



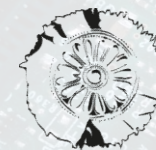
AMANDA

The world in your hands

AutonoMous self powered miniAturized iNtelligent sensor for
environmental sensing anD asset tracking in smArT IoT environments

The AMANDA Project

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AMANDA project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 825464.

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Our motivation

- The world is undergoing a digital transformation in common pursuit to innovate
- There is a growing need for a sophisticated approach to solve problems in:
 - **Smart cities:** Air quality monitoring, temperature, humidity, noise and occupancy
 - **People and asset security:** Imaging, tracking, fingerprint, data privacy, cybersecurity
 - **The COVID-19 pandemic**



- Imagine if there was an intelligent system with miniature dimensions and ultra-low-power consumption, that can be easily installed or used as a wearable and with a maintenance-free lifetime of more than 10 years!

The AMANDA project – a European multi-national collaboration

Partners: 8

- Country Coverage: **6 Countries**

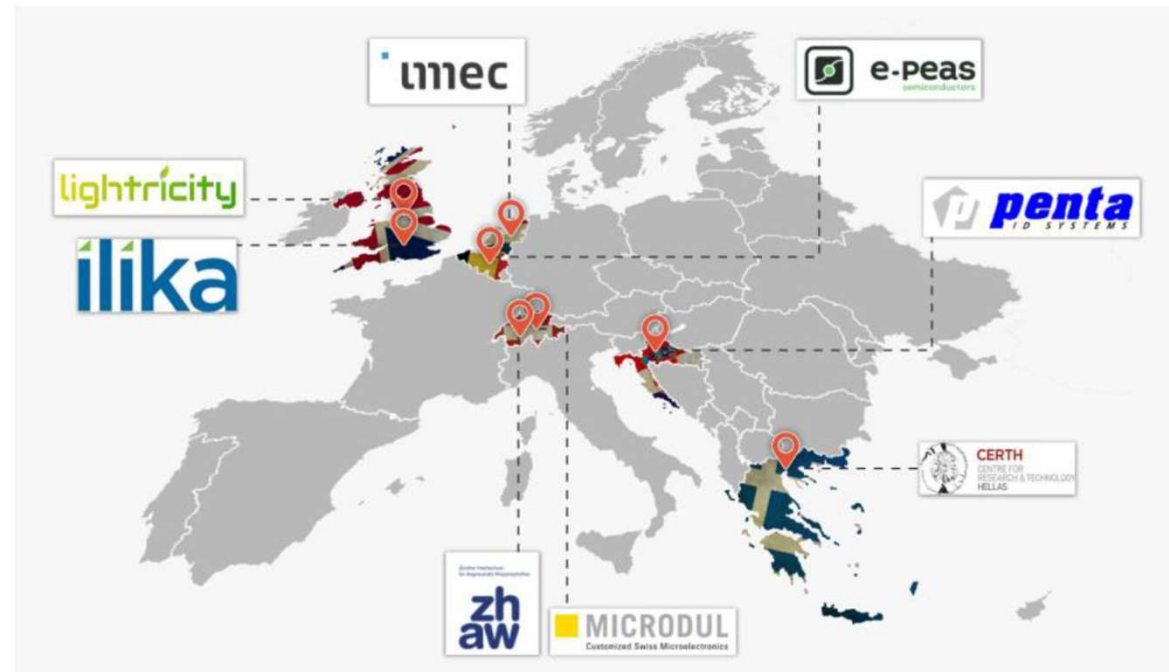
- Belgium, Croatia, Greece, The Netherlands, Switzerland, UK

Academia

- Centre for Research and Technology Hellas [**CERTH**] (Greece)
- Stichting IMEC Nederland [**IMEC**] (The Netherlands)
- Zurich University of Applied Sciences [**ZHAW**] (Switzerland)

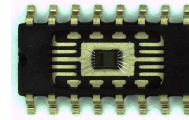
Industry partners

- Lightricity Limited [**Lightricity**] (UK)
- e-peas S.A. [**EPEAS**] (Belgium)
- Ilika Technologies Ltd [**Ilika**] (UK)
- Microdul AG [**Microdul**] (Switzerland)
- PENTA društvo s ograničenom odgovornošću za informatički inženjering [**PENTA**] (Croatia)

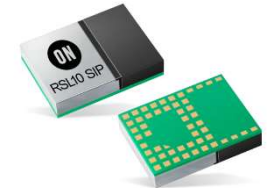


The AMANDA concept

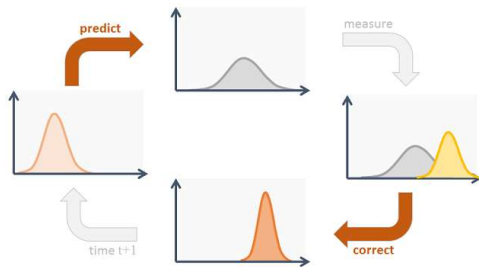
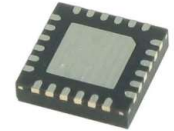
- **Miniaturization:** Design and develop a **miniaturized and adaptable embedded system** with the **dimensions of a credit card** and a **3mm thickness**



- **Develop advanced sensing technology:** Advanced miniaturized **multi-sensing** technology



- **Ultra-low power consumption and energy autonomy:** **Ultra-low power** electronics, energy harvesting and storage

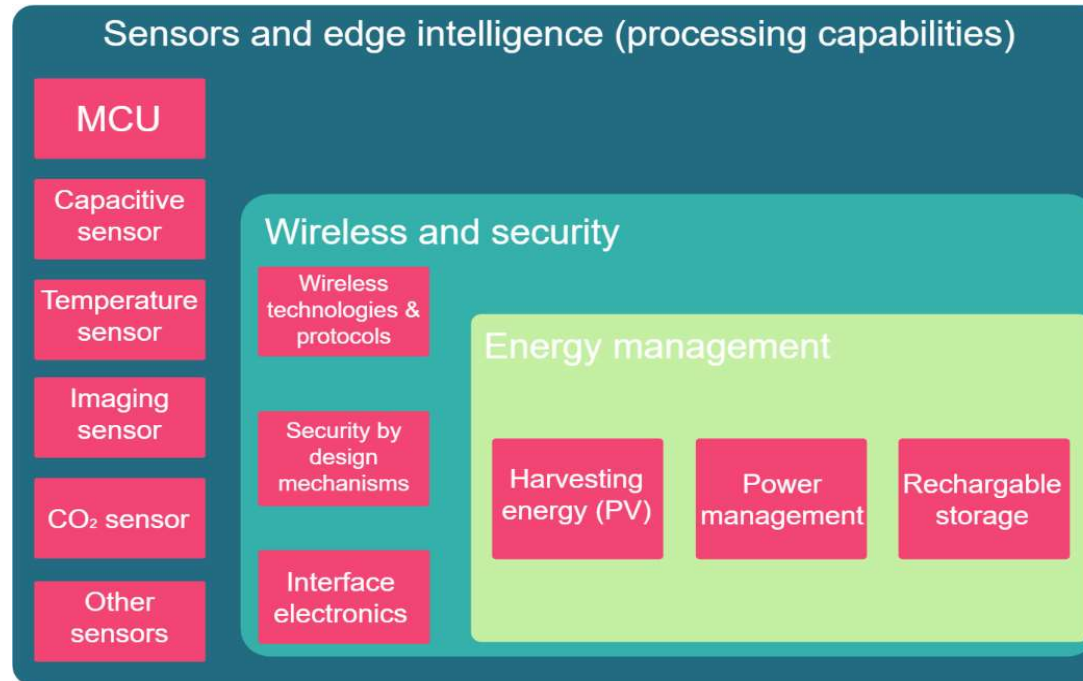


- **Wireless communication capabilities:** **Short-range** and **long-range communications**, ultra-low-power **localization** and **tracking**
- **Intelligence and data security:** Processing capabilities for **sensor/data fusion**, **low-power edge intelligence** and **cybersecurity**

AMANDA conceptual view



AMANDA architecture



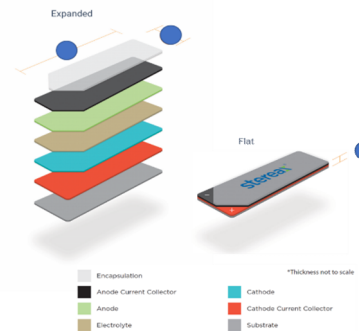
The hardware architecture layers of AMANDA

AMANDA main hardware components

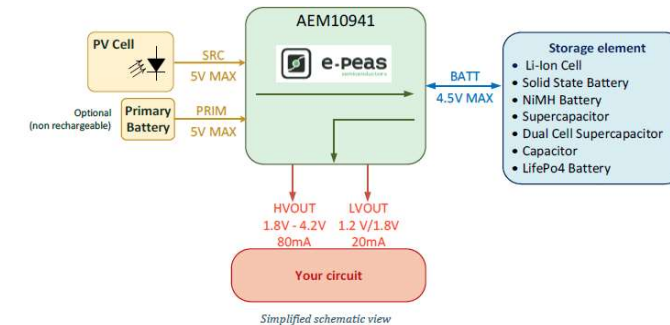
- **PV Energy Harvester – Lightricity**
 - Ultra-thin, ultra-efficient with a small footprint



- **Energy storage – Ilika**
 - Miniaturised solid-state lithium-ion battery

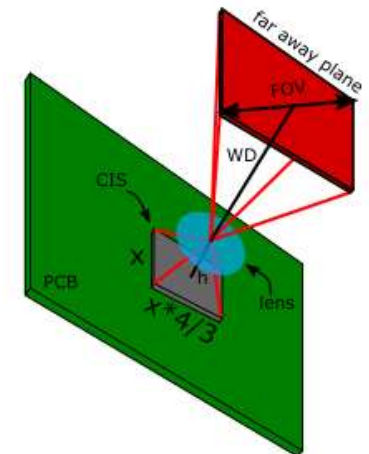
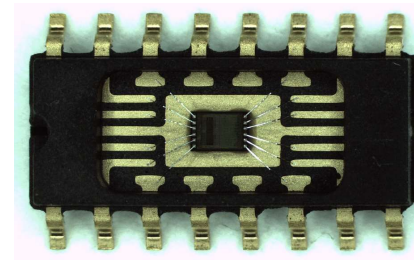
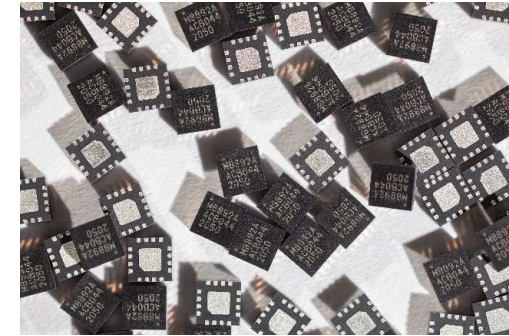


- **Power management integrated circuit (PMIC) – EPEAS**
 - Innovative PMIC with a small system footprint that manages the energy provided by the energy harvester

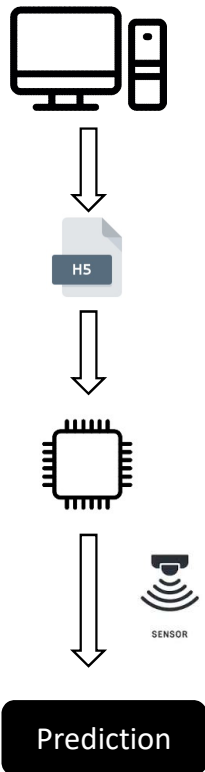


AMANDA main hardware components

- **Touch sensor - Microdul**
 - Lowest active-power capacitive switch, able to measure absolute capacitance
- **Temperature sensor - Microdul**
 - Low-power temperature sensor with minimum dimensions
- **Imaging sensor – EPEAS**
 - Fully-integrated QVGA CMOS imager with ultra-low power consumption



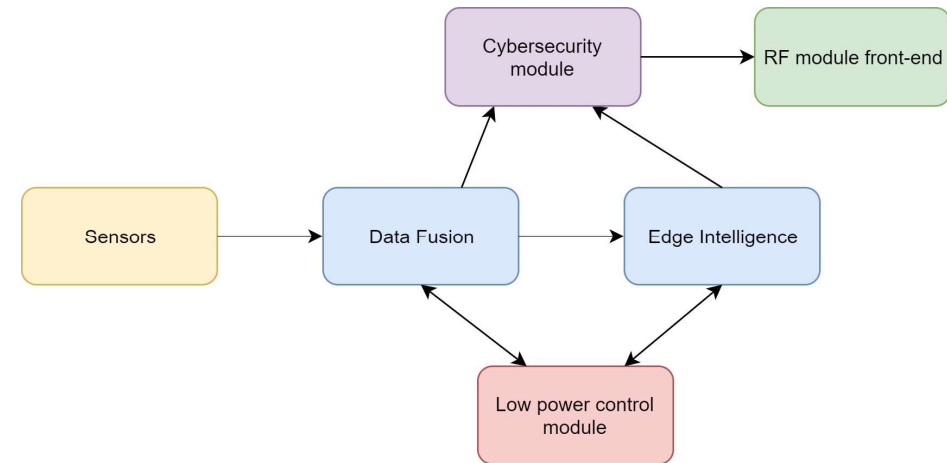
AMANDA modular software development



Data fusion: capitalizing on recent advances for data computing at fog/edge nodes such as **collection**, **cleaning**, **pruning** and **indexing**

Cybersecurity: focused on low-power implementations that offer **hardware and software protection against malicious users or devices**

Edge intelligence. Supervised and unsupervised learning methods are used to **identify patterns, extract and select features, make predictions and decisions with minimal human involvement**



Different architecture layers of AMANDA

Wireless communication



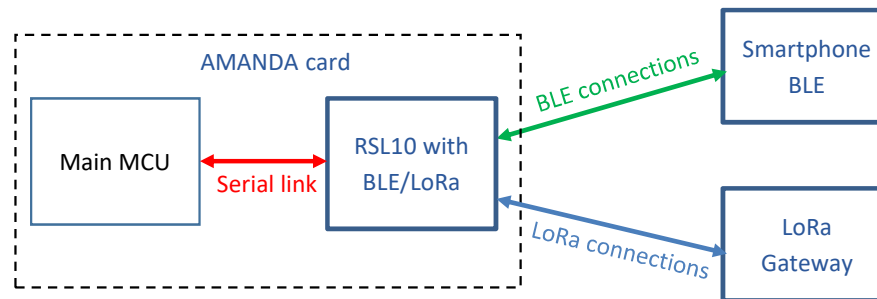
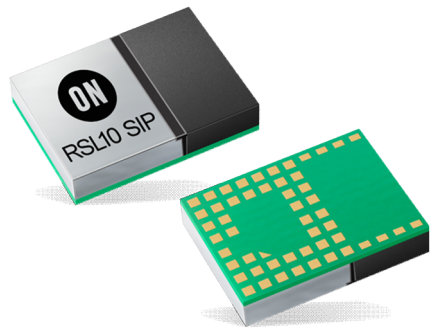
- Very widespread protocol, available on smartphones, PCs
- Very low power consumption (tens of μJ)



- Reads or writes data from/on passive NFC devices
- Enable wireless charging capabilities



- Widespread in IoT applications
- Several Kms range
- Adaptive data-rate to increase range or decrease energy consumption





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Thank you

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