

Building cost-effective, wireless sensors platforms for agroecology monitoring

Technology developed in



Capacity-building
with **Erasmus+**



Deployed & Exploited in

Ae AgriFutur



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Wireless Sensors Made Simple
for agroecology & sustainable agriculture

Powered by technologies developed in Intel-IrriS



BUILDING AN ECOSYSTEM OF SENSORS



Agriculture

Agroecology

Wildlife

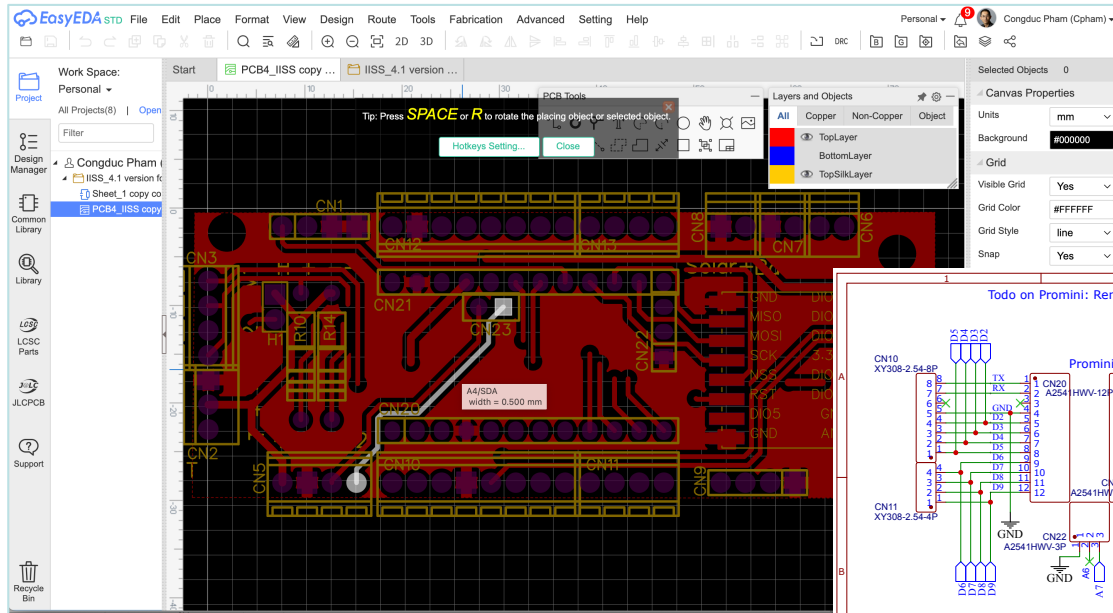
Biodiversity

Environment

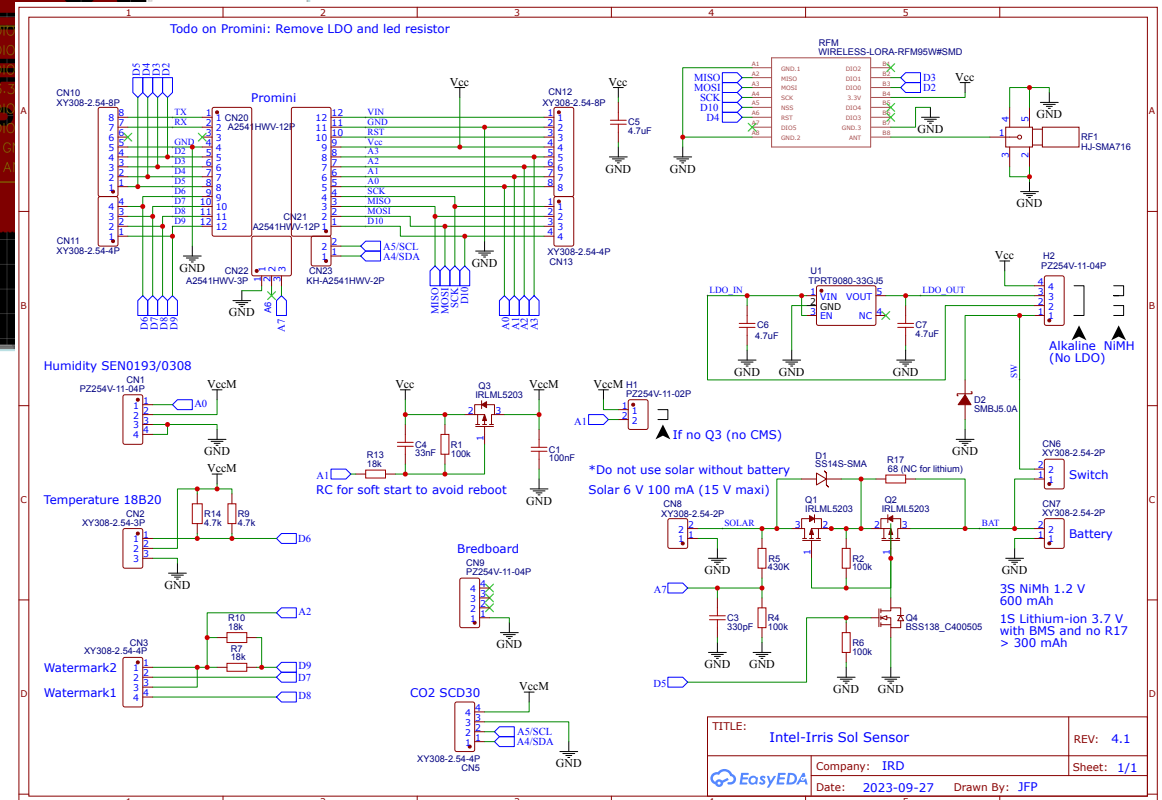
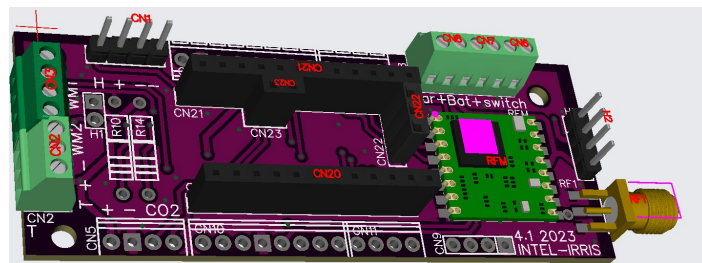
Surveillance



DESIGNING A CUSTOM PCB




We use EasyEDA, a free software to design electronic PCB






ORDERING THE PCB


EasyEDA generates so-called Gerber files used to produce the PCB. We provide the Gerber files as free resources for research

PRIMA-Intel-IrriS / PCBs / 

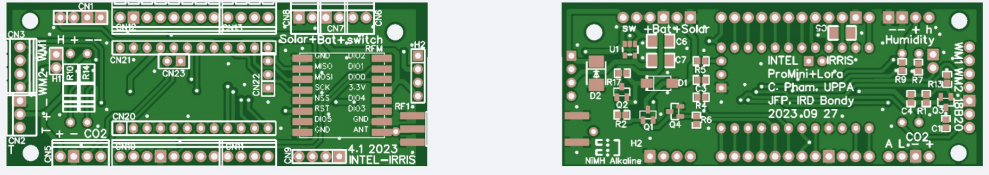
 CongducPham Update README.md

Name	Last commit message
..	
IRD_PCB_4_1	Update PCB files and tutorials
MySecondProMiniLoRaBreakout_2022-01-20.zip	Update PCB files
MySecondProMiniLoRaBreakout_RAK3172_2023-0...	Add new PCBs and update tutorials
MySecondProMiniLoRaBreakout_SX128X_2022-01-...	Update PCB files



 EUR ▼

Standard PCB/PCBA | Advanced PCB/PCBA | SMT-Stencil | 3D/CNC



← Back to Upload File | Detected 2 layer board of 30.89x79.5mm (1.22x3.13 inches) | [Gerber Viewer](#)

Base Material: FR-4 | Flex | Aluminum | Copper Core | Rogers | PTFE Teflon

Layers: 1 | 2 | 4 | High Precision PCB | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20

Dimensions: 79.5 * 30.89 mm

PCB Qty: 5

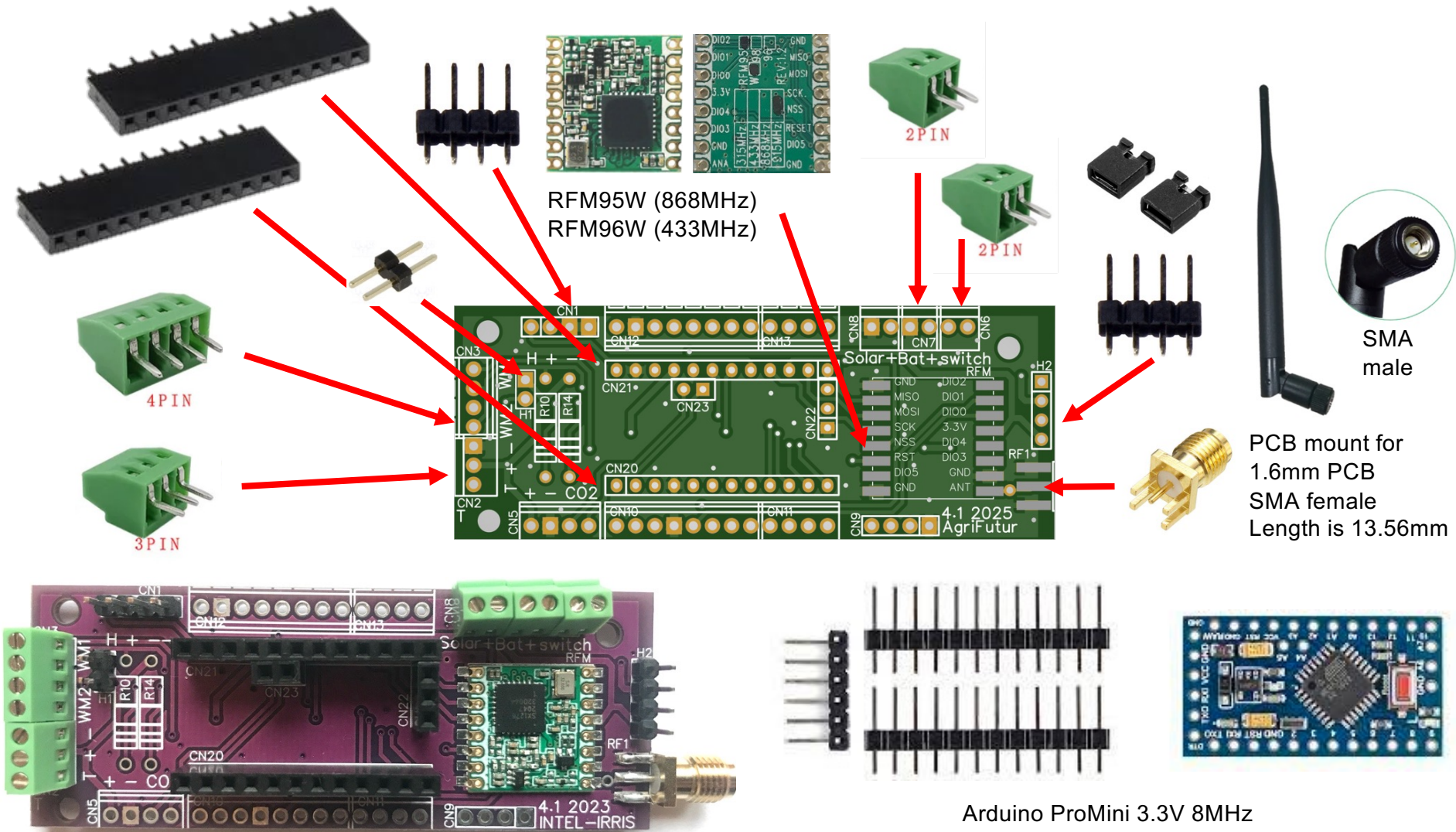
Product Type: Industrial/Consumer electronics | Aerospace | Medical

https://github.com/CongducPham/PEPR_AgriFutur

Here we order from JLCPCB manufacturer

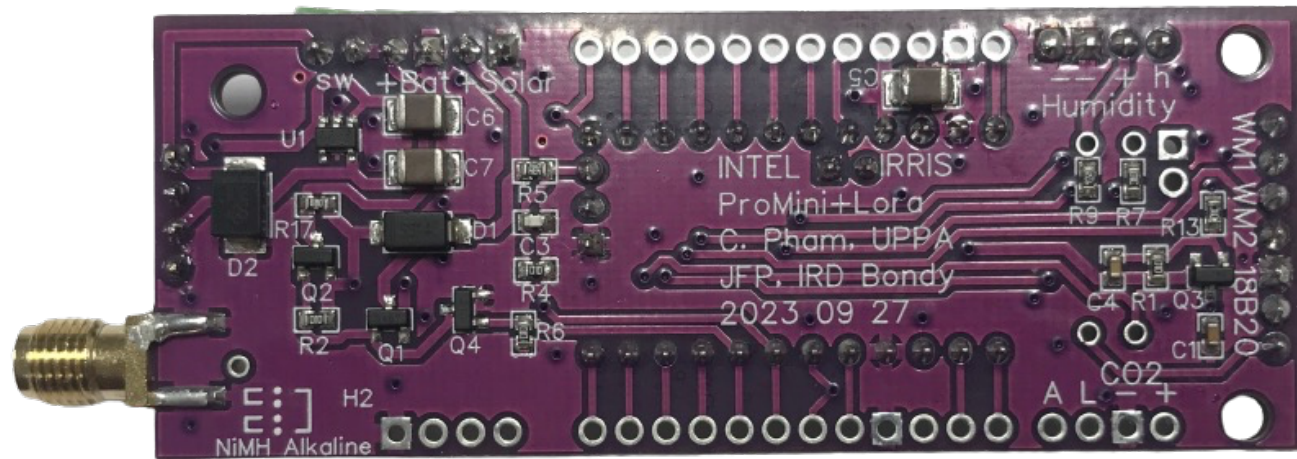


DO-IT-YOURSELF APPROACH – RAW PCB



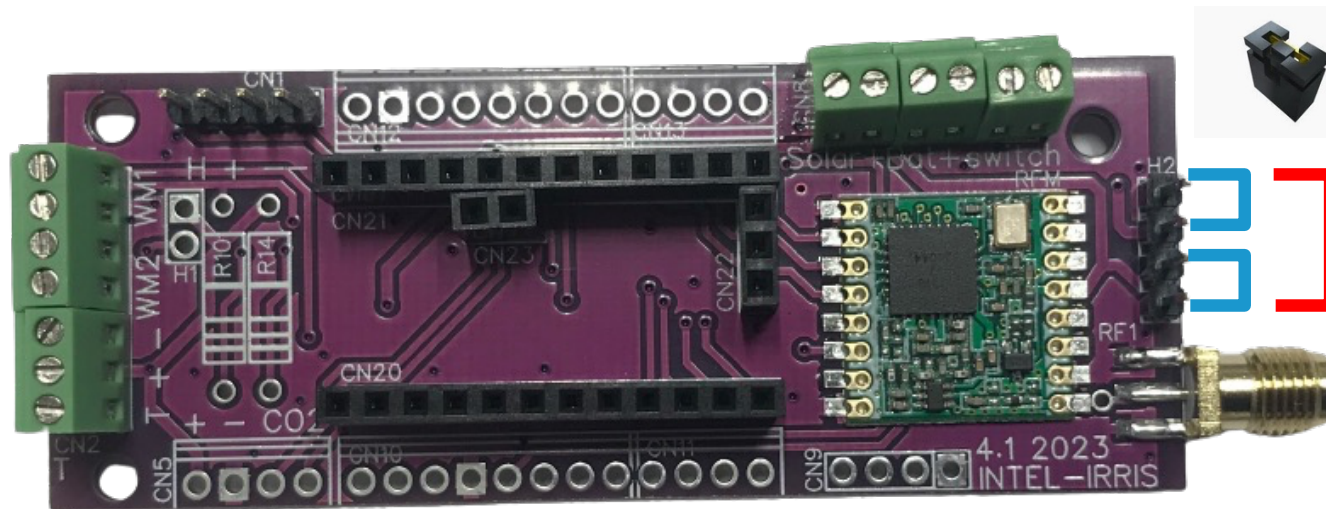


ORDER THE FULLY ASSEMBLED VERSION

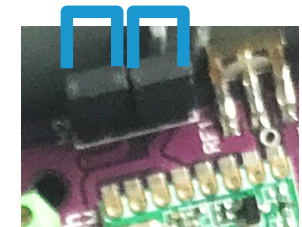


By providing the Bill of Materials (BOM) file, the manufacturer can produce the fully assembled version

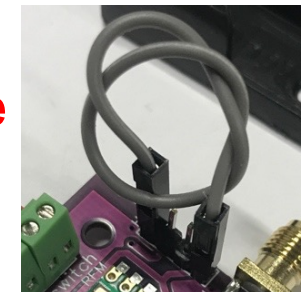
The full assembled version comes with the solar charging circuit on the back side of the PCB



Connect for SOLAR with NiMh

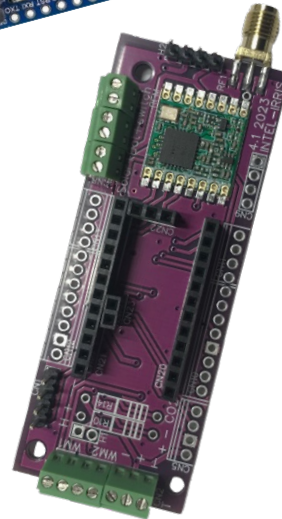


Connect for alkaline batteries





CASING AND INTEGRATION



For SOLAR



For 2xAA
alkaline
batteries



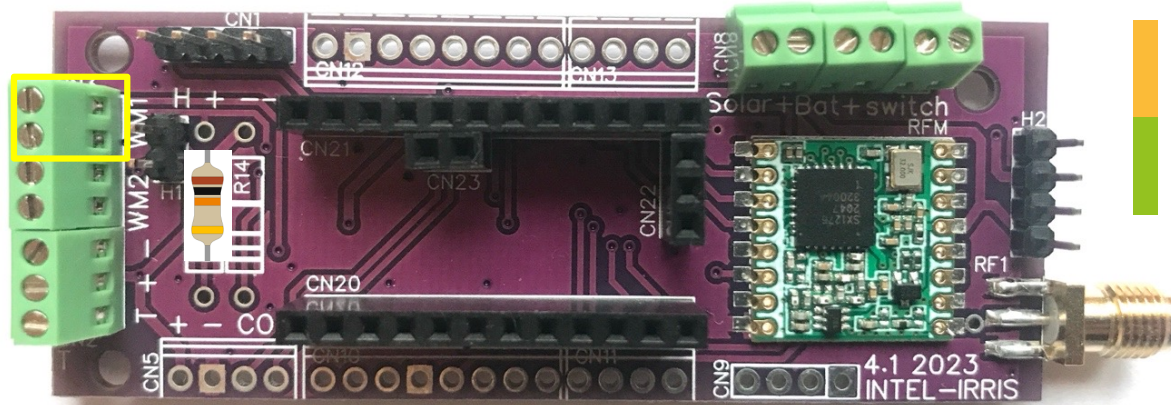
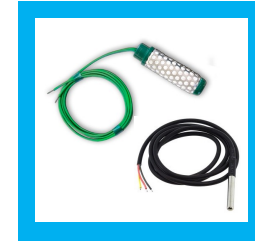
For SOLAR with
NiMh battery



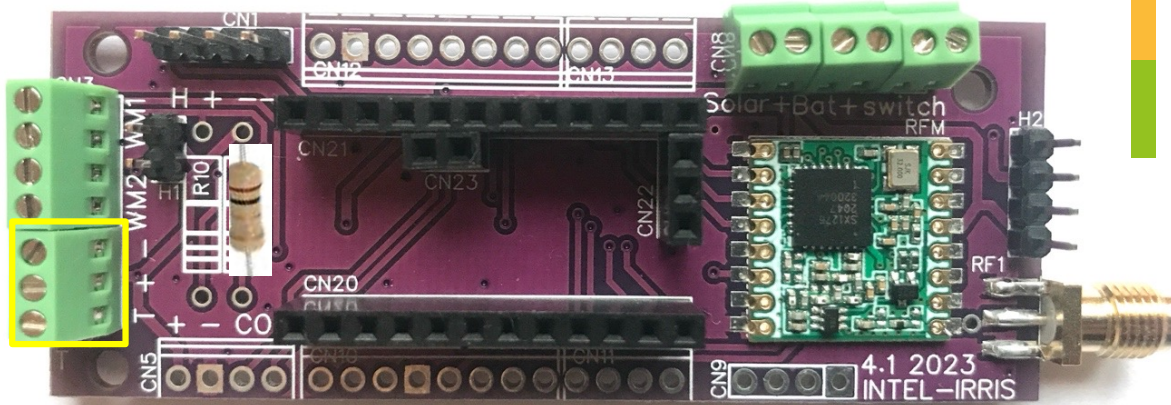
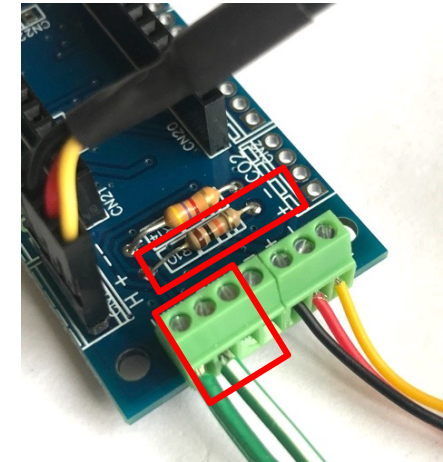
SMA
male



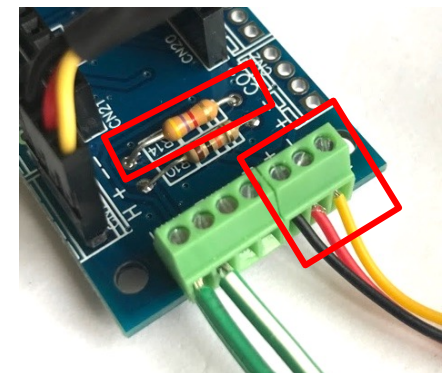
ADDING PHYSICAL SENSORS. EX:



Add a 10kOhms resistor for raw PCB.

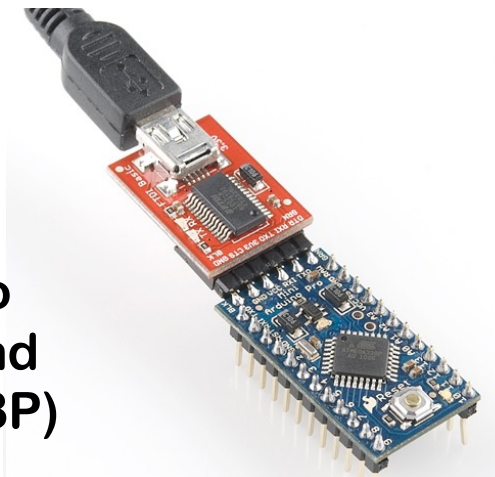
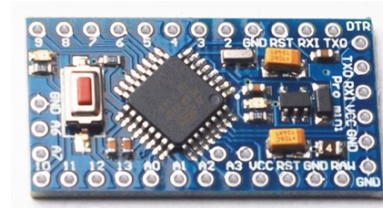


Add a 4.7kOhms resistor for raw PCB.

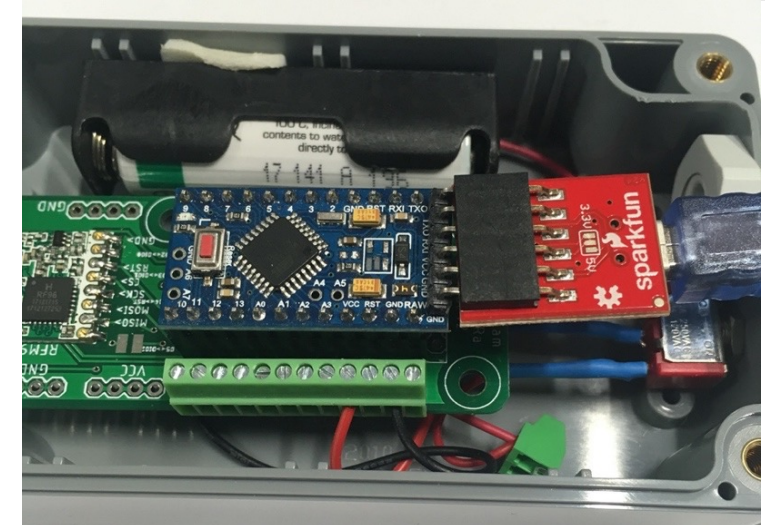




ADD THE MICROCONTROLLER



We use an Arduino Pro Mini at 3.3V and 8MHz (ATmega328P)



We develop and provide the code (Arduino) for the microcontroller

Technology developed in



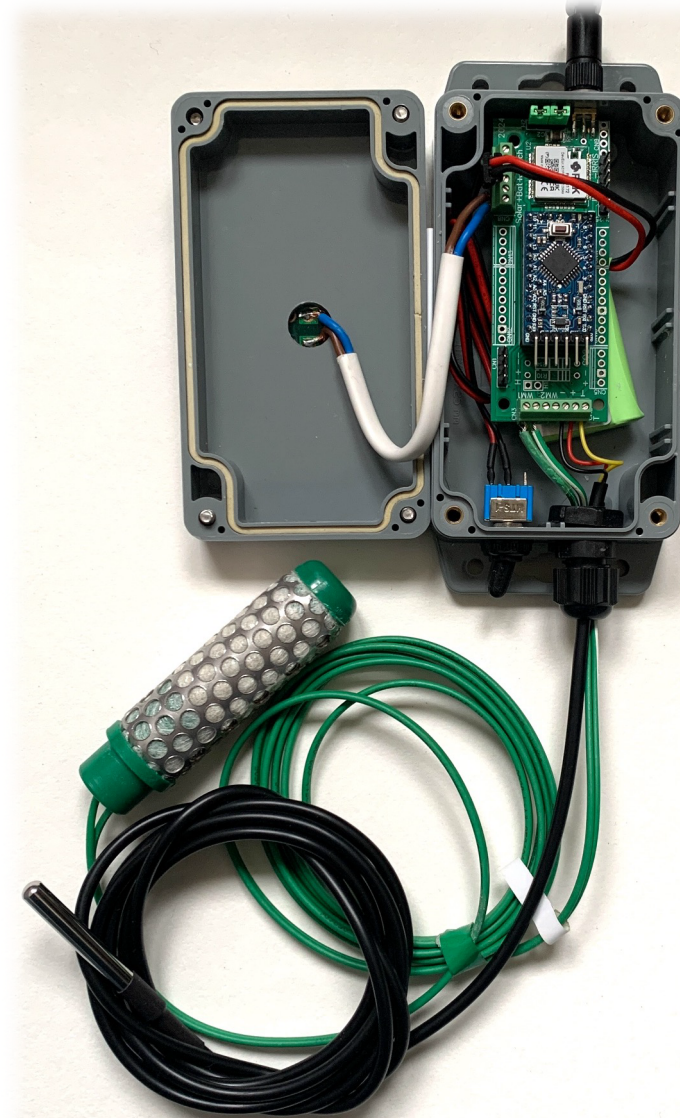
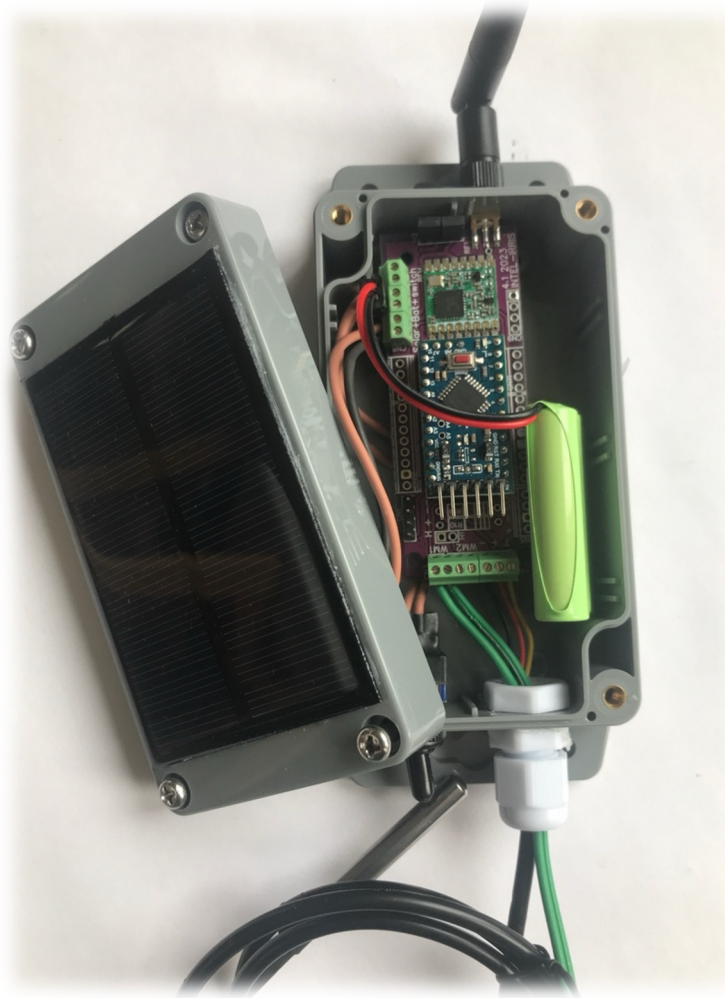
Capacity-building
with **Erasmus+**



Deployed & Exploited in



FINAL RESULTS



Technology developed in



Capacity-building
with **Erasmus+**



Deployed & Exploited in



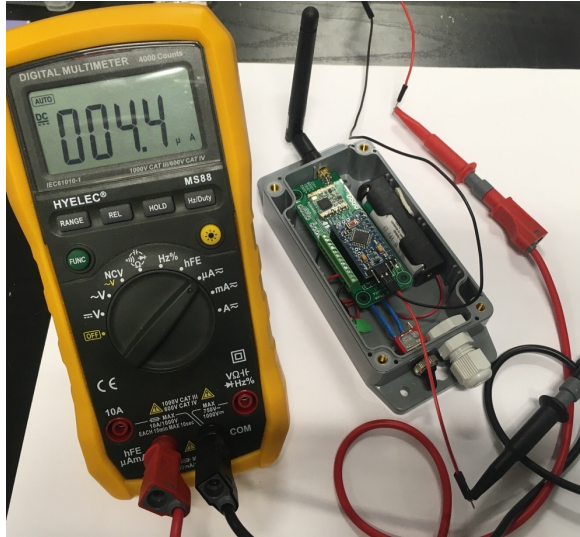
DEPLOYMENT & PILOTING



Prof. Congduc Pham
<http://www.univ-pau.fr/~cpham>

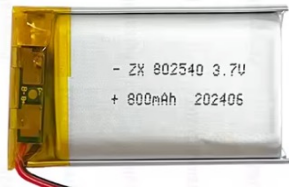


ENERGY EFFICIENCY



Measured below 5uA in deep sleep, between 2 active periods with transmissions

Expected autonomy with 1 transmission / hour is over 2 years with 2 AA batteries



Li-ion or LiPo = 3.7V



1xAA 14500 3.6V



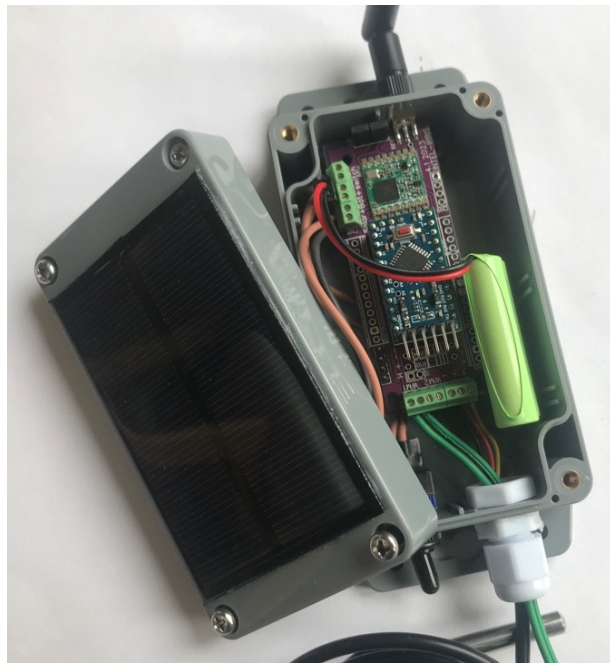
1 x 18650 = 3.7V



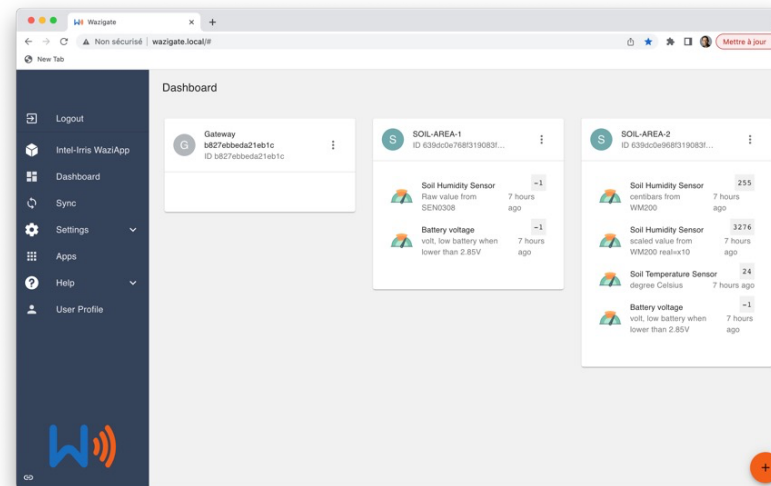
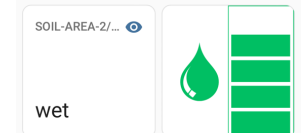
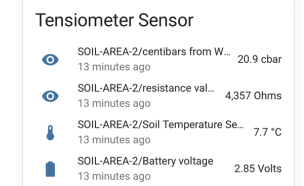
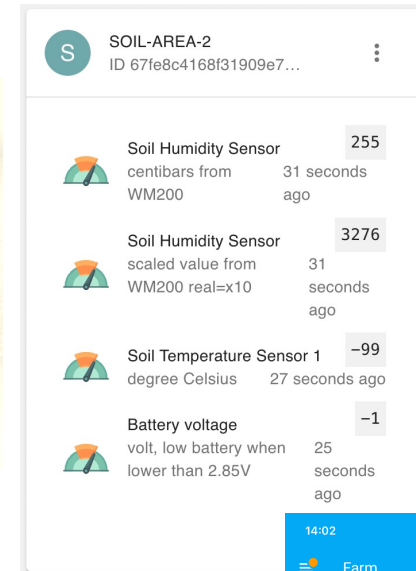
3xAA ~ 4.8V



DATA TRANSMISSION TO GATEWAY



**LONG RANGE
RADIO, 3-10KM**



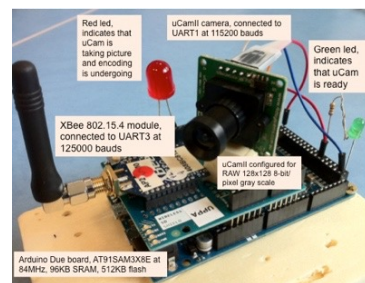
Limited LoRaWAN
SF12BW125
868.1MHz
ABP mode
Dev addr is 26011DAA
1 msg/60mins
1 sensor
XLPP data



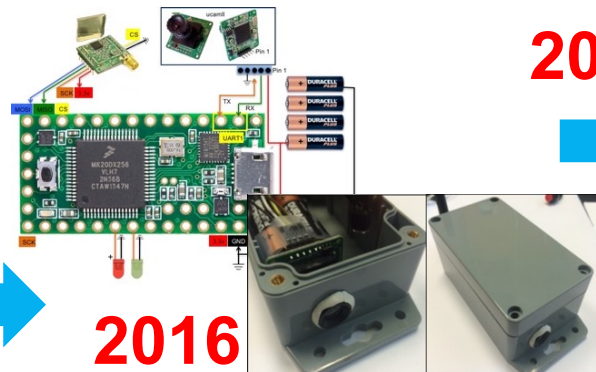
ADVANCED SENSING SYSTEMS



Many applications need visual information → Image Sensing IoT

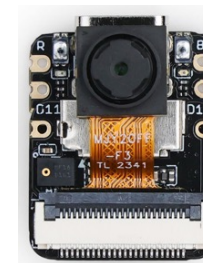


2012



2016

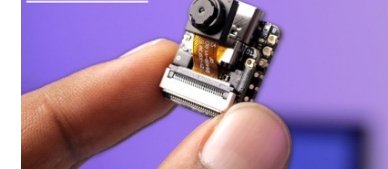
2024



ESP32S3 32-bit, dual-core, up to 240 MHz

XIAO
 ESP32S3

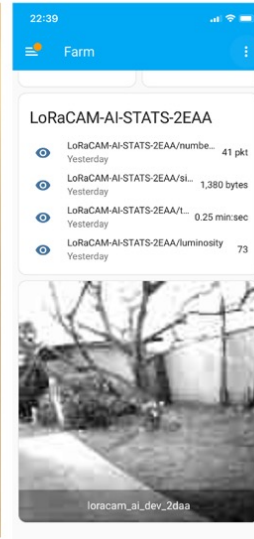
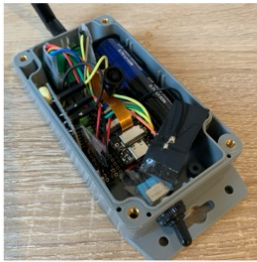
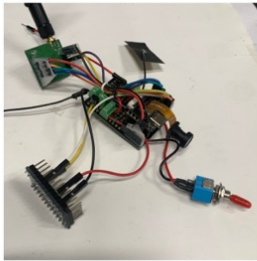
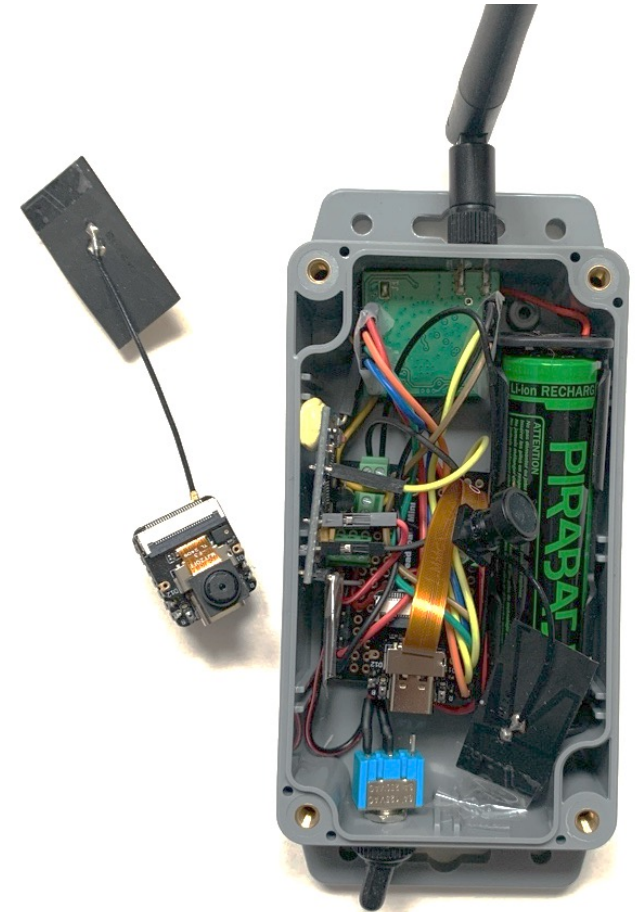
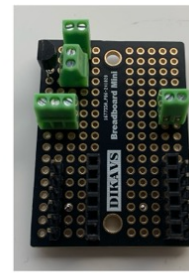
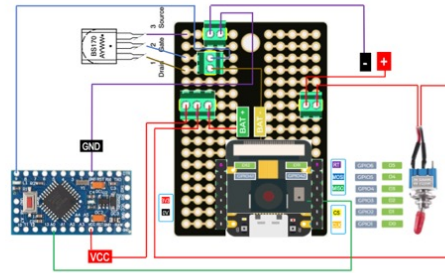
Smallest ESP32 Cam Board





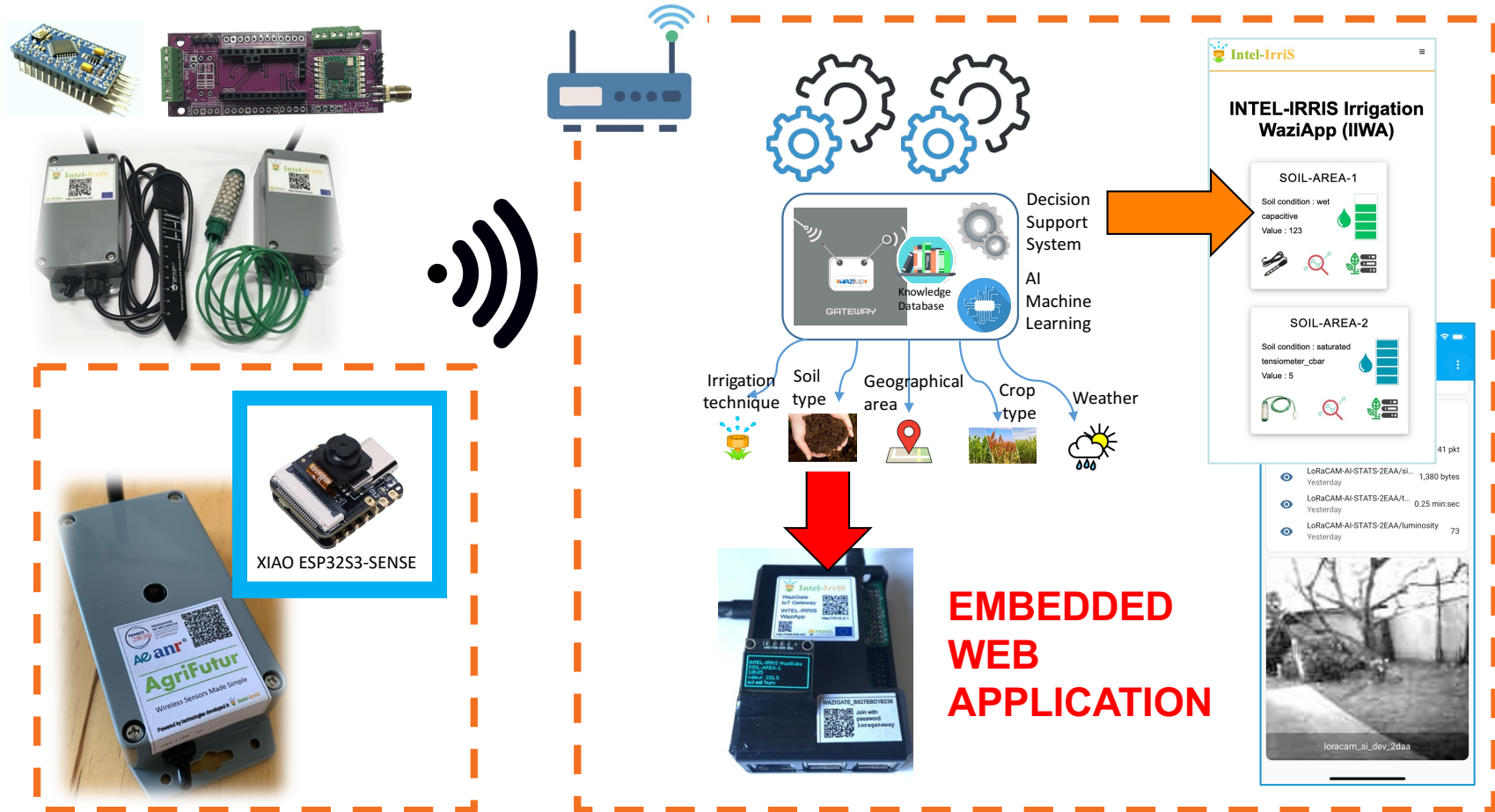
PROOF-OF-CONCEPT: LORACAM-AI

UPDATED VERSION IN 2025 FOR THE PEPR AGRIFUTUR PROJECT





INTELLIGENCE AT THE EDGE



TinyML, TensorFlow Lite,
 CMSIS-NN, Edge Impulse, etc