



# BEYOND

Building a Centre of Excellence  
for EO-based monitoring of Natural Disasters



## DisasterHub

A mobile application for enabling crowd generated data fusion in Earth Observation disaster management

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**Athens, Electra Palace**



FP7-Regpot-2012-23-1

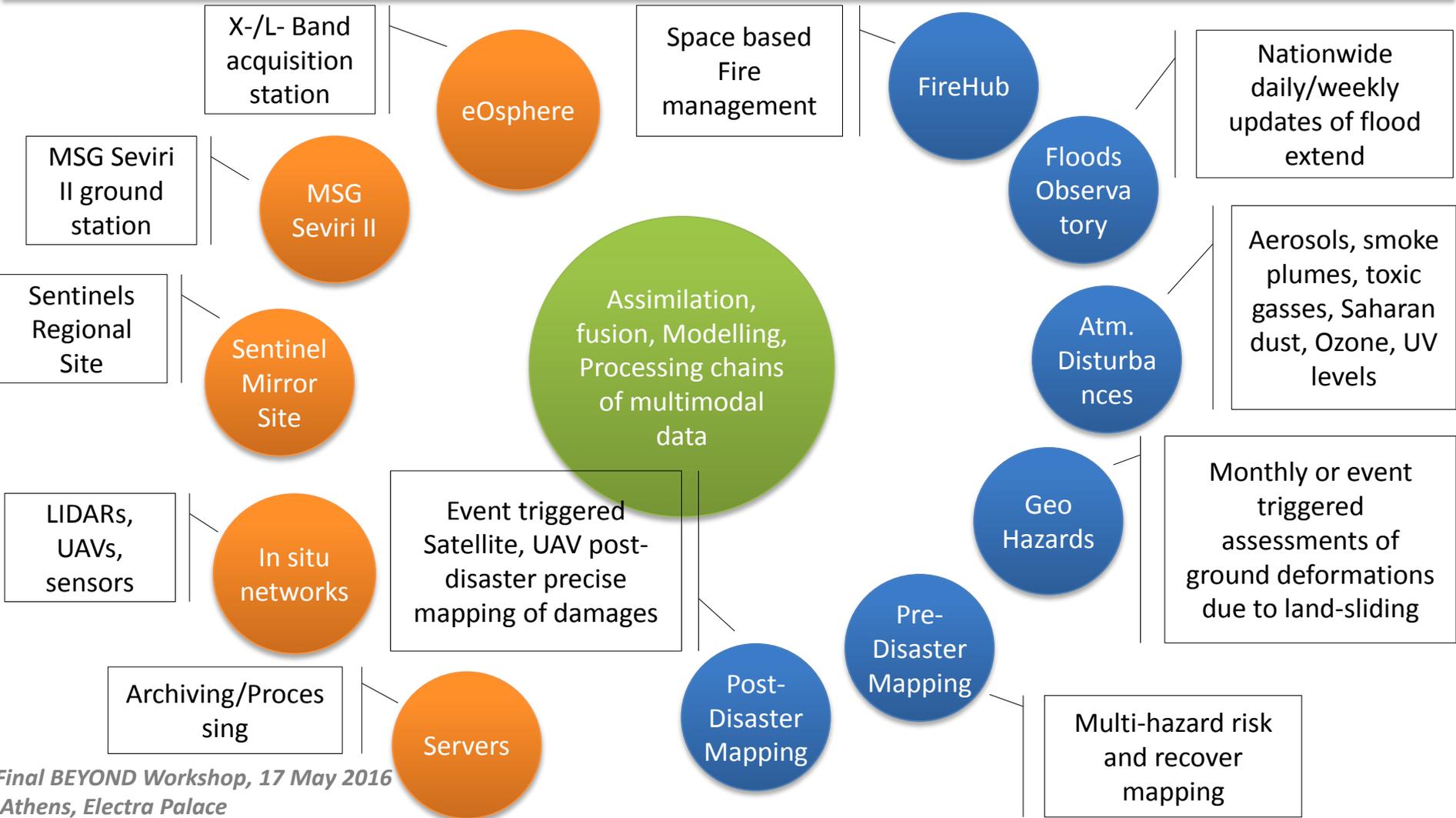


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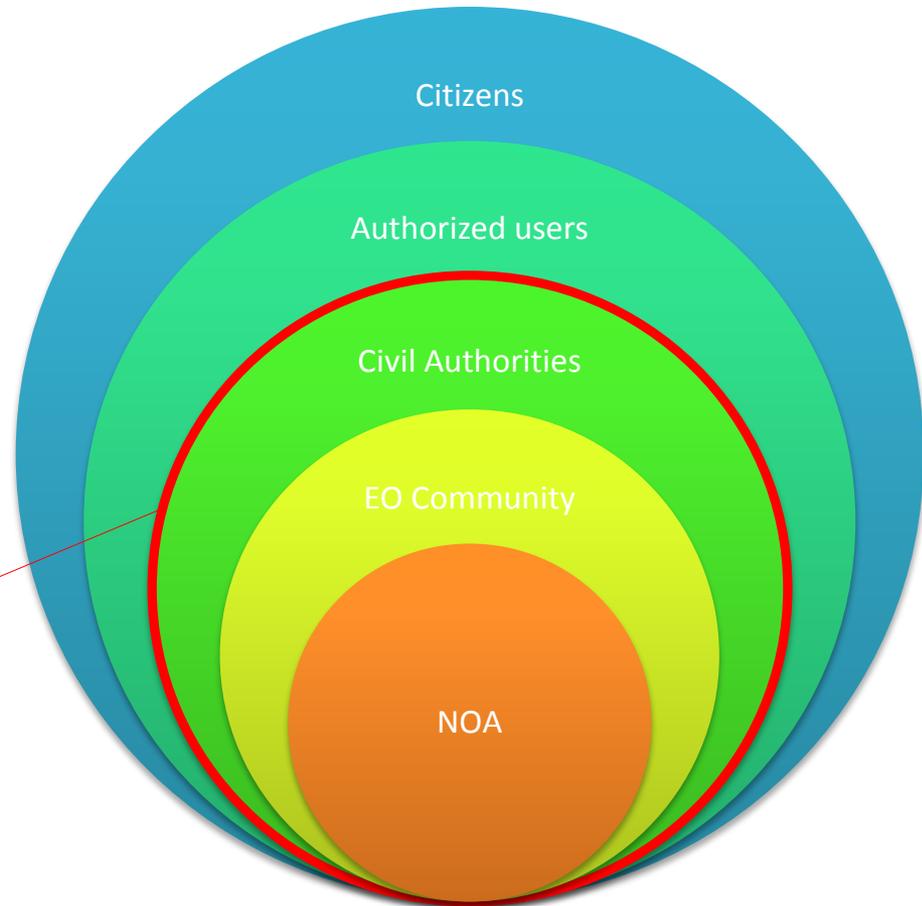
## BEYOND Ecosystem (Services, products & infrastructure)



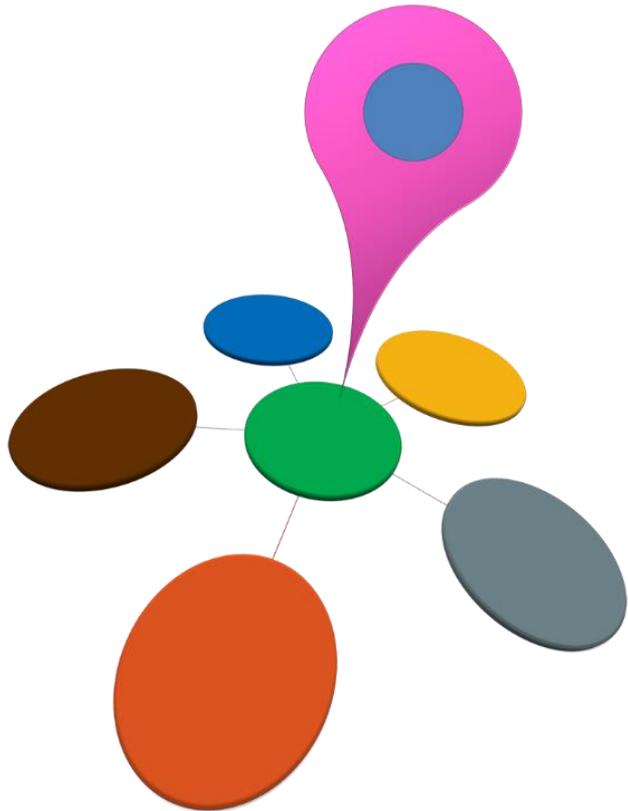
## What is the gap?

- ❖ Communication gap between the BEYOND ecosystem and those either directly concerned by natural disasters, i.e. the citizens or are responsible for managing them.

The outreach of most services hit this wall



## How are we going to fill the gap?



- ❖ Our answer is the DisasterHub mobile application.
- ❖ DisasterHub will fill in this gap by introducing a mobile application that will act as a middleware between a mobile user and the rich suite of the BEYOND EO services, building on the concept of citizen observatories in support of Copernicus, GEO, GEOSS, and UN-SPIDER.

## DisasterHub – The idea

- What is the idea behind DisasterHub?
  - ❖ To provide the citizens with an easy to use mobile app that will bring them closer to the EO services of the BEYOND ecosystem and will also allow them to interact with these services.
- What is our ultimate goal?
  - ❖ To build a tool that will allow us to:
    - i. Integrate all the services under a common, portable platform.
    - ii. Integrate open geospatial and socioeconomic data, via open/linked data ingestion mechanisms (APIs).
    - iii. Develop the techniques that will enable the fusion and co-registration of crowd generated information with EO data, in order to further enhance the disaster management services.



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## DisasterHub – The initiative

- ❖ The *MYGEOSS Second Call For Innovative Apps in the environmental and social domains* (<http://digitalearthlab.jrc.ec.europa.eu/mygeoss/call.cfm>)
- ❖ DisasterHub was among the 15 best application proposals and awarded a contract by the JRC for further development.
- ❖ Presentation of a first stable release at the 10<sup>th</sup> GEO European Projects Workshop, 31 May – 02 June 2016, Berlin.
- ❖ Final deliverables & reports in the middle of June.

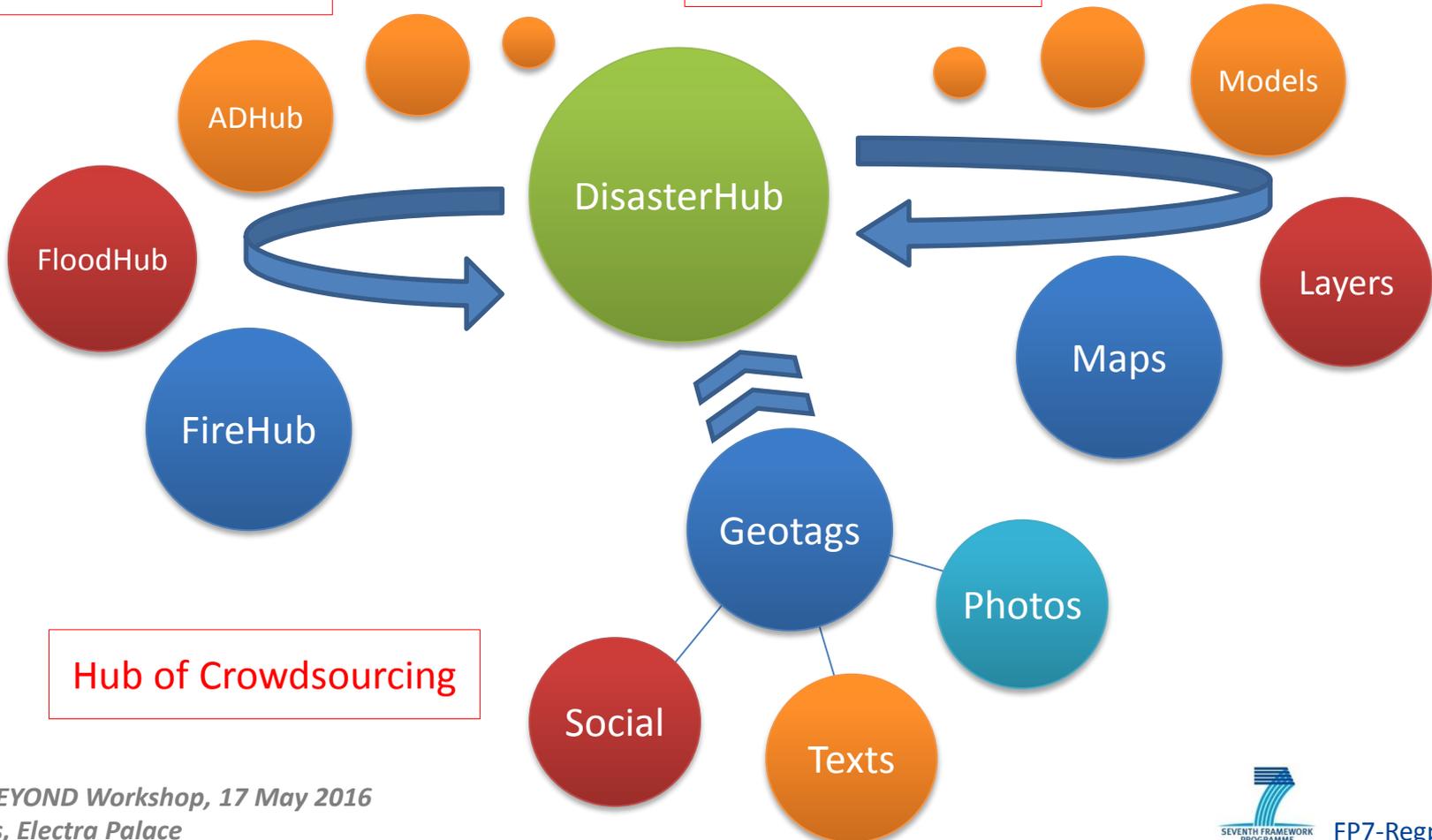
## DisasterHub – The architecture

- Recapping
- ❖ DisasterHub is going to integrate:
  - All the services of the BEYOND ecosystem.
  - Open geospatial and socioeconomic data (e.g. GEOSS Data CORE).
  - Crowd generated data.
- So what is the design paradigm of the DisasterHub architecture?
- ❖ DisasterHub is going to introduce a **Hub of hubs** comprised of:
  - A hub of services.
  - A hub of data.
  - A hub of crowdsourcing information.

## DisasterHub – A Hub of hubs

Hub of Services

Hub of Data



## DisasterHub – A Hub of hubs

- ❖ Development: started on Feb. 2016, ongoing.
- ❖ Current status: internal beta testing.
- ❖ Basic functionalities implemented:
  - Integration of the *Copernicus masters* awarded FireHub service ([http://www.copernicus-masters.com/index.php?kat=winners.html&anzeige=winner\\_bsc2014.html](http://www.copernicus-masters.com/index.php?kat=winners.html&anzeige=winner_bsc2014.html)). The user gets a real time feed of forest fires taking place, and also can search into the archive for past events.
  - A geo-tagging mechanism where the user can notify the other users for a hazardous event by placing a marker on the map that indicates the location of the event. He may accompany this location with more information such as:
    - A photo.
    - A short text information (max. 500 chars).
    - An emergency alert (e.g. people in danger).
  - A social sharing mechanism of the geotags.

## DisasterHub – The app (cont'd)

### ❖ Basic functionalities implemented (cont'd):

- ❑ Integration of several OGC compliant open data, accessible through WMS and WFS services:
  - Backgrounds: OSM, MapQuest Sat, Very High Resolution Aerial Images of Greece from National Cadastre Services(EKXA VLISO).
  - Overlays: Corine Land Cover, Natura 2000, Urban Atlas, Toponyms, several Spatio-temporal layers provided from FireHub and generated through the satellites images acquired from MSG Seviri II and polar orbiting satellites such as Aqua/Terra MODIS, NPP VIIRS, NOAA AVHRR, etc.
- ❑ An elaborate authentication mechanism for securing the user's privacy that is based on JSON Web Tokens. This mechanism uses the services of Auth0 (<https://auth0.com/>) to securely install the user sign in/signup information and also keeps a backup in an encrypted database at the NOA infrastructure.
- ❑ A Server Side API, using PHP & PostgreSQL for the storing of the crowdsourcing information, i.e. the storing of the geo-tagging information.

## DisasterHub – App use cases

### ❖ Single step Sign in / Sign up

DisasterHub

Username

Password

Sing in

Auth0 Token Based Authentication

Sign in Sign up

DisasterHub

Email

Username

Password

Sing up

Sign in Sign up

## DisasterHub – App use cases (cont'd)

### ❖ Main screen

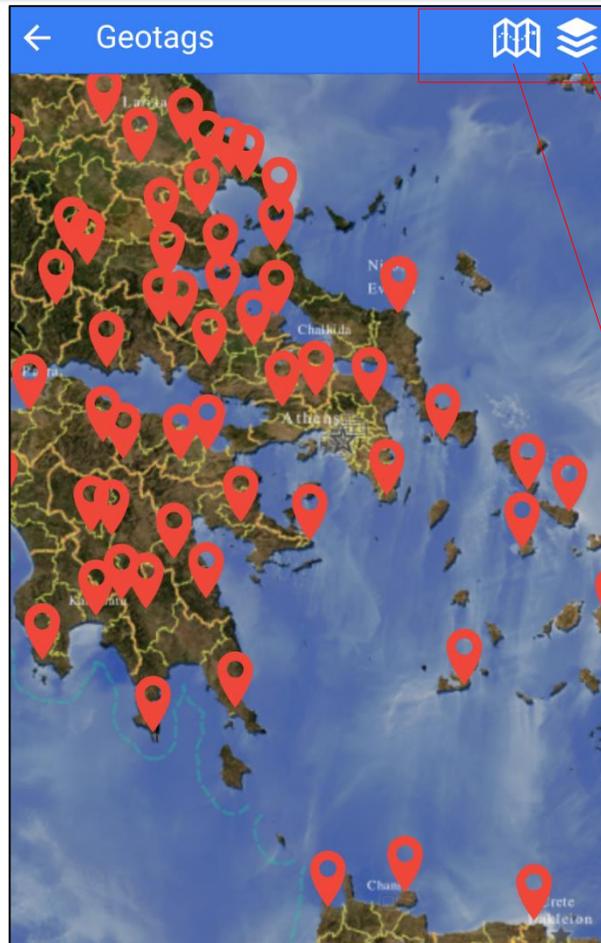
Basic info of the hazardous event.  
Click to navigate map to this area.

Fires	
Fire event 411 Δ. Ξυλοκάστρου - Ευρωστίνης Area: 53, duration: , Coordinates: 38° 07'...	17/04/2016
Fire event 2497 Δ. Κορινθίων Area: 841, duration: 0.67, Coordinates: 3...	15/04/2016
Fire event 2496 Δ. Αλμυρού Area: 3554, duration: 0.67, Coordinates: ...	14/04/2016
Fire event 409 Δ. Δέλτα Area: 5, duration: , Coordinates: 40° 33' 5..	12/04/2016
Fire event 408 Δ. Τανάγρας Area: 57, duration: , Coordinates: 38° 15'	12/04/2016
Fire event 410	12/04/2016

Click on the button to add a geotag

## DisasterHub – App use cases (cont'd)

### ❖ Geotags screen



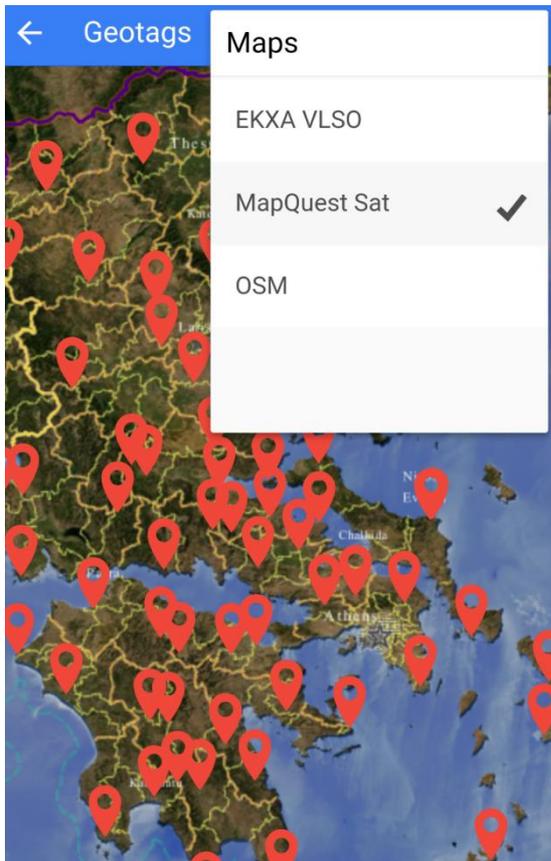
Popovers with open data

Overlay layers  
based on open  
data (e.g.  
Natura 2000)

Base layers  
based on open  
data (e.g. OSM)

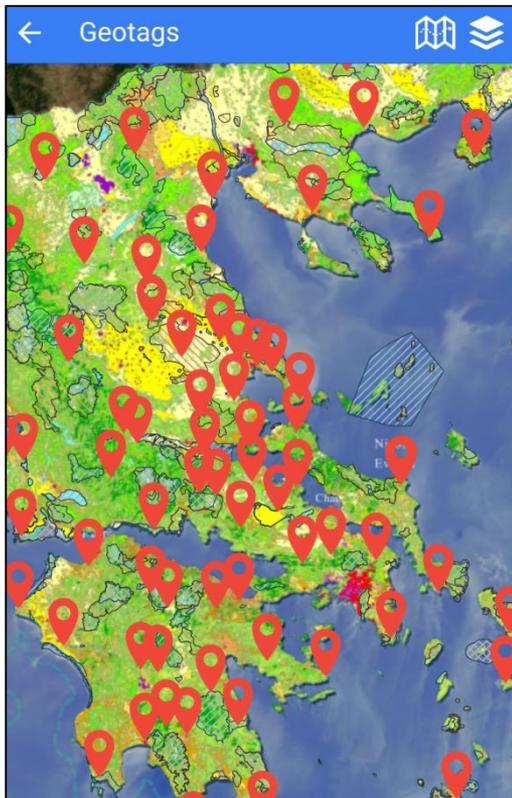
## DisasterHub – App use cases (cont'd)

### ❖ Geotags screen with popovers shown



## DisasterHub – App use cases (cont'd)

- ❖ Geotags screen with Corine Land Cover and Natura 2000 selected



- ❖ Geotags screen with EKXA VLISO as background



## DisasterHub – App use cases (cont'd)

### ❖ 3 steps geo-tagging mechanism. Step (1/3)

(1)

Zoom to the area of  
interest and tap-hold to  
add a marker

(2)

Click on the tick button  
that will pop up to  
continue to the next  
step



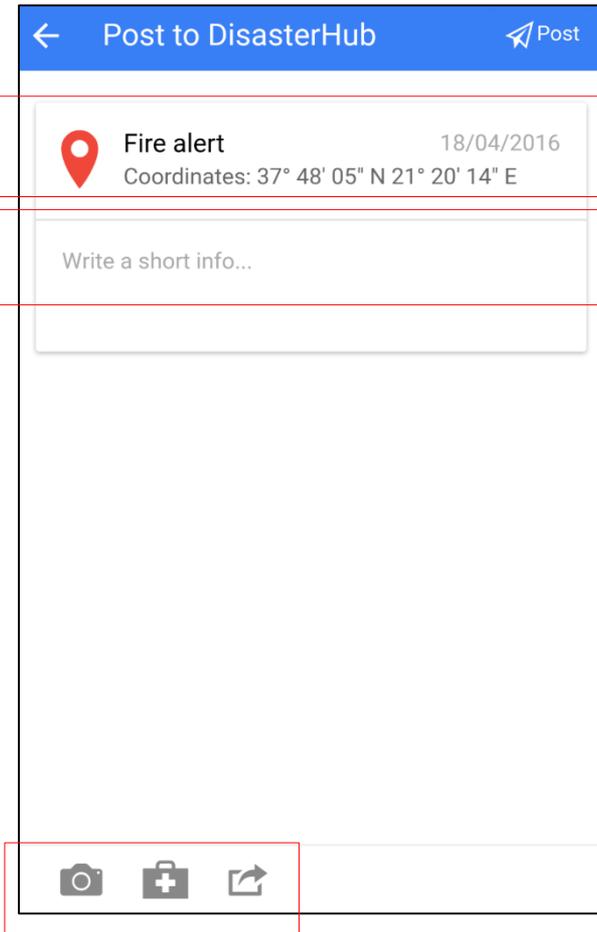
## DisasterHub – App use cases (cont'd)

### ❖ 3 steps geo-tagging mechanism. Step (2/3)

Basic info of the geotag

Add some text info  
(e.g. a description  
that might help the  
first responders)

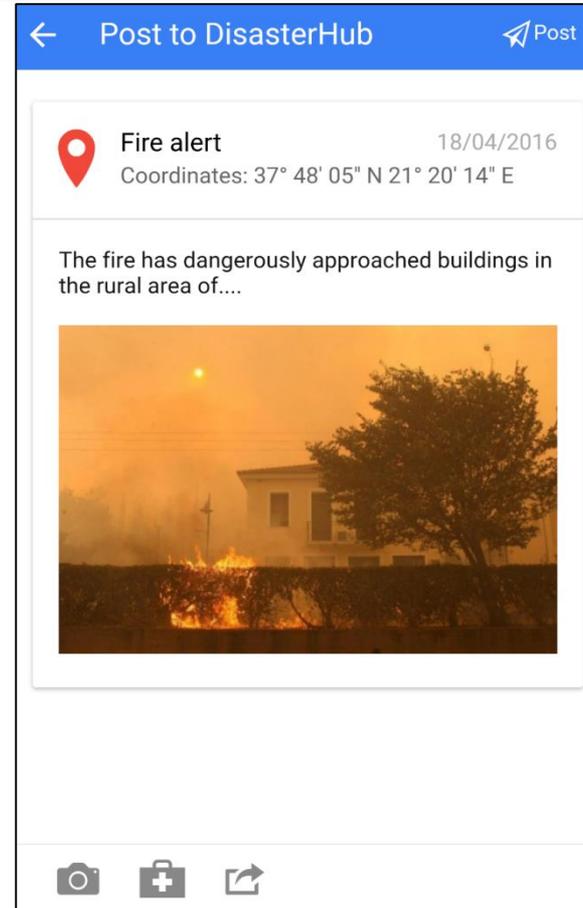
Add a photo or an  
emergency alert.  
Share your geotag to  
the social media.



## DisasterHub – App use cases (cont'd)

- ❖ 3 steps geo-tagging mechanism. Step (3/3)

**Success!!!**  
**Your geotag is now**  
**successfully ingested in**  
**DisasterHub and other users**  
**can view it**



## DisasterHub – App use cases (cont'd)

### ❖ Event navigation mechanism (Select event)

Click event to  
navigate map to the  
event's burned area

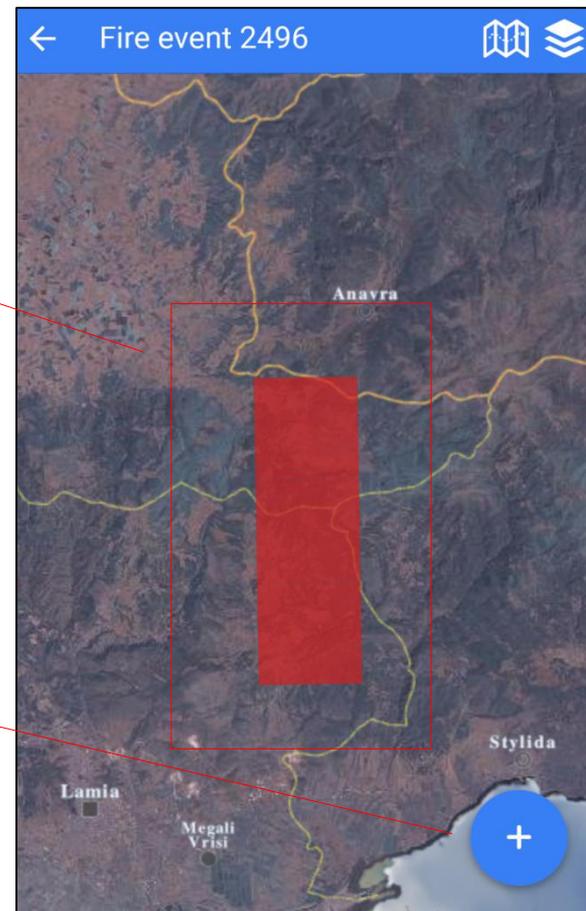
	Fire event 411 Δ. Ξυλοκάστρου - Ευρωστίνης Area: 53, duration: , Coordinates: 38° 07'...	17/04/2016
	Fire event 2497 Δ. Κορινθίων Area: 841, duration: 0.67, Coordinates: 3...	15/04/2016
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	Fire event 410 Δ. Χαλκιδέας	12/04/2016

## DisasterHub – App use cases (cont'd)

### ❖ Event navigation mechanism (Event view)

Polygons of the burned area as generated from FireHub.

Click on the floating menu button to view further options.



## DisasterHub – App use cases (cont'd)

### ❖ Event navigation mechanism (Event view options)

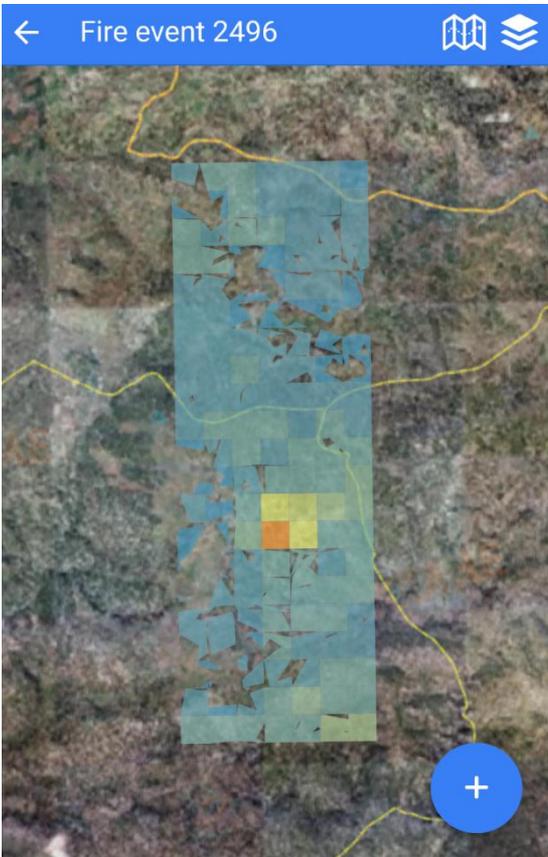
The floating menu expanded with further view options. The user can do one or more of the following:

- a) View the event evolution
- b) View the geotags that other users put regarding this event.
- c) Refine the spatial analysis of the fire polygons, i.e. downscale.

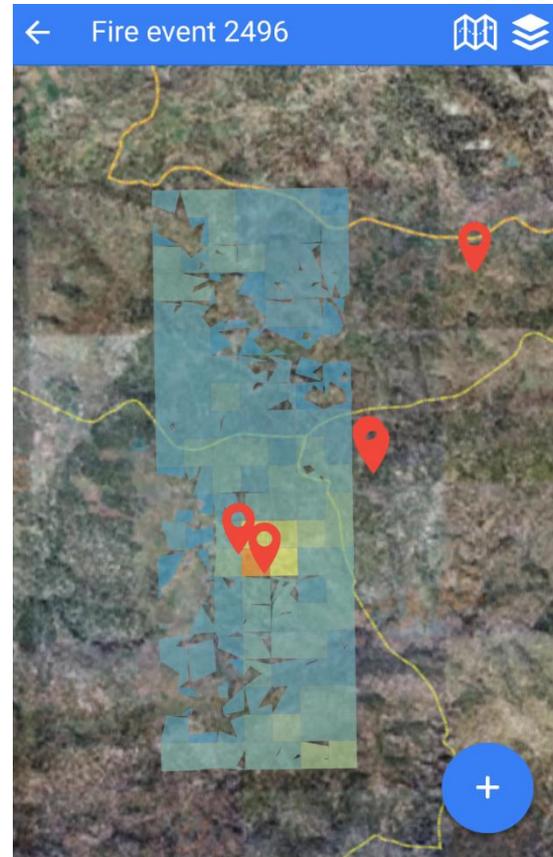


## DisasterHub – App use cases (cont'd)

### ❖ Event navigation mechanism (refined view)



### ❖ Event navigation mechanism (refined + geotags view)



## DisasterHub – Open source

❖ DisasterHub is entirely built using Open source frameworks and tools.



NodeJS



AngularJS



Ionic  
framework



Apache  
Cordova



PhoneGap



ngCordova



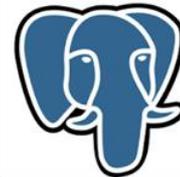
OpenLayers 3



Auth0



PHP



PostgreSQL



PostGIS



HTML5



CSS



Sublime Text



Telerik

## DisasterHub – Open data

❖ DisasterHub is using datasets that are following the GEOS Data Sharing principles (<http://www.earthobservations.org/dswg.php>):

- OSM.
- MapQuest satellite.
- High resolution aerial images of Hellenic National Cadastre (EKXA VLISO).
- CLC 2006.
- Natura 2000.
- Urban Atlas.
- Toponyms.
- Crowd generated geotags without user information.
- FireHub generated datasets:
  - Raw fire polygons generated through processing MSG Seviri II satellite images.
  - Refined fire polygons generated through further processing of MSG Seviri II satellite images.
  - Fire polygons generated through processing satellite images from polar orbiting satellites (Aqua/Terra MODIS, NPP VIIRS, NOAA AVHRR).

## DisasterHub – Roadmap

- ❖ Provide the user with more functionalities, such as:
  - Push notifications.
  - Navigation.
  - Advanced filtering mechanisms (e.g. view the hazardous events that are active and closer to her current location).
  - Advanced support during and after crisis (e.g. provide him with possible escaping routes during crisis).
  
- ❖ Integrate more hazards. The Ministry of Infrastructure, Transport and Networks of Greece has already expressed its interest in integrating Geo hazards (Earthquakes, landslides, volcanos) and floods.



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## DisasterHub – The END

thank  
you!