

BIG DATA EUROPE

Empowering Communities
with Data Technologies



THE BDE PILOT FOR SECURE SOCIETIES



Manolis Koubarakis

National and Kapodistrian University of Athens

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The Big Data Europe project

The **Big Data Europe** project is a H2020 action which has developed a **big data platform** and has applied it to the **seven societal challenges** of the H2020 programme:

- ⊙ Health
- ⊙ Food & Agriculture
- ⊙ Energy
- ⊙ Transport
- ⊙ Social Sciences
- ⊙ Security



SC7 – Secure Societies

The SC7 societal challenge of H2020 is about **protecting freedom and security of Europe and its citizens**. In other words:

- ⊙ enhance resilience against natural and man-made disasters
- ⊙ develop novel solutions for the protection of critical infrastructure
- ⊙ fight crime and terrorism
- ⊙ improve border security
- ⊙ provide enhanced cyber-security



Main Objective of the SC7 Pilot

Automatically detect **land cover changes**, caused by physical or human activities, and alert users accordingly.



Kutupalong, Bangladesh 09/16/2017



Kutupalong, Bangladesh 05/25/2017



Technical Objectives

Track changes on land cover/land use by integrating heterogeneous information sources:

- ⊙ Detect changes using **satellite images**
- ⊙ Monitor related information in **news feeds** and **social media**





A High-level View



Remote Sensing



Change
Detection
Workflow

Big Data Platform



Event
Detection
Workflow

Social Sensing





Pilot Data Sources

⊙ Sentinel-1

- Free and open data (radar images)
- Satellites operated by ESA in the framework of the Copernicus programme funded managed by EC
- Same area acquired every 6 days with 2 satellites



○ Sentinel-2

- Multispectral images

⊙ Reuters

- News articles through RSS feeds in XML format



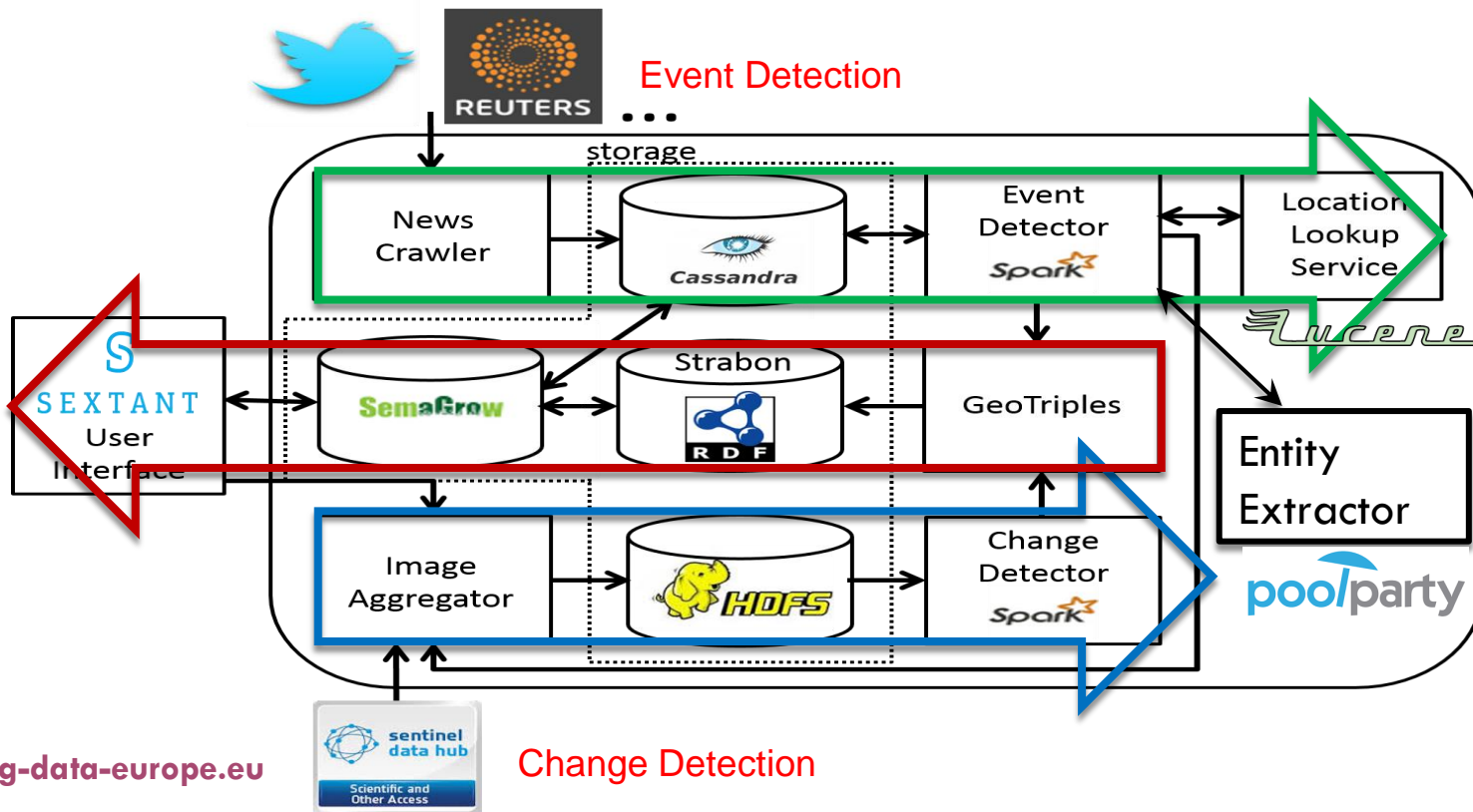
⊙ Twitter

- Free Twitter Public Streaming API and specific user accounts
- Plain text along with metadata in JSON format





Pilot Architecture





Pilot Details

- ⊙ Change Detection Workflow
 - System able to search, download and process images in parallel (**Spark**)
 - Operators used: Subset, DBscan, Terrain Correction (**from SNAP to Spark**)
- ⊙ Event Detection Workflow
 - System able to periodically monitor social media and news agencies
 - Events are identified as document clusters (**Spark**)
 - Events mapped to geolocations (**Lucene**)
- ⊙ Common workflow
 - GIS interface (**Sextant**) allows users to activate the two workflows
 - Geographic information stored in RDF store **Strabon** and queried through **stSPARQL**
 - Linked geospatial data as the integration technology (**Strabon**, **SemaGrow** and **Sextant**)



Pilot Details (cont'd)

- ⊙ Authentication and authorization through user accounts.
- ⊙ All components and workflows run on the **BDE platform.**



Big Data Challenges Addressed

- ⊙ Volume
- ⊙ **Velocity** (high volume of images and media information arriving)
- ⊙ **Variety** (two kinds of data sources)
- ⊙ **Veracity** (quality of source information and results important)



Big Geodata@UoA

- ⊙ Previous projects on semantic and linked data technologies for EO data: TELEIOS, LEO, Melodies, Optique (FP7), ProdTrees (ESA)
- ⊙ Current project (H2020): Copernicus App Lab <http://www.app-lab.eu/>
 - Make Copernicus services data (Land, Marine, Atmosphere) available on the Web as linked data
 - Enable their use by developers that are not EO experts
 - ESA App Camp in September 2017 (<http://www.app-camp.eu/frascati/>)



APP
LAB



Big Geodata@UoA (cont'd)

- ⊙ Contribution to very recent OGC white paper on big geospatial data
<http://docs.opengeospatial.org/wp/16-131r2/16-131r2.html>
- ⊙ Recent IEEE Internet Computing article on “Big Linked Geospatial Data and its Application to Earth Observation”
<http://cgi.di.uoa.gr/~koubarak/publications/2017/ic4ld-manolis.pdf>
- ⊙ See the web page of my group (Knowledge Representation, Reasoning and Analytics) for more details: <http://kr.di.uoa.gr/>



Demo

- © Video to avoid internet delays



- ⊙ Thank You!
- ⊙ For more details, see:
 - <https://www.big-data-europe.eu/>
 - <http://pyravlos-vm5.di.uoa.gr/bde-website/>
- ⊙ See you in Toulouse next week for BiDS 2017!
- ⊙ Questions?