al. "Land Cover Segmentation with Sparse Annotations from Sentinel-2 Imagery." *IGARSS 2023*



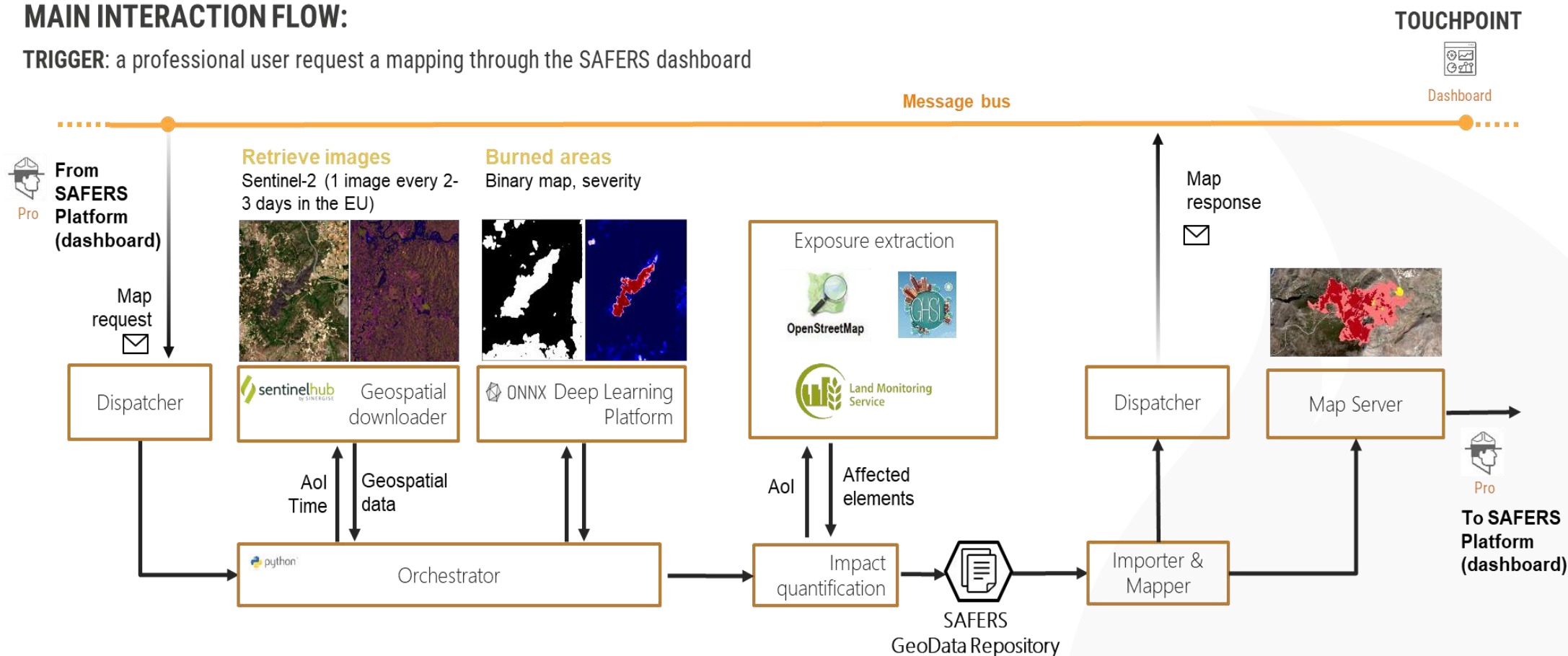
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On-demand Layers: Burned area mapping

MAIN INTERACTION FLOW:

TRIGGER: a professional user request a mapping through the SAFERS dashboard



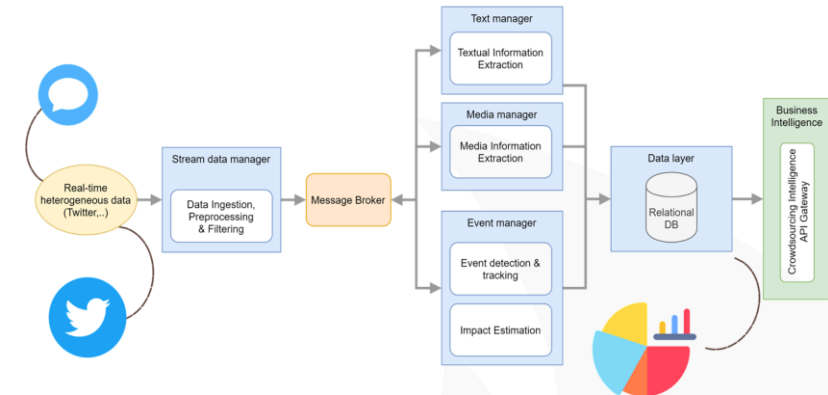
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Social Media Module

Main objective: extract informative content related to forest fire events, selecting and classifying multimedia information (text, images, videos), detecting events, and extracting impacts in terms of affected people and infrastructures.

The Social Module can:

- **Filter and classify tweets and content:** Informativeness, information type, hazard type, Named entity extraction, Image content classification, help request
- **Detect events:** estimate their location, start and end time
- **Extract their impacts:** quantification of affected people and infrastructures



Piscitelli et al. "Multilingual text classification from twitter during emergencies" *IEEE ICCE 2021*

Blanco et al. "Impact Estimation of Emergency Events Using Social Media Streams", *IEEE RTSI 2022*

Salza et al. "A 'glocal' approach for real-time emergency event detection in twitter", *ISCRAM 2022*



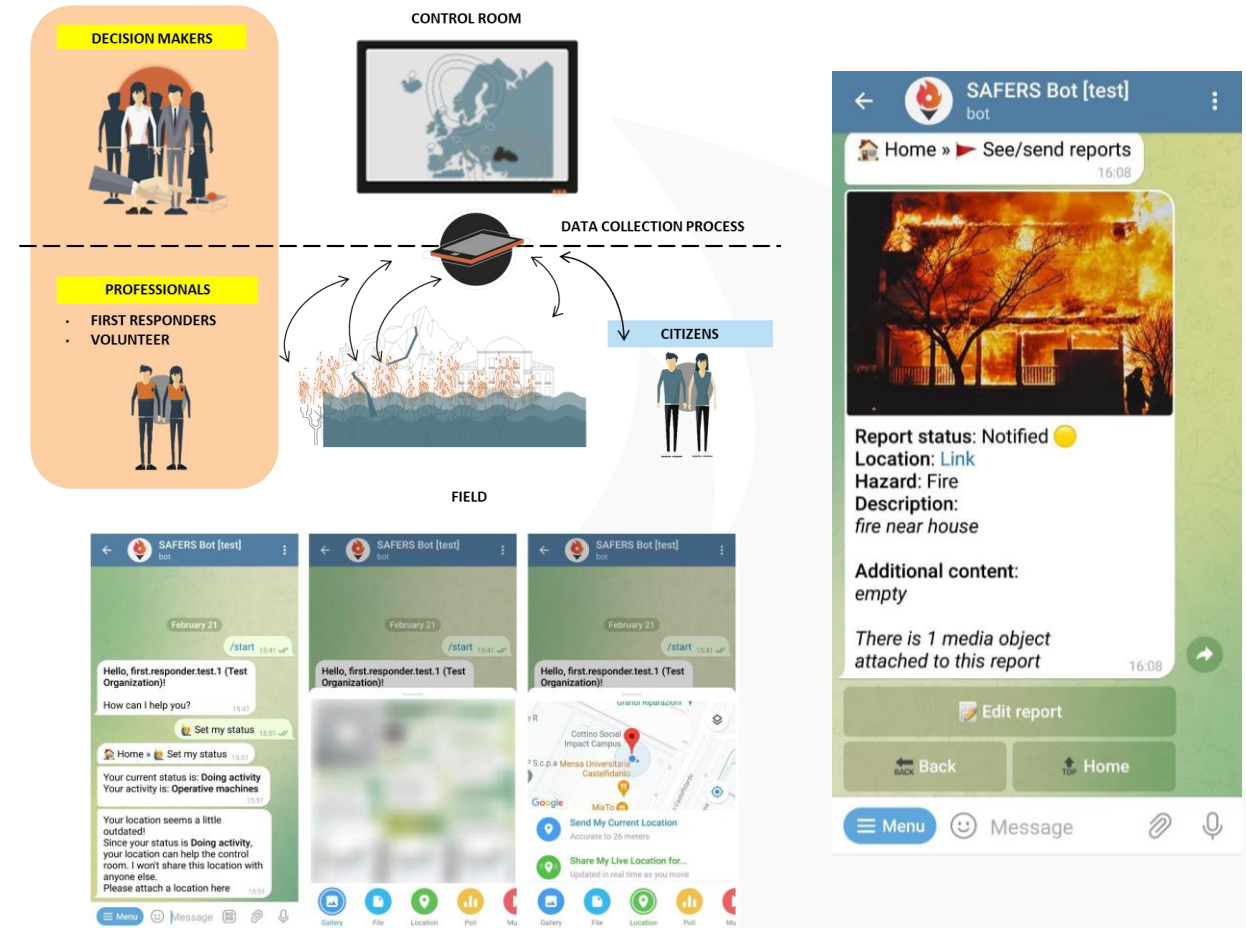
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Crowdsourcing solutions – Chatbot

Main objective: devise an intelligent Chatbot, creating a communication channel between the control room and the people involved - citizens and professionals - in potential emergency situations

Through the chatbot, users can:

- **Create Reports**
- **Receive Communications**
- **Update location, status activity** (professionals)
- **Manage Missions** (professionals)
- **Read tips and answer quizzes** (citizens)



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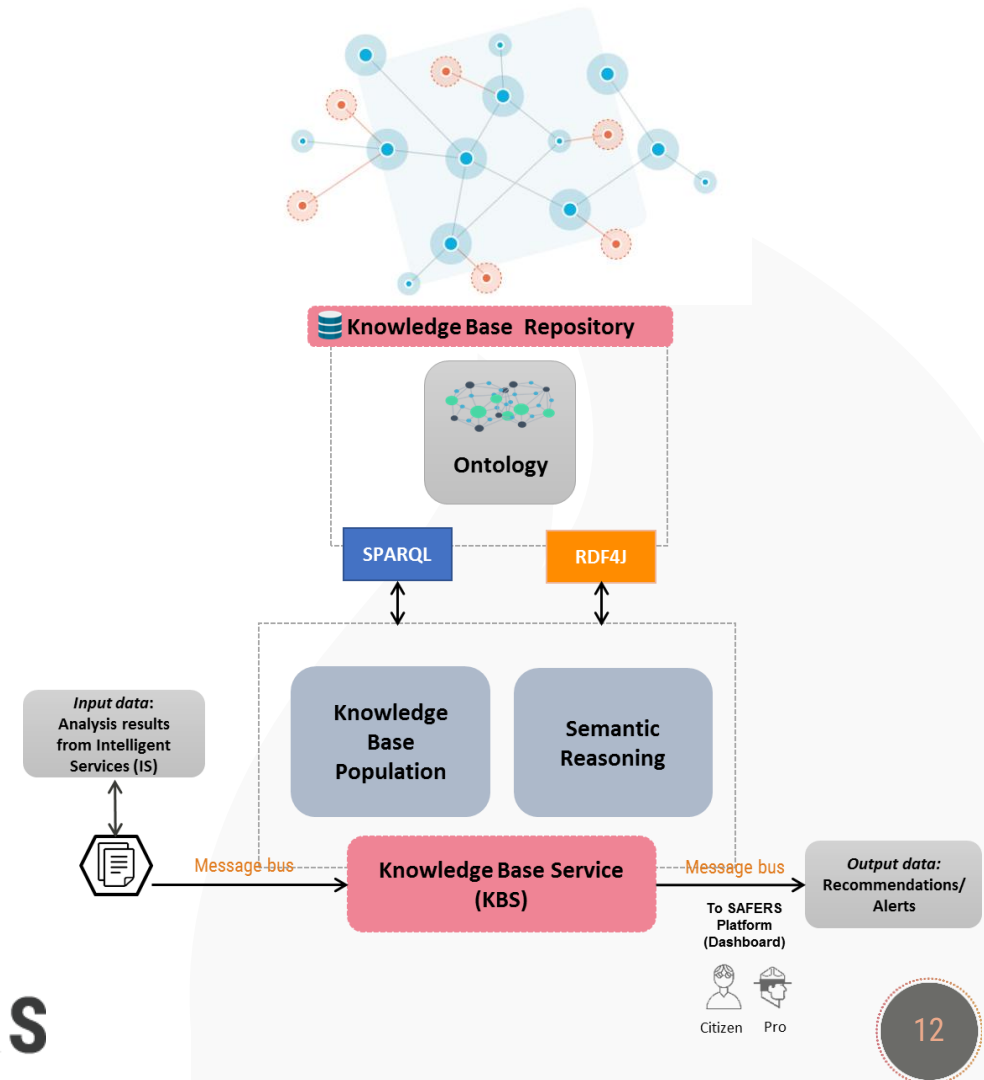
Intelligent Services – Decision Support System



CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

Main objective: Translate incoming data from earth observations, weather forecasts, social media apps, etc., into valuable information to help society become more resilient by enabling the generation of sophisticated alerts and visualising them to the Dashboard

1. posts data to the SAFERS GeoData Repository (securely through AUTH)
2. The GDR stores the data and publishes a message to the Message bus
3. The KBS receives the message and retrieves the required data for the reasoning tasks
4. KBS posts enriched data in the form of an alert / recommendation to the Dashboard



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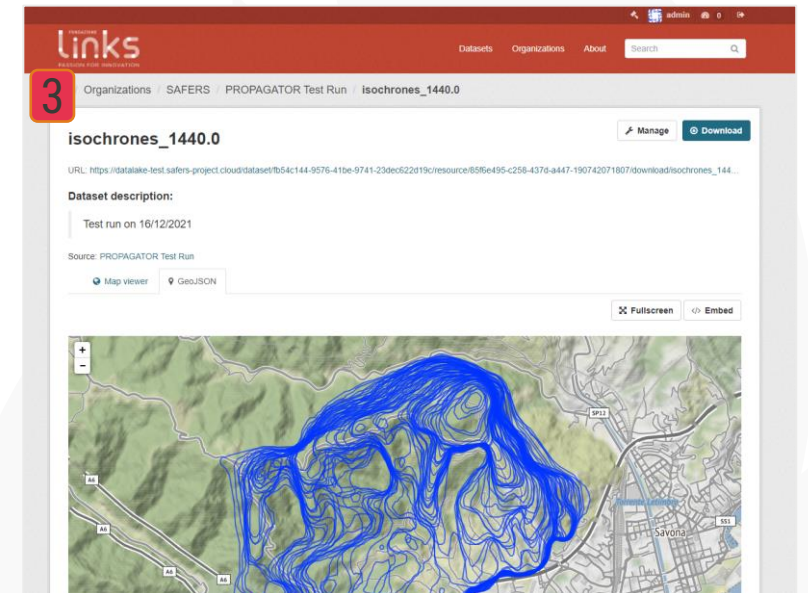
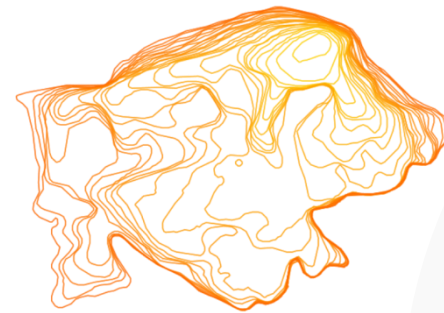
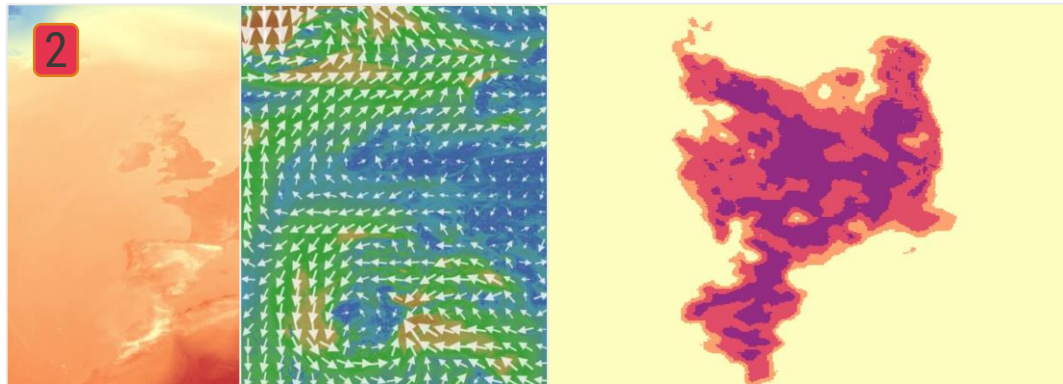
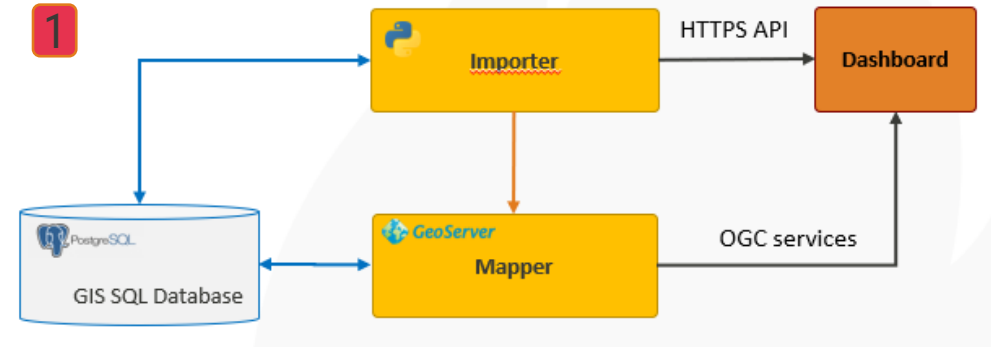
SAFERS Geodata repository



Main objective: repository for storing geospatial data directly supplied to the system or produced by intelligent services. Data is uploaded into a Data Lake, converted by an importer into OGC-compliant layers (WMS, WMTS, WFS, WCS).

Main functionalities:

- Support of INSPIRE metadata (1 - 3)
- Integration with OAuth2 authorization and authentication system
- Support of geospatial data (2)
- Notification on SAFERS messaging system (1)
- Integration with data cloud storage



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Thank you for your Attention!

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