

MAKING IOT HAPPENING!

IOT WORKSHOP
SWINBURNE UNIVERSITY OF TECHNOLOGY SARAWAK
FEBRUARY 7TH, 2018

DISRUPTIVE
INTERNET
OF THINGS
APPLICATIONS
IN AFRICA

WAZIup

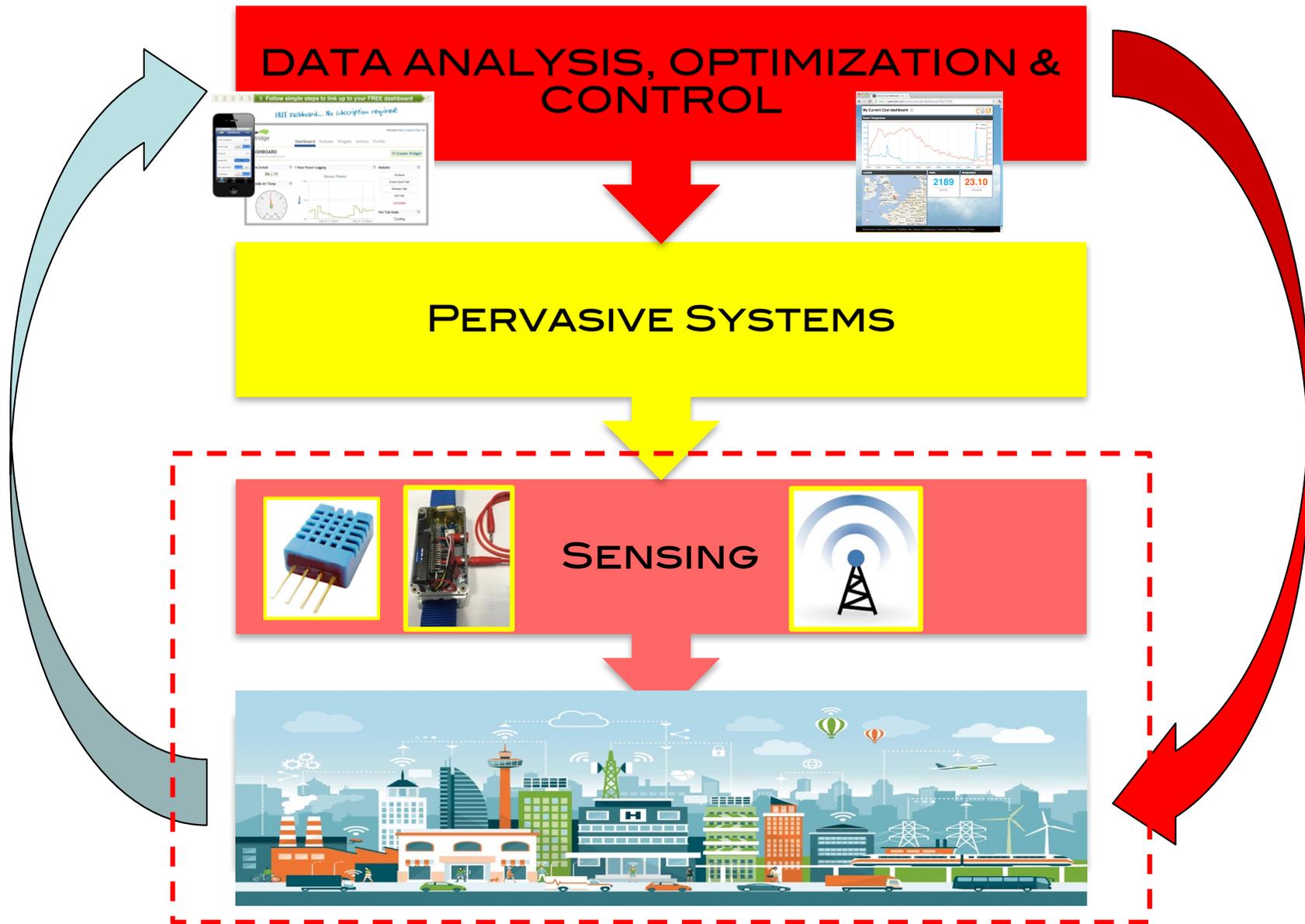
EUROPEAN UNION, CTIC, Farmerline, iSpace, KINSHASA, SWINBURNE UNIVERSITY OF TECHNOLOGY, coders africa, INNOTEQ, Université de Pau et des Pays de l'Adour, CREATE-NET



PROF. CONGDUC PHAM
[HTTP://WWW.UNIV-PAU.FR/~CPHAM](http://www.univ-pau.fr/~cpham)
UNIVERSITÉ DE PAU, FRANCE



CONTROL, OPTIMIZE & INSTRUMENT!



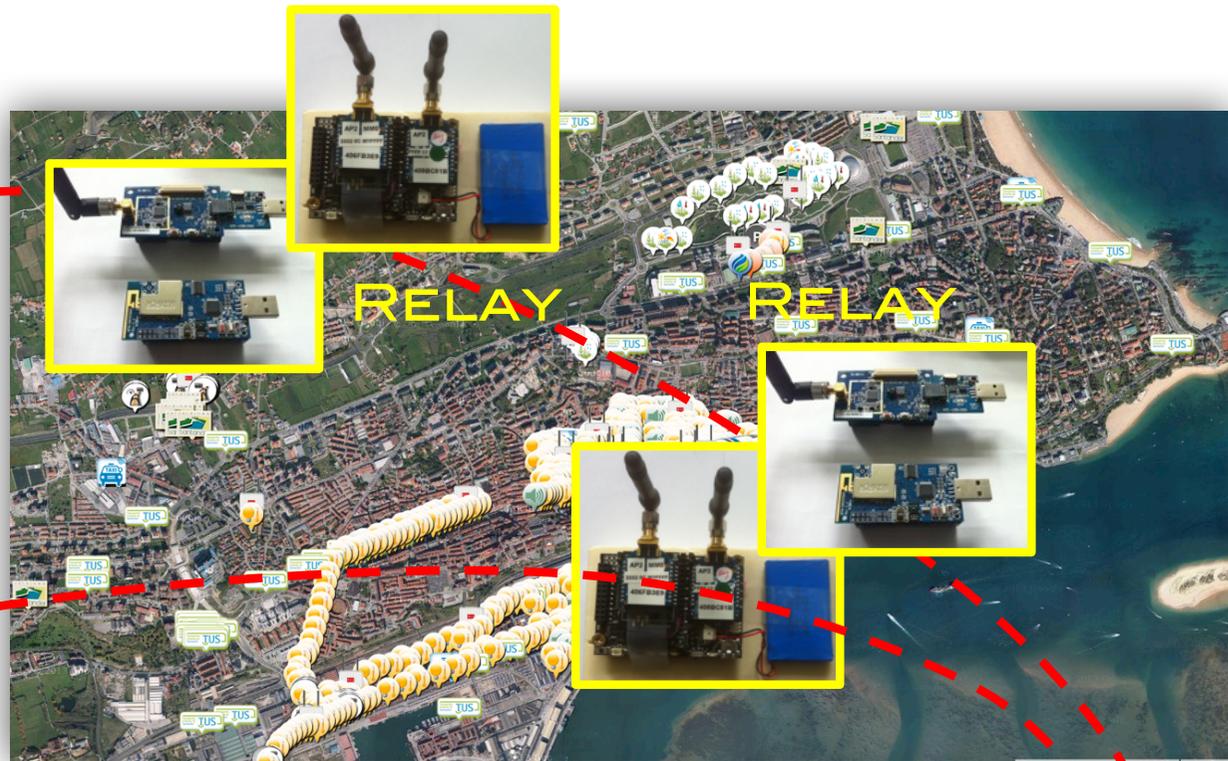


SmartSantander test-bed

Santander's sensor network deployment



Use deployed low-resource IoT node to enhance innovative acoustic services

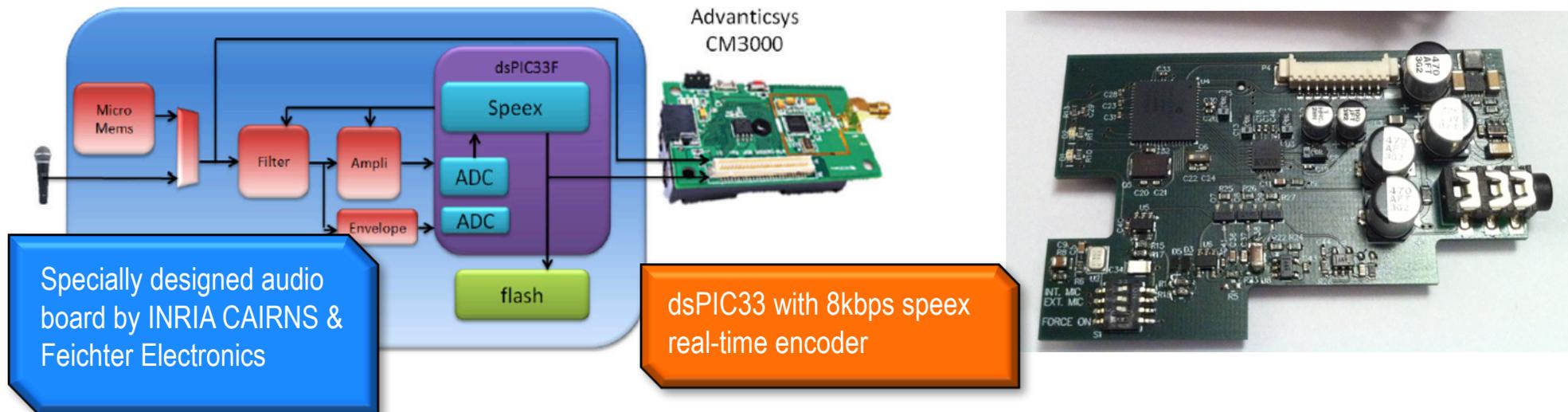


PLAY/STORE RECEIVED
AUDIO DATA

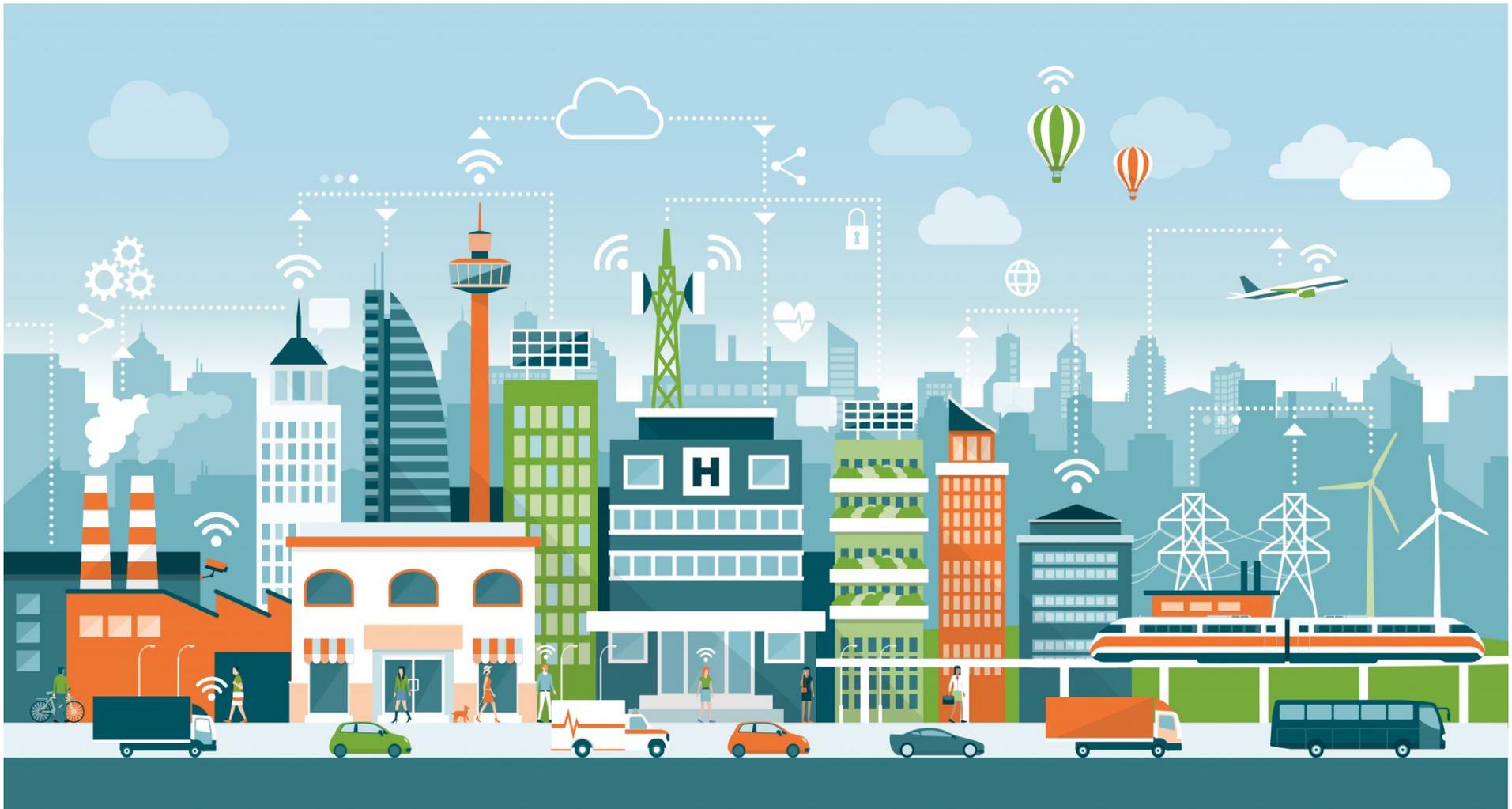


Development of audio board

- Use dedicated audio board for sampling/storing/encoding at 8kbps



- Allows for multi-hop, encoded audio streaming scenarios on resource-constrained IoT devices



Needs, constraints, cost, design approach, control mechanism

Bridging the digital divide



IOT=DEVELOPMENT OPPORTUNITIES IN REMOTE/RURAL AREAS



Irrigation



Livestock farming



Fish farming & aquaculture



Storage & logistic



Agriculture



Fresh water

IoT is not the story only for the industrialized countries



Source: Lenawo

IoT transition from industrial to developing and emerging market

MATURATION OF THE IOT MARKET...



... but not adapted for rural developing countries context & environment

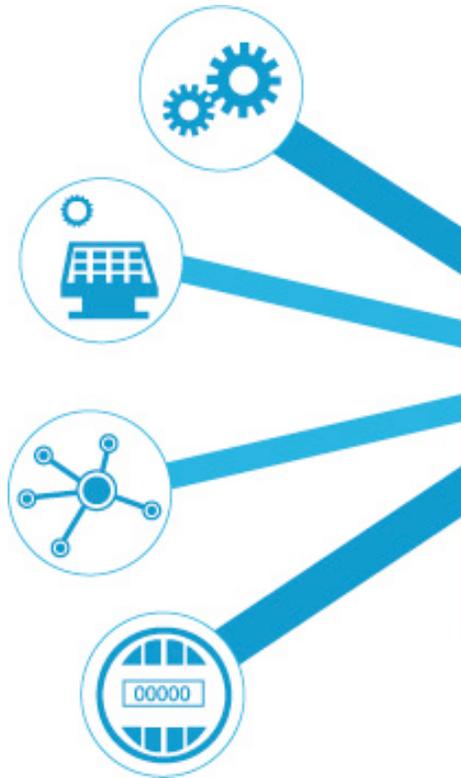
- Too expensive
- Too integrated
- Highly specialized
- Difficult to customize
- Difficult to upgrade



Ultrasonic fill level sensor
10+ years battery life
IP 66, [-40°, +85°]



INTERNET, CLOUD & BIG DATA ANALYTICS



Internet connectivity is weak and expensive!

Nearly impossible in remote/rural areas

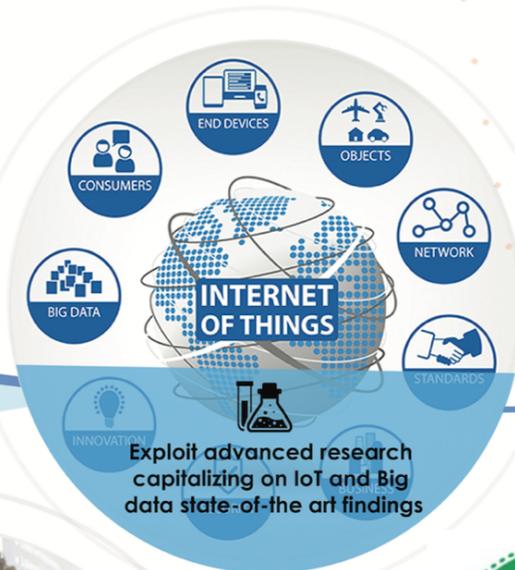


- 
Predictive Maintenance
- 
Outage Management
- 
Fraud Detection
- 
Demand/Supply Optimization
- 
Customer Engagement

Graphics from <http://www.vitria.com/iot-analytics/>



Affordable technologies to empower rural economics



Develop IoT solutions and applications meeting African needs

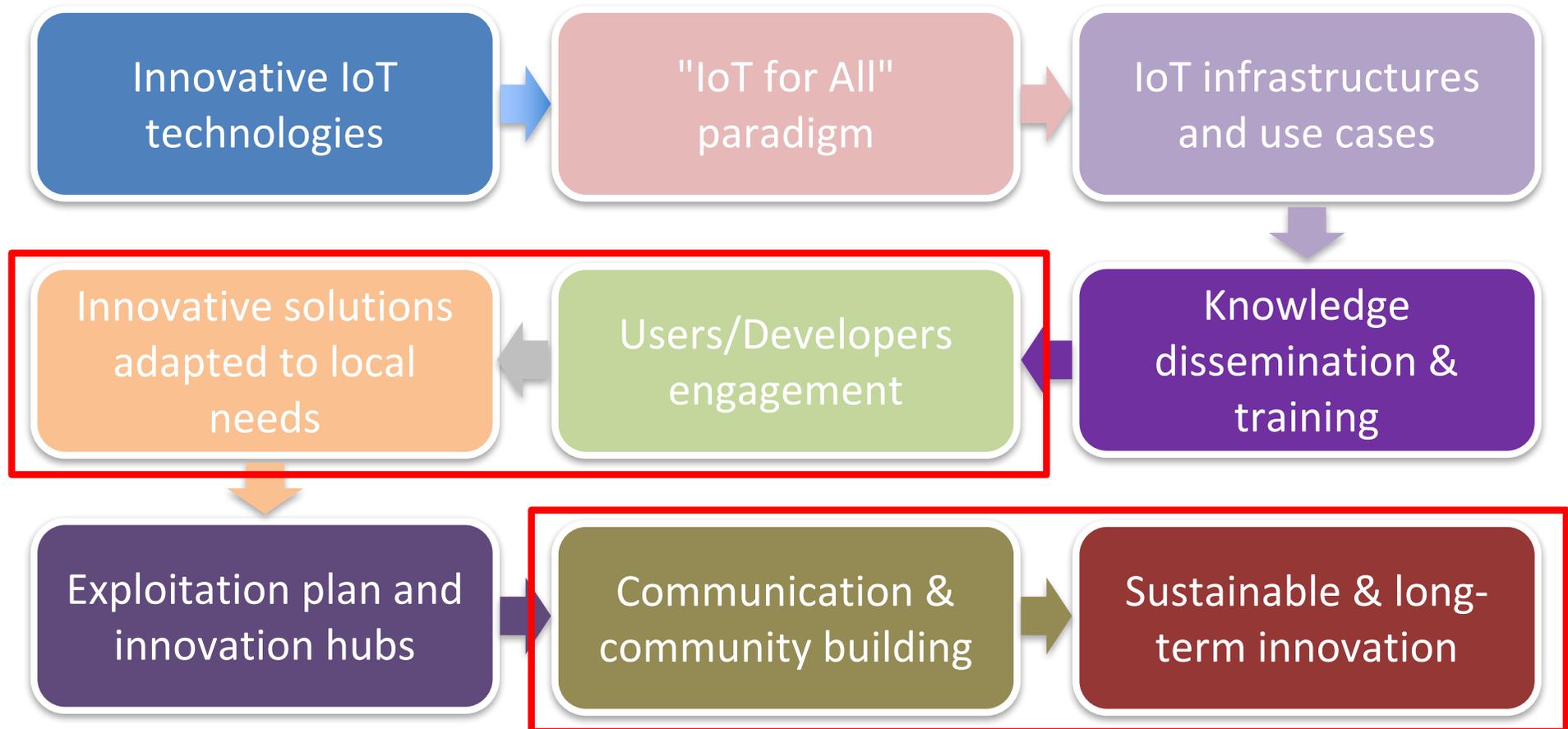
DO MORE with LESS

- www.waziup.eu
- Waziup IoT
- Waziup IoT
- Waziup
- Waziup



waziup.community@create-net.org

MAKING IOT HAPPENING!



INVOLVING INNOVATION HUBS/STAKEHOLDERS

- **Close to dev & entrepreneurs** communities
- Have their **own community and com channels** (community builders & catalysts)
- Used to organizing disruptive events
- **On the field** (know the targets personally & the market)
- **Used to empowering startups & businesses** (coaching, business dev, incubation, acceleration...)
- Affiliated to **international networks** that could be involved in dissemination or Business dev (Afrilabs)



COMMUNITY BUILDING FOR SUSTAINABLE INNOVATION

International Events
+ 20 organized & attended

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



Launch event (Ghana, iSpace)



IoTWeek 2016 (Belgrade, EGM)



Launch event (Senegal, CTIC Dakar)



IoTBigData 2016 (Italy, EGM)



IoT Care Conference (Budapest, CNET)

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



RESSACS 2016

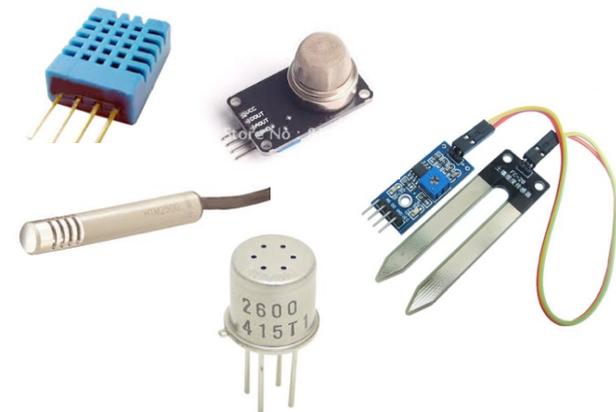
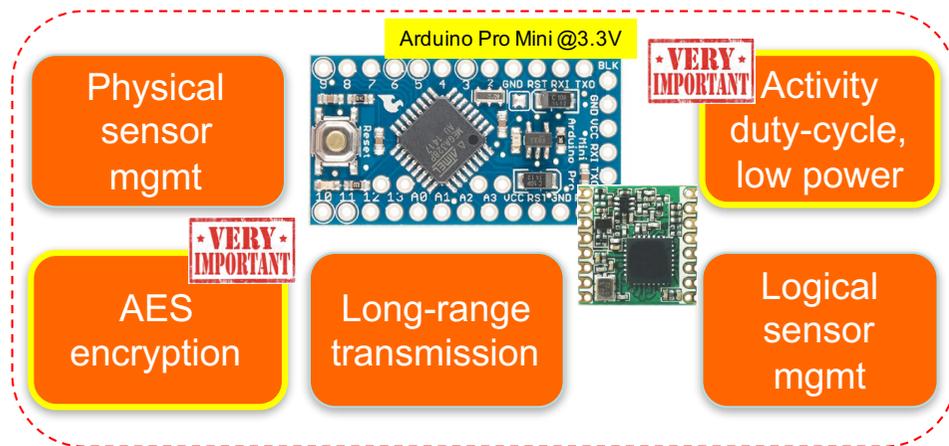


Credit: C. Vavasseur, CTIC Dakar Workshop at the RESSACS 2016 (France, UPPA) 14

GENERIC SENSING IOT DEVICE VS HIGHLY SPECIALIZED



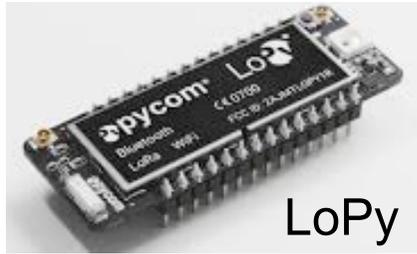
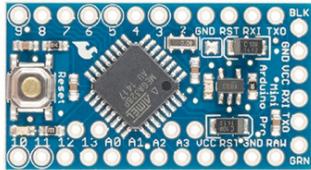
- ❑ Build low-cost, low-power, **long-range** enabled generic platform
- ❑ Methodology for low-cost platform design
- ❑ Technology transfers to user communities, economic actors, stakeholders,...



LOW-COST HARDWARE



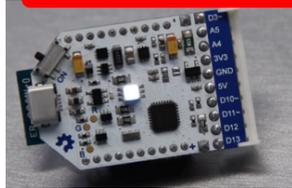
Arduino Pro Mini



LoPy

<http://blog.atmel.com/2015/12/16/rewind-50-of-the-best-boards-from-2015/>

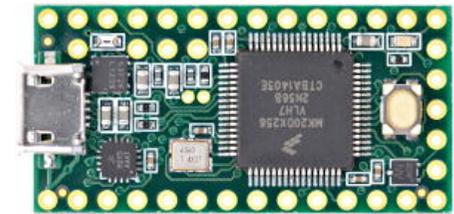
<http://blog.atmel.com/2015/04/09/25-dev-boards-to-help-you-get-started-on-your-next-iot-project/>



Theairboard



Expressif ESP32

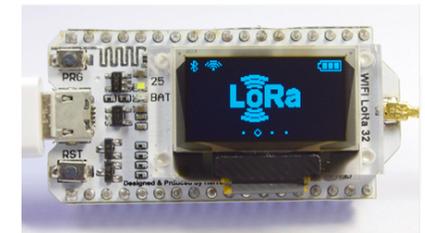
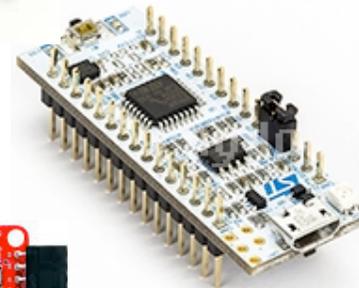


Teensy 3.2



LinkIt Smart7688 duo

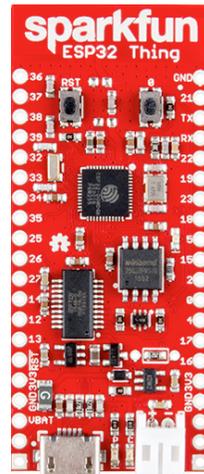
STM32 Nucleo-32



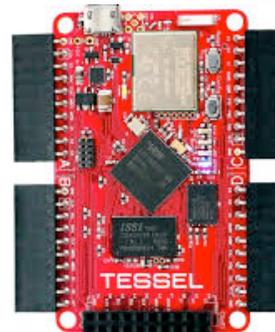
Heltec ESP32 + OLED



Adafruit Feather



Sparkfun ESP32 Thing



Tessel

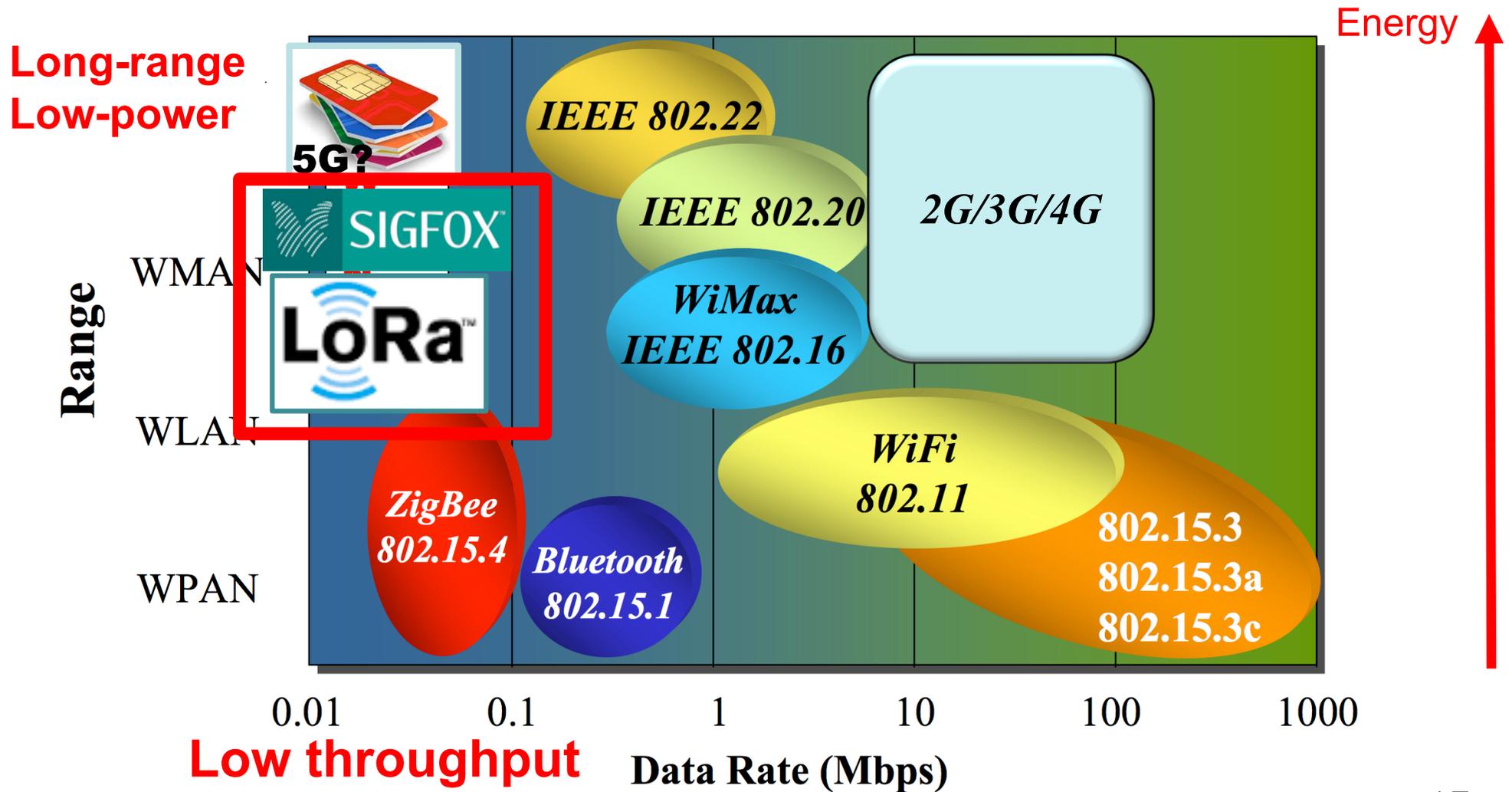
SodaqOnev2



Tinyduino

USAGE OF LATEST LOW-POWER & LONG-RANGE RADIO TECHNOLOGIES

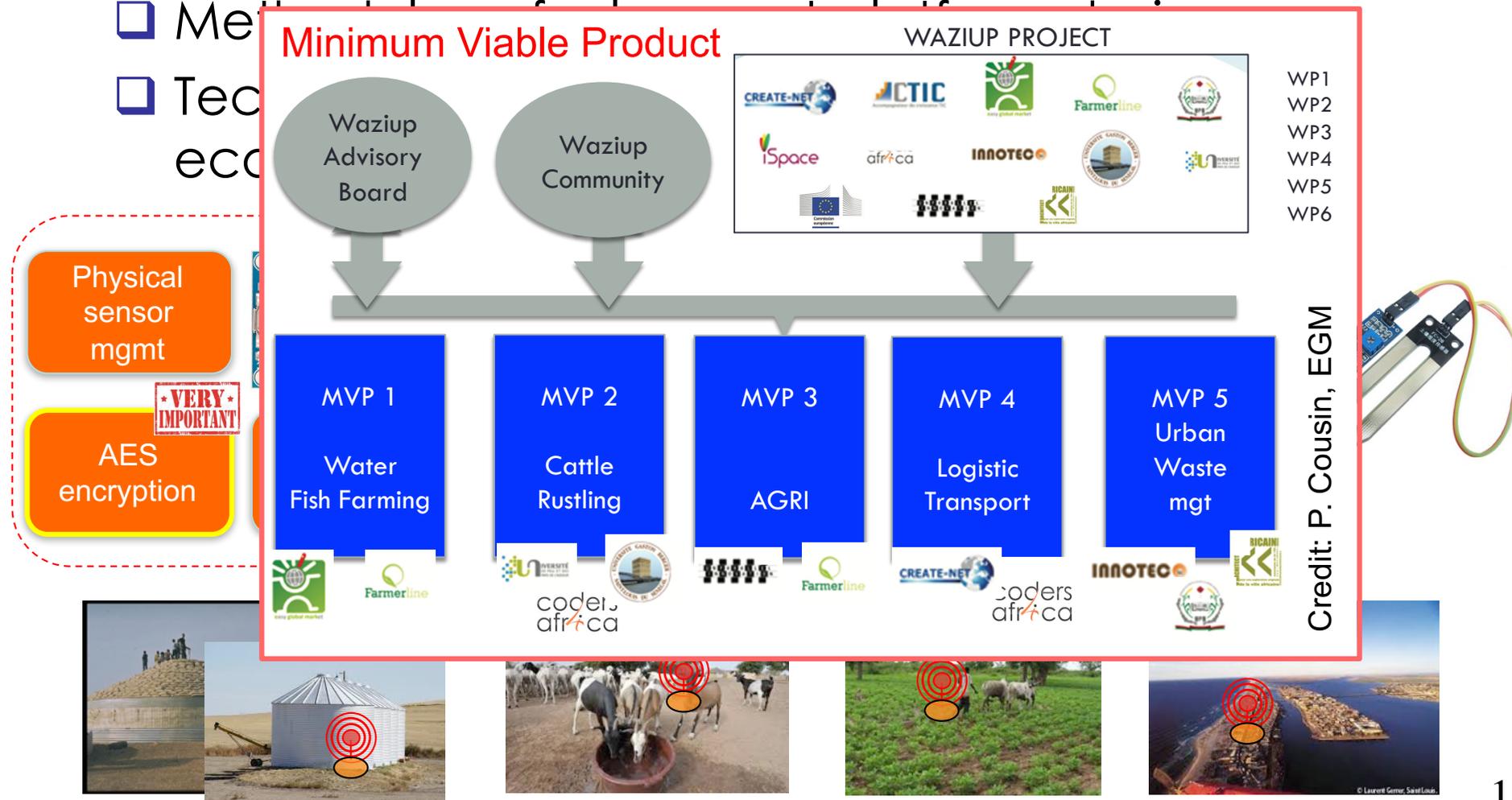
Energy-Range dilemma

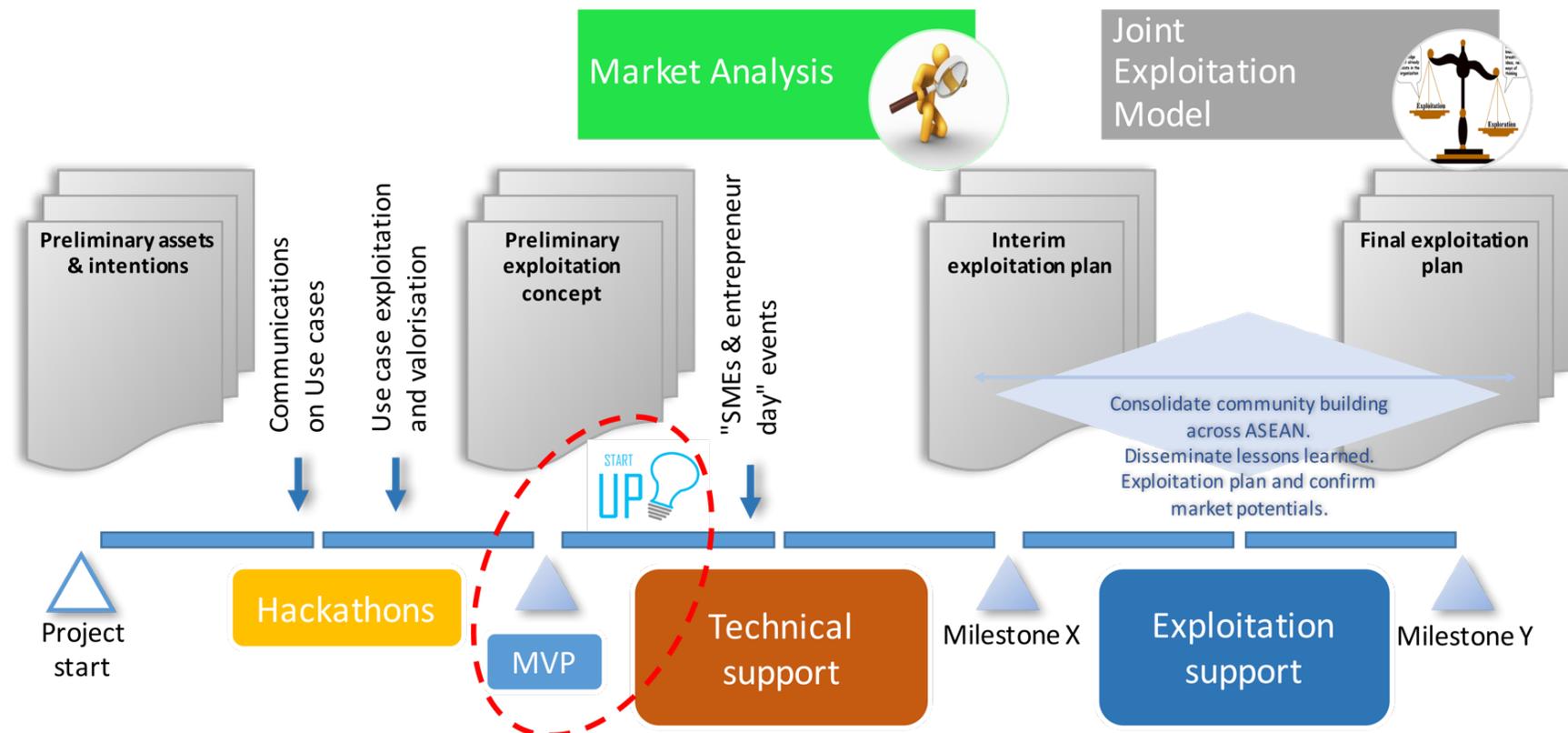
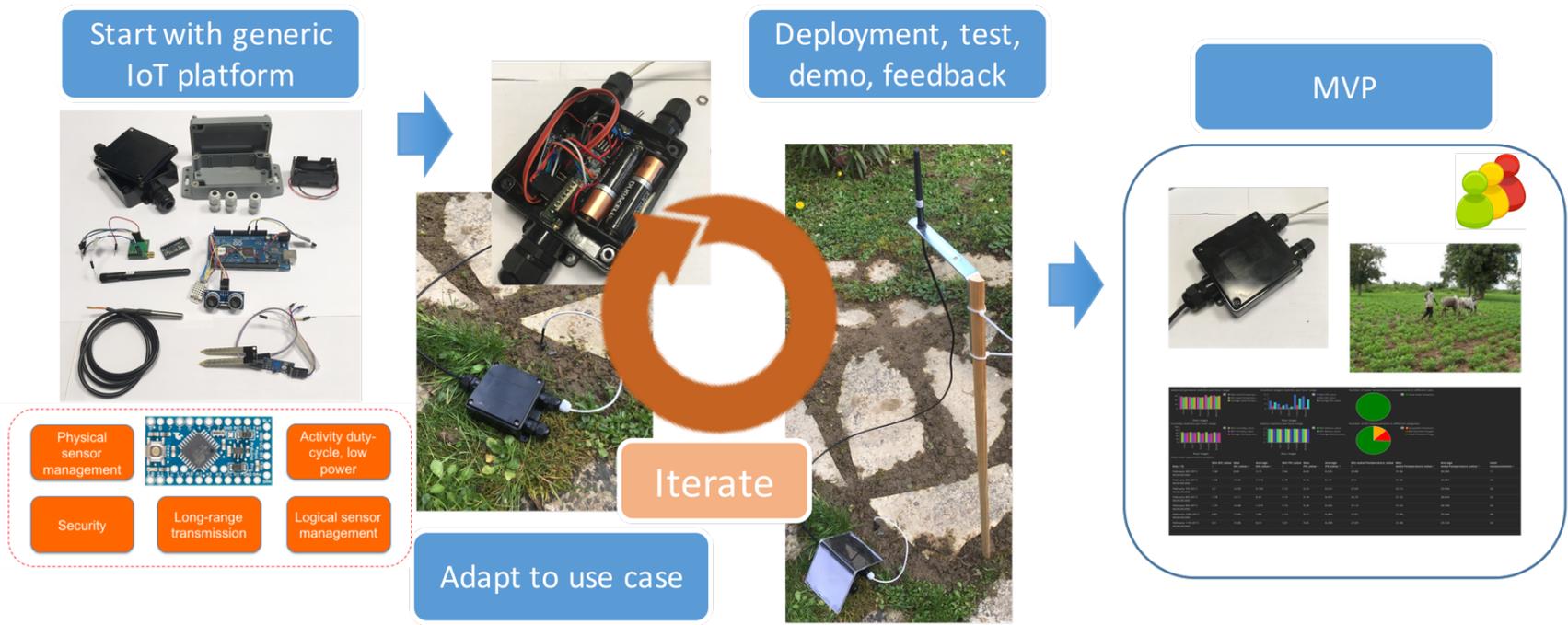


GENERIC SENSING IOT DEVICE

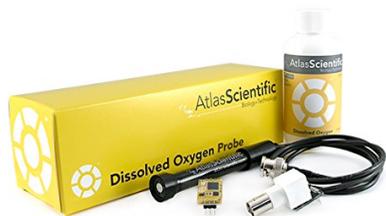
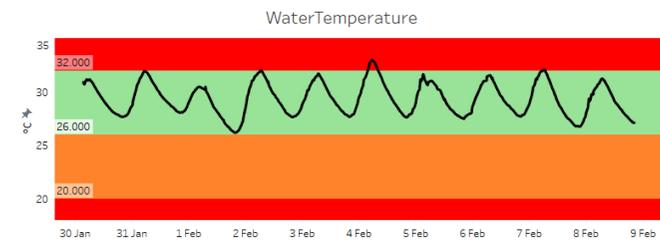
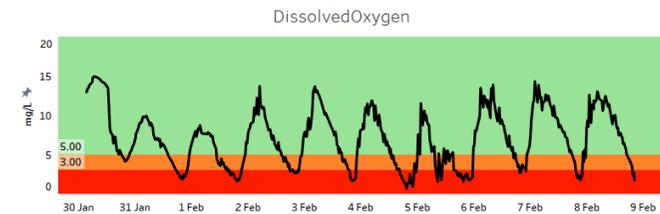
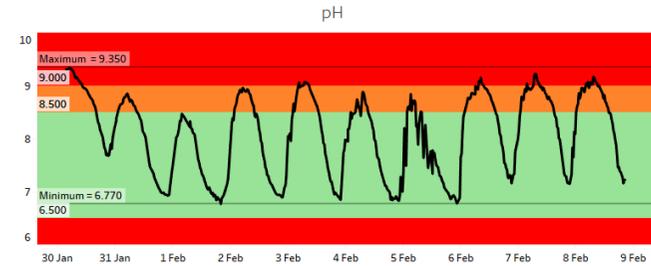
- Build low-cost, low-power, Long-range enabled generic platform

- Meet the needs of the African continent
- Technical excellence
- economic



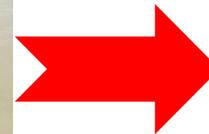


LOW-COST BUOY FOR FISH FARMING MVP



Physical sensor reading

Credit: EGM



Physical sensor management



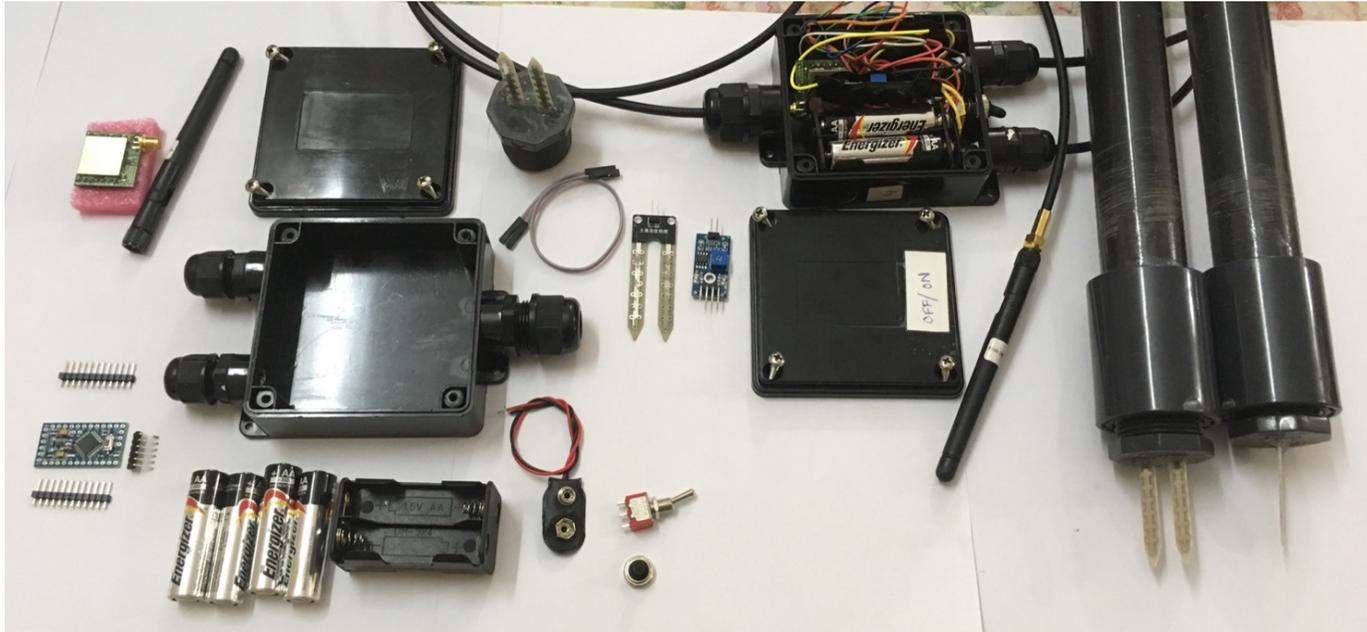
Activity duty-cycle, low power

Security

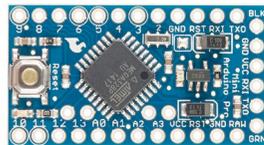
Long-range transmission

Logical sensor management

SOIL HUMIDITY SENSORS FOR AGRI MVP



Physical sensor management



Activity duty-cycle, low power

Security

Long-range transmission

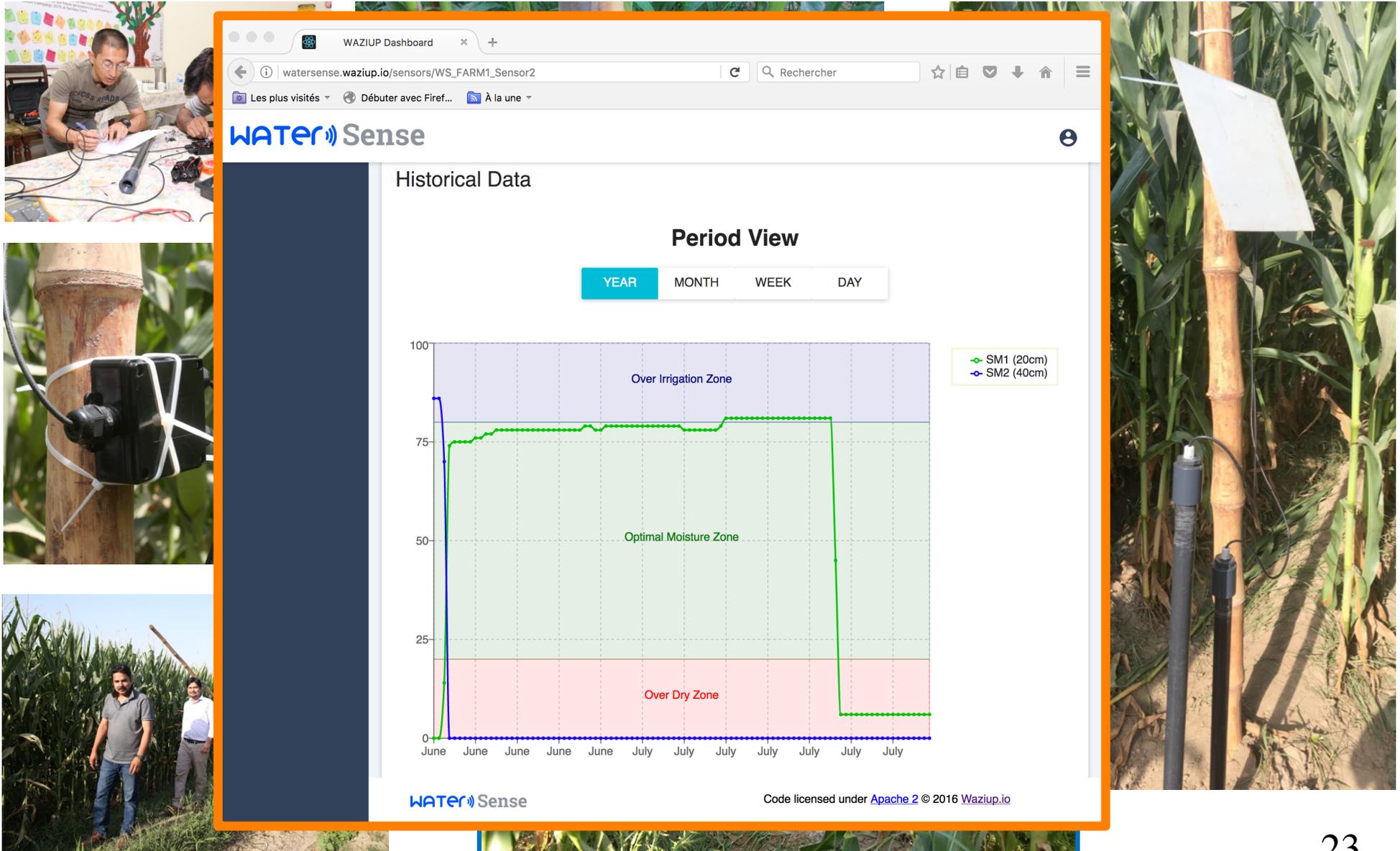
Logical sensor management



DEPLOYMENT FOR NESTLÉ'S WATERSENSE PROJECT



DEPLOYMENT FOR NESTLÉ'S WATERSENSE PROJECT



The image displays the deployment of the WaterSense project, featuring a screenshot of the WAZIUP Dashboard, a close-up of a sensor on a bamboo pole, and a photo of two people in a cornfield.

WAZIUP Dashboard Screenshot:

The dashboard shows the URL `watersense.waziup.io/sensors/WS_FARM1_Sensor2` and the title "Historical Data". The "Period View" is set to "YEAR". The graph displays moisture levels for two sensors: SM1 (20cm) and SM2 (40cm).

Moisture Data Summary:

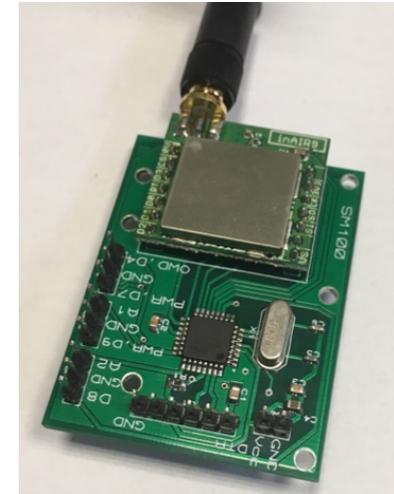
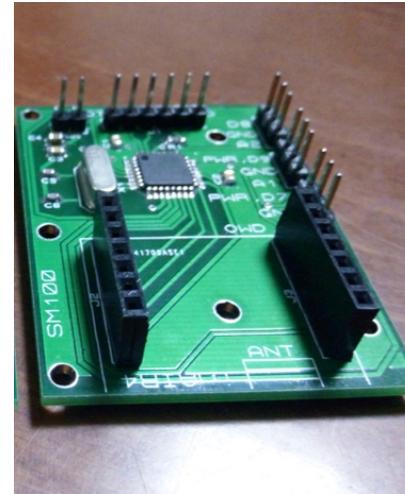
Time Period	SM1 (20cm) Moisture (%)	SM2 (40cm) Moisture (%)
Start of June	~0	~85
Mid June	~75	~75
Mid July	~80	~75
End of July	~10	~10

The graph is divided into three zones:

- Over Irrigation Zone:** Moisture levels above 80%.
- Optimal Moisture Zone:** Moisture levels between 50% and 80%.
- Over Dry Zone:** Moisture levels below 50%.

Code licensed under [Apache 2](https://www.apache.org/licenses/LICENSE-2.0) © 2016 Waziup.io

LOCAL INTEGRATION WITH TECHNOLOGY TRANSFER

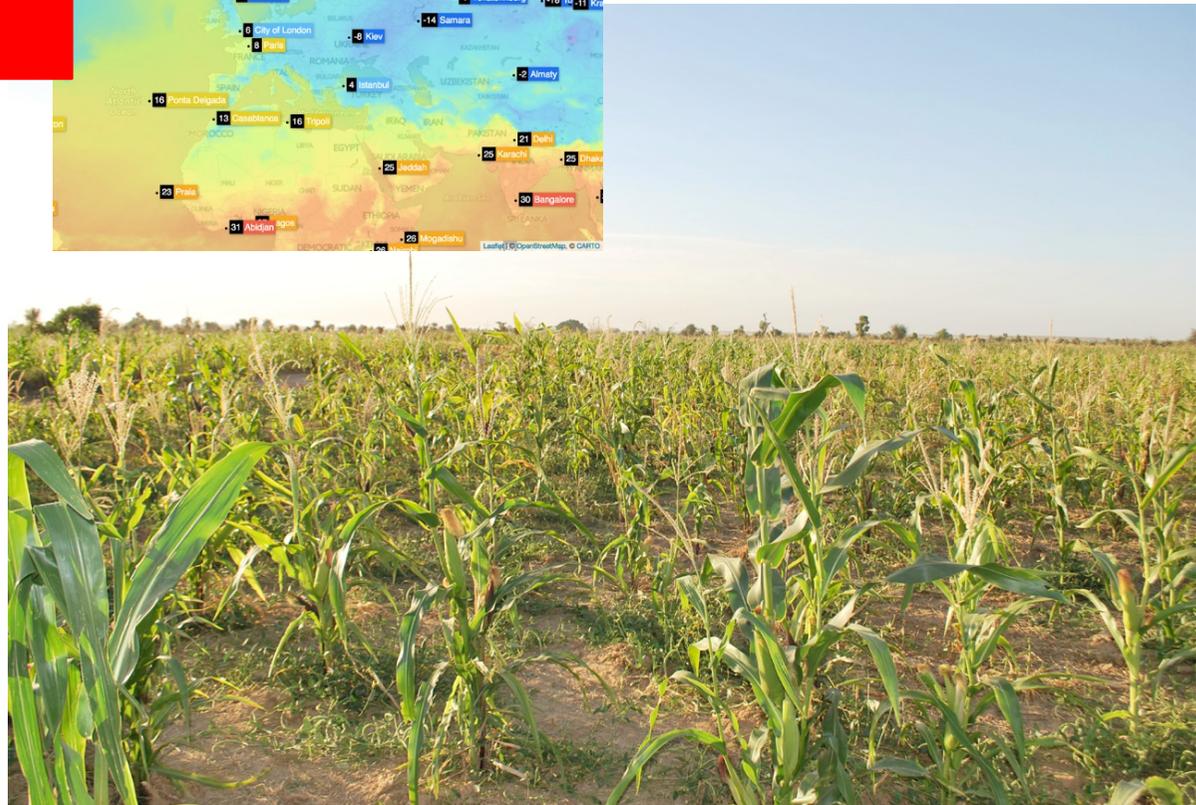


LOCAL LOW-COST WEATHER STATION FOR AGRI MVP

<https://openweathermap.org/>



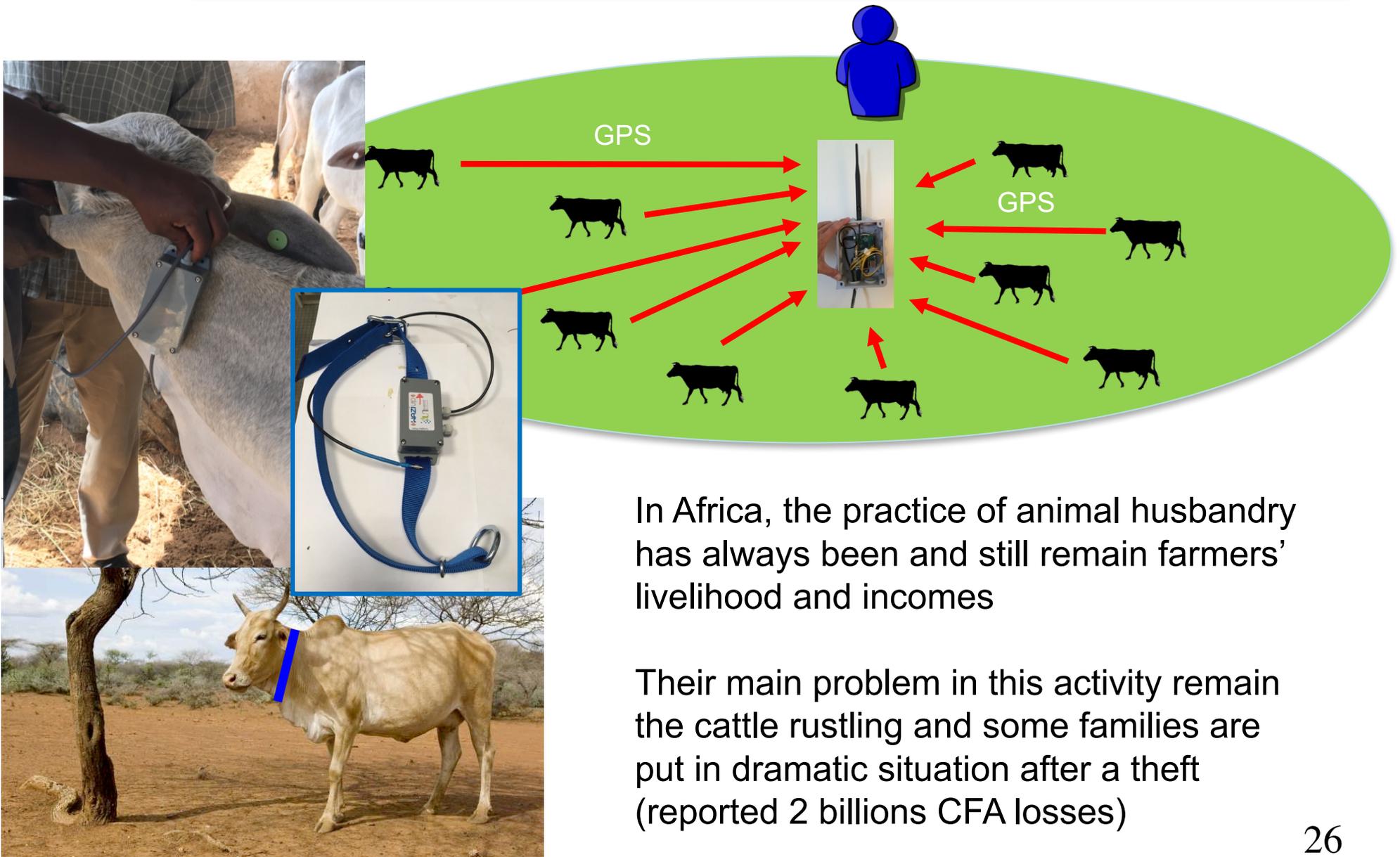
Photo from Unparallel



Get local weather measurements

Combine with open weather data to get more accurate local predictions

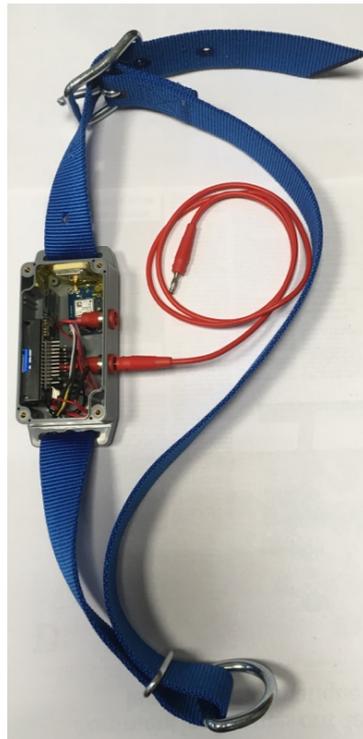
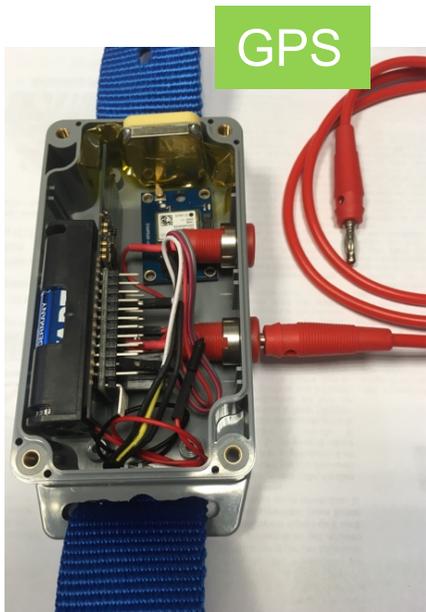
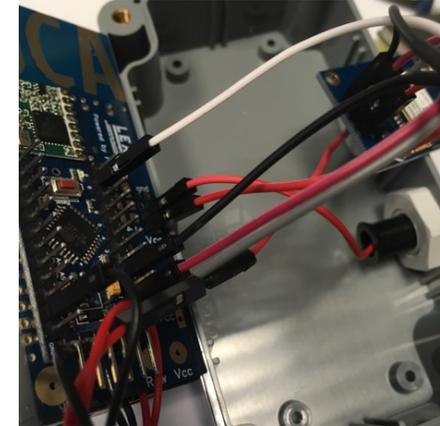
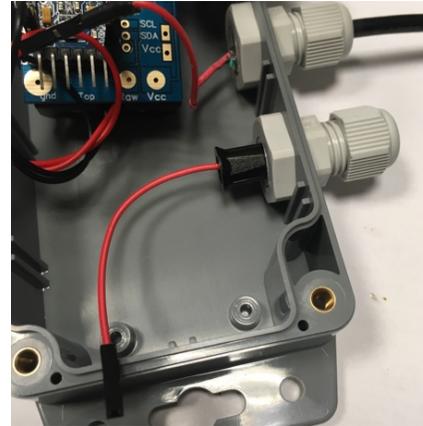
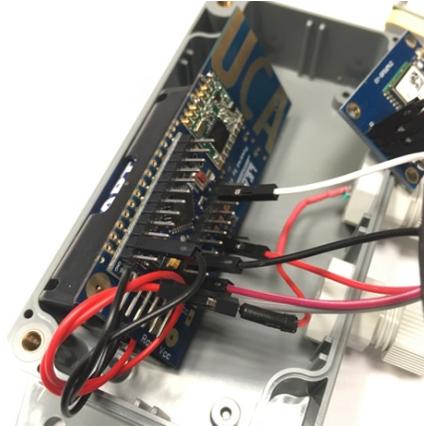
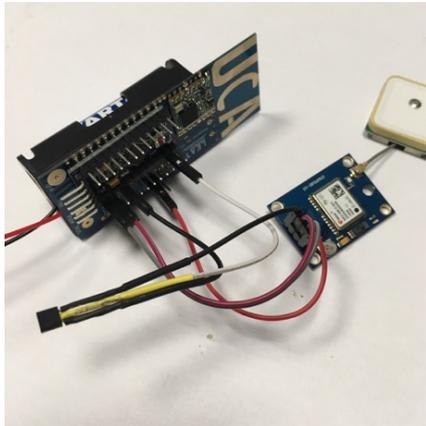
COLLAR FOR CATTLE RUSTLING MVP



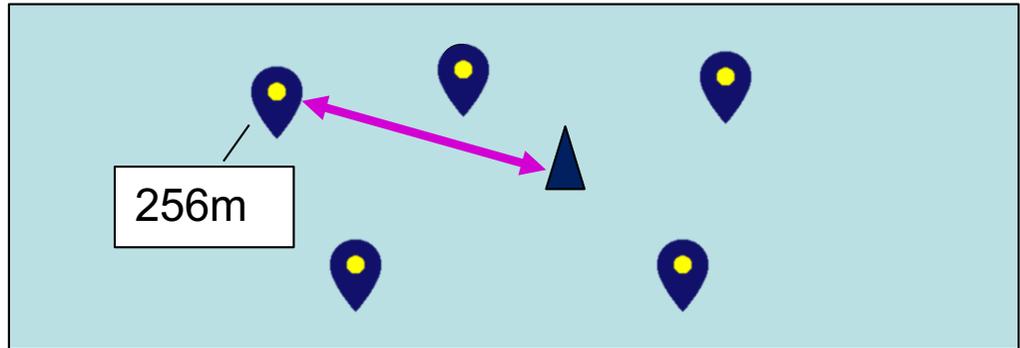
In Africa, the practice of animal husbandry has always been and still remain farmers' livelihood and incomes

Their main problem in this activity remain the cattle rustling and some families are put in dramatic situation after a theft (reported 2 billions CFA losses)

EASY INTEGRATION AND CUSTOMIZATION

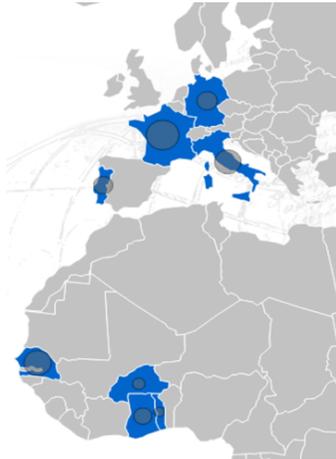


A web interface can be developed to display the position of the gateway and the position of the remote GPS devices

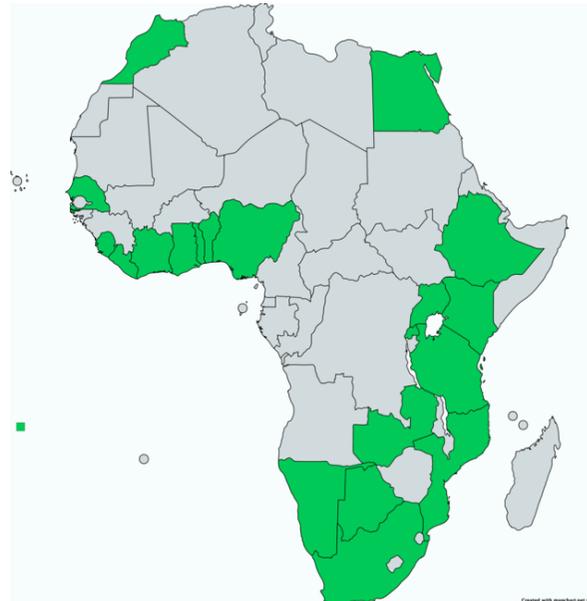


SCALING UP!

Feb 2016 - 2019



May 2018 - 2021



COLLABORATION WITH SUTS

- ❑ Research & development of IoT platforms
- ❑ Grant applications
- ❑ Technology transfers
- ❑ Local innovation hub & entrepreneurship
- ❑ Contribute to digital economy of Sarawak

