



WP T1 - Deliverable 2.1

Partner Workshop on Sensors and Big Data

Improving Resources Efficiency of Agribusiness supply chains by Minimizing waste using Internet of Things sensors (REAMIT)



REAMIT

Partner workshop on sensors and big data



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1 Introduction

The overall objective of the workshop was to share and discuss between partners and sensors & big data solution provider potential combinations of technical solutions to be implemented during the pilot experimentation. The final goal of the workshop is the production of an internal “test roadmap” of the optimum technologies tested during the pilots. The output is reflected in the deliverable “Test Roadmap”.

2 Workshop

The workshop took place in Luton 12th September 2019 with the demonstration of two technology providers.

- The first presentation was made by Peter Marchant from Review Display Systems Ltd. and Šimon Chudoba from IQRF Alliance. They develop specialised and generalised sensors. Few example of sensors implementation were presented, for instance sensors were installed in hospital freezers where medicines were kept in order to ensure that the right temperature was maintained. The sensors measured things like CO₂, temperature etc. results were uploaded unto the cloud devices through a gateway at regular intervals.

After the presentation potential collaboration with pilots has been discussed and for one; French pilot; it's been imagined to combine IQRF sensors with the Raman spectroscopy. To do so further discussion on technical side has been engaged in order to assess the solution. The result of the exchange with IQRF convinced the pilot to implement IQRF solution: sensor and gateway.



From left to right: **Šimon Chudoba** (IQRF), **Ram Ramathan** (REAMIT Project lead) and **Peter Marchant** (Review Display Systems Ltd)

- The second presentation was made by Samuel Van Ransbeeck on an aquaculture project being carried out by the University of Bedfordshire with partners in Brazil. The sensors deployed for this project come from a British Company called Seneye which installed sensors to detect their PH value, light, temperature etc.

3 Main output of the workshop

The main result and output from the workshop are:

- IQRF solution (Humidity and temperature sensor and Gateway) will be implemented jointly with the Raman spectroscopy for the French pilot.
- A white paper “Review of Potential Sensor Technology for Continuous Monitoring of Food Quality in Transport” has been prepared by Partners in Ulster University with further inputs from Levstone and IT Tralee. This was discussed at the workshop and it was highlighted that the white paper should be improved further with inputs from all the partners. The white paper when sufficiently improved will be submitted to a suitable journal.
A first abstract will be submitted to the European Operations Management Association (EurOMA) mid December 2019.
- Role of the technology partners was clarify in order to avoid overlapping between some having the same field of expertise. It’s important for the consortium to assign specific tasks to partners :
 - Whysor expressed interest in being involved mainly with connecting sensors to the cloud but not much in the analytics stage.
 - The data collected from sensors will be made available to SenX, ITT, BED and Levstone to conduct independent analysis and the sharing the results. This is because the same data can provide multiple insights depending on how it is analysed.
- A pilot report template has been agreed to be used to highlight the progress.

4 General information about REAMIT technical solution provided

Here is a brief overview of technical solution the consortium provides to the pilots.

4.1 Sensors

4.1.1 Raman spectroscopy

Our Raman sensor proposes a full integrated and completely automated system able to

analyze the food sample directly in a refrigerated truck used for food transportation. The optical measurement is done by a contactless optical head and the system can be self-ruling or operated by a user. The generated data will be compared directly by the built-in database or sent to the control center for data analysis and exploration.

Non-invasive techniques such as Raman spectroscopy, based on the interaction of light with matter, offer a versatile method which allows the rapid characterization and observation with very high reliability. The resulting Raman spectrum offers an overall view very useful to understand the analyzed sample. One measurement of a few seconds is able to provide the molecular composition of the sample without any sampling or extraction allowing for example, the determination of its content in biological molecules (carbohydrates, proteins, and lipids) or the evaluation of the quality gap between the “normal food” and “waste”. The distinctive traits can be related to the presence of microorganisms degrading the quality of food, the nutritive value is lost during processing and/or bad storage or other problems occurring during food transportation.

4.1.2 Cyberbar technology

Cyberbar technology allows food traceability using a novel food-grade data matrix technology. Tamper-proof food traceability is provided through direct imprinting of smartphone-readable data matrices onto food. Cyberbar is a novel labelling system based on the laser imprinting of data matrix imprint directly onto meat product such as a chicken breast fillets, prime beef cuts, etc using a novel food grade marking system. The resultant data matrix information can be readily interpreted using image analysis software typically found on smartphone devices, whilst overcoming the undesirable leaching effect. Using this technology, it affords the food processor, the retailer and the consumer the opportunity to access on-the-spot (real time) information on the food product thus offering a secure tamperproof food traceability systems for both local and global use.

This technology enables verifiable traceability in real time extending right down the food supply chain from the food processor to the consumer ensuring a robust integral chain of custody is achieved.

4.1.3 3D Fluorescence

Fluorescence spectroscopy is a type of electromagnetic spectroscopy that analyzes fluorescence from a sample. It involves using a beam of light, usually ultraviolet light, that excites the electrons in molecules of certain compounds and causes them to emit light; typically, but not necessarily, visible light





4.2 Big Data analytics

Big Data infrastructure will address REAMIT data requirements: (i) to compile data from sensors to a Big Data platform; (ii) to develop another platform for linking suppliers and consumers; and (iii) to analyse sensor data to understand the patterns of food waste, to identify “food at risk”, and to provide decision support to food owners for making rapid decisions to save food. Food owners, truck drivers and warehouse managers will be connected using a dedicated Smartphone APP.

Different consortium partners bring their own value added in this perspective including 1) an Open Source data analytics framework including a (geo) data time series database and a data analytics engine for sensors data, 2) a end to end sensors data technology that goes from the data collection to the analytics, 3) business applications (including mobile app) in industry and logistics based analytics data technology and services for real time data.

5 The REAMIT Consortium

 University of Bedfordshire	<p>The University of Bedfordshire is the lead partner of the REAMIT project. They have expertise in making business sense of big data and internet of things technologies, applied to agriculture, aquaculture and other sectors.</p>
 images et réseaux	<p>Images et Réseaux is an ICT Cluster in western France , and we are focused on cores digital technologies (5G & next generation infrastructures, big data and AI, immersive & interactive content, cyber physical system, digital trust, and photonics) in 5 sectors (health, agriculture & farming, digital fab & services, digital territory, and digital entertainment)</p> <p>https://www.images-et-reseaux.com/</p>
 UCD DUBLIN	<p>University College Dublin (UCD) is Ireland's premier university, with over 24,000 students and a research budget in excess of €100 million per annum. The UCD members have expertise in food engineering, have developed IoT based sensors (e.g., the CyberBar system) and lead life cycle assessment modelling for the analysis of environmental impacts of a range of production systems.</p>
 UNIVERSITÉ DE NANTES	<p>The GEPEA laboratory of University of Nantes participates mainly in the development of optical sensor for REAMIT project. The laboratory has solid scientific skills in optical biosensors applied to food and environmental fields.</p> <p>https://www.gepea.fr/</p>
 LEVSTONE	<p>Levstone Ltd a software house specialising in high-security, cutting edge mobile software and cloud big data solutions. Levstone are winners of InnovateUK (Gov) research projects.</p> <p>Our solutions are used in logistics, transportation, and health and social care for vulnerable citizens. We focus on real-time data acquisition (inc. IoT sensors), data privacy and ensuring data authenticity.</p>
 NOTTINGHAM TRENT UNIVERSITY	<p>Nottingham Trent University is one of the leading higher education institutions in East Midlands, UK. We are liaising with local businesses for our curriculum enrichment and practice-based education. Our primary activities in this REAMIT project are dissemination of results to wider community and communication to internal & external stakeholders through various media. We will also be involved in implementation of IoT technology in agri-food supply chains of local food businesses.</p>
 WHYSOR	<p>Whysor's main activities are in the Internet of Things and Big Data area. They connect IoT devices to the cloud, by providing a long-range (LoRa) infrastructure for the Internet of Things. For the REAMIT project, Whysor will work with pilot tests in all five countries to collect data from sensors and put them in the cloud and also work on analytics along with other partners. Next to being a broker we will be providing dashboarding functionality to view the gathered data in realtime as well as the ability to</p>

	generate alerts based on that data.
	<p>The IMaR Research Centre, based in Institute of Technology Tralee, has at its core expertise in electronic and mechanical hardware, software, IoT and data analytics. This expertise is applied across a large range of verticals including manufacturing, agriculture and food sectors. IMaR has previously developed sensor platforms for environmental monitoring and analysis in the food supply chain through their involvement in the Life+ funded Freshbox project.</p> <p>www.imar.ie</p>
	<p>SenX is the software developer and publisher of Warp 10, an Open Source solution to manage and to analyze data from sensors / IoT. Warp 10 is based on a Geo Time Series technology and propose a Time Series database and a library of more than 900 data analytics functions in an horizontal, performant, neutral, secured and industrial perspective.</p>
	<p>The University of Ulster is a partner of the REAMIT project. They have expertise in sourcing and developing sensors as well as intelligently analysing data from sensors with applications in agriculture, health, tourism and other sectors</p>
	<p>Dunbia (Northern Ireland) is a processor red meat situated in Co Tyrone NI with locations throughout the UK. With annual processing of 60,000 cattle and 200,000 lambs, the Dungannon based facility performs slaughter, deboning and retail packing of meat products at its sites. Combined with externally purchased products its annual turnover of £220m includes markets across the UK (retailers) and export (Europe and Asia), serving markets with carcase, primal and retail packed products. In the REAMIT project, Dunbia will be one of the end-users. They will provide access for fitting sensors that track quality of raw meat in trucks and food processing warehouses to facilitate data download from sensors for further analysis to eventually reduce food waste.</p>

6 Contact

Website: www.reamit.eu



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