Innovating in Africa with Internet-of-Things technologies: towards a smarter world!

DISRUPTIVE INTERNET OF THINGS APPLICATIONS IN AFRICA

AAIS webminar – Presented on Dec 16th, 2020

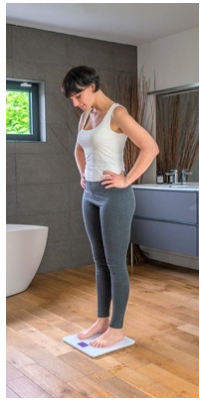
Prof. Congduc Pham
http://www.univ-pau.fr/~cpham
Université de Pau, France

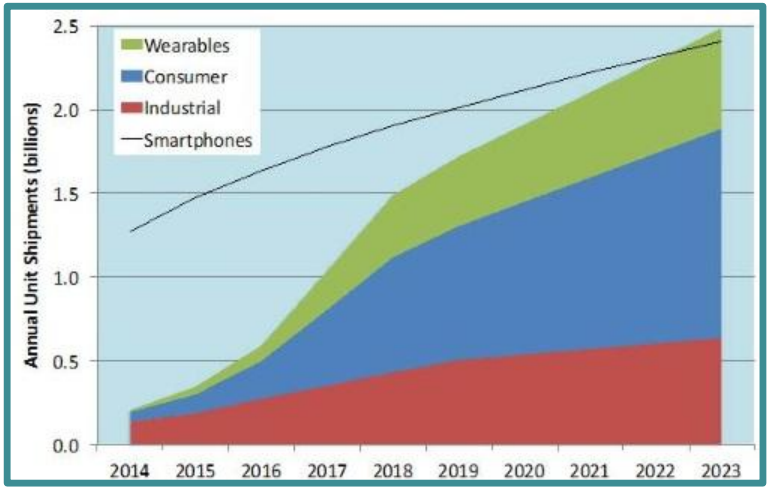
UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR

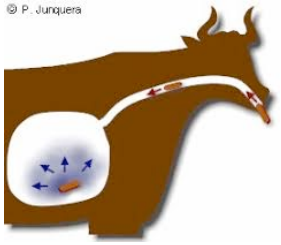
HORIZON 2020

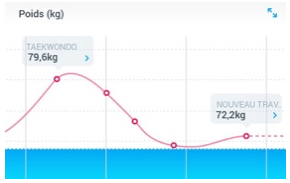
WAZIUP
IoT – from idea to reality
WAZIHUB

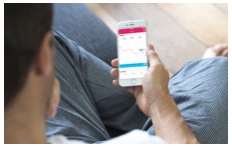
Internet-of-Things



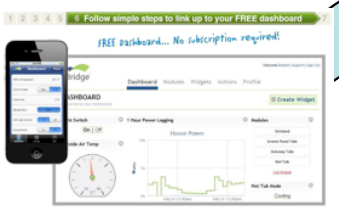








Sense, Monitor, Optimize & Control



DATA ANALYSIS, OPTIMIZATION & CONTROL

MONITORING

SENSING
PHYSICAL WORLD INTERACTION

APPLICATION DOMAINS

Firebase
WAZIUP
WAZIHUB
FIWARE
Axēda
ioBridge
Connect things.
ThingSpeak
GroveStreams
SensorCloud
freeboard
dweet.io
OpenRemote
TempoIQ

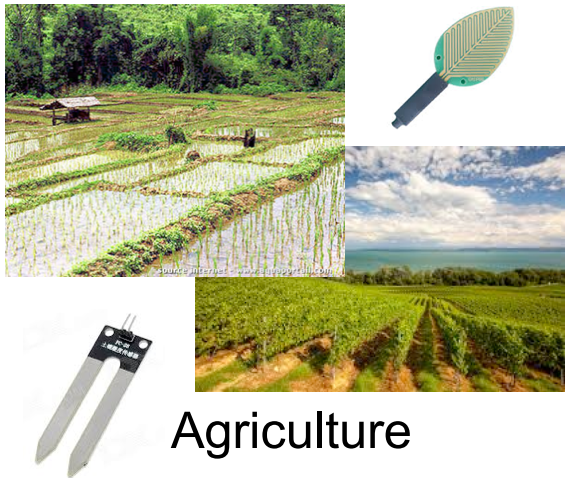
IoT for development!

Irrigation

Livestock farming

Fish farming & aquaculture

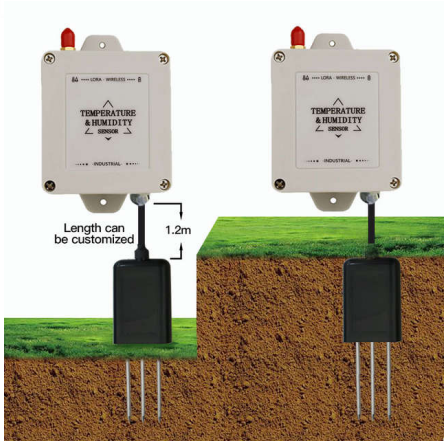
Logistic, Storage,
Asset Tracking

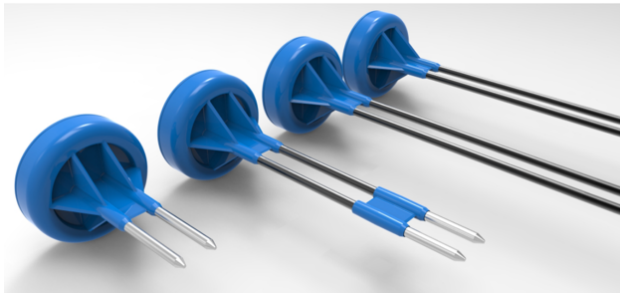


Agriculture

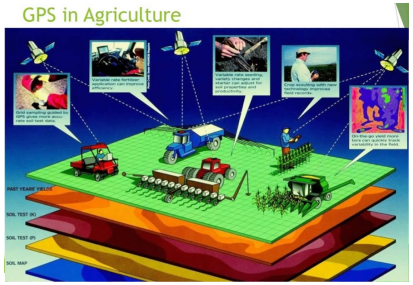
Fresh water

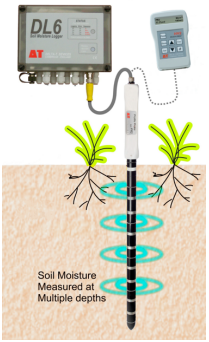
Example: Smart Agriculture





Most of existing systems are not adapted for developing countries, rural areas, smallholders





Making real IoT happening!

Innovative IoT technologies

"IoT for All" paradigm

IoT infrastructures and use cases

Knowledge dissemination & training

Users/Developers engagement

Innovative solutions adapted to local needs

Exploitation plan and innovation hubs

Communication & community building

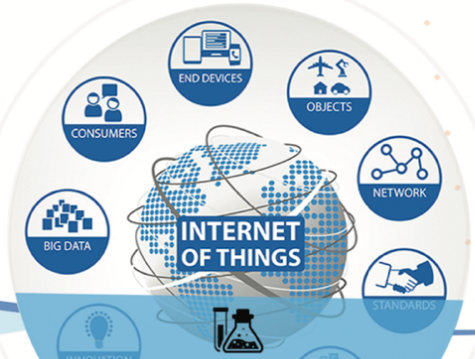
Sustainable & long-term innovation

WAZIUP Open IoT and Big data platform for Africans, by Africans

Feb2016-Jan2019

HORIZON 2020

Affordable technologies to empower rural economics



Exploit advanced research capitalizing on IoT and Big data state-of-the art findings

Develop IoT solutions and applications meeting African needs

DO MORE with LESS

www.waziup.eu

Waziup IoT

Waziup IoT

Waziup

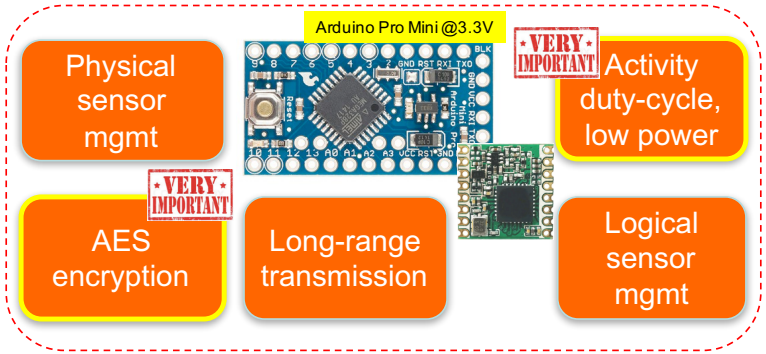
Waziup

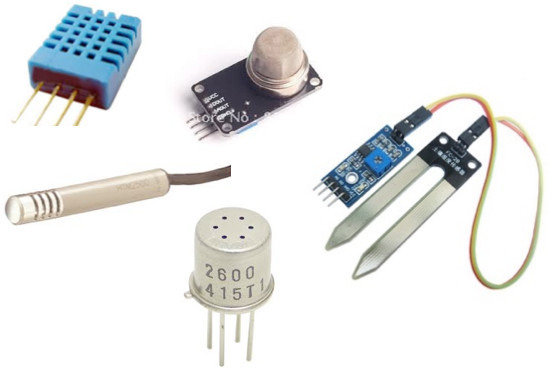
CREATE-NET · CTIC · Farmerline · iSpace · coders afrrica · INNOTEC

waziup.community@create-net.org

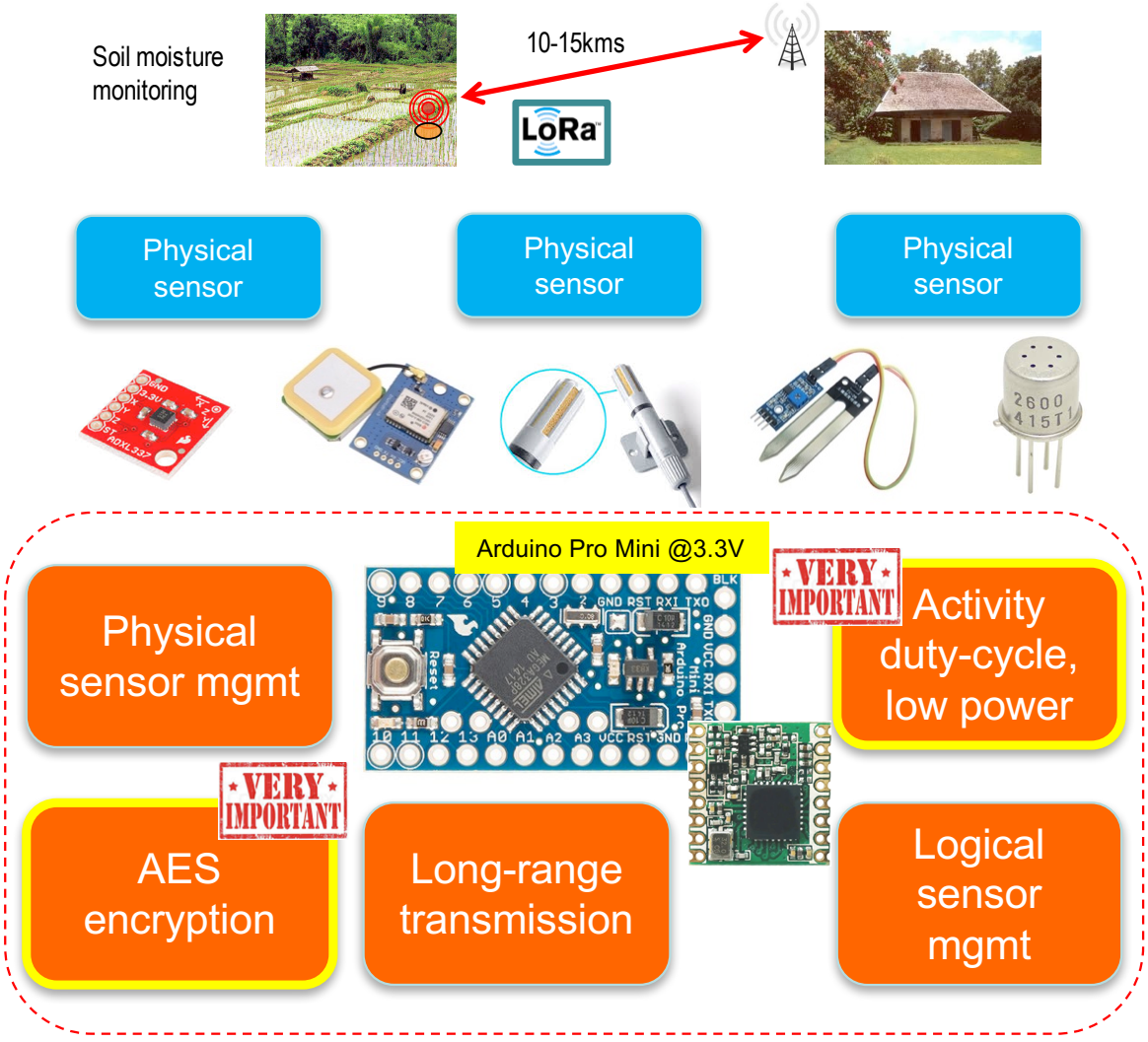
Generic IoT v.s. highly specialized

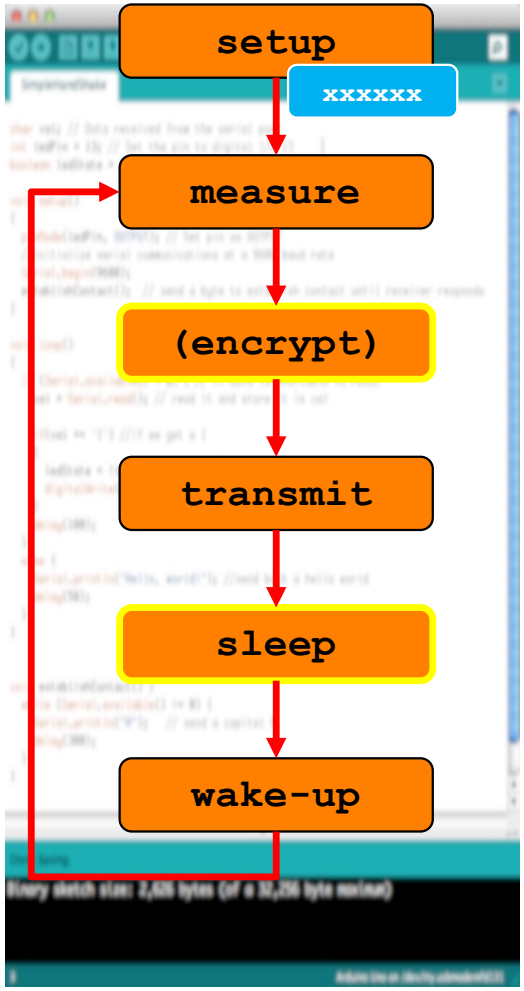
- Build low-cost, low-power, generic IoT platform
- Methodology for low-cost platform design
- Technology transfers to user communities, economic actors, stakeholders,...



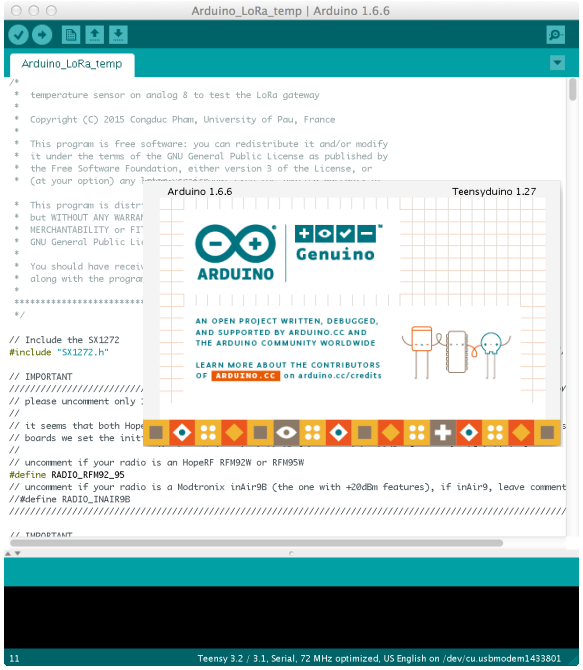


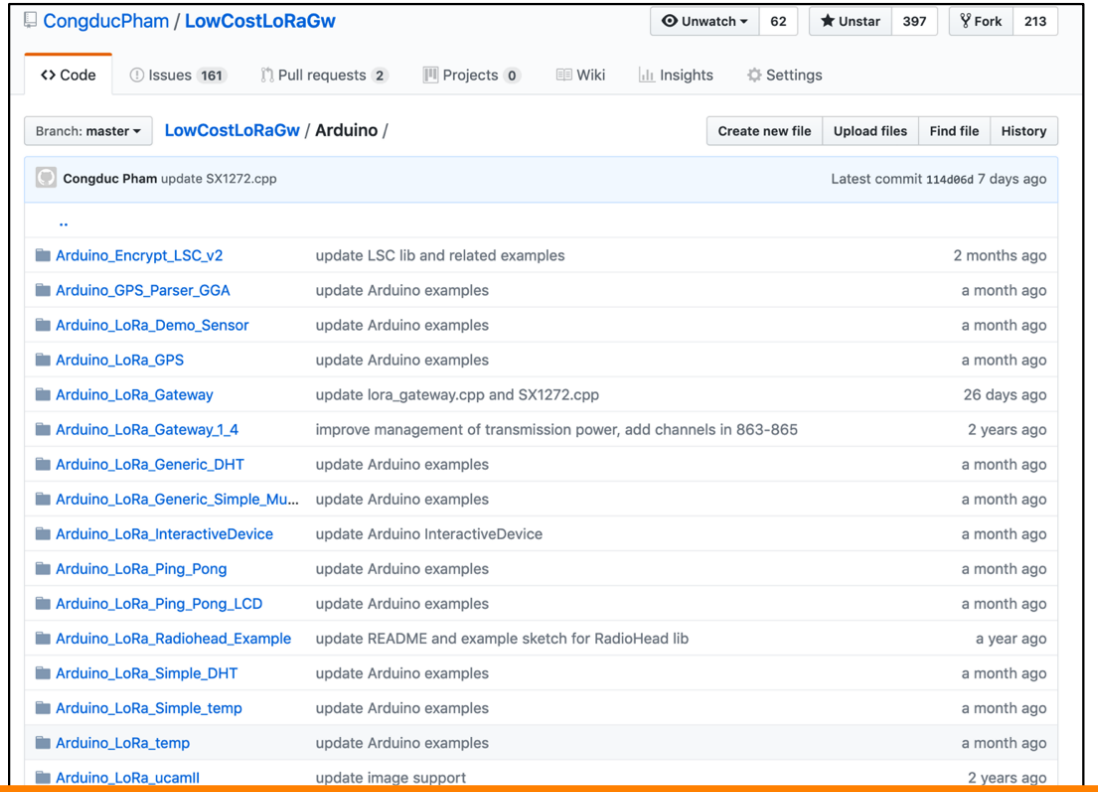
Simple development cycle





WAZIUP provides 100% open-source code templates





Many examples using various temp/hum sensors
https://github.com/CongducPham/LowCostLoRaGw/tree/master/Arduino

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http://www.univ-pau.fr/~cpham

Building domain-specific sensors

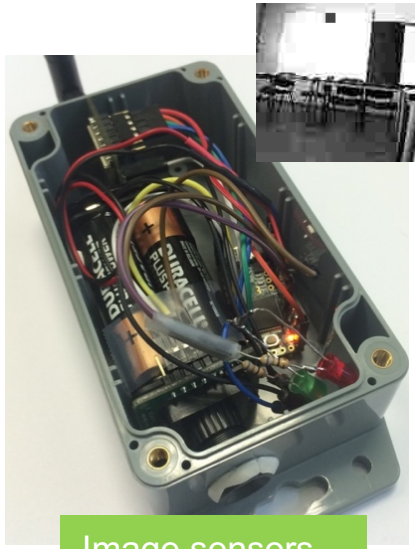
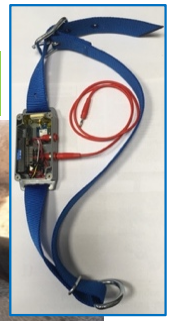
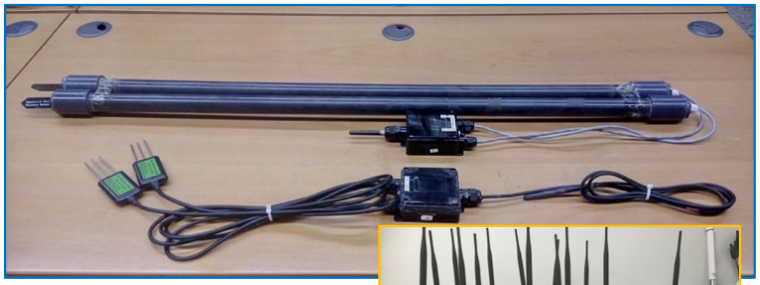


Image sensors

GPS collar





Soil Moisture

Photo from Unparallel

Photo from EGM

Buoy for water quality

Weather Station

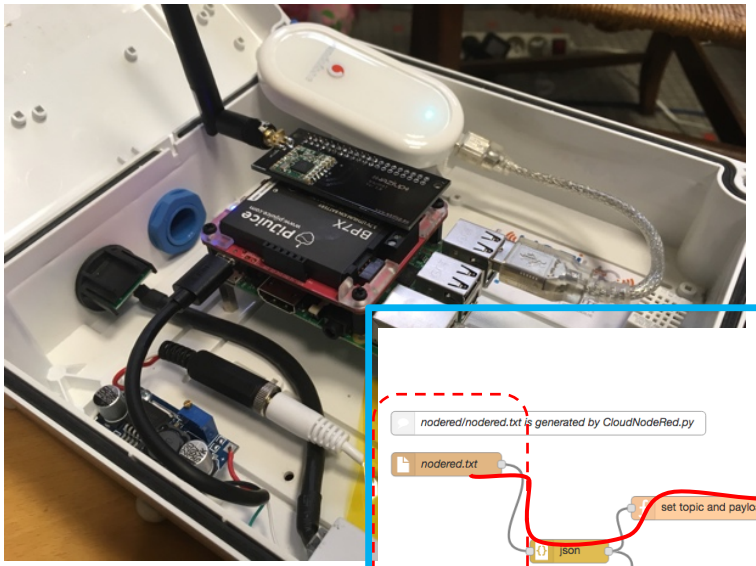
Bin presented at Woelab

Waste Mngt

Open, versatile IoT gateway

Soil moisture monitoring

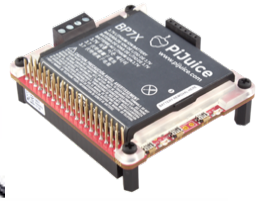
10-15kms

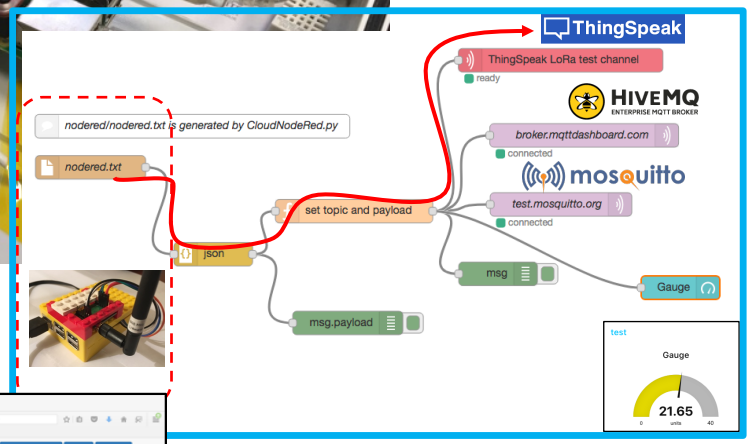


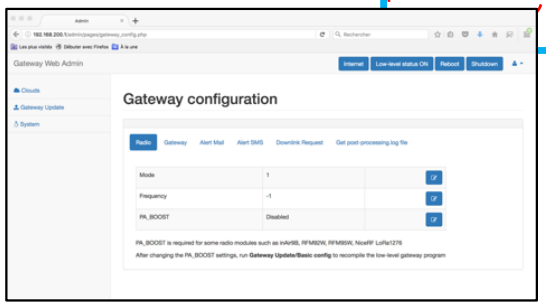
THE THINGS NETWORK

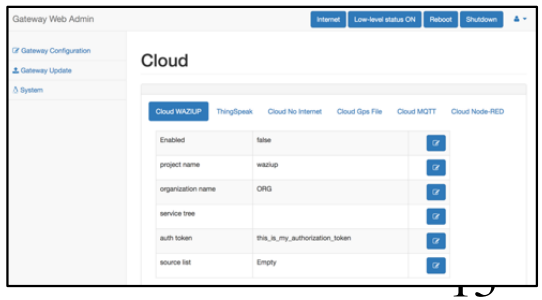
Latest distribution
https://github.com/CongducPham/LowCostLoRaGw

Raspberry PI: lots of libraries, lots of software, lots of hardware, lots of shields,…









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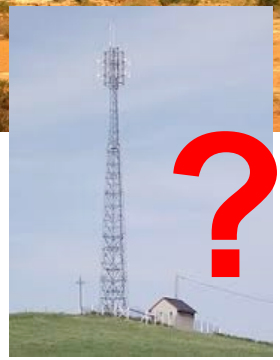
Deployment in rural areas no Internet ☹

- deploying IoT in very isolated areas...
- ... where internet and electricity are not stable!



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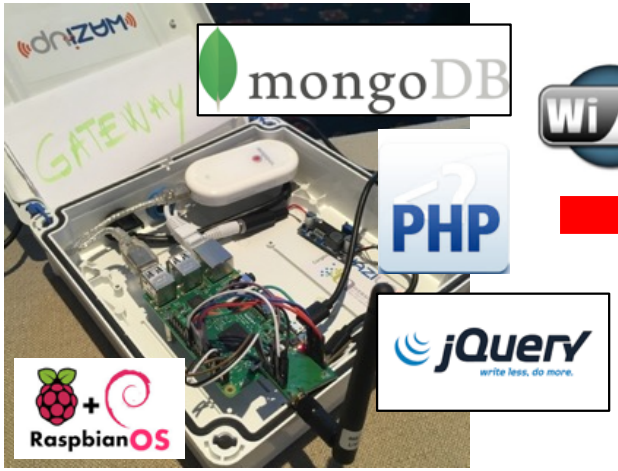
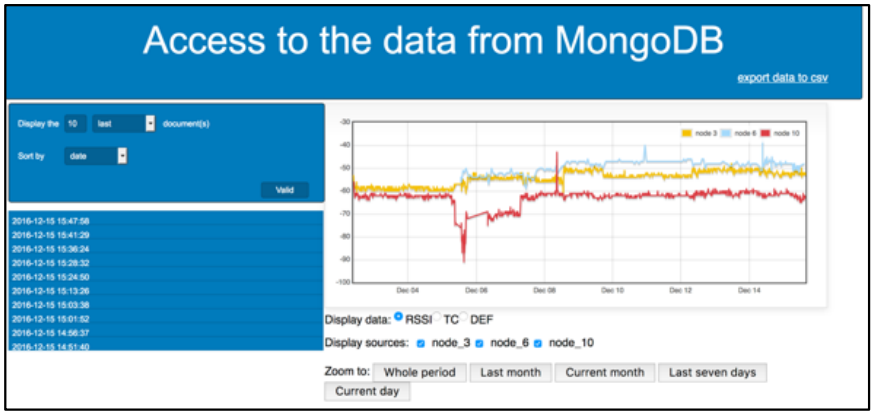
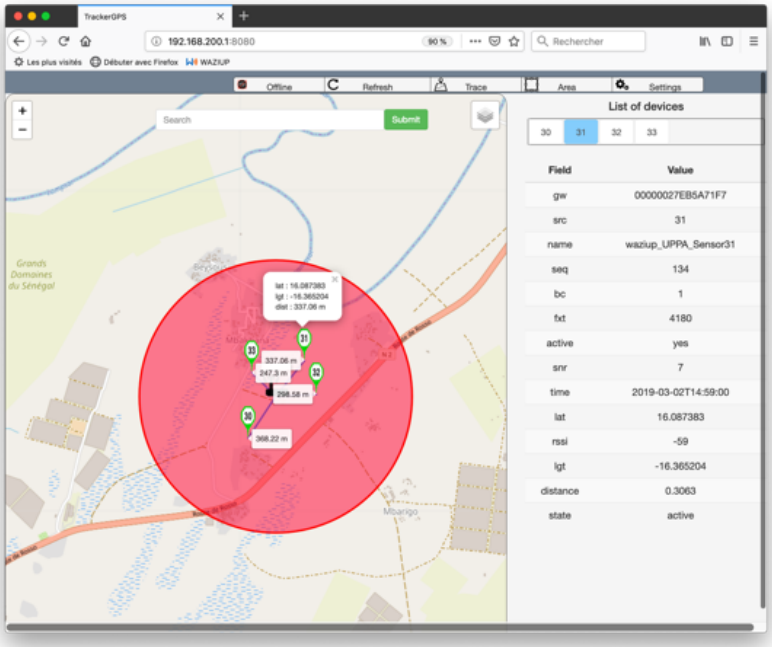
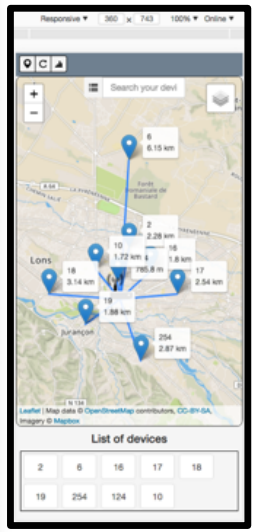
WAZIUP: deploying IoT in Africa

Autonomous gateway – no Internet scenario









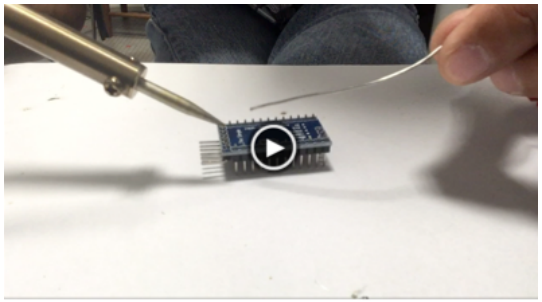
Link to a short demo video of the collar web interface: https://youtu.be/meFDav1SLPI

Tutorials/resources

https://github.com/CongducPham/tutorials

YouTube videos

Low-cost LoRa IoT device



+92000 views

Dec2020

https://www.youtube.com/watch?v=YsKbJeeav_M

Low-cost LoRa IoT gateway

+21000 views

Dec2020

https://www.youtube.com/watch?v=mj8ItKA14PY

Extreme low-power LoRa IoT

+8900 views

Dec2020

https://www.youtube.com/watch?v=2_VQpcCwdd8

Setting up a gateway in 5mins

+4300 views

Dec2020

https://www.youtube.com/watch?v=CJbUFXLpSok

Community building for sustainable innovation

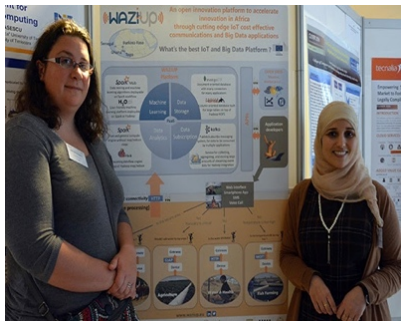
International Events
+ 20 organized & attended

Launch event (Ghana, iSpace)

Launch event (Senegal, CTIC Dakar)

Workshop at the European Conference on Networks & Cmmunications (Greece, CNET)

IoTWeek2016 (Belgrade, EGM)



IoTBigData2016 (Italy, EGM)

IoTCareConference (Budapest, CNET)

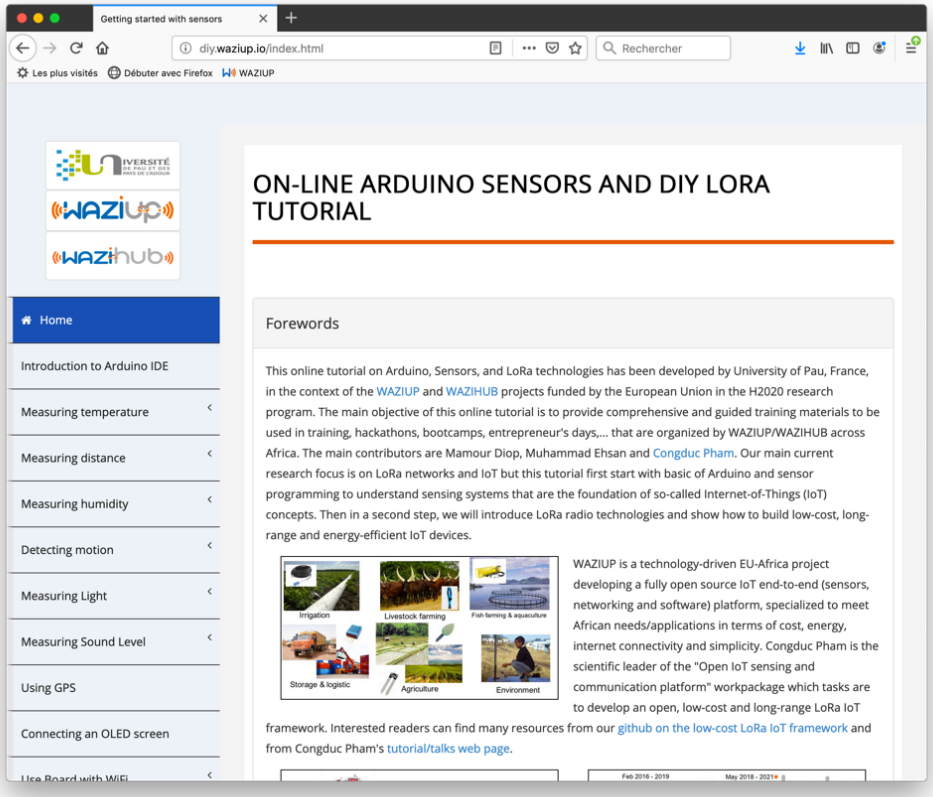
WAZIUP Workshop on IoT (Togo, L'Africaine d'Architecture)

Credit: C. Vavasseur, CTIC Dakar

Workshop at the RESSACS 2016 (France, UPPA)

Training & hackathons

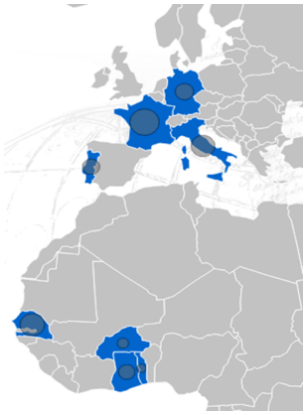
- Technical training sessions
- Hackathons, ...



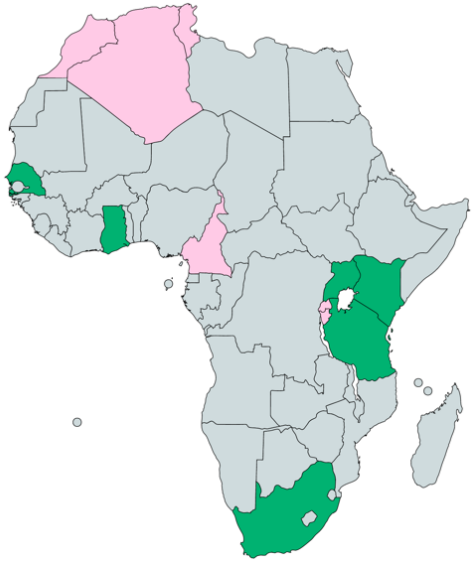
Online Arduino & IoT step-by-step tutorial
https://diy.waziup.io

Scaling up!

Feb 2016 - 2019



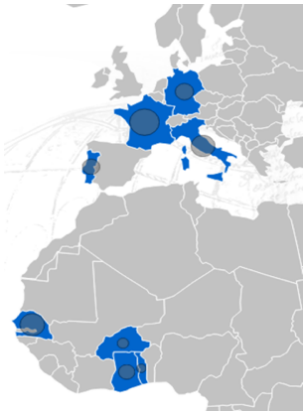
May 2018 - 2021

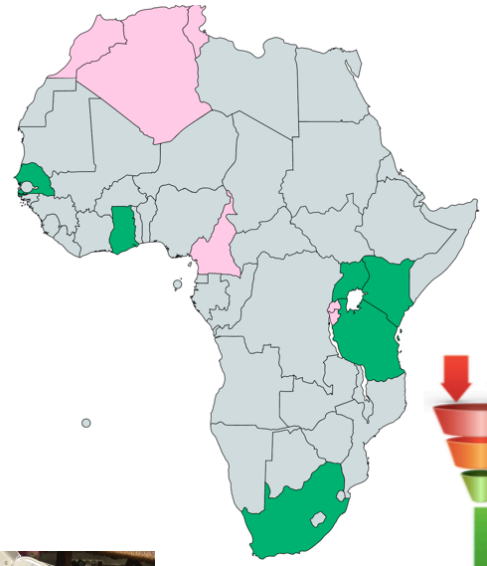


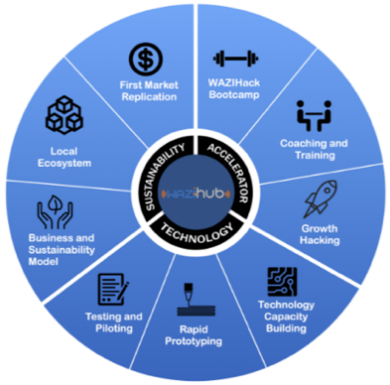
WAZIUP & WAZIHUB articulation

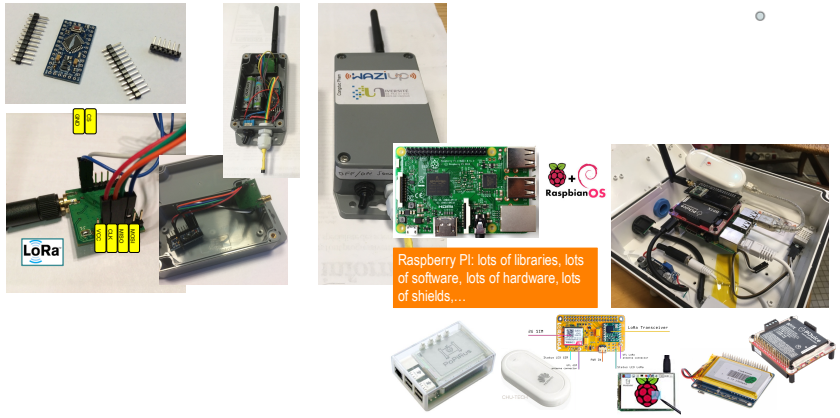
Feb 2016 - 2019

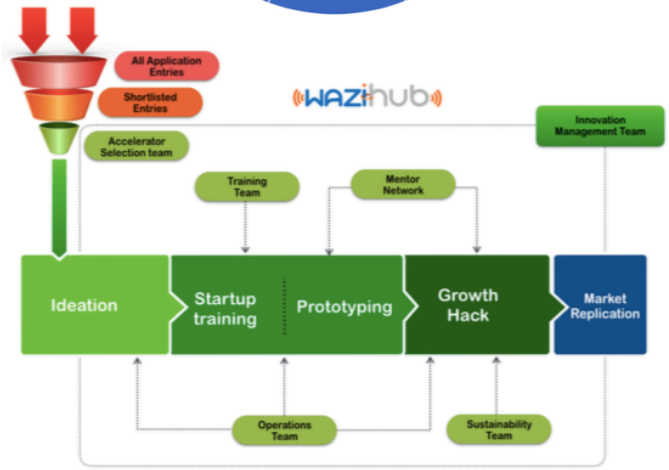
May 2018 - 2021











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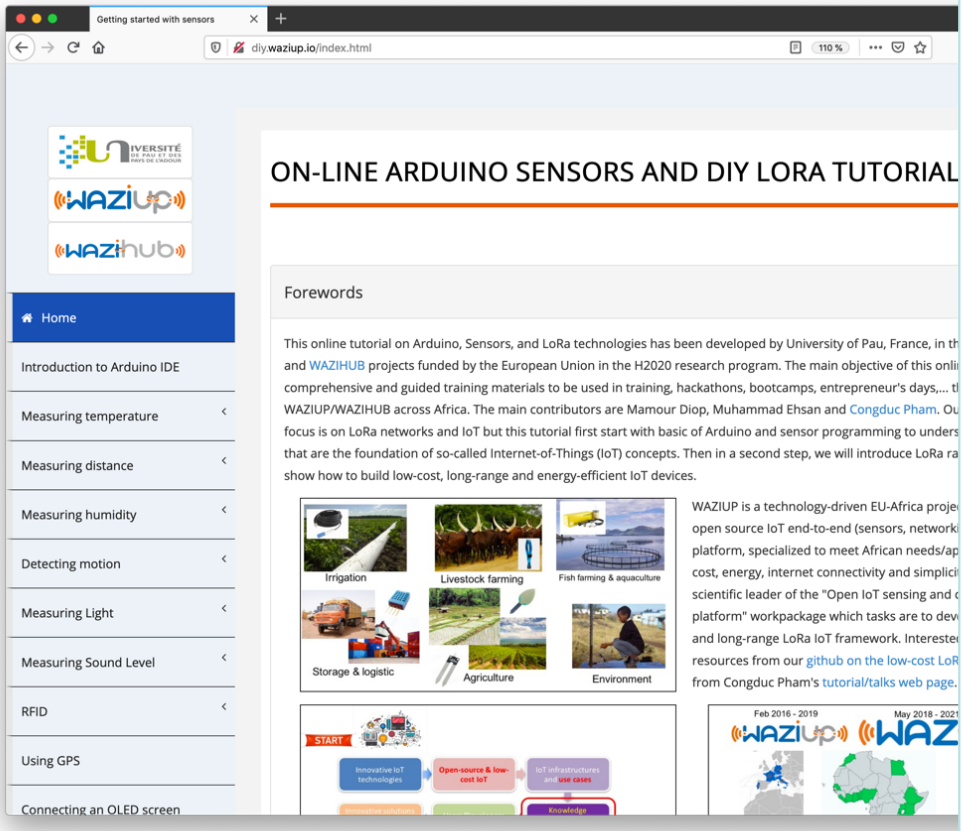
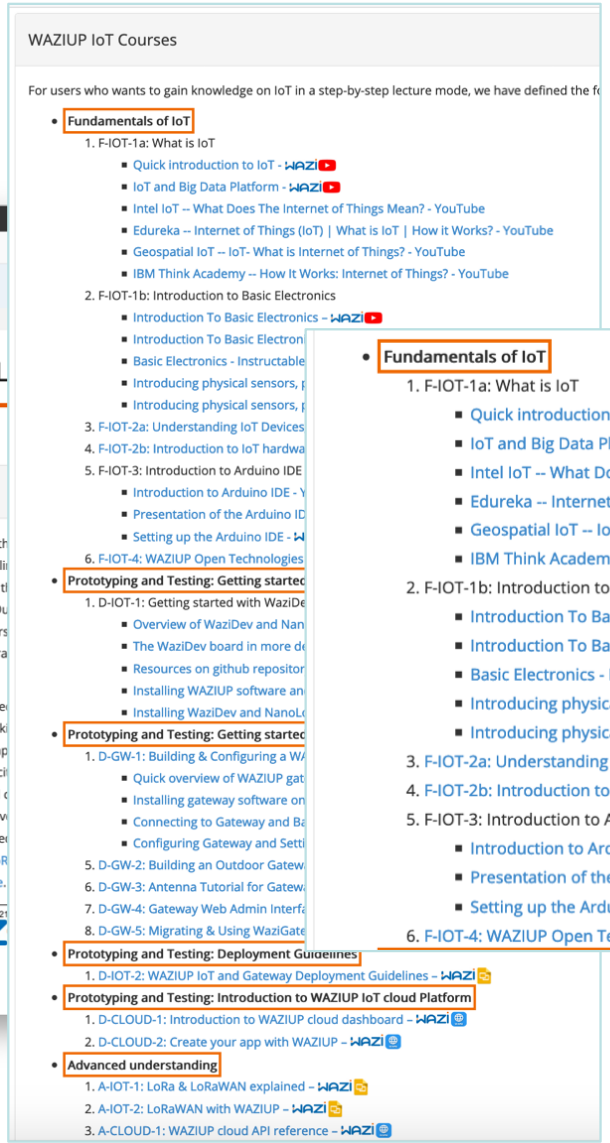
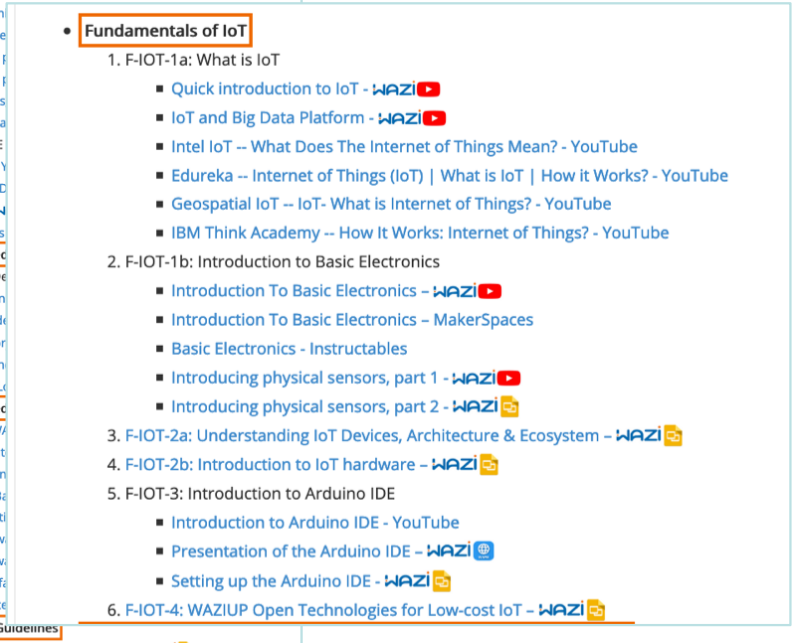
WAZIUP Online Course

- http://diy.waziup.io

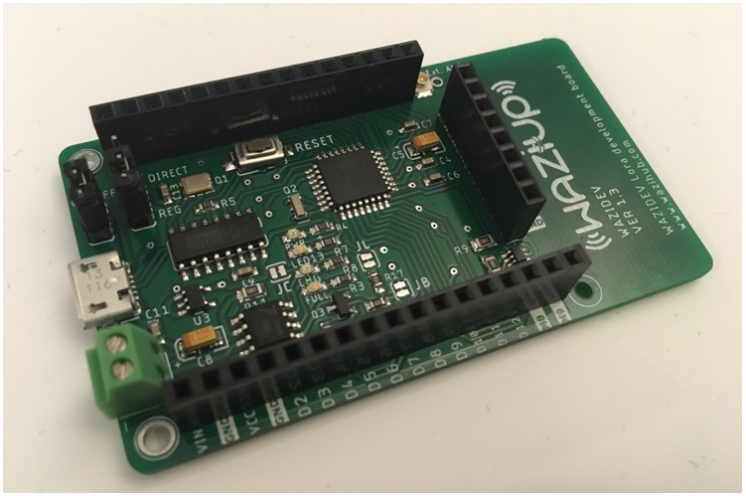


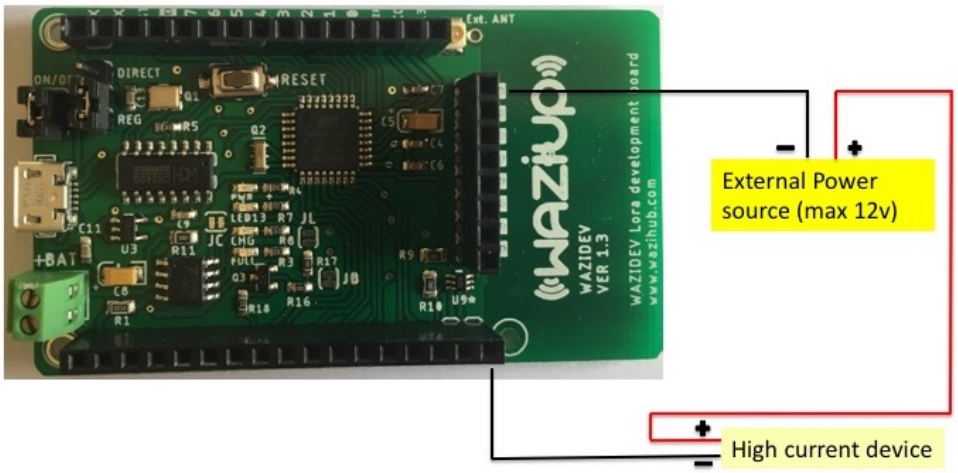




WAZIDev board

- Fully integrated development board: WAZIDev
  - Integrated MCU (ATMega328P, 3.3V & 8MHz)
  - On-board FTDI chip
- Features
  - All pins of MCU will be exposed
  - 2 MOSFET transistors to control energy-consuming sensors (e.g. GPS)





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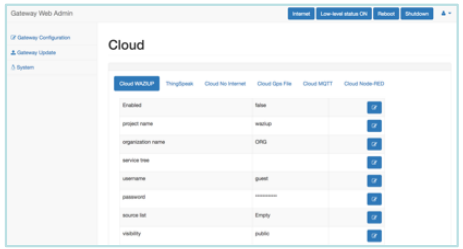
e.g. WAZIGate

- Based on the general distribution
- Enhanced with more specific web UI
- Enhanced with Docker environment
- Provides ready-to-use WAZIUP gateway distribution

"Branding" your IoT gateway

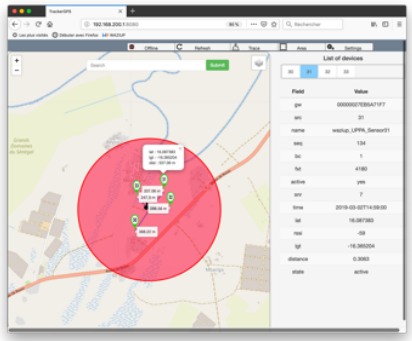
- Develop/Add project/company specific features on top of the general distribution

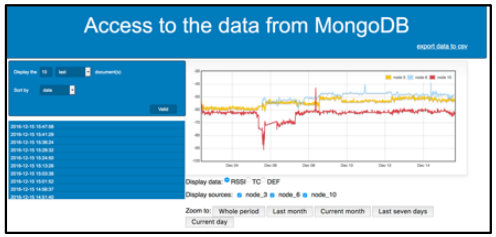


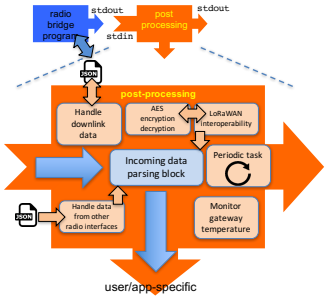
ADDITIONAL FEATURES SET 2

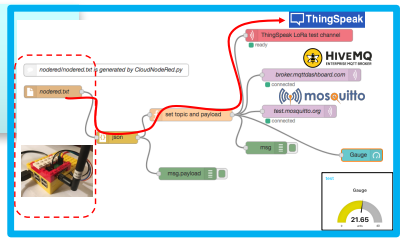
ADDITIONAL FEATURES SET 1

GENERAL DISTRIBUTION









Emergence of an ecosystem!

AFRICA INNOVATION EUROPE PARTNERSHIP

ITU

SMART INCUBATOR

AfriLabs

ZiNDi
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DIHNET.EU
Europe's Network of Digital Innovation Hubs

ADNE
AFRICAN DIASPORA NETWORK EUROPE

AI4EU
Advancing Europe through collaboration in AI

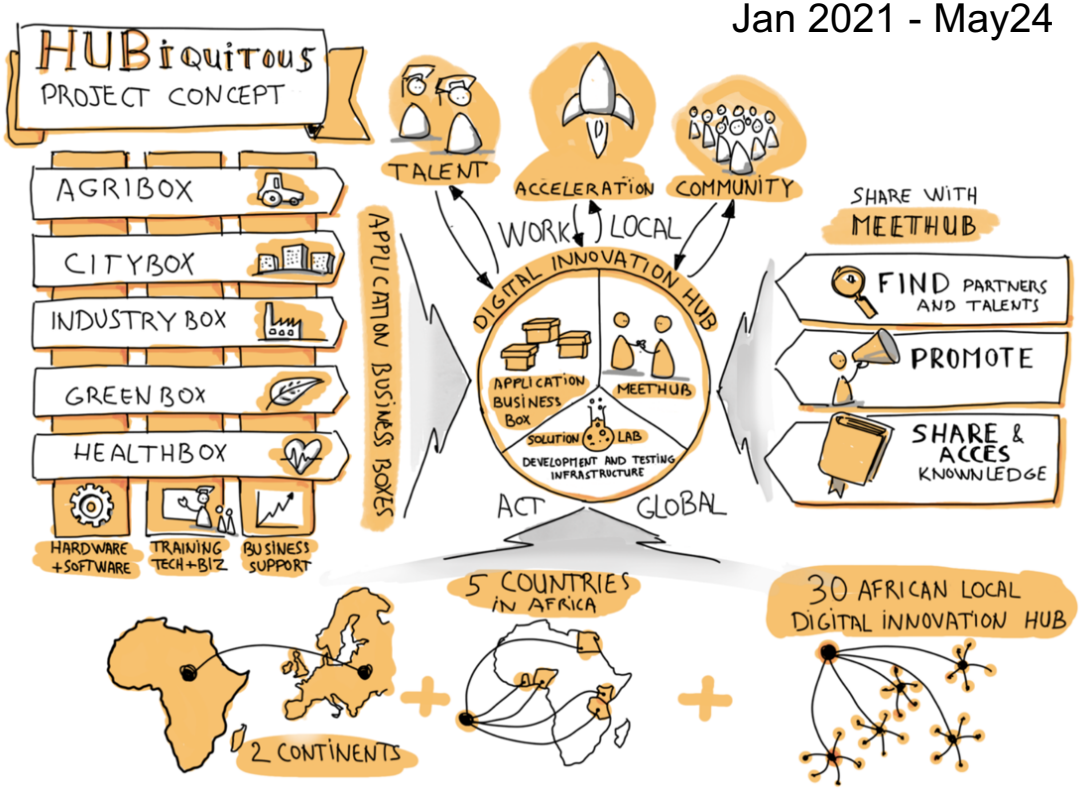
SOFT LANDING

Beyonds state-of-the-art!

HUBiquitous

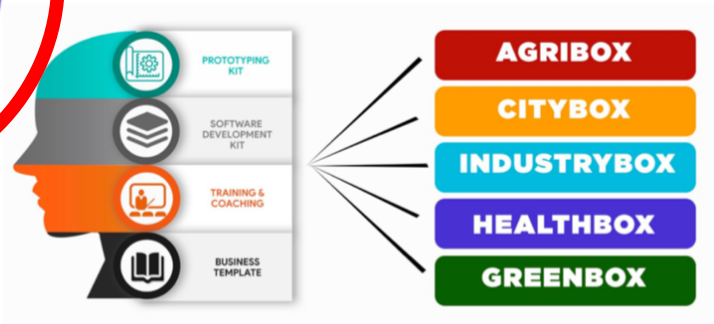
Jan 2021 - May24

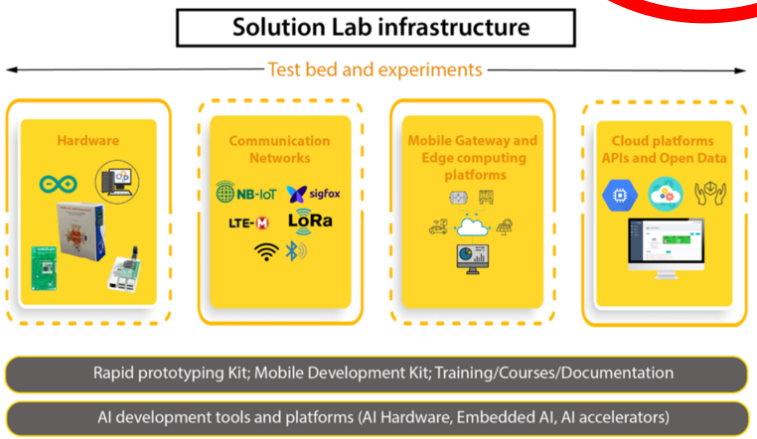
Widen the scope of technologies to prepare for the next 10 years of innovation in IoT, AI & BigData



3 Innovation Enablers

Create vertical solutions with go-to-market objectives





Create synergies amongs innovation actors, DIHs, stakeholders,…

Make disruptive technologies accessible to entrepreneurs!

Innovating in Africa with Internet-of-Things technologies: to[illegible]s a smar[illegible]

AAIS webminar – Presented on Dec 16th [illegible]

Prof. Congduc Pham
http://www.univ-pau.fr/~cpham
Université de Pau, France

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