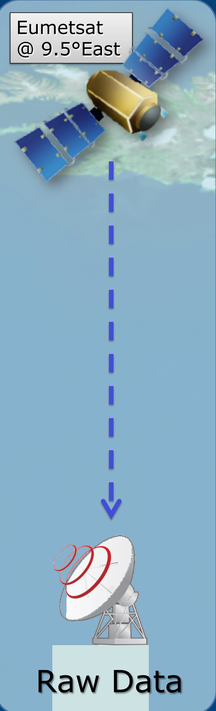
A Semantically Enabled Fire Monitoring Application

TELEIOS is a European project that addresses the need for scalable access to petabytes of Earth Observation data and the discovery and exploitation of knowledge that is hidden in them using **Scientific Database**, **Semantic Web** and **Linked Data** technologies. We demonstrate a first prototype of the **TELEIOS Virtual Earth Observatory** architecture, using a **forest fire monitoring** application as an example.

SWeFS is a Greek project that develops a novel Sensor Web platform for protecting wildland-urban interface zones against the serious threat of forest fires. To achieve its goal SWeFS integrates techniques from **sensor networks**, **distributed vision** systems, **remote sensing**, **data stream fusion**, space-time predictive modeling and control systems.

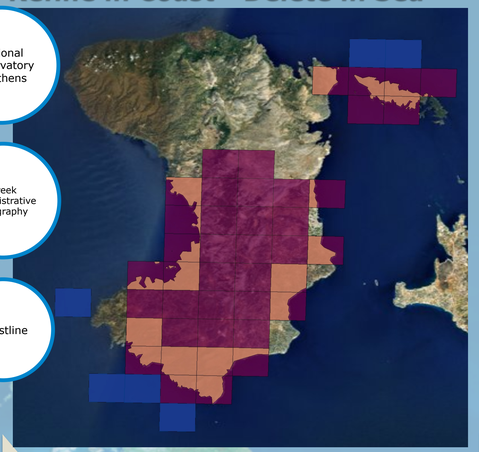


Improving the accuracy of hotspot products using linked geospatial data and stSPARQL update queries

Semantic Annotation

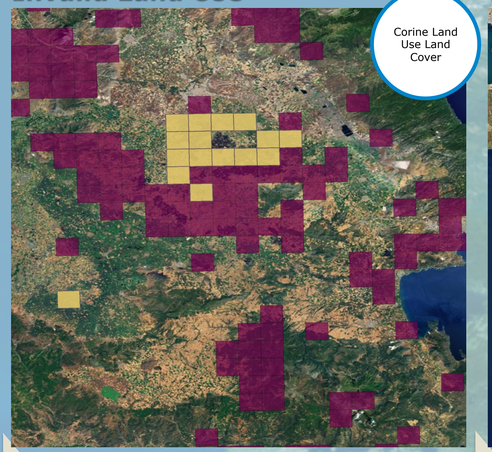
In the **ingestion** phase, a shapefile containing information about detected fires is annotated using an appropriate ontology and then is transformed into RDF and linked data about fire products. Due to the low spatial resolution of the satellite instrument and possible errors in the fire detection technique, the **thematic, spatial and temporal accuracy** of the produced hotspots is improved by **querying linked geospatial information** using **stSPARQL** and evaluating **stSPARQL update** statements.

Refine in Coast - Delete in Sea



Fires possibly detected in the vicinity of coasts due to the low spatial pixel resolution of the MSG/SEVIRI instrument and errors in image georeferencing are corrected by overlaying the coastline of Greece. The part of the hotspot's geometry overlapping the sea is discarded to have a hotspot lying completely on land.

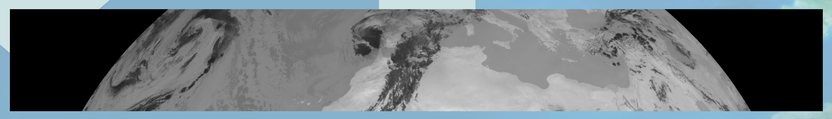
Invalid Land Use

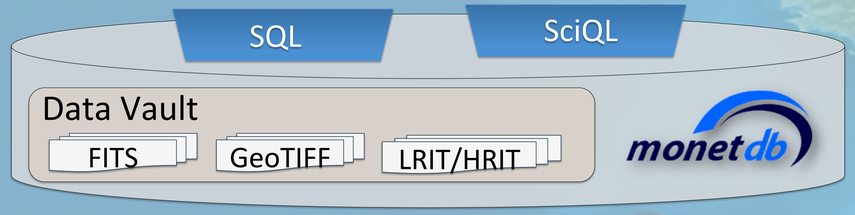


Fires detected in big agricultural plains are typically started by farmers as part of their agricultural practices so they are not wild fires, and they do not constitute an emergency situation. This type of noisy information is avoided by combining derived hotspot products together with land use/land cover information published by our group as linked geospatial data.

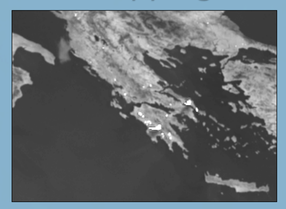
Time Persistence

A level of confidence is attributed to each detected pixel by a simple heuristic which takes into account the temporal and spatial persistence of an observation i.e., the number of times a specific fire is detected over the same or near the same geographic location during an appropriately defined continuous time period.

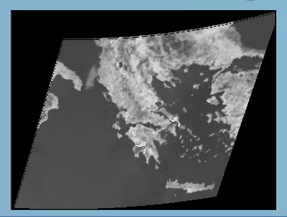




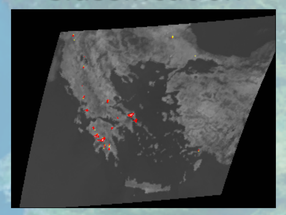
Cropping

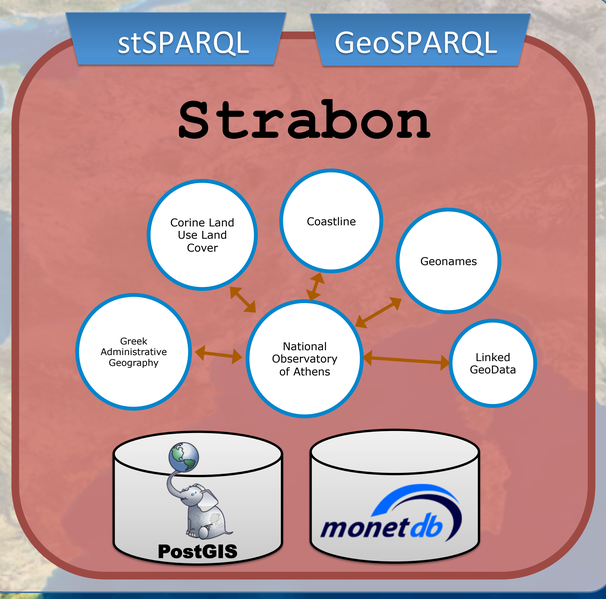


Georeferencing

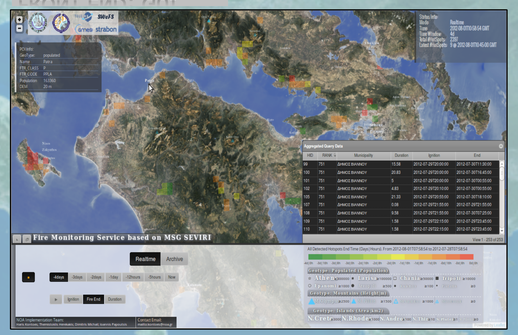


Classification





FRONT END: GUI



Challenges

- Developing a scalable **geospatial RDF store** strabon.di.uoa.gr
- Developing a new **query language** for **linked geospatial data** (**stSPARQL**)
- Publishing **new linked geospatial datasets** (some with very **complex geometries**) linkedopendata.gr
- Executing efficiently complex stSPARQL update statements

Highlights

- Fully **automated**
- Available on the **Web** for the general public papos.space.noa.gr/fend_static
- Real-time performance
- Used **operationally** on a daily basis in the summer of 2012 by the **Greek Civil Protection Agency,** the **Fire Brigade** and the **Army during** and **after** fire events
- Initial user feedback very encouraging

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