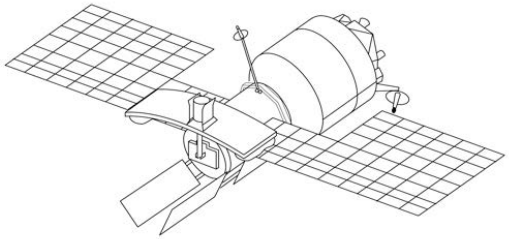
# BEYOND Ground Segment Facility

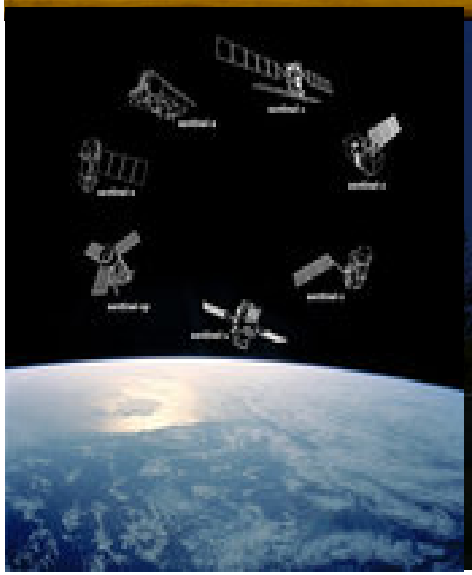
# The Hellenic Sentinel Data Hub (Mirror Site)

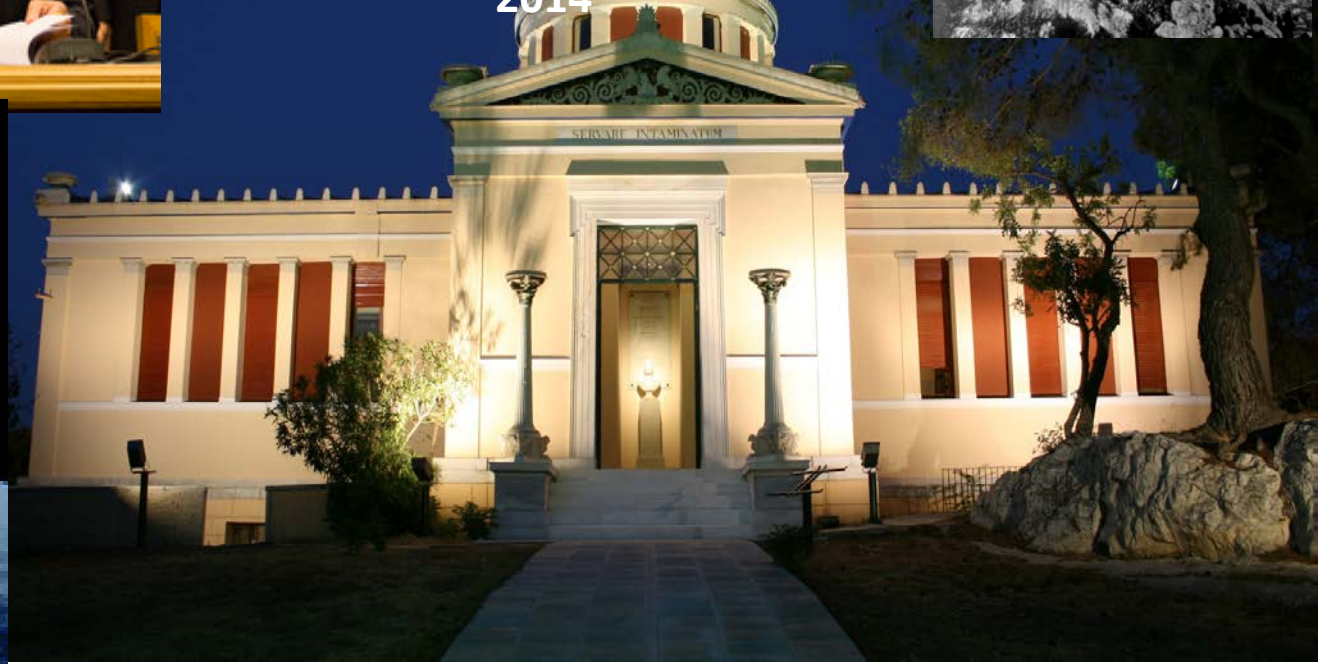


BEYOND

- www.beyond-eocenter.eu

**The 1st Collaborative Ground Segment (Mirror Site) for Sentinel satellite missions was signed between ESA and NOA on 12 May 2014**





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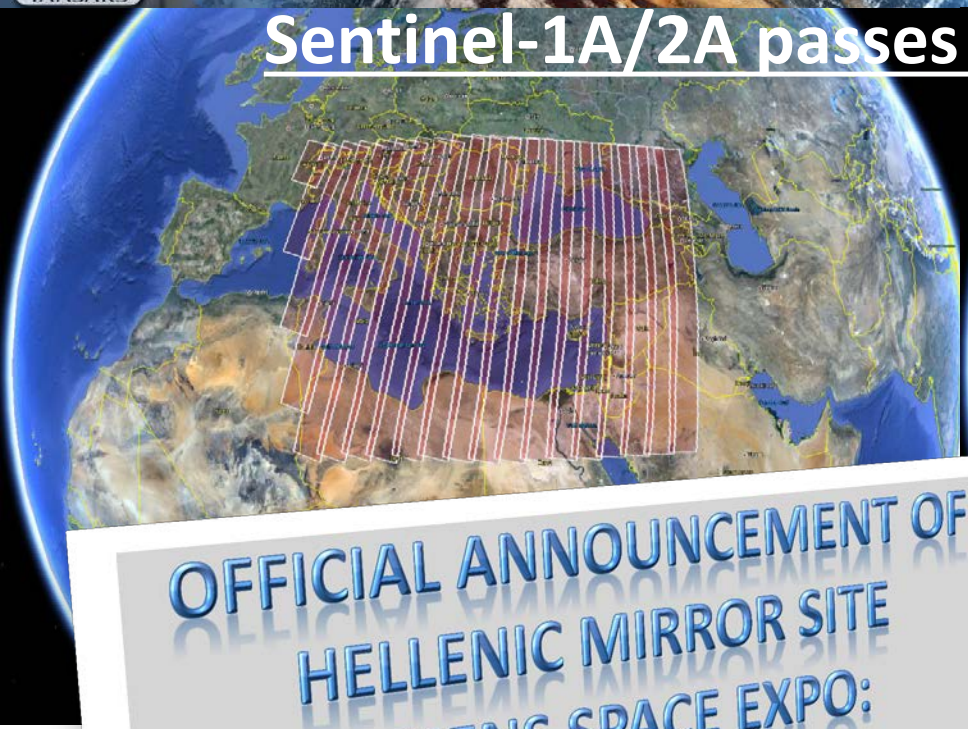
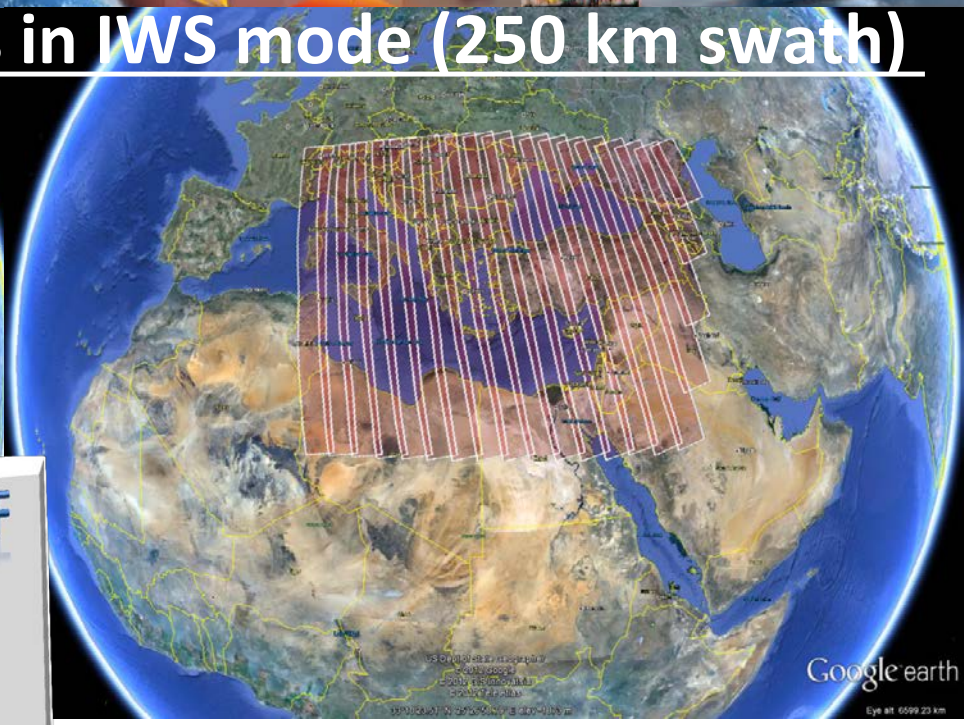
Building a Centre of Excellence
for EO-based monitoring of Natural Disasters

IAASARS

# Sentinel-1A/2A passes in IWS mode (250 km swath)






OFFICIAL ANNOUNCEMENT OF
HELLENIC MIRROR SITE
ATHENS SPACE EXPO:
28 MARCH – 5 APRIL 2015

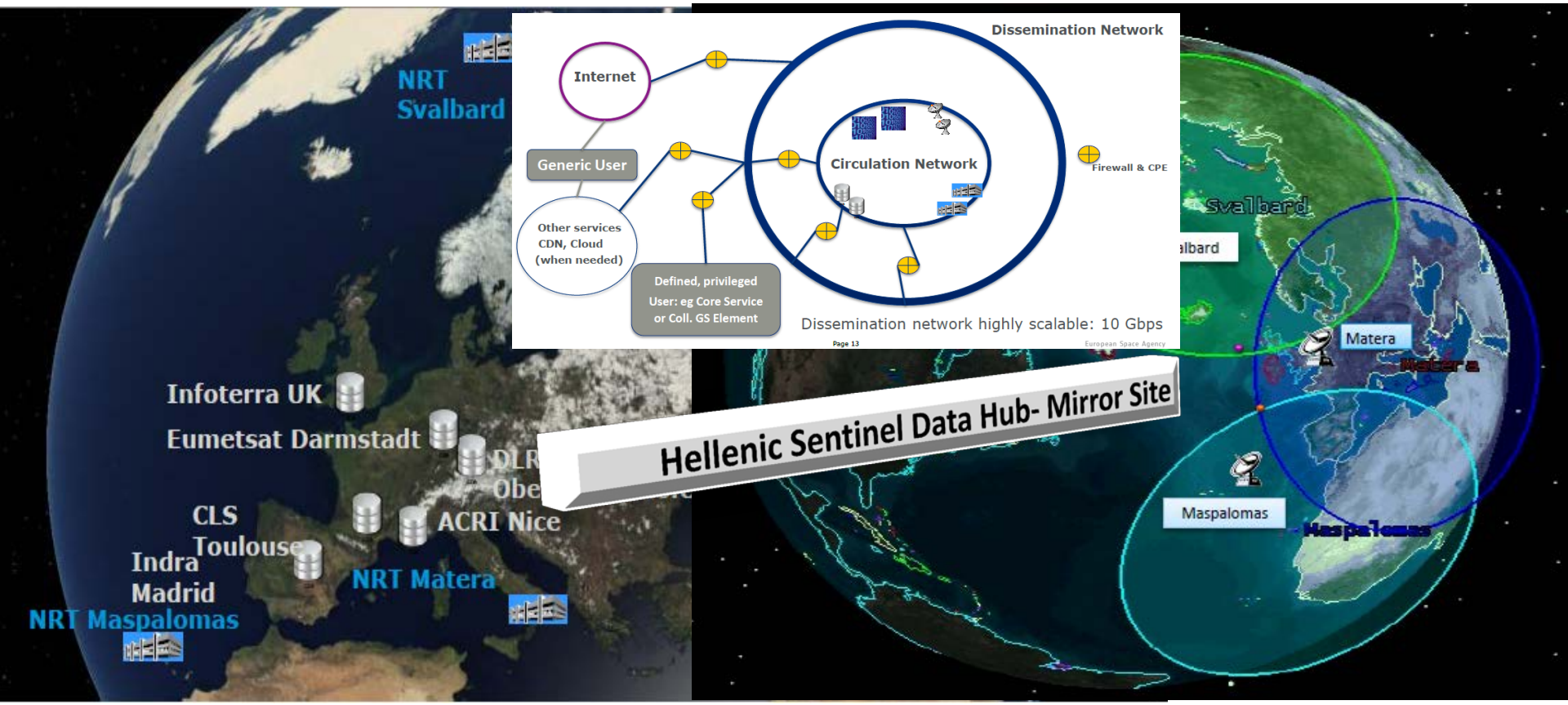
HTTP://SENTINELS.SPACE.NOA.GR

- Built up an additional pick up point **(Mirror Site)** of Sentinel data at the premises of the **National Observatory of Athens (NOA)** in collaboration with the **Greek Research and Technology Network GRNET S.A.** the Greek Partner of the GEANT network.

- **Disseminate Sentinel data and higher level Copernicus products** to the End User & Scientific communities mainly at national level, but also to neighboring South Eastern Mediterranean and Balkan countries on the basis of the existing and/or future transnational needs and cooperations.

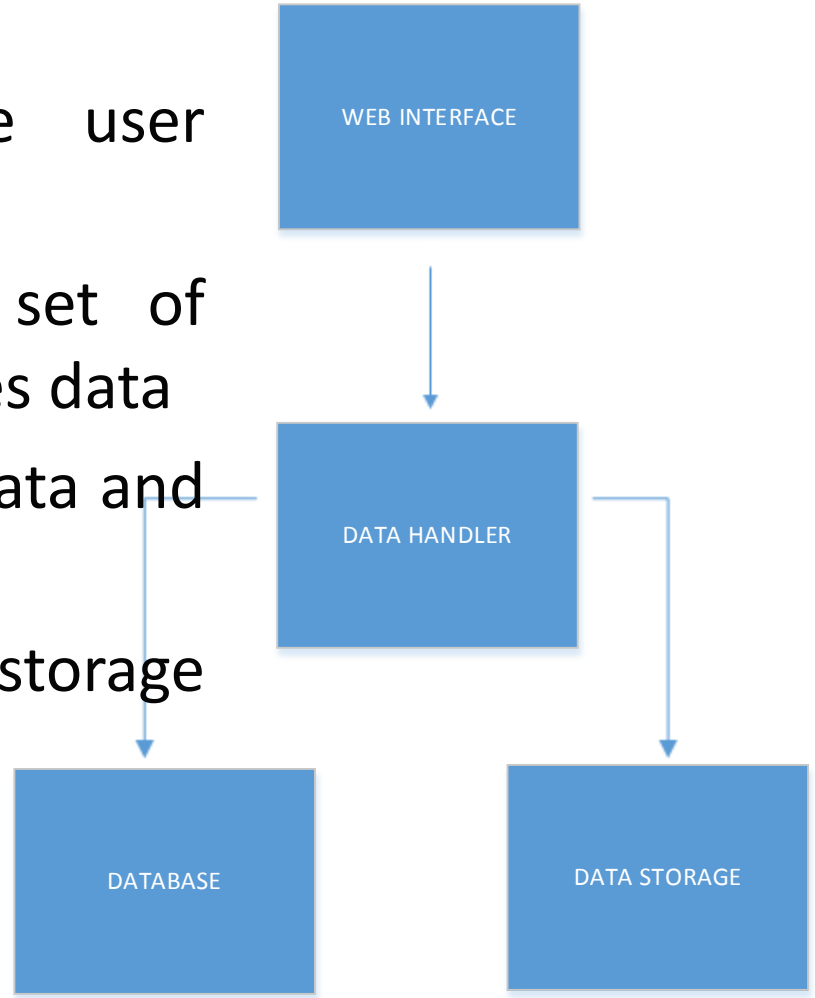
- The whole project is in line with the ongoing initiatives and strategic objectives for building at NOA a Center of Excellence for EO based monitoring of the Environment and Natural Disasters and processing of Space Data.

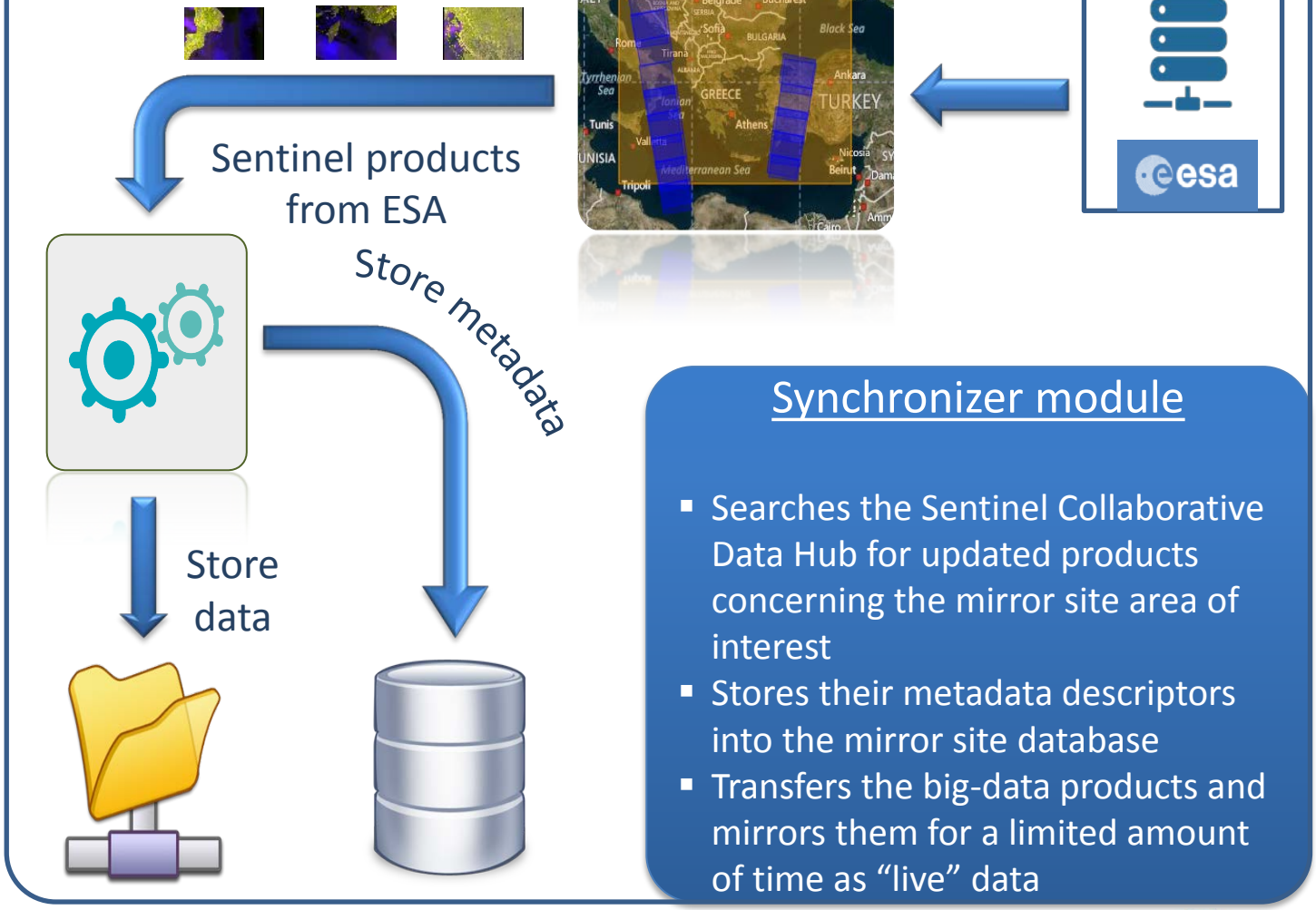
- **a GSC Core Ground Segment**, with **GSC-funded Functions and Elements**, providing :
  - the primary access to Sentinel Missions data as well as
  - the coordinating access functions to Contributing Missions data



## 3Level Architecture

- **Web Interface Level 1st**: the user interaction level
- **Data Handling Level 2nd**: The set of scripts that downloads and organizes data
- **Database Level 3rd**: storing metadata and systemwide events
- **Data Storage Level 3rd**: physical storage of data



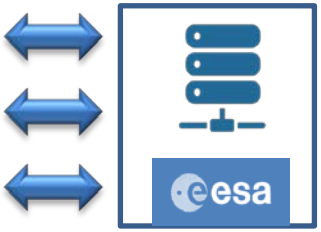



## Synchronizer module

- Searches the Sentinel Collaborative Data Hub for updated products concerning the mirror site area of interest
- Stores their metadata descriptors into the mirror site database
- Transfers the big-data products and mirrors them for a limited amount of time as “live” data

## Downloader module

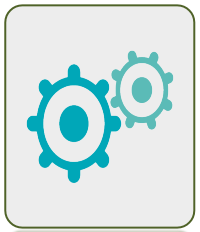
- Gathers the Mirror Site user requests posed through the GUI in the form of orders (i.e. collections of products).
- Concurrently downloads products that are not lying in the local storage.
- Informs users for the availability of the big data products in order to download them via the Mirror Site facilities and its Web GUI.

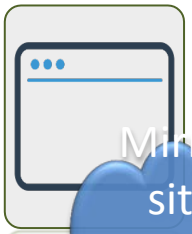



Concurrent download of Sentinel products from ESA

Concurrently store data

Concurrently update metadata





Requests of users for Sentinel products

30 Parallel Transfers

GEANT Network

ESA Dedicated SENTINEL DataHub

| Concurrent Downloads | Volume (Gigabytes) | Transfer Time (secs) | Transfer Speed (MBps) | Estimated Transfer | Estimated Transfer Time |
|---|---|---|---|---|---|
| sequential | | | | | |
| 10 | 5 | | | | |
| 20 | 19 | | | | |
| 30 | 47 | | | | |

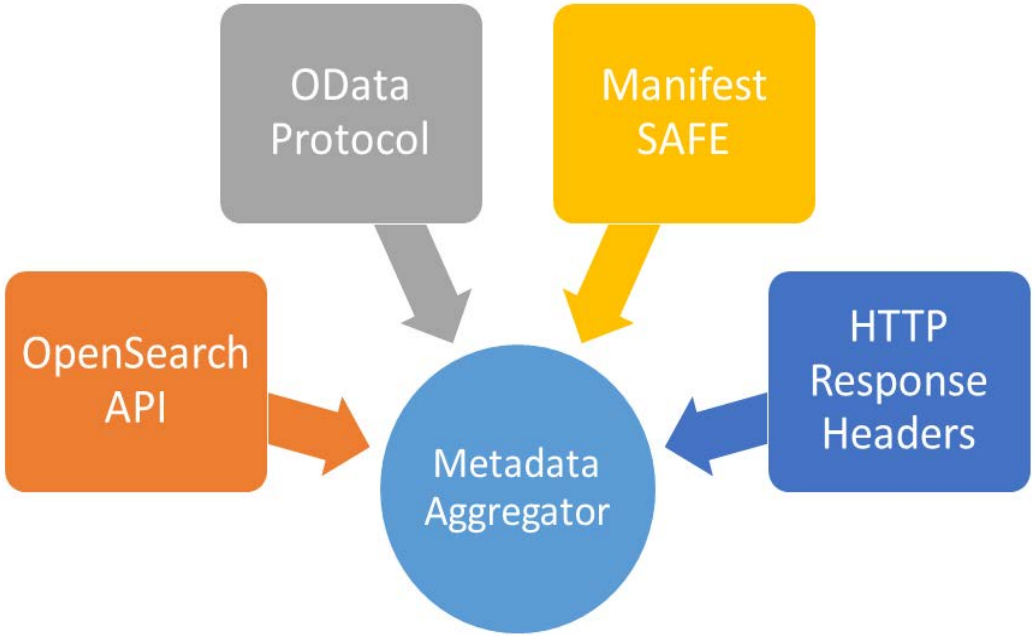
GRNet Dedicated

NOA SENTINEL MirrorSite

On Monday 24th November 2014 the NOA Sentinel Mirror Site team received from ESA the URL and the temporal credentials of a dedicated Sentinel DataHub instance in order to benchmark its performance.

# Hellenic Sentinel Data Hub
# The BackEnd architecture
# Metadata Aggregation/Cataloguing

- Four steps in order to aggregate all the metadata for a Sentinel product:
  1. Get metadata through the ESA's OpenSearch API.
  2. Get metadata through the ESA's OData protocol.
  3. Get metadata from the Product's manifest file in SAFE format.
  4. Use HTTP Response headers.
- Parse metadata.
- Rename metadata.
- Catalogue metadata.



# Statistics on Users & Data Traffic

**In a few months of operations**

- Number of registered Users : 160
- Size of downloaded files: ~440 GB

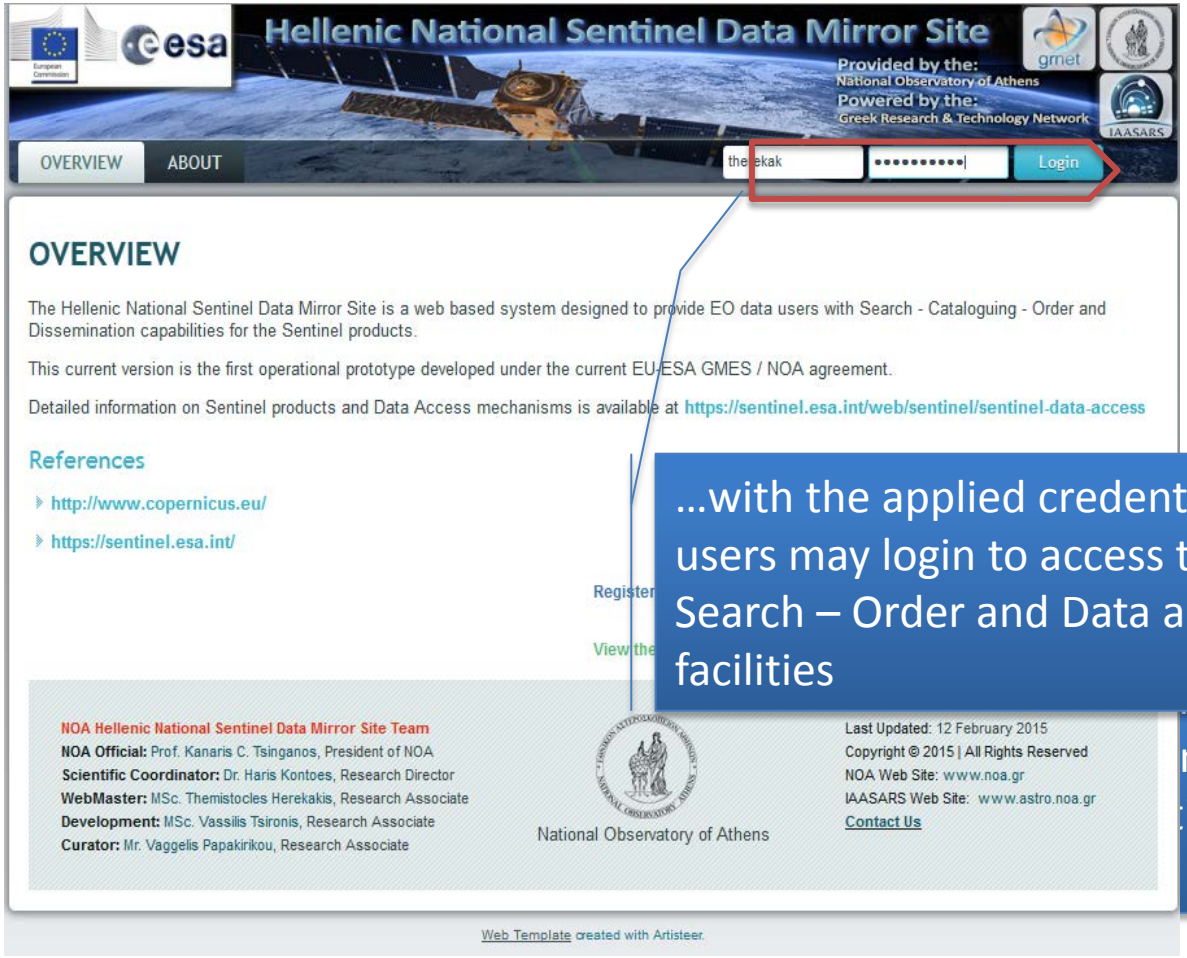
The Greek Mirror Site is advertised through the ESA portal to be known in larger audiences

- The distribution of IP addresses accessing the Mirror Site indicates that most visits come from the Greek domain, while there is a considerable number of international visitors

- Most registered users are from Greece but also a number of European and non European countries (France, Belgium, Italy, Romania, Germany, Canada, etc).

NOA Sentinel Mirror Site

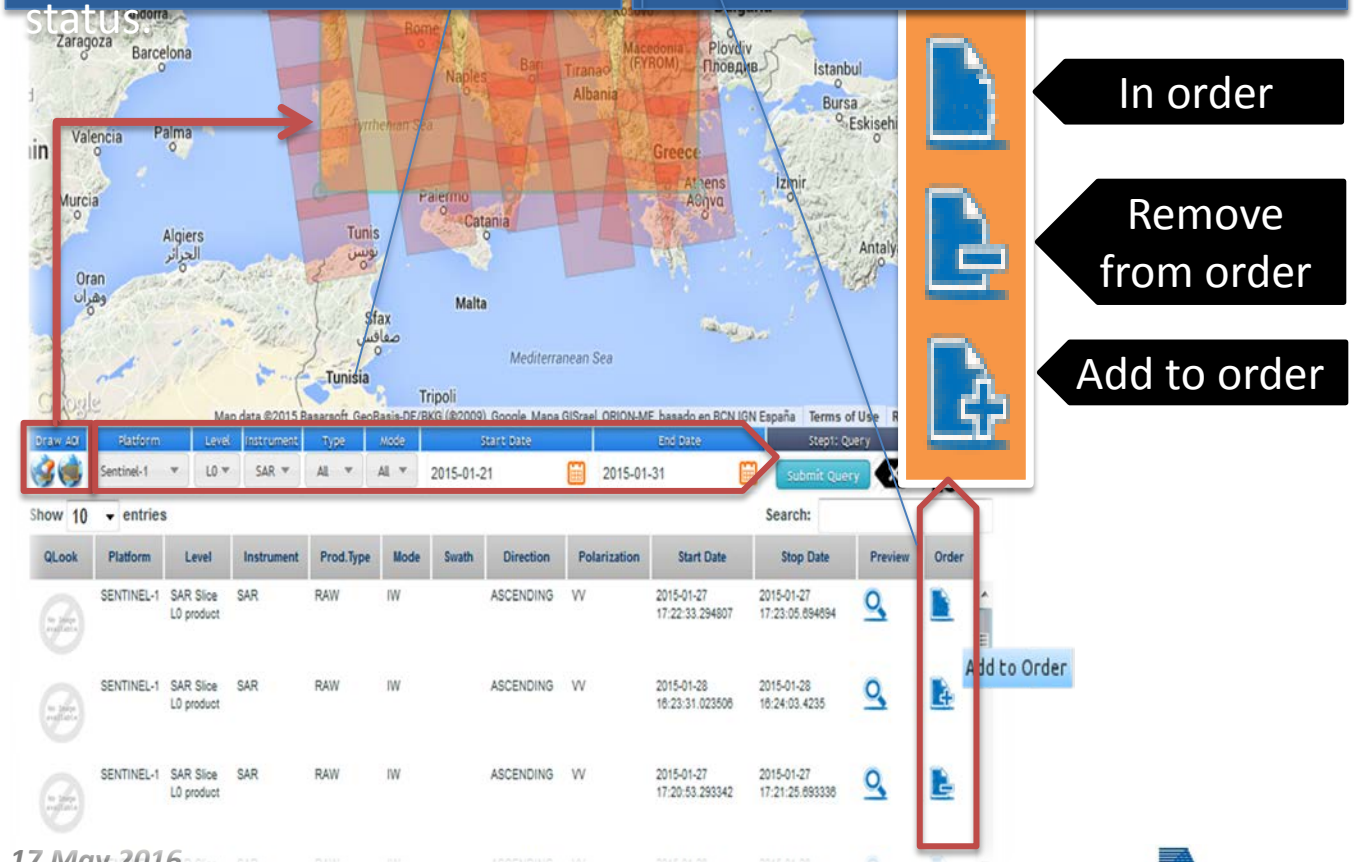
GUI
Provides a registration mechanism so that new users can obtain access to Catalogue Search and Order facilities



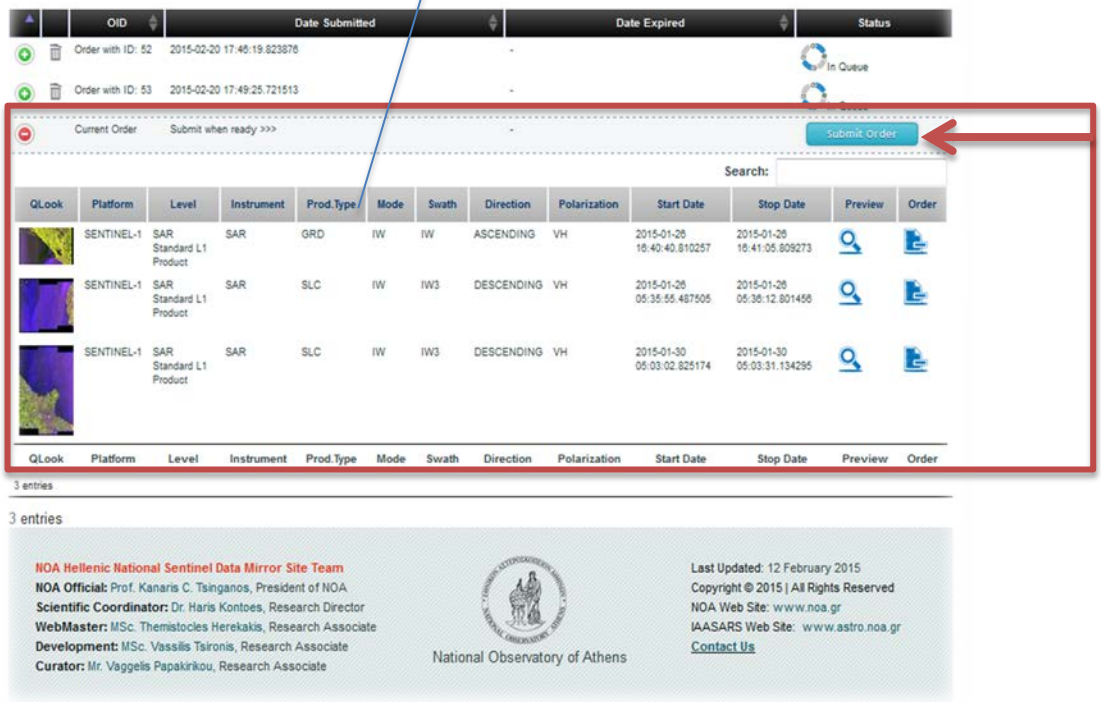

…with the applied credentials users may login to access the Search – Order and Data access facilities

…the catalogue of queried products provides more information regarding the spatial coverage, the attributes and their order status.

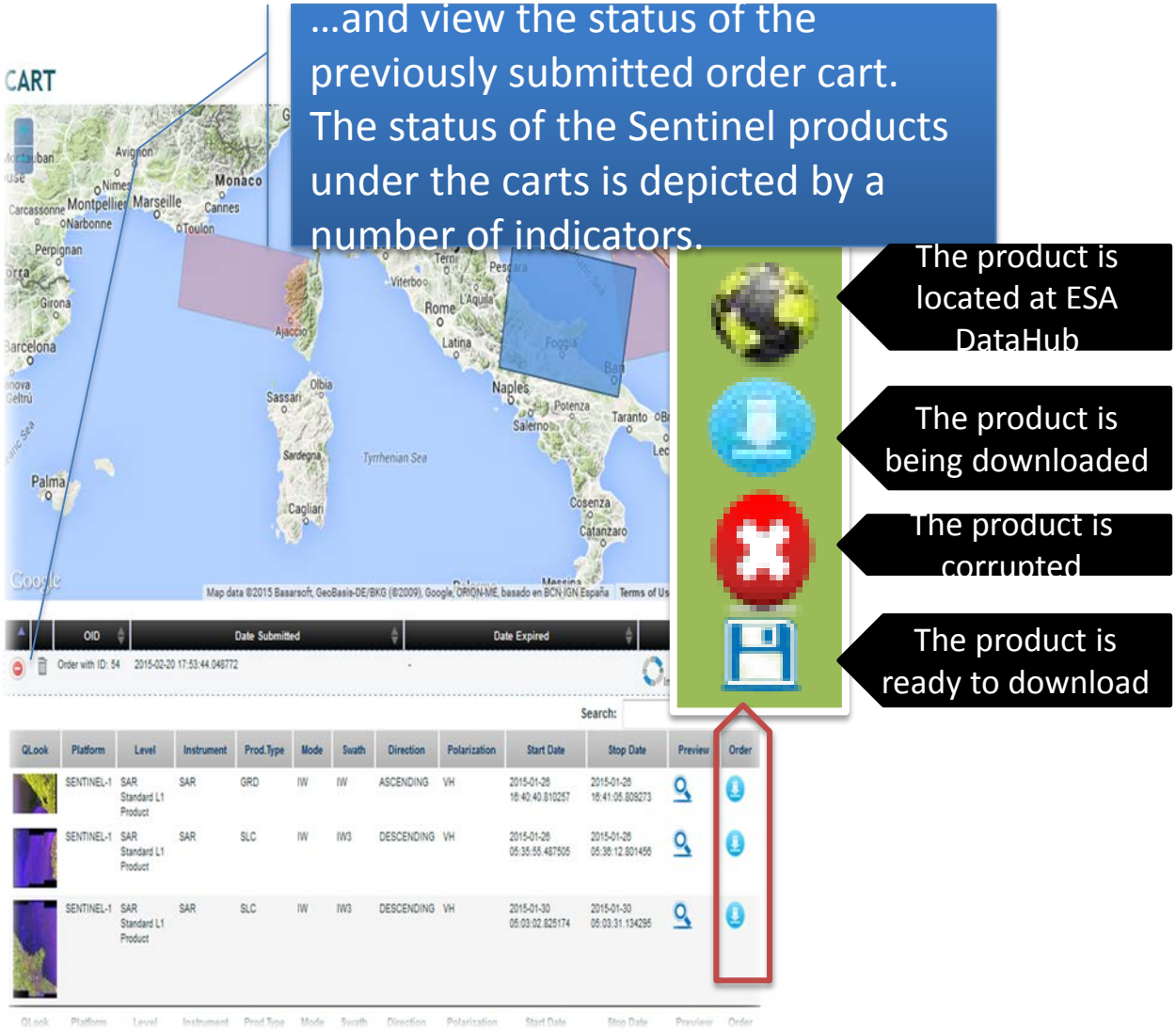
.. and then by querying the desired date range and product attributes…



The Cart preview page offers cart management facilities. Users can submit the present session's selected products thus creating a new order cart…



…and view the status of the previously submitted order cart. The status of the Sentinel products under the carts is depicted by a number of indicators.

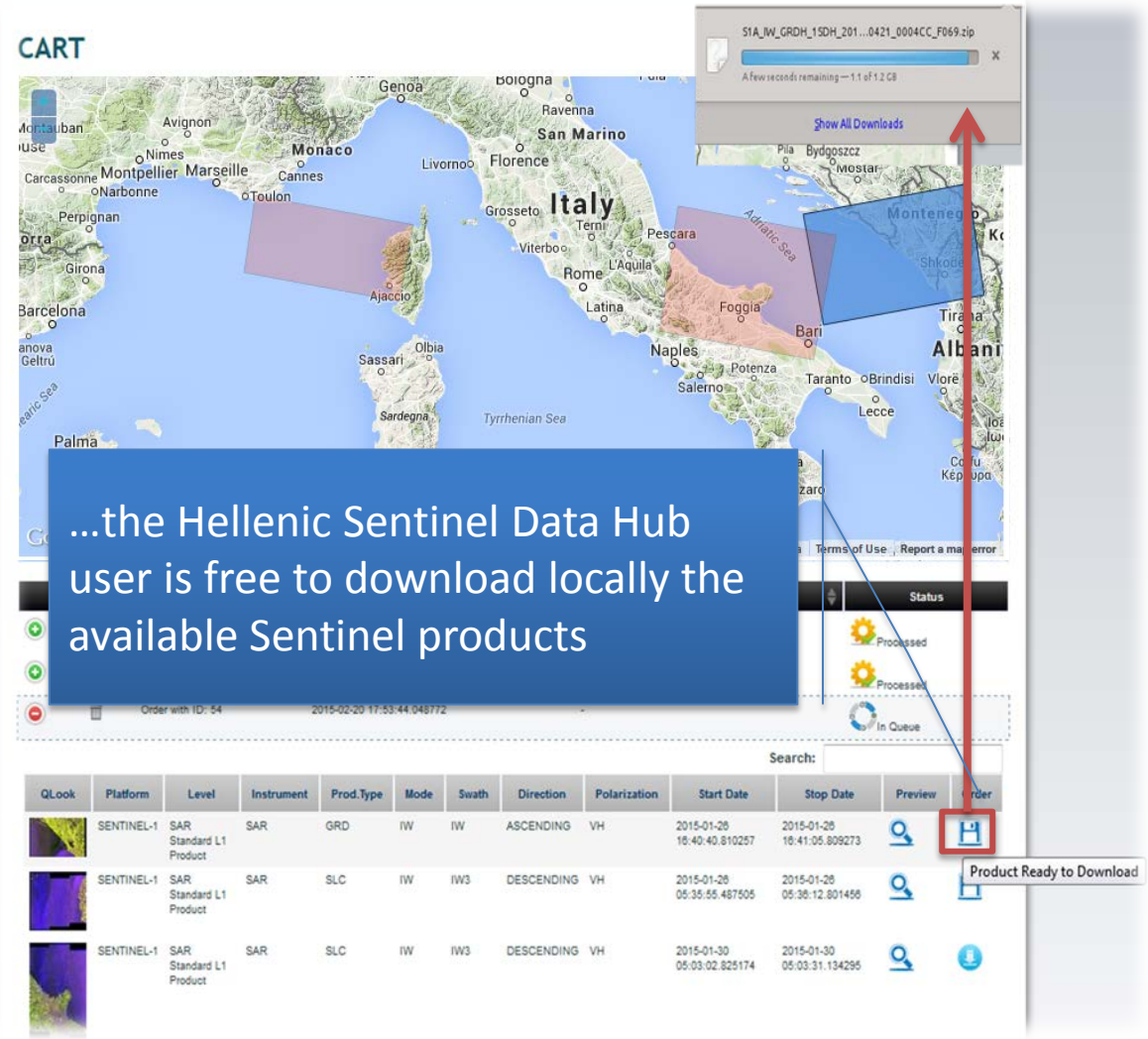



The product is located at ESA DataHub

The product is being downloaded

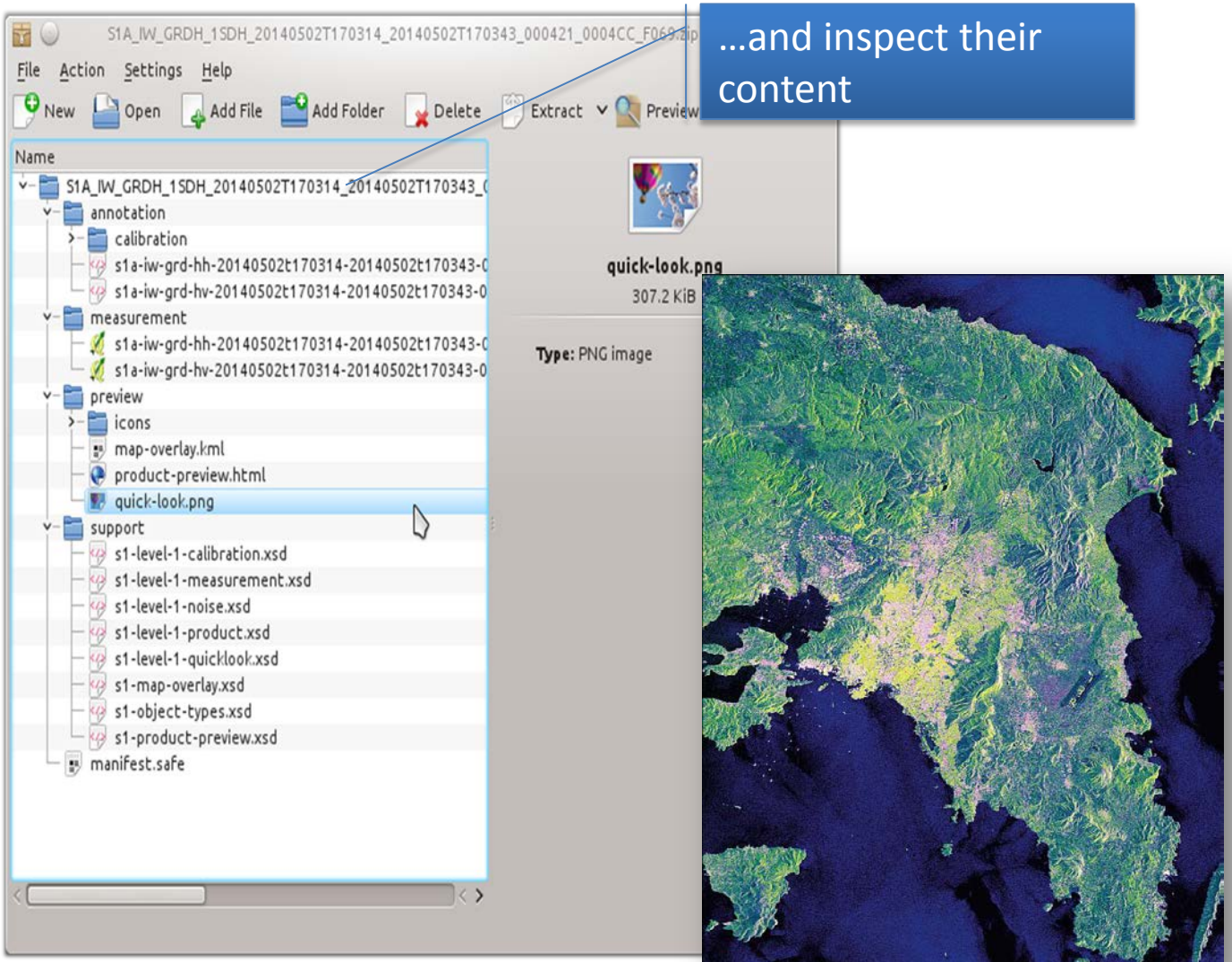
The product is corrupted

The product is ready to download

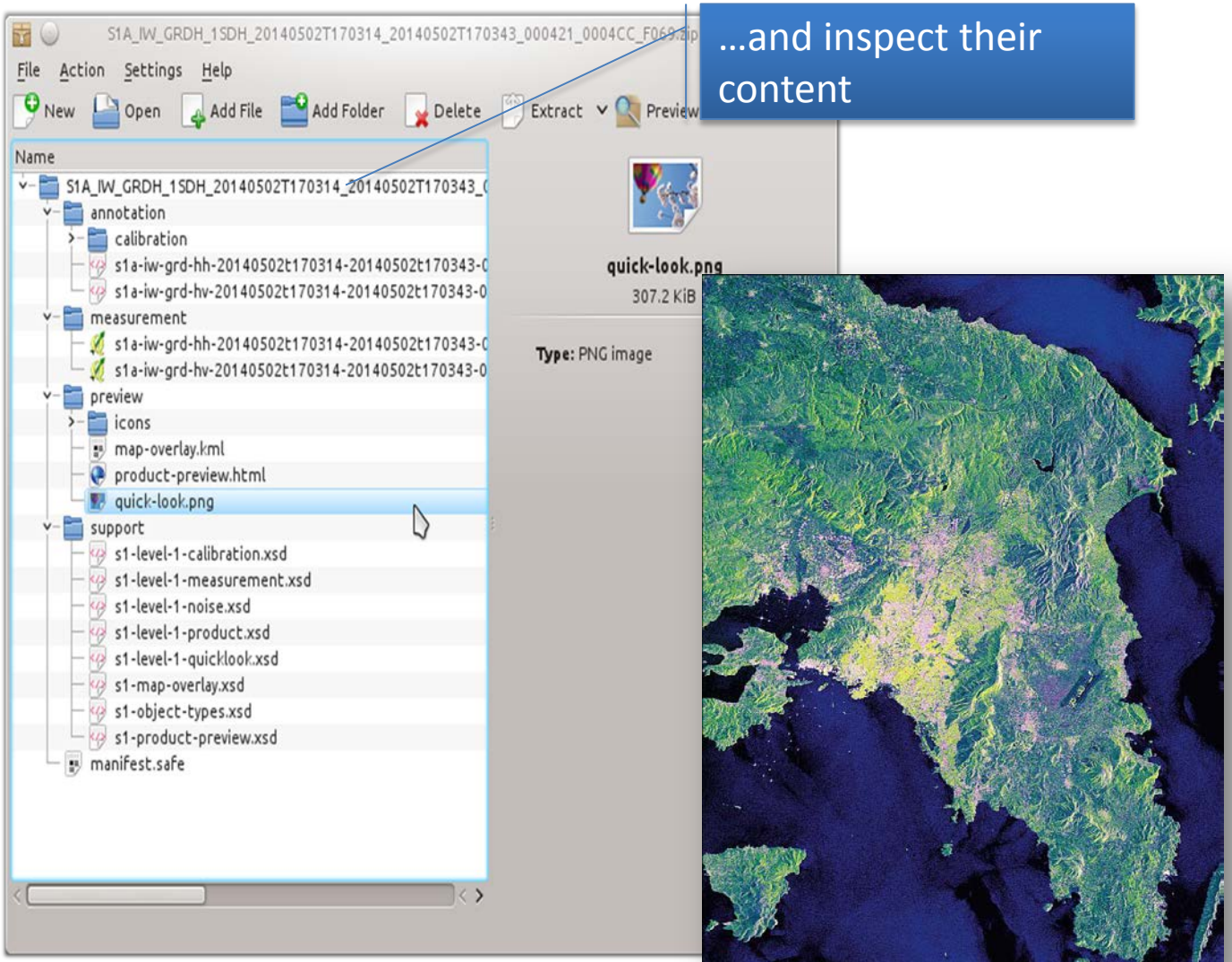



…the Hellenic Sentinel Data Hub user is free to download locally the available Sentinel products

…and inspect their content

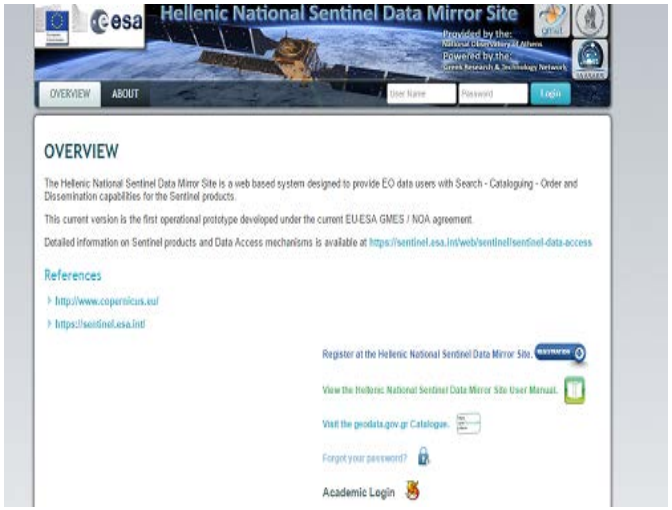


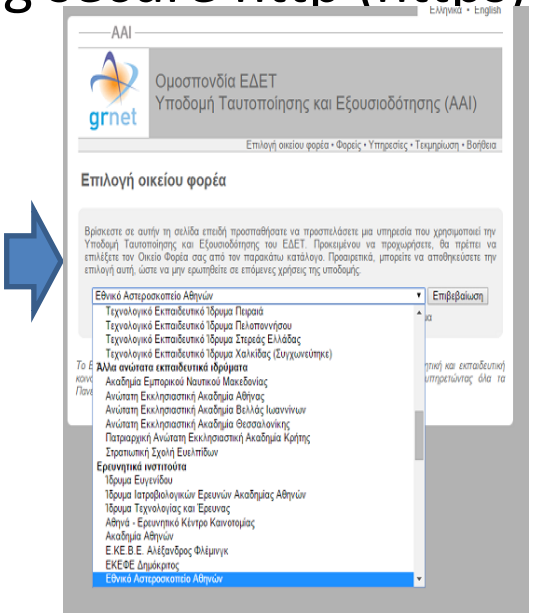
…and inspect their content

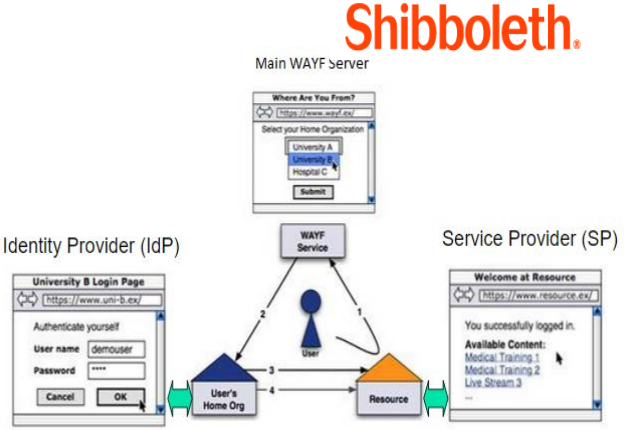


# Hellenic Sentinel Data Hub
# Shibboleth

- The Hellenic Sentinel Data Hub boosts it's popularity by allowing all members of the Greek Academic community (professors, students, researchers) to securely login via their academic credentials.
- The Hellenic Sentinel Data Hub has joined the GRNET's SSO Federation, which is based on **Shibboleth**.
- Enhanced security using secure http (https) connections

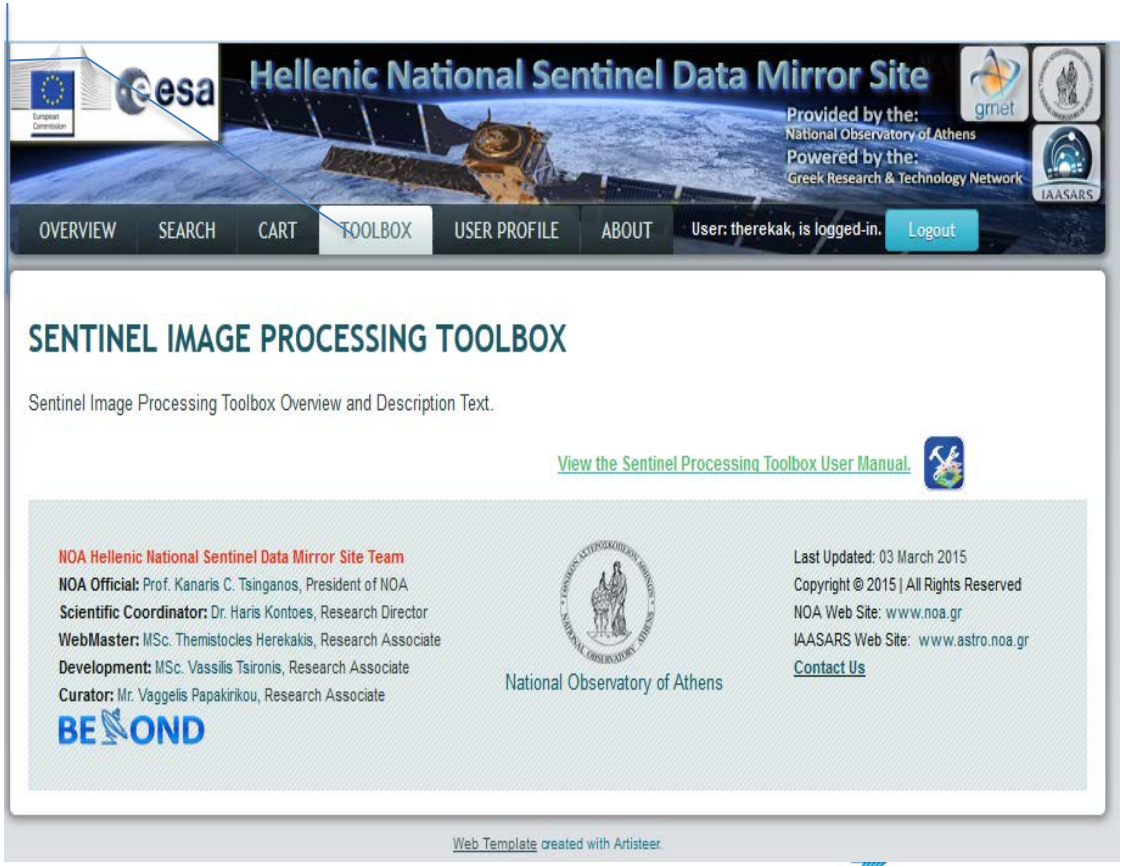


## The SENTINEL Image Processing Toolbox application on ~Oceanos

The SENTINEL Image Processing Toolbox application is accessible via the Hellenic Mirror Site and the “TOOLBOX” menu item.



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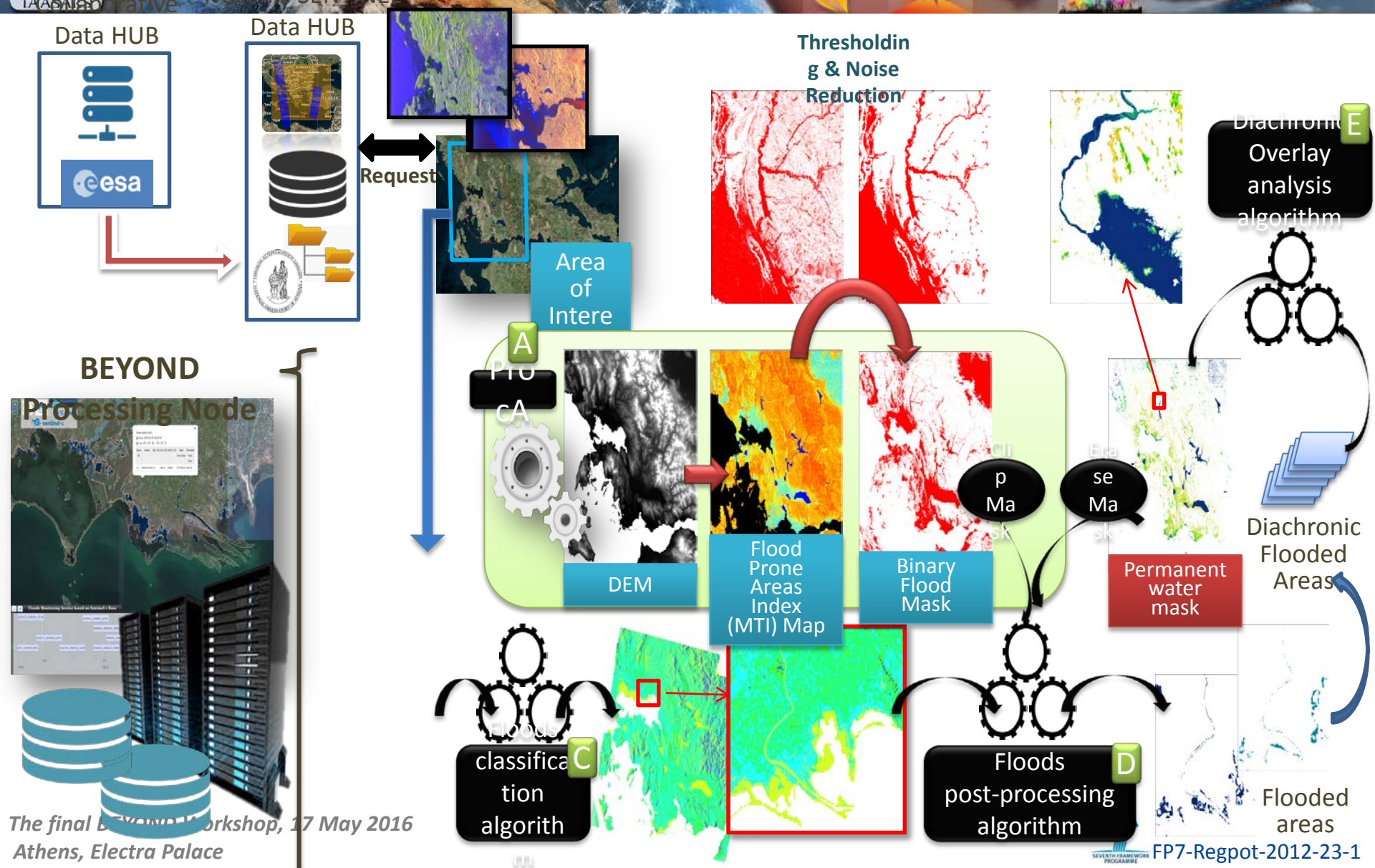
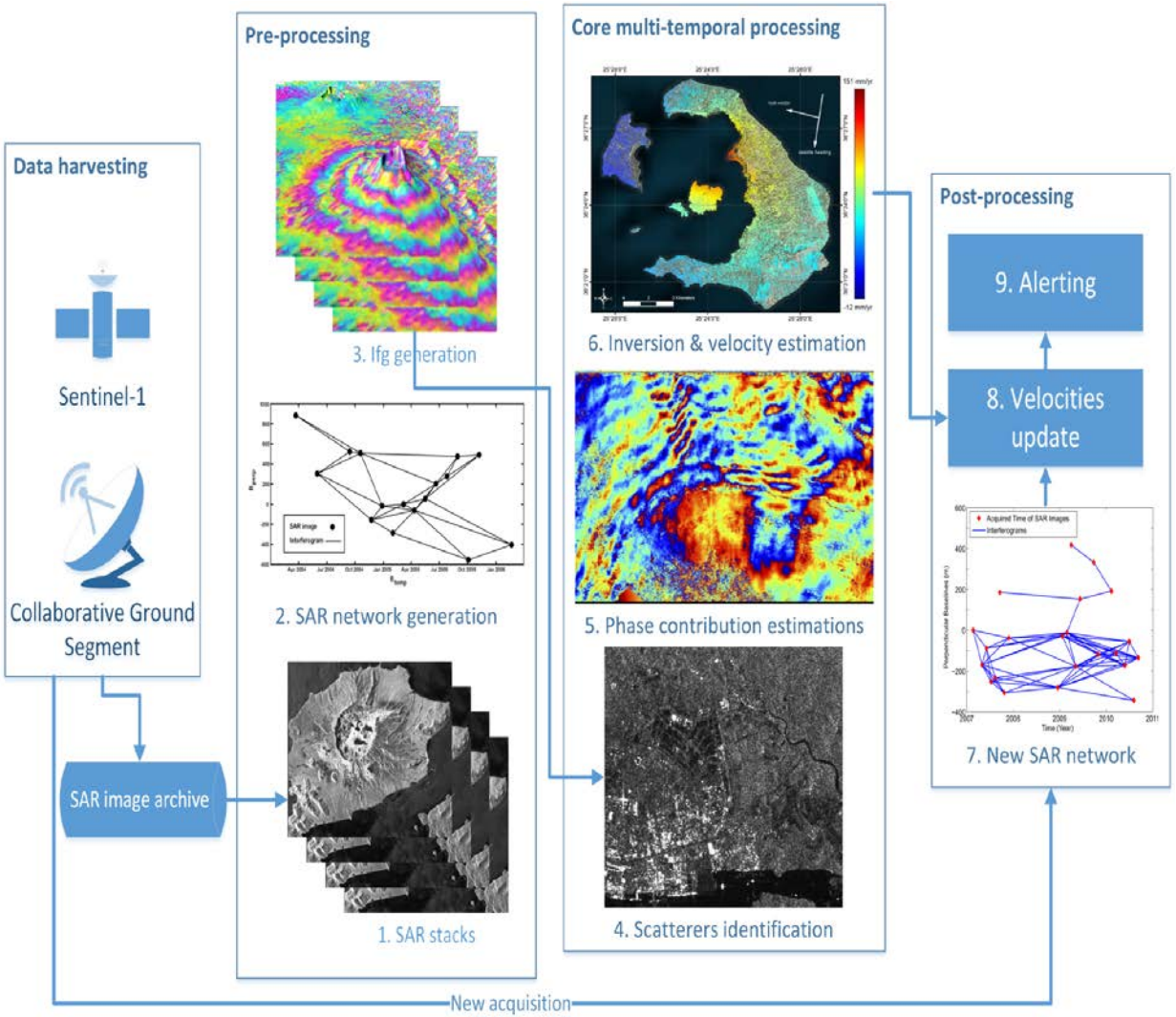
# FloodsHUB Architecture



# PS InSAR Architecture - Deformation velocity fields

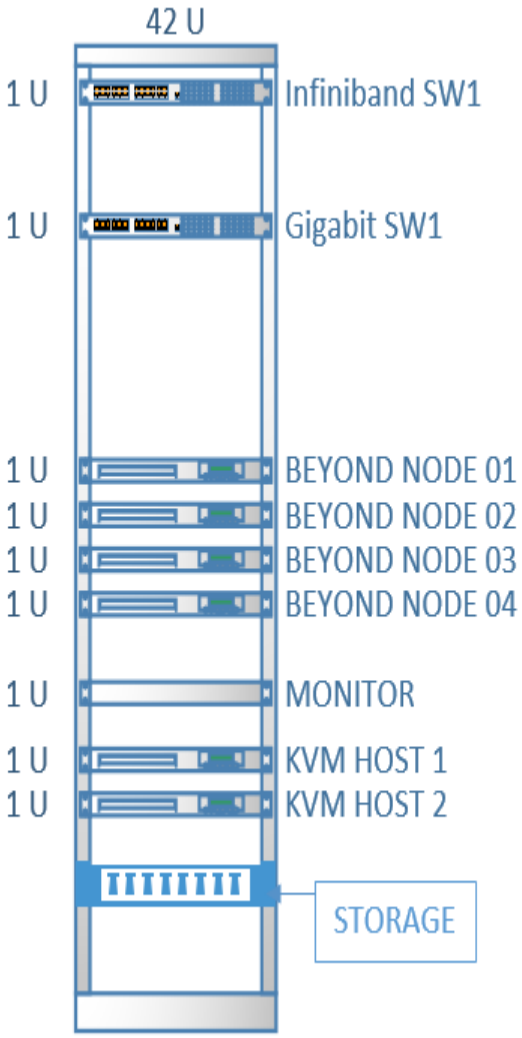


- IAASARS has empowered it's computational infrastructure with high-performance server hardware.

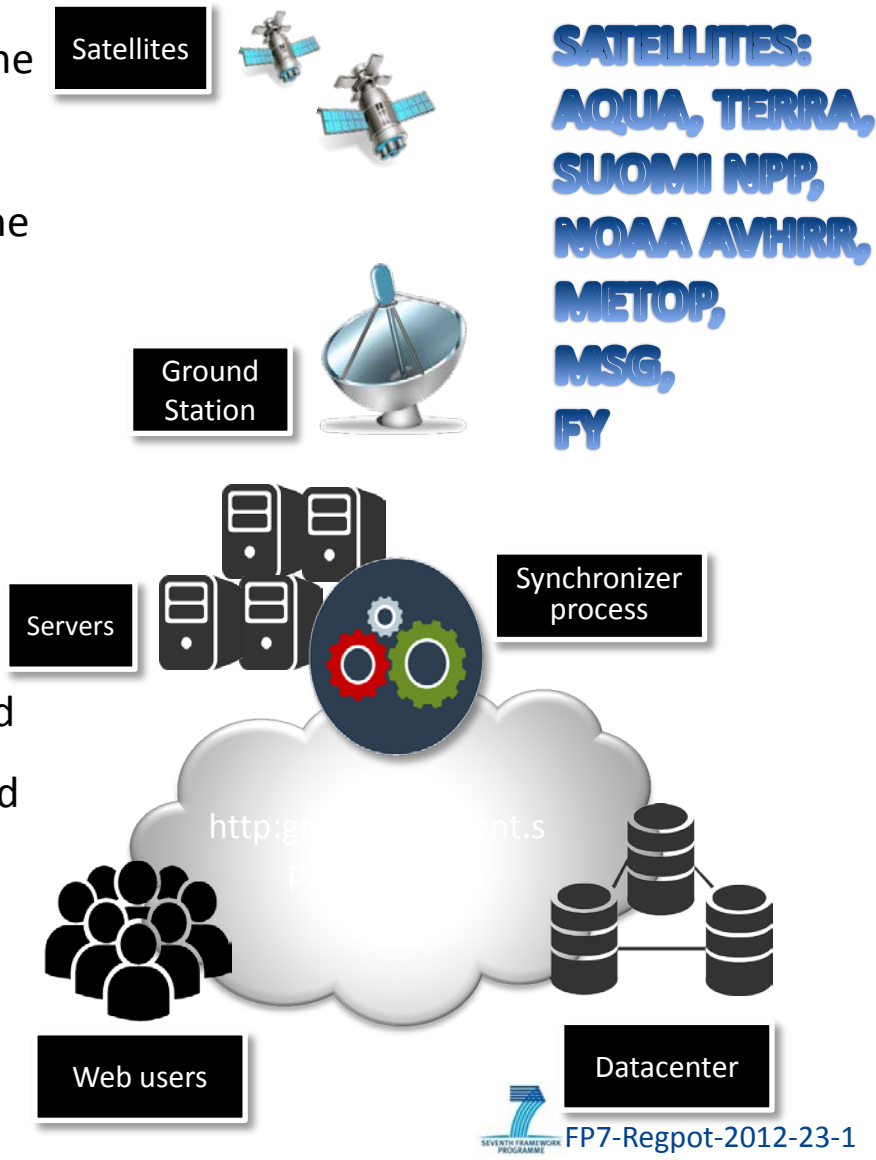
- BEYOND NODE 01-04:
  - Model: Dell PowerEdge R620
  - CPU: 2x Xeon 8 Core
  - RAM: 64GB
  - OS: Centos 6.6 Minimal

- PowerVault MD3400, 12G SAS, 2U-12 drive

- 2 KVM Virtualization Servers
  - Model: Dell PowerEdge R815
  - CPU: 2x AMD Opteron 6128
  - RAM: 512GB
  - OS: RHEL 6.0 64-bit (Dell pre-installed image)



- The ground segment architecture is based on the N-tier paradigm.
- The 1st tier comprises the ground station and the servers used for acquisition and processing.
- The 2nd tier comprises the datacenter and the backend processes used to extract and store metadata in the catalogues (e.g. Synchronizer process).
- The 3rd tier constitutes the frontend that is used to allow the users to search, view and download products. Ground Segment on the cloud!



# Thank you for your attention!

## For more information

http://beyond-eocenter.eu

http://sentinels.space.noa.gr