



Growing
ideas
through
networks

WG2 UBH Conservation

Meeting results and main conclusions

Alfonso Bahillo – Naples – February 13, 2020



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UNDERGROUND4VALUE

Initial discussion

- 12 members from Italy, Portugal, Poland, UK, Israel, Turkey and Spain have attended the WG2 meetings. Mostly architects, geologist and engineers.
- Four technologies for UBH conservation were presented:
 - Underground energy structures for space heating and cooling
 - Infrared thermal imaging
 - The use of innovative SLAM solution for a fast acquisition of UBH
 - Rock Fatigue
- Two case studies motivated the fruitful discussion:
 - Bourbon Tunnel in Naples
 - Megalithic Route in Central Region of Portugal

Research questions for the UBH conservation and monitoring related to the Action's case-studies (I)

- **Identify underground structures**

- Geo-radar (when the soil is dry, if there is water it does not work)
- Electrical Tomography (2D resolution is cheaper but 3D... and the are to be coveraged. It is a metter of cost)
- Penetrometer drills after electrical tomography to identify different layer properties

Research questions for the UBH conservation and monitoring related to the Action's case-studies (II)

- **Georeferencing and mapping the underground**

- SLAM with:

- Laser-scanner (it provides the geometry in gray scale, good but not enough),
- Lidar + IMU + Vision (+ GNSS) (Is the accuracy enough? Let's try!),

- Dead-reckoning using foot-mounted IMU (Is the accuracy enough? Let's try!)

Research questions for the UBH conservation and monitoring related to the Action's case-studies (III)

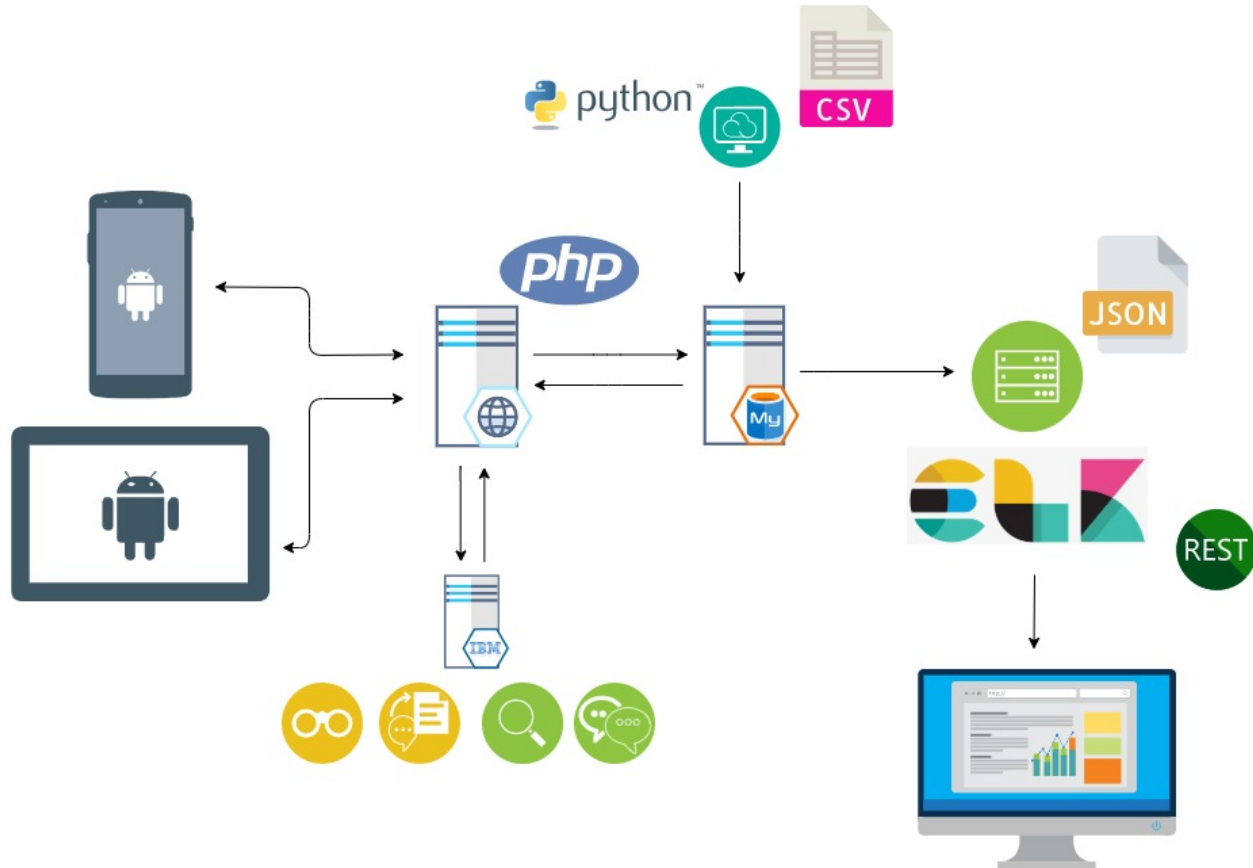
- **"See behind the walls", looking for hidden information**
 - Sound and EM waves
- **Remotely monitoring physical parameters (humidity, temperature, progression of cracks and vibrations) and presence of people**
 - Remote sensing

Research questions for the UBH conservation and monitoring related to the Action's case-studies (IV)

- **Monitoring underground structures**
 - Polarimetric imaging (as hypothesis)
- **Getting heating/cooling energy from underground using ground source heat pump** (as a possible collateral application)

Future APP for this COST Action

DARIAH (*The Digital Research Infrastructure for the Arts and Humanities*)



Thank you!

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Specific Action's challenge to cover from WG2

UBH conservation. Starting by reviewing sectoral literatures, the WG individuates the main methodological approaches and defines new research questions for the UBH conservation, which are incorporate in the case-studies assessment and in future research needs. The WG pays attention to **technologies for UBH non-invasive diagnosis, innovative ICT tools for on-site monitoring** tools of the cavities (sensing) techniques for **evaluating the stability of the site**, integrated approaches to the stability of cavities, techniques of simulation of underground failures, detailed **high-resolution visualisation and virtual reconstruction** of the more interesting items of the heritage. The WG contributes to the case-studies assessment and to the training school modules, and finally publishes the results.