

Harvesting: A new challenge for powering IoT nodes

Organized by EnSO Project under ECSEL Programme





EnSO has been accepted for funding within the Electronic Components and Systems For European Leadership Joint Undertaking in collaboration with the European Union's H2020 Framework Programme (H2020/2014-2020) and National Authorities, under grant agreement n° 692482

Workshop Agenda

INTRODUCTION & KEYNOTE	
9h00 - 9h05 9h05 - 9h30 9h30 - 9h45	Welcome greetings <i>Ramon Jane, Workshop Chairman</i> Keynote "IoT Ecosystem and Business Creation", <i>David Langley , co-chairman WG2 AIOTI</i> Scope and Outcomes for EnSO Project, <i>Raphaël Salot, Project Leader</i>
PORTFOLIO OF HARVESTING TECHNOLOGIES – Chairman: Peter Spies – FRAUNHOFER IIS	
9h45-10h 10h-10h15 10h15-10h30 10h30-10h45	Thermoelectric, Janina Paris, MAHLE Thermolektronik Solar, Anne Labouret, SOLEMS Mechanical, Jerome Delamare, ENERBEE Vibrational, Gonzalo MURILLO, Energiot
10h45-11h15	Coffee Break
USE CASES IN DIFFERENT DOMAINS – Chairman: Daniel Martinez – RICOH SPAIN IT SERVICES	
11h15-12h15	Smart Health: Freek Boesten, Maastricht Instruments Smart Society: Smart Lock, Julien Boullie, OJMAR Smart Mobility/Industry: Leonardo Goboni, AED Engineering
ROLE OF EU PROJECTS IN MARKET ROLL OUT - ROUND TABLE - Chairwoman: Emma RICHET - AYMING	
12h15-13h	Introduction of projects & Round Project VICINITY, Juan Rico, ATOS Project INSCOPE, Corne Rentrop, TNO Project EnSO, <i>Raphaël Salot, CEA-LETI</i> NMBP Committee H2020, Carles <i>Cané, CSIC-CNM</i>



USE CASES IN DIFFERENT DOMAINS

Daniel Martinez, Ricoh Spain IT Services **RICOH** imagine. change.





SMART HEALTH

Freek Boesten, Maastricht Instruments





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MEMBER OF BRIGHTLANDS MAASTRICHT HEALTH CAMPUS

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 - Regenerative Medicine
 - Cardiovascular Research
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 - Performance Materials
 - Bio-Based Materials
 - Biomedical Materials
- SMART SERVICES CAMPUS HEERLEN
 - Big data analyses
 - Finance & business
- GREENPORT CAMPUS VENLO
 - Agriculture & food
 - Logistics

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Our Expertise

STRONG RELATION TO MAASTRICHT UMC+ RESEARCH



INDIRECT CALORIMETRY





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Our Expertise

STRONG RELATION TO MAASTRICHT UMC+ RESEARCH







USE CASE: SMART HEALTH





OPTIMIZE WEREABLE DEVICE





HOSPITAL FIT MARKET PERSPECTIVE



Figure : Share of the age brackets within the population in EU-27 (Source: EUROSTAT 2012)



TOWARDS WEREABLE HEALTHCARE

3 objectives: stimulating the development of innovative health solutions that:







NEW MEASUREMENTS

NEW APPLICATIONS



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SMART SOCIETY

Julien Boullié, OJMAR S.A.





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Company overview

COMPANY FACTS

DESIGN, MANUFACTURING AND MARKETING OF LOCKING SOLUTIONS FOR FURNITURE

1918, EIBAR, BASQUE COUNTRY, SPAIN

CURRENT LOCATION

ELGOIBAR, BASQUE COUNTRY, SPAIN

QUALITY POLICY

ISO 9001 ISO 14001

R+D+I 84 PATENTS

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LOCKER LOCKS WELLNESS

NUMBER ONE IN SPAIN FRANCE UNITED KINGDOM POLAND BELGIUM

STRONG PRESENCE IN GERMANY AUSTRALIA

...





LOCKER LOCKS **FITNESS**

NUMBER ONE IN SPAIN UNITED KINGDOM ITALY HOLLAND POLAND

STRONG PRESENCE IN U.S.A. AUSTRALIA LATIN AMERICA GERMANY

. . .





LOCKER LOCKS CORPORATE

REFERENCES U.B.S., United Kingdom J.P. MORGAN, United Kingdom CREDIT SUISSE, Poland CREDIT SUISSE, United Kingdom DEUTSCHE BANK

...





Company overview



THE FIRST REAL-TIME WIRELESS LOCKING SYSTEM IN THE MARKET





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Know-how related to the project

Ojmar has a long experience in all the industrial phases:

- Design & development of locking systems,
- Manufacturing and assembly of mechanical and electromechanical products
- After sale support for all kind of indoor environmental conditions

Knowledge of power management limitations necessary to warranty a high level of availability of a lock powered by battery:

- high currents (200mA to 1A approx.) to move or block the mechanism,
- very low sleeping currents (tens of uA) during most of the time (an open/close cycle is only lasting a few seconds),
- medium current (20 to 40mA) when communication is required



Goals and targets of the project

 Develop a new "smart" lock as a use case of the project that can use the AMES (Autonomous Micro Energy Sources) module and harvesting techniques



- Test and develop an IOT product for a new market for Ojmar. The idea is to provide an answer when operators/workers need to access "isolated" buildings (whereever they are) using a mobile device as a temporary "key".
- Collaborate and share knowledge with "key" companies on harvesting techniques and power management of embedded devices
- Open a new market segment opportunity for Ojmar



Functional approach of the use case

 A "smart" lock and a "smart" hasp have been developed to answer the need of the project and will be installed on pilot sites



- Using an NFC interface, the lock and hasp are able to communicate with the portable device (tablet)
 - Through a secure communication between the lock and a central server (through an App designed by Gas Natural), the server will provide a temporary authorization to open/close the door from a central server of a multi-site management



Technical approach

- The AMES module is able to provide power supply to the lock for standard operation (sleep current and communications needs and standard open/close operations)
- When intensive use of the lock will be done, the electro mechanism will require an additional super cap to provide enough energy to move it from the "open" state to its "close" state and vice versa.
- The power management is also realized using a P.V. harvester to load the rechargeable battery (approx. 0.8mW in cloudy outdoor weather).
- A NFC harvester is under development to enable an emergency opening when the battery fails.



Expected benefits and market vision

- The results should be "autonomous" or "quasi" autonomous locks designed for a specific application thanks to optimized power management and selected harvesters.
- The solution provides an answer to a new segment of market for Ojmar (isolated facilities).
- From the project will start a business plan development to reach some market share objectives.
- The technology and knowledge, results of the project, can be used to improve other products from Ojmar.



Conclusions

- After studying different energy harvesters and optimizing power management and needs, a solution has been selected and implemented in the new locks.
- First locks prototypes have been designed and are under test.
- Improvements to be added to locks and power management.
- Pilot installation to be set soon.
- Good collaborating efforts so far in the ENSO project.

Thank You Julien Boullié: jboullie@ojmar.com





SMART MOBILITY/INDUSTRY

Leonardo Govoni, AED Engineering





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Wireless and Energy harvesting

AD Engineering

Ultra Wide Band









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Objectives



AED Engineering Framework: Smart Industry

Main objectives:

- Development of a self-sufficient indoor localization system
- Implementation of navigation assistance



EnSO proposed Use Cases



Localization of the Key Fob of a car (inside and outside)





Localization of a person or a robot inside a building for navigation assistance





Localization System - Architecture







Localization System - Architecture





IoT Week Bilbao 2018 4-7 JUNE 2018, BILBAO (SPAIN) EUSKALDUNA CONFERENCE CENTRE

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Localization System - Architecture







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AI

Localization System - Architecture







Localization System - Tag







Localization System - Devices









Tags with batteries

Tag with EnSO AMES

Anchor

Power Consumption and Accuracy

- A Tag can run with a 300mAh battery without harvesters for > 1 month
- 2D accuracy: 0.17m (75%), 0.26 (95%)



Video of the first Demo







Market





Indoor localization can be used to provide navigation assistance:

- In wide area public facilities (airports, supermarkets...)
- In industrial facilities to reach faulty devices or setting devices
- In logistic facilities to support for goods recognition
- In museums for guiding purposes
- For blind people assistance in private/public facilities
- Augmented reality in museum, houses, archaeological sites
- To wheelchair inside schools or hospitals
- Localization of expensive or few available devices (hospitals)
- Localization of patients for activity reporting (hospitals)

• ...



Conclusion

- Ultra Wide Band allows indoor localization

Powering you

- EnSO: AMES for energy harvesting and optimization



ROLE OF EU PROJECTS IN MARKET ROLL OUT - ROUND TABLE

Emma Richet, AYMING





PROJECT VICINITY

Juan Rico, ATOS





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Vision and Mision



VICINTY's vision is to:

- Provide "Interoperability" as a service, not yet another standard
- Create an open platform for domain-crossing, value-added services

by building and demonstrating a

- Bottom-up, user-driven, decentralized, extensible ecosystem
- Like a social network for things, enabling value added services
 - Where users can share the access to their smart objects without losing the control over them
 - Where innovative x-domain services and new business models can be established



Unique Selling Point



VICINITY's Unique Selling Point is its ability to:

- Enable sharing of data at semantic level
- Users maintain ultimate control of their data, no disclosure to 3rd party
- GDPR-ready architecture
- Edge-computing approach / P2P yields higher scalability, dependability





Open calls

- 1st Open Call
 - New IoT Infrastructures
 - Funding up to 60.000 €
 - Expected duration of the project 6 Months
 - Start: 15/03/2018 Finish: 15/06/2018
 - Projects start: October 2018

2nd Open Call

- Value added services
- Funding up to 60.000 € (tbd)
- Expected duration of the project 6 Months (tbd)
- Start: 15/11/2018 Finish: 15/02/2019 (tbd)
- Projects start: May 2019 (tbd)





PROJECT INSCOPE

Corne Rentrop,

TNO



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NMBP Committee H2020

Carles Cané, CSIC-CNM





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EU FP Funding Opportunities for micro-Energy Harvesting, micro Batteries & micro Fuel-Cells

A lot of Activity in H2020 and also FP7.

- At materials Level: NMP and NMBP Calls but also EEB, Biotech,...
- At devices Level: NMBP, ICT, JTI
- At systems level: JTI: ECSEL-ENIAC, Clean Sky, Fuel Cells.
- SME Program
 - Sectors,: Energy, Transport, Health,...
- TRLS: from Fundamental (ERC), Basic (FP7) to high (FP8, JTIs, OLAE,...)





European Research Council Established by the European Commission







NMBP

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- NMP-2014.05--Industrial-scale production of nanomaterials for printing
 - BASMATI: Scaling up nanoMATerials and Inks for printing
- NMP.2013.2.2-4 Materials solutions for durable energy-harvesters
 - SINERGY: Si Thermoielectrics
 - MANpower Vibrational Energy Harvesting and Storage
 - MATFLEXEND: MATerials for FLEXible ENergy harvesting
- NMP.2012.1.1-1 Rational design of nano-catalysts for sustainable energy
 - CHIPCAT: Thin-Film Nanocatalysts for On-Chip Fuel Cells
- NMP-2010-1.2-3 Thermoelectric energy converters based on nanotechnology
 - THERMOMAG. Nanostructured harvesting ThElectrics based on Mg2Si
 - NEAT: Nanoparticle Embedded in Alloy Thermoelectrics
- NMP-2010-4.0-4 multi-functional fibre-based products
 - ROPAS: Roll-to-roll PAper Sensors
- NMP-2009-1.2-1 Nanotechnology for harvesting energy via photovoltaic
 - SANS. Sensitizer Activated Nanostructured Solar Cells
- NMP-2009-2.1-1 Nano-structured materials based on graphene
 - GRENADA: GRaphenE for NAnoscaleD Applications
- NMP-2008-1.1-1 Converging sciences/technologies (nano, bio, info and/or cogni)
 - 3D-NANOBIODEVICE 3-D devie for biomedical application
- NMP-2008-2.1-2 Processing and upscaling of nanostructured materials
- SIMBA Scaling-up production of Metallic nanopowders for Batteries
 - NMP-2007-2.2-3 Advanced material architectures for energy conversion
 - SUPERLION: Superior Energy and Power Density Li-Ion Microbatteries



Public Private Partnerships: EEB, Green Car

Energy Efficient Buildings

- EEB-07-2017 Integration of energy harvesting at building and district level
 - ENVISION ENergy harVesting by Invisible Solar IntegratiON in building skins
 - PLUG-N-HARVEST: PLUG-N-play passive and active multi-modal energy HARVESTing systems,
- EeB.NMP.2012-5 Novel materials for smart windows
 - HARWIN: Harvesting solar energy with multifunctional glass-polymer windows

Green Car

- GC.NMP.2010-1 Materials, technologies and processes for sustainable automotive electrochemical storage applications
 - LABOHR: Lithium-Air Batteries
- GC.NMP.2012-1 Innovative automotive electrochemical storage applications based on nanotechnology
 - LISSEN; Lithium Sulfur Superbattery Nanotechnology



Biotech & ICT

Biotech

- BIOTEC-5b-2015 SME boosting biotechnology-based industrial processes
 - H2AD Innovative and scalable biotechnology using Microbial Fuel Cell

ICT

- ICT-02-2014 Smart System IntegrationH2020-EU.2.1.1.1. A new generation of components and systems: Engineering of advanced embedded and energy and resource efficient components and systems
 - Smart-MEMPHIS. Smart MEMs Piezo based energy Harvesting with Integrated Supercapacitor
- ICT-2011.3.6 Flexible, Organic and Large Area Electronics and Photonics
 - OLAE+: Organic and Large Area Electronics
- ICT-2009.3.3 Flexible, organic and large area electronics
 - Low-cost highly conductive high resolution structures for flexible/large area electronics
- ICT-2009.3.9 Microsystems and smart miniaturized systems
 - SIMS: Development of a Smart Integrated Miniaturised Sensor System for analytical challenges in diagnostics, industry and the environment



JTIs ECSEL and Clean Sky:

ECSEL/ENIAC

- ECSEL-18-2015 Smart Systems Integration
 - ENSO: Energy for Smart Objects

Clean Sky

- JTI-CS-2013-1-SGO-02-068 Harness integrated sensors network for wiring health monitoring
 - SensWIRING: Integrated Delocalized Sensors for Health Monitoring
- JTI-CS-2012-3-SFWA-03-011 Wireless Sensor Nodes for continuous flight test measurements
 - FLITE-WISE: FLite Instrumentation TEst WIreless SEnsor
- JTI-CS-2010-1-SFWA-01-016 Ultra low power autonomous wireless stain gauge data acquisition unit
 - Hardware & Software Development of Wireless Sensor Network Nodes for Measurement of Strain in Airborne Environment



JTI Fuel Cells:

- FCH-02-9-2017 Development of next-generation SOFC stack for small stationary applications
 - OxiGEN. Next-generation Solid Oxide Fuel Cell stack and hot box solution for small stationary applications
- FCH-02.6-2015 Development of cost effective manufacturing technologies for key components or fuel cell systems
 - Cell3Ditor. Cost-effective and flexible 3D printed SOFC stacks for commercial applications
- SP1-JTI-FCH.2011.3.1 Next generation stack and cell design
 - EURECA: Efficient use of resources in energy converting applications
- SP1-JTI-FCH-2010.4.2 Fuel supply technology for portable and micro FC
 - ISH2SUP: In situ H2 supply technology for micro fuel cells powering mobile electronics appliances
- SP1-JTI-FCH.2010.4.4 Components with advanced durability for Direct Methanol Fuel Cells
 - DURAMET: Improved Durability and Cost-effective Components for New Generation Solid Polymer Electrolyte Direct Methanol Fuel Cells



Research for SMEs

- ZEOCELL: Nanostructured Electrolyte Membranes for PEM Fuel Cells. CELL
- Windtree: Nature inspired energy generation system for urban distributed power
- WIRAILCOM Wireless Railway Condition Monitoring
- CMSWIND: Advanced condition monitoring system for the assessment of wind turbines rotating parts
- PLATIO: Innovative outdoor solar and kinetic energy harvesting pavement system
- FABRIC: Fabric structures for solar power generation
- SEA Kinetic Energy Recovery System
- POWERAMP: Clean Energy Production through Roadway Surface Power Harvesting Systems for Increased Safety in the Transportation Sector

Innovation Programs:

- S2R-OC-IP2-02-2017 Energy harvesting methodologies for trackside and on-board signalling and communication devices. Adaptation of already existing technologies for developing a purely on-board Train Integrity
 - ETALON: Energy harvesTing for signAlLing and cOmmunicatioN systems



European Research Council (ERC)

- SOLARX: Photon Management for Solar Energy Harvesting with Hybrid Excitonics
- 3D-CAP: 3D micro-supercapacitors for embedded electronics
- ULTRA-SOFC : Breaking the temperature limits of Solid Oxide Fuel Cells: Towards a newfamily
 of ultra-thin portable power sources
- SUPERCELL: Single-Use paPER-based fuel CELLs
- 3D2DPrint: 3D Printing of Novel 2D Nanomaterials: Adding Advanced 2D Functionalities to Revolutionary Tailored 3D Manufacturing
- iPUBLIC: Inkjet Printed Ultrafast Batteries and Large Integrated Capacitors
- ThermoTex: Woven and 3D-Printed Thermoelectric Textiles
- NANOGEN: Polymer-based piezoelectric nanogenerators for energy harvesting
- NEMESIS: Novel Energy Materials: Engineering Science and Integrated Systems



THANK YOU!

Visit us at: http://www.enso-ecsel.eu/





