Smart Cloud of Things

Validation of solutions for management of sensors in the context of Internet of Things, validation of novel fibre optical based turbidity sensors, and experimental assessment of using unmanned aerial vehicles for wide scale thermal characterization of crops. Validated in a pilot site in Beja consisting of a pomegranate field. Integrated software components with COTS sensors, custom developed hardware and vehicles capable of autonomous flight.
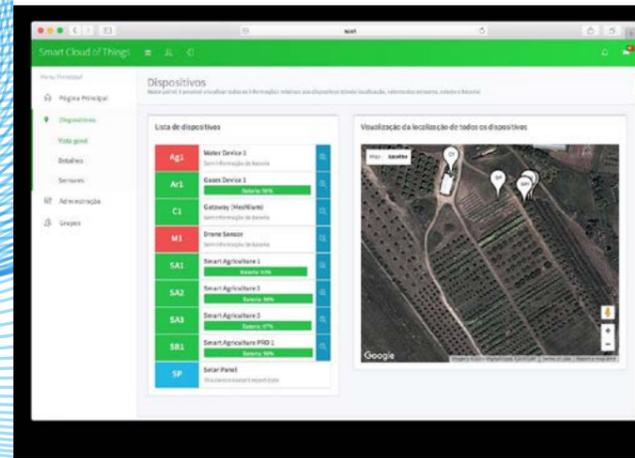

Fig. 1 - General view of the sensor dashboards presented to researchers at IP Beja.

Fig. 2 Initial prototype of the water sampling unit and general connectivity.

Main Project Team

Main Project Team	
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Funding Agencies	
IP Beja	**67,000€**
Start Date	01/01/2015
Ending Date	01/04/2015
Indicators	
Journal Papers	1

Two Main Publications

M. Antunes, J. P. Barraca, D. Gomes, P. Oliveira, R. L. Aguiar, **Smart Cloud of Things: An Evolved IoT Platform for Telco Providers**, Journal of Ambient Wireless Communications and Smart Environments (AMBIENTCOM), Vol. 1, no. 1, pp. 1-24, July, 2015

PROJECT WEBPAGE URL
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GENERAL MOTIVATION AND OBJECTIVES

This project aims to provide a solution for continuous monitoring of key parameters of a pomegranate fields. In particular, it validates software components for collection, store and processing of data, novel fibre optical sensors for turbidity measurement, and provides an initial assessment of the use of unmanned autonomous vehicle for large scale temperature monitoring. Therefore, it mainly consisted of a validation trial for other technologies developed in IT.

Execution of this project required the collaboration from researchers from multiple groups, building on the particular expertise of each field of science. The project involved the adaptation and development of software components for high performance collection, analysis, storage and visualization of IoT data, aligned with latest standards from OASIS and ETSI. It also involved the adaptation of the preliminary prototypes produced in the SWAT project, so that they could be used for monitoring of water quality in an agriculture scenario. It should be noticed, the approach followed is highly based on cloud processing as sensors only produce raw values. This brings high flexibility as calibration of values and extraction of knowledge is software based, while allowing for better protection of Intellectual Property. As an experimental activity, the use of autonomous unmanned aerial vehicles was also tested. These vehicles consisted of quadcopters with the capability of autonomous flight, equipped with a thermal imaging sensor, and capable of acquiring geo-referenced images over an extended field. The purpose was to allow covering a wide area, determining hotspots with increased water requirements.

The project main motivation of to provide a solution for integrated, continuous monitoring of a crop for IP Beja, answering a specific call for proposals.

CHALLENGE

Remote sensing with COTS sensors for a standards compatible IoT platform, novel turbidity sensors and use of autonomous unmanned aerial vehicles for thermal characterization.

WORK DESCRIPTION AND ACHIEVEMENTS

The work developed was instantiated in a pilot site at the premises of IP Beja. Consisted of multiple sensors capable of monitoring the evolution of pomegranate trees, including the humidity and temperature at level depths, gases composition, water minerals, turbidity, and solar radiation. A IoT platform was developed allowed long term storage of all data, as well as visualization, alarms and export of data for scientists. Moreover, it also provided an interface for scientists to tap into the data feed and receive real time information from all sensed data.

An unmanned aerial vehicle, capable of autonomous flight following a predetermined path was also used for remote sensing. This vehicle was equipped with a thermal imager and a GPS device, allowing the determination of temperature profiles over a wide area.