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SnapEarth

EarthPress Solution: Enabling Artificial Intelligence for real-time generation of News articles related to disasters based on EO data

20.09.2022

www.snapearth.eu

Alexandros Zamichos - CERTH

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

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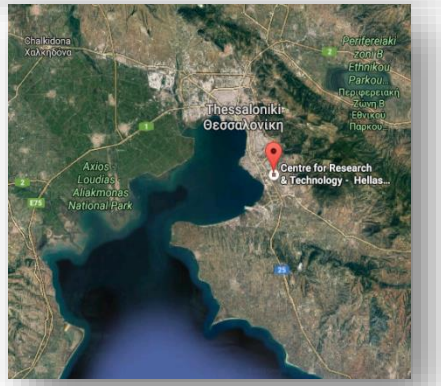
INNOVATION SPIRIT

GROUP

ROMANIA

Center for Research & Technology Hellas (CERTH)

- **Founded in 2000** and is one of the leading R&D centers in Greece
  - >800 employees
  - >1500 research projects
  - >1500 international partners
- Includes five (5) institutes:
  - Chemical Process & Energy Resources Institute (CPERI)
  - **Information Technologies Institute (ITI)**
  - Hellenic Institute of Transport (HIT)
  - Institute of Applied Bioscience (INAB)
  - Institute of Bio-Economy and Agri-Technology (IBO)
- **Annual financing ~ € 30M:**
  - 30% industrial research contracts
  - 60% research projects
  - 10% government institutional funding



Listed among **TOP-20 E.U. institutions** with the highest participation in competitive research grants

Information Technologies Institute (ITI)

- Founded in 1998 as a non-profit organisation
- Part of CERTH since 2000 , **~400 employees**
  - **11 Senior Researchers, 80 Post docs, 80 MSc, 230 Assoc. Researchers** (mainly Electrical & Computer Engineers and Computer Scientists)
- Leading Institution of Greece in the fields of Informatics, Telematics & Telecommunications, etc.
- Project record (> 500):
  - >200 Horizon2020 EC co-funded Research Projects
  - >100 Research/Innovate National R&D Projects
  - > 120 Consulting subcontracts with the Private Sector (Industry)
  - Around 10 M€ funding per year during the last 3 years
- Publication record (2013-2019):
  - >250 journals; >650 conferences; >60 books and book chapters; >14.000 citations

1st in Greece for **the last 7 consecutive years** in the participation in competitive research grants (FP7, H2020)

EarthPress Overview

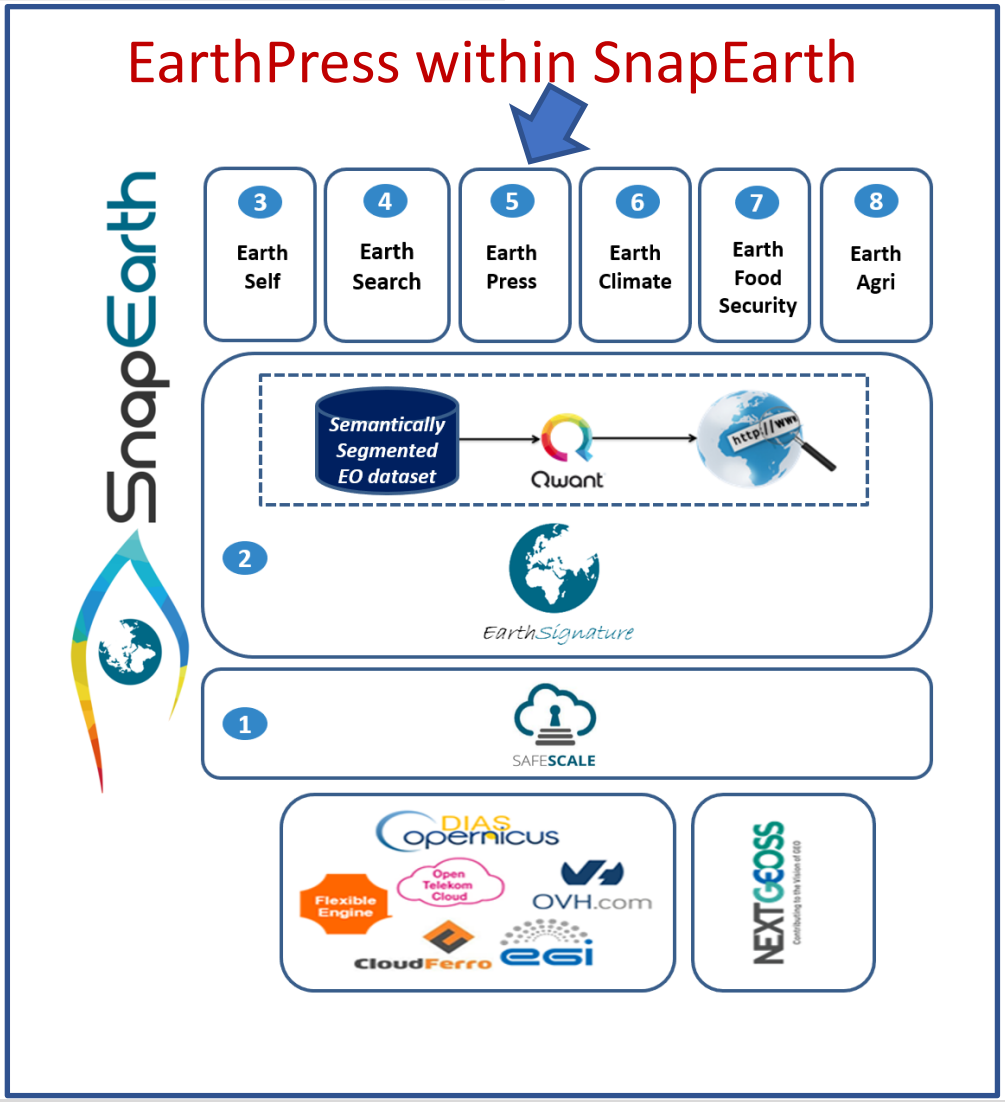
EarthPress

- A **web platform** that scopes to **facilitate journalists in synthesizing news** articles about **disasters**

The platform will :

1. **provide access** to **multimedia** data **from multiples sources**
2. **detect** automatically **breaking news** related with disasters
3. **extract** & **present** useful **information** and statistics **from geospatial data**
4. **generate automatically** ready to print **news articles**

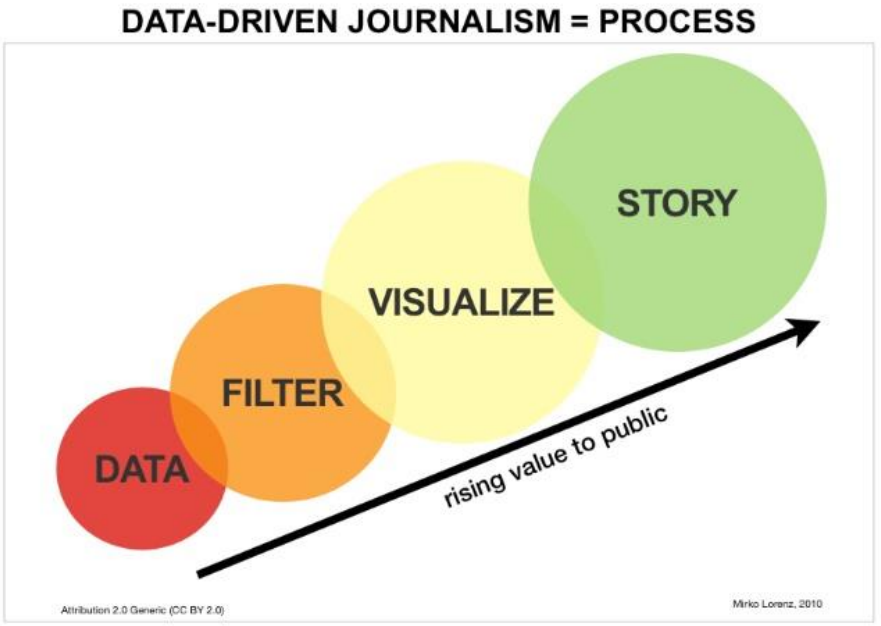
Why such a platform could be useful ?



Data-driven journalism

- **Data-driven journalism** is a **journalistic process** based on **analyzing** and **filtering large data sets** for the purpose of **creating** or elevating a **news story**.

- **Steps of the process:**
  - **Data collection:** raw data needs to be available (search for data on the web)
  - **Data filtering:** process of filtering relevant information with the news story
  - **Data visualization**: process of transforming data & creating visualizations to help readers understand the meaning behind the data
  - **Story generation (publishing):** process of creating the story and attaching data & visuals to the story



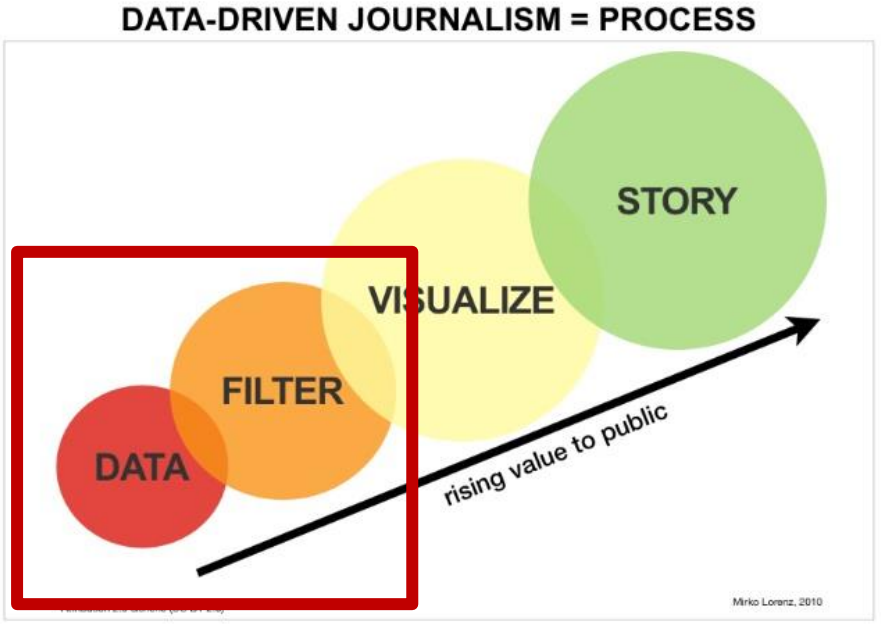
Difficulties in data-driven journalism (1/2)

Data collection:

- multimedia collection for articles can be laborious
- information retrieval from **multiple sources** requires programming knowledge

Data filtering:

- Handle the **tremendous amount** of collected data
  - **Different** specialized **formats**
- Filter out **misinformation** & **fake news**



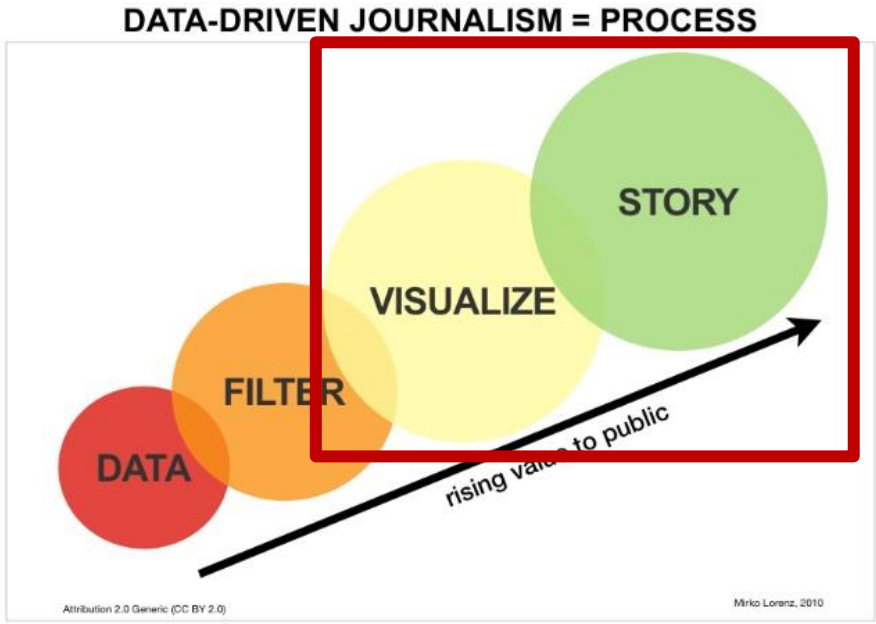
Difficulties in data-driven journalism (2/2)

Data visualization:

- **Extract additional knowledge** from multi-media (e.g. extract automatically the flooded area from satellite images , videos) **and create** easily **understandable visualizations**

Story generation (publishing):

- **Combine all the available** data for synthesizing the final article
- Limited available response time for publishing breaking news



The whole process ➔ A time consuming procedure

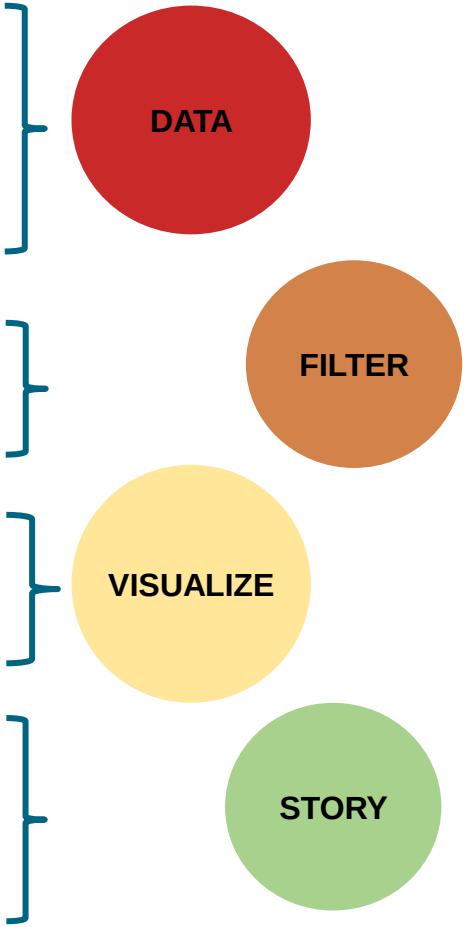
Journalists data sources

- **Commonly used**
  - **Google suite**: multimedia content, related information & news articles, maps
  - **Social media**: multimedia content, tweets, etc.
  - **News sites**: multimedia content & news articles
  - **TV news**: videos
  - **Government agencies**: statistics & comments
  - **Photo reporters**: images

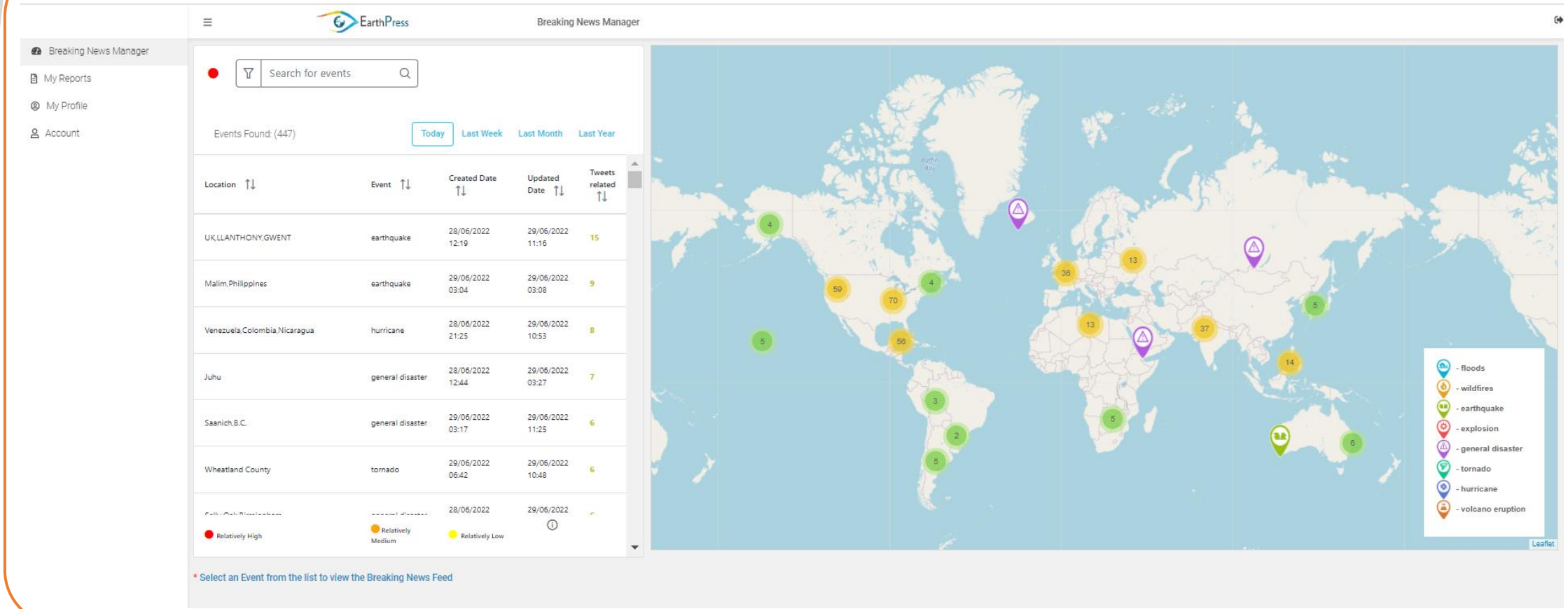
- **Rarely used:**
  - **Copernicus**: satellite images
  - **NASA**: satellite images

EarthPress Scope

- EarthPress targets in **facilitating journalist** to
  - access **reliable multimedia information from multiple sources**
  - **monitor** natural disaster events through a breaking news manager
  - **access Earth Observation** (EO) data from Copernicus in an **easily manipulated format**
  - **filter** and present only the **relevant** to the news story **data**
  - **distinguish** real from **fake news** and posts
- Extract rough **statistics** from satellite multispectral data
- Provide **changes in land cover** in the form of information layers
- **synthesizes** ready to print AI generated **article tailored to user profile**
- Provide all the above in **a single platform**
- **Reduce time needed for publishing news articles**



EarthPress Interface Overview



Breaking news manager

EarthPress Interface Overview

- **Functionalities**
  - Disastrous events identification
    - Downloading of multimedia content from Tweets/News Articles
    - Information extraction
      - Event's date
      - Event's type(i.e. earthquake, floods, fires, explosion, tornado, hurricane, volcano eruption, general disaster)
      - Event's location
    - Fake new detection (ongoing task)
  - Filtering of disastrous events related tweets
  - Search events by keywords
  - Apply filters in the search bar
    - By type (e.g. present only explosion events)
    - By date
    - By location
  - Downloading and processing of satellite images

EO data retrieval-Visual information processing

Data:
- Sentinel-2 Level-2A products.
- CLC*

❖ **PROBLEM**

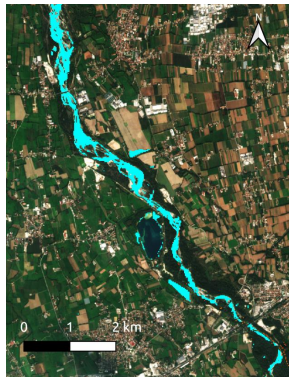
Challenge in CLC annotations: coarser resolution (100m) than 10m spatial resolution of Sentinel-2 imagery

❖ **SOLUTION**

EarthSignature: semantic segmentation model

EarthPress

EarthSignature



The CLC 2018 classes affected from the flood are:	
Beaches dunes sands	48.18%
Broad-leaved forest	22.60%
Transitional woodland-shrub	10.93%
Non-irrigated arable land	9.96%

Total area affected from the flood:	1.43 km^2
Uncertainty:	[-0.58%, +3.31%]

**CORINE land cover (CLC): The 'Coordination of information on the environment' (Corine) is an inventory of European land cover split into 44 different land cover classes.*

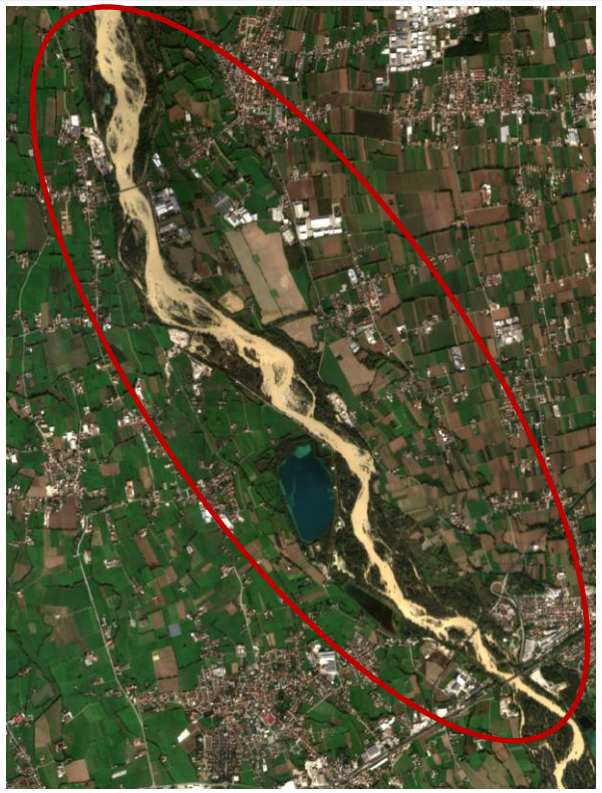
Visual information processing (1/2)

SnapEarth

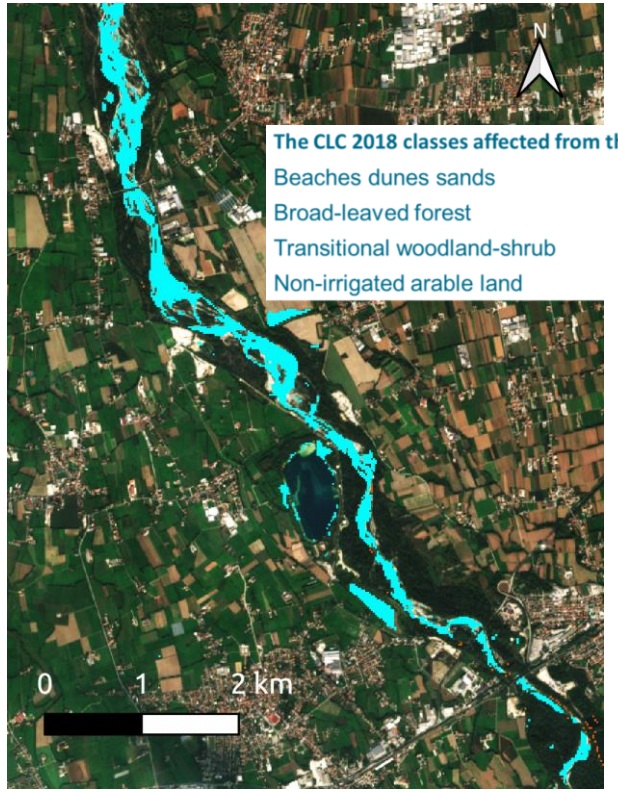
Flood event mapping in Giaretta Lake, Italy

Flood event between 21/10/18 and 31/10/18

Before



After



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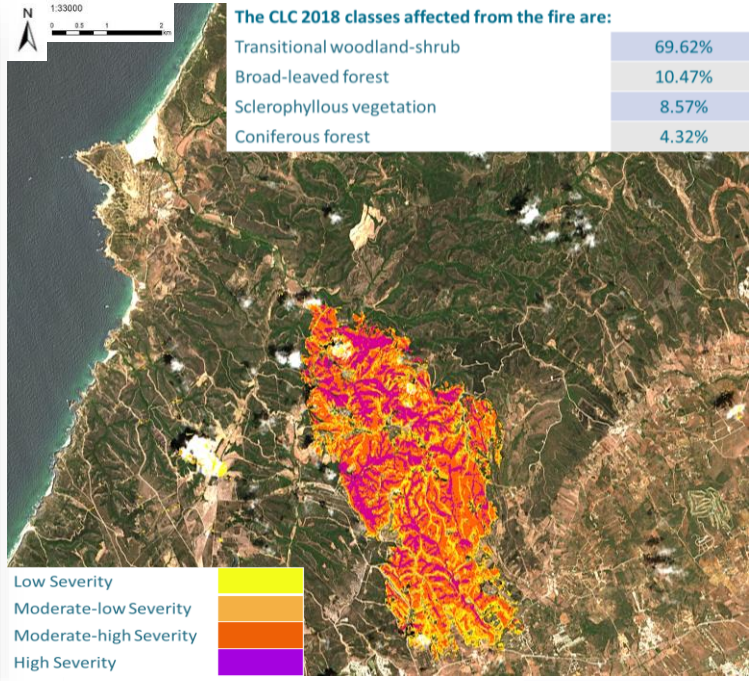
Visual information processing (2/2)

Fire in Barao de Sao Joao, Portugal

Fire event 19/06/20

Before

After



Total area affected from the fire	22.44 km²
High severity	4.81 km²
Medium-high severity	8.94 km²
Medium-low severity	5.06 km²
Low severity	3.63 km²
Uncertainty	[-1.8% ,+0.5%]

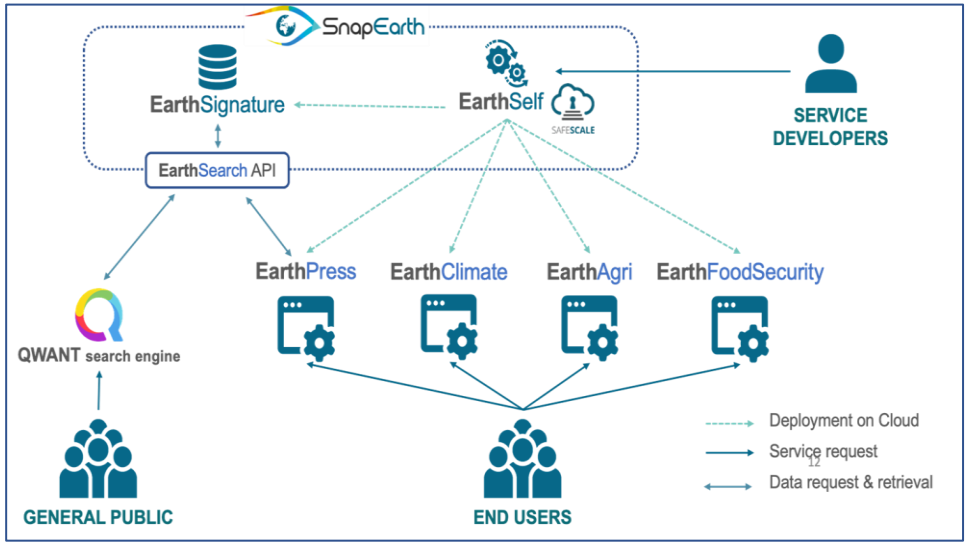
Copernicus EMS and EarthPress comparison

	EarthPress (fires, floods)	On demand Rapid Mapping (fires, floods)	EFFIS (fires)	EFAS (floods)
Resolution of products	**10m**	Product specific	250m / 375m	100m
Time from event to results	• **About 30 minutes for processing** • **Depended on the availability of Sentinel-2 imagery – 3 days max frequency**	A few hours to days for final products	1-2	30 days
Access to produced products	**Journalists, Public (following the business plan of the project)**	Public	Public	Public
Product creation requests	**users or automatic**	only from authorized users	automatic or authorized users	automatic or authorized users

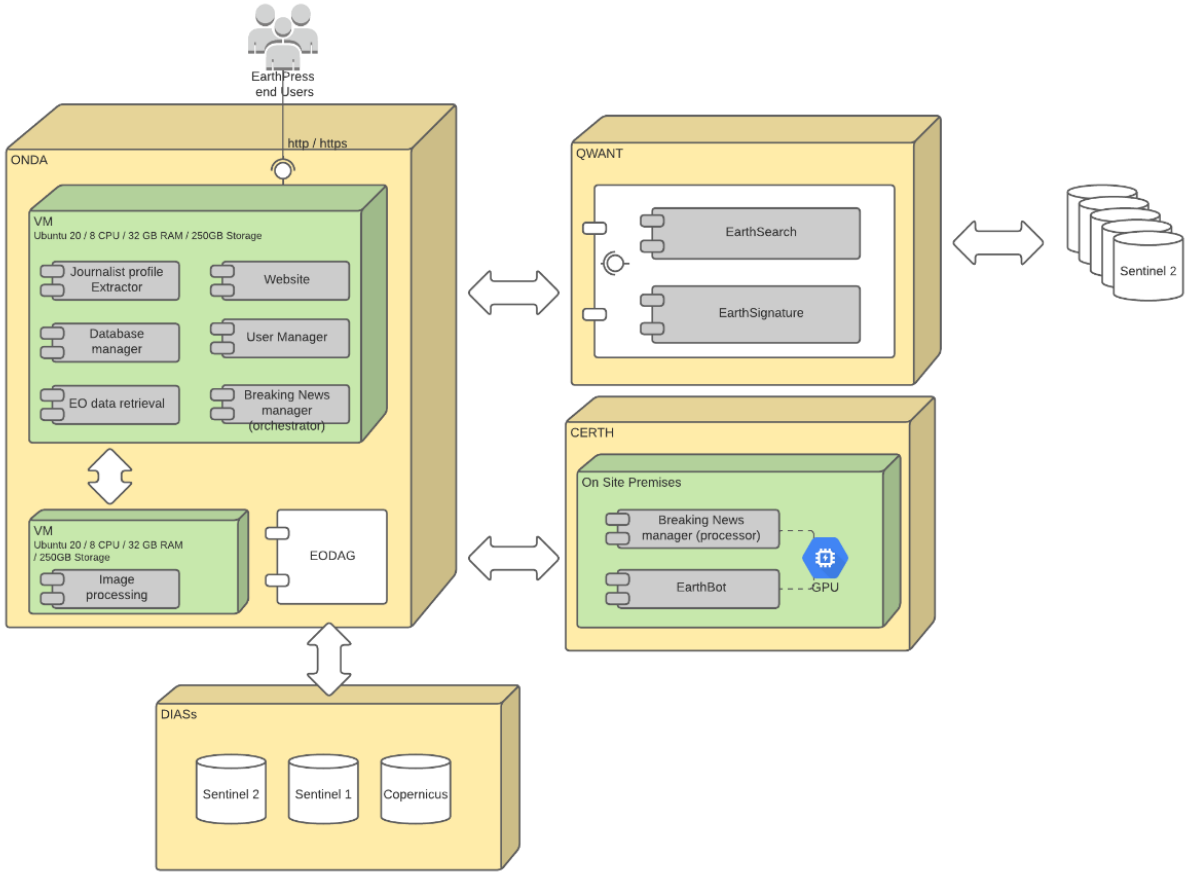
EarthPress global coverage

- EarthPress can detect disastrous event in a worldwide level.
- EarthPress can process and detect changes globally from satellite data.
- EarthPress uses Corine Land Cover (CLC) 2018 to determine land cover affected from the event (for areas within Europe).
- This functionality will be further enhanced by the EarthSignature component, that will provide more timely and accurate information (for areas within Europe).
- Regarding events outside Europe, land cover affected information can be potentially extracted from a global land cover layer (e.g. Copernicus Global Land Cover – 23 classes in total, 100m resolution)

EarthPress platform deployment



- Deployed on a machine in cloud (Creodias)
  - 2 x 8 CPUs
  - 32 GB RAM
  - 0,25 TB Object Storage



Contact

- Website: https://snapearth.eu/
- Newsletter: https://snapearth.eu/resources/newsletters
- Social Media:
  - Facebook: https://www.facebook.com/SnapEarth-101390444737532/
  - Twitter: https://twitter.com/Snap_Earth
  - LinkedIn: https://www.linkedin.com/showcase/snapearth/
- General questions: contact@snapearth.eu
- Specific solutions:
  - EarthPress: drosou@iti.gr, imanakos@iti.gr, zamihos@iti.gr, mtsourma@iti.gr, avgikou@iti.gr, chadoulis@iti.gr, afrokita@iti.gr

- Please give us you feedback about the EarthPress platform by filling the following : questionnaire

Questions ?

Centre of Research & Technology - Hellas
Information Technologies Institute