Interreg North-West Europe REAMIT
European Regional Development Fund
EUROPEAN UNION
www.reamit.eu

RESOURCE & MATERIALS EFFICIENCY

Biogros and the REAMIT Project

Pilot-test start date: November-2021

BIO GROS Produits biologiques et demeter
https://www.biogros.lu

We are REAMIT

REAMIT is a transnational European territorial cooperation project funded by Interreg North-West Europe (NWE) Programme aiming to reduce food waste. The project focuses on fruits, vegetables, meat, and fish supply chains as these are wasted in large quantities. It is being carried out in Ireland, Germany, France, UK and the Netherlands due to the amount of interconnected food supply chains and huge food waste in these countries. The REAMIT project is using existing Internet of Things and Big Data technologies to best fit the needs of the food supply chain management system in the NWE region. Through testing and adaptation, these technologies are being enabled to continuously monitor and record food quality and signal potential food quality issues. Through analytics, owners of 'food at risk of becoming waste' are provided with decision support options to minimise food waste including redistribution to nearby customers. As part of the technology demonstrations, the REAMIT project team is working with Biogros, helping to reduce food waste.

We are Biogros

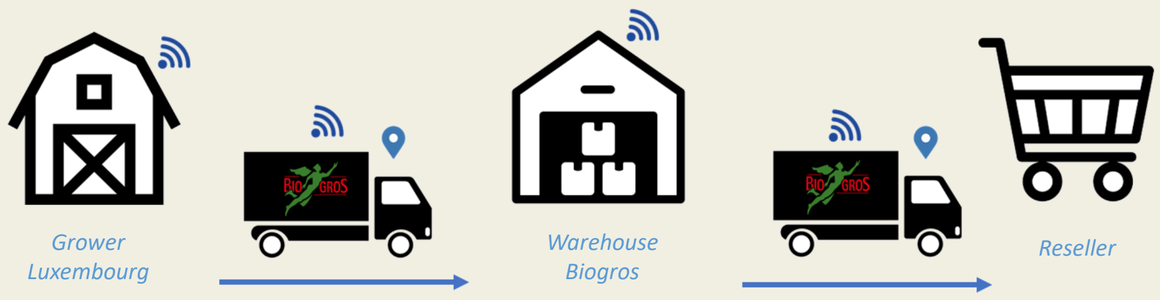
Biogros is a wholesaler for high quality organic and biodynamic foods (3.500 items in fruit, vegetables, dry goods and dairy produce) in Luxembourg. For more than 25 years, Biogros has been supplying high quality organic food six days a week to their Luxembourg customers.

Biogros stocks products from well-known organic brands like Naturata, Rapunzel and Lebensbaum, as well as organic products from lesser known or smaller producers. Thanks to our close collaboration with organic farmers from the cooperative Bio-Bauern-Genossenschaft Lëtzebuerg (BIOG), who also offer a whole range of regional organic products.

Challenges at Biogros

While receiving deliveries from BIOG organic growers in Luxembourg, Biogros noticed that the quality of fragile produce, such as mushrooms, unions, potatoes and celery roots, would occasionally not be up to standard. Biogros wanted to gain insight in the climatic conditions (temperature and humidity) in the full supply chain, from grower to supermarket. Biogros sought a system which would perform the following:

1. The trucks should be connected to the cloud to allow for real-time data reporting / monitoring while the trucks perform deliveries
2. The warehouses of both grower and Biogros should be connected to the cloud, measuring temperature and humidity to allow for real-time data reporting/ monitoring
3. An alerting system should send SMS messages to drivers and warehouse logistics staff notifying if any anomalies occur
4. Alerts should not be sent when the trucks are stationary e.g., parked overnight, performing a delivery, etc.
5. The power consumption of the proposed system should be such that maintaining the equipment does not become an arduous task

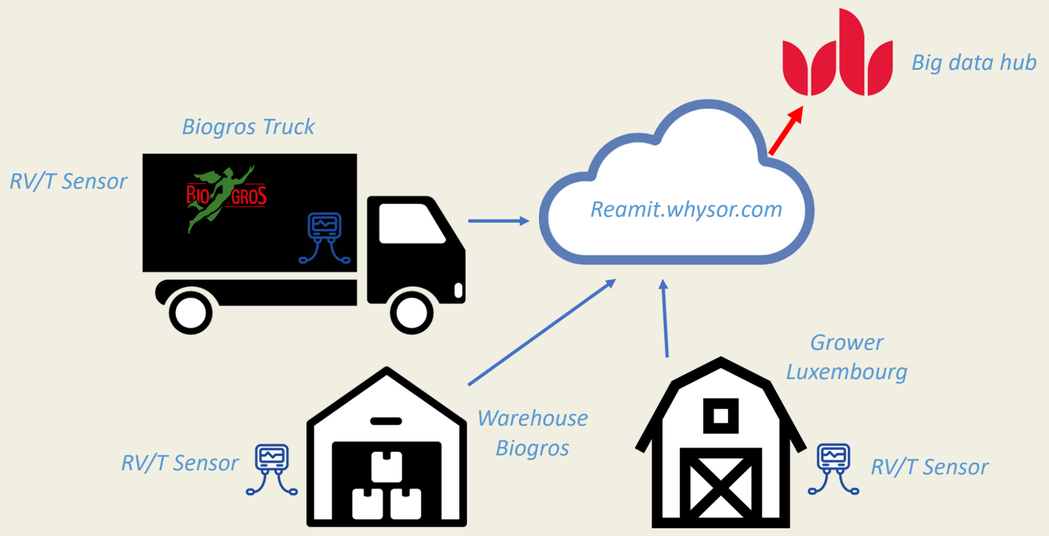


REAMIT's solution

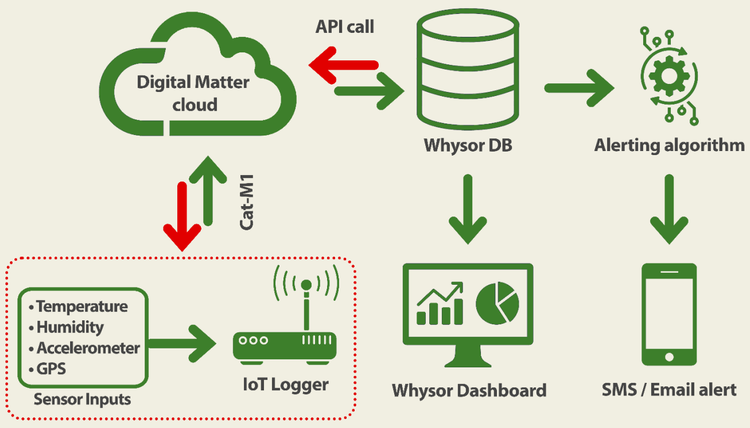
The REAMIT team at Whysor (the Netherlands) examined Biogros' system requirements and proposed a real-time monitoring and alerting system for anomaly detection during the full supply chain. The Eagle datalogger (Digital Matter, South Africa) was selected as the platform for the development of the REAMIT solution. The logger is an IP67 rated rugged cellular IoT device, supporting a range of inputs for various IoT applications. The Eagle runs on either batteries or can be wired to permanent power. It has analog, digital and serial inputs. It contains a GPS module and an accelerometer for geofencing and movement detection and is equipped with a sim card allowing the device to perform as an IoT gateway, running on the GPRS LTE / 4G network.

For the Biogros pilot, the logger was fitted with a T9602 Temperature/Relative Humidity sensor (Amphenol, USA), to allow monitoring in ambient and chilled zones of trucks and warehouses.

Whysor developed the REAMIT dashboard for real time monitoring and alerting, which was utilized by each pilot study in the project. The dashboard runs on both desktop computer and smartphone. The alerts can trigger an e-mail or SMS notification.



System Architecture



Alerting logic. The threshold values for the alerting system are defined by the technical team at Biogros, for all locations inside the warehouse or inside the truck. Text messages are sent if the limit value is exceeded, e.g., above 8°C in the vegetable department or above 10°C inside the truck.

To avoid false alerts, the system records 2 consecutive values above the threshold before sending the alert. The values are recorded every 5 minutes by the logger.

Trip detection. A trip detection algorithm was developed based on accelerometer measurements and GPS data reported by the Eagle logger. A trip would be reported if motion was detected by the accelerometer and if the GPS coordinate had changed from the previous reading. This algorithm allowed the system to sleep when trips are not being performed to conserve battery life, as well as avoiding sending false alerts while trucks are parked overnight.

Results and Conclusion

The IoT anomaly detection system was deployed in Biogros between March-July 2022 in nine trucks, at three growers and at seven departments inside the Biogros warehouse. Logistics staff at the warehouse were given access to the REAMIT dashboard for real-time monitoring of the vehicles and warehouses and were added to the alerting service. This allowed them to receive text messages to their smartphone if an anomaly was detected. Early results show that the system is robust and avoids sending false alerts due to the trip detection algorithm, a purpose-built customised system.

Practical application. We have developed an IoT solution which monitors in real time the temperature and humidity of the full supply chain.

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