LOG RECEIVED MESSAGES USING CLOUD SERVICES

\$T=23°

Node 10

\&H=85%

Node 3

radio bridge program → stdout

stdin → post processing
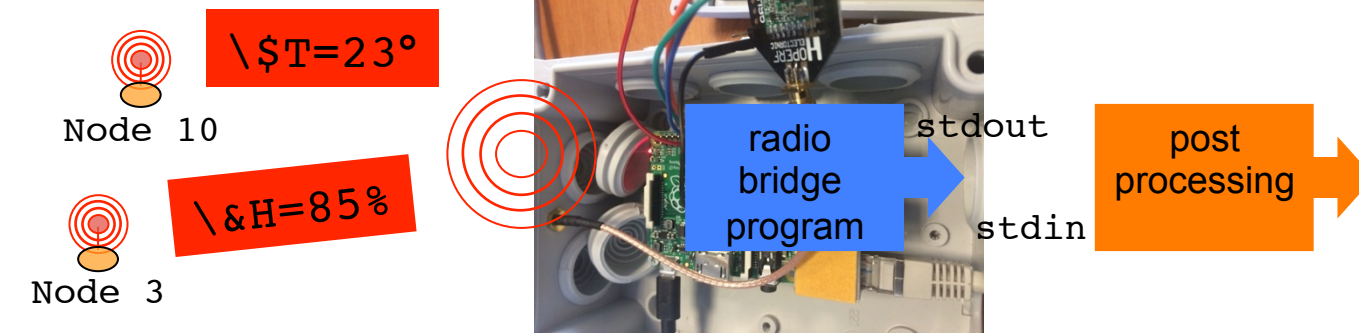
```
> sudo ./lora_gateway | python ./post_processing_gw.py
Power ON: state 0
LoRa mode: 4
Setting mode: state 0
Channel CH_10_868: state 0
Power M: state 0
Get Preamble Length: state 0
Preamble Length: 8
LoRa addr 1 : state 0
SX1272/76 configured as LR-BS. Waiting RF input for transparent RF-serial bridge

--- rxlora. dst=1 type=0x10 src=10 seq=0 len=5 SNR=9 RSSIpkt=-54
Rcv ctrl packet info 1,16,10,0,5,9,-54
(dst=1 type=0x10 src=10 seq=0 len=5 SNR=9 RSSI=-54)
rcv msg to log (\$) on dropbox : T=23°
--- rxlora. dst=1 type=0x10 src=3 seq=0 len=5 SNR=8 RSSIpkt=-54
Rcv ctrl packet info 1,16,3,0,5,8,-54
(dst=1 type=0x10 src=3 seq=0 len=5 SNR=8 RSSI=-54)
rcv msg to log (\&) on firebase : H=85%
```
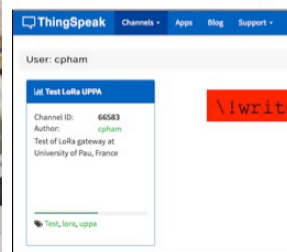
\$ or \& before the data indicates that the data should be logged on a file or server. It is up to the end-device to decide which option
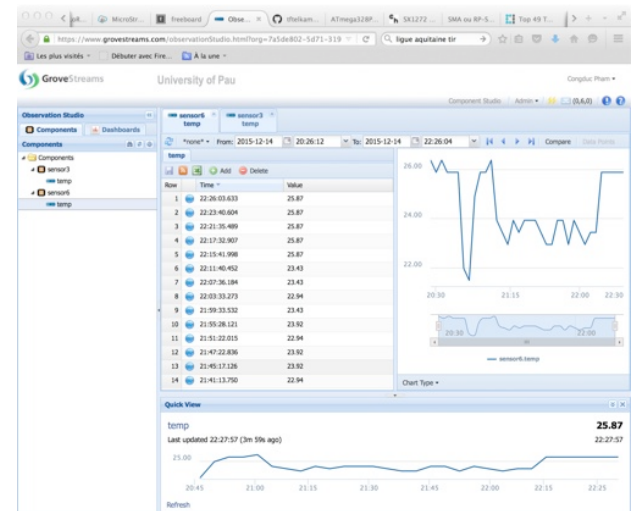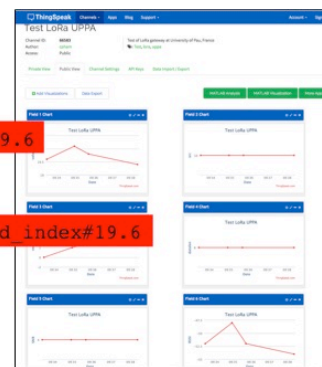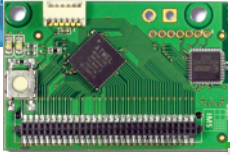
44
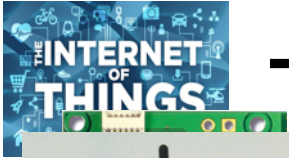
Templates for various clouds

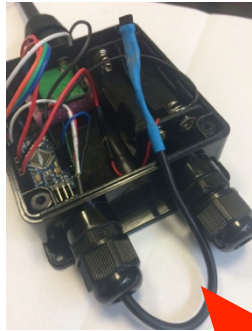
45
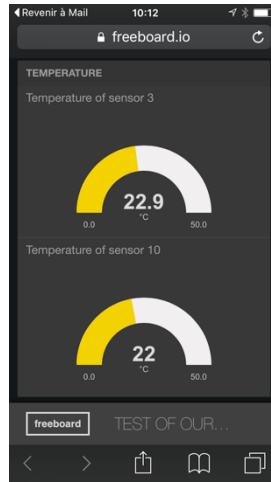
Do it yourself !

Step-by-step tutorial and source code available
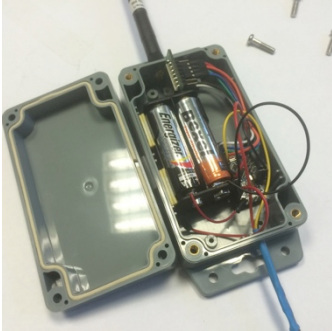
Python scripts available

Step-by-step tutorial and source code available

https://github.com/CongducPham/LowCostLoRaGw

46
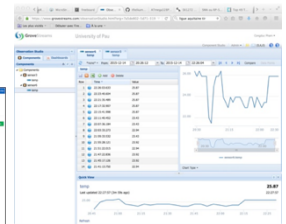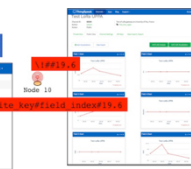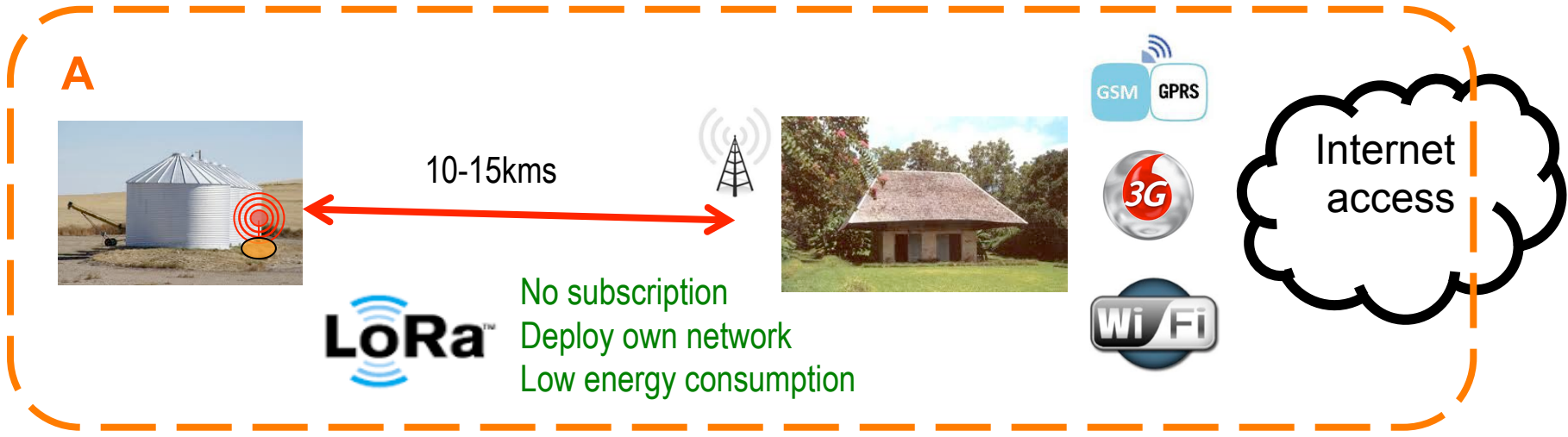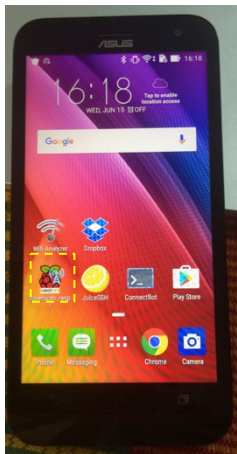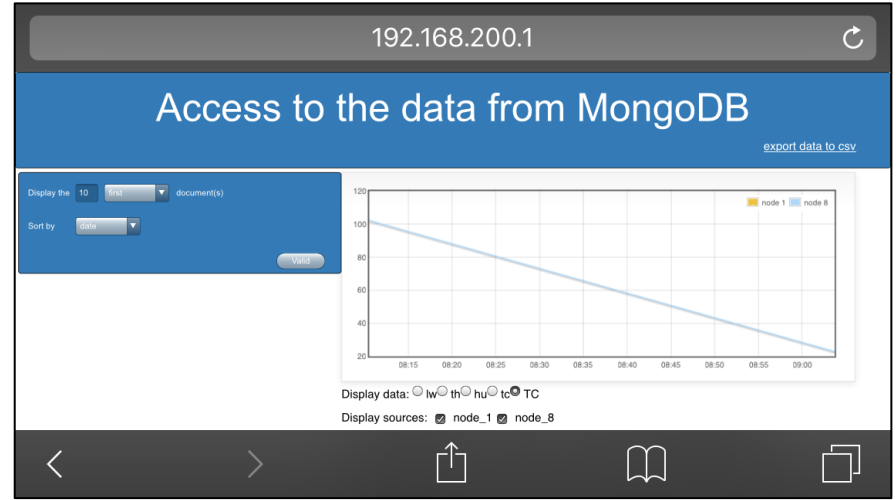
Working without Internet access

A

10-15kms

No subscription
Deploy own network
Low energy consumption

GSM GPRS

3G

Wi Fi

Internet access

B

Wi Fi

47

Standalone gateway

48

Local data analytics

Credit: C. Dupont, CreateNet

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End Nodes

- pet tracking
- smoke alarm
- water meter
- trash container
- vending machine
- gas monitoring

Concentrator /Gateway

3G/ Ethernet Backhaul

Network Server

Application Server

Figure from Semtech

A

Application, MVP

WAZIUP Sensor platform

radio bridge program — stdout / stdin — post processing

WAZIUP gateway platform

OpenStack Cloud Controller

Create VMs

Buildpacks	Services	Execution Env
Java	Cloud Foundry	deploy
Python	Mongo DB	
PHP	HTTP server	
Scala	MySQL	
Flink	…	
New IoT broker		

deploy locally — MongoDB — New

WAZIUP platform

B

Wi-Fi Bluetooth

freeboard FIWARE ThingSpeak Dropbox Firebase GroveStreams SensorCloud™

Now,
IoT becomes reality!

SIGFOX — One network A billion dreams

nwave

LoRa™   LTE-M

NB-LTE

WEIGHTLES

DASH7 ALLIANCE   EC-

Bluetooth 4.0

Dropbox   Firebase   FIWARE

Axeda   ioBridge Connect things.

ThingSpeak   GroveStreams

sorCloud™   freeboard

OpenRe

Faster Analytics

The INTERNET of THINGS

Anything Any Device

time ontext

Any Place Anywhere

Any Service Any Business

Any Path Any Network

51
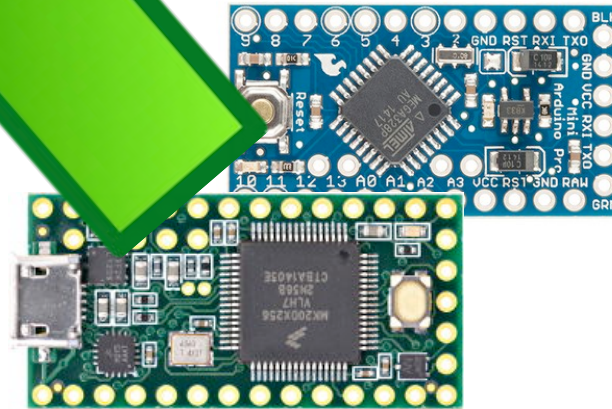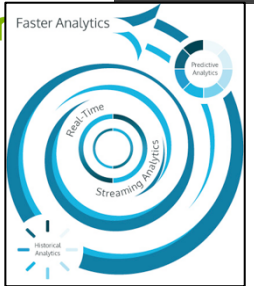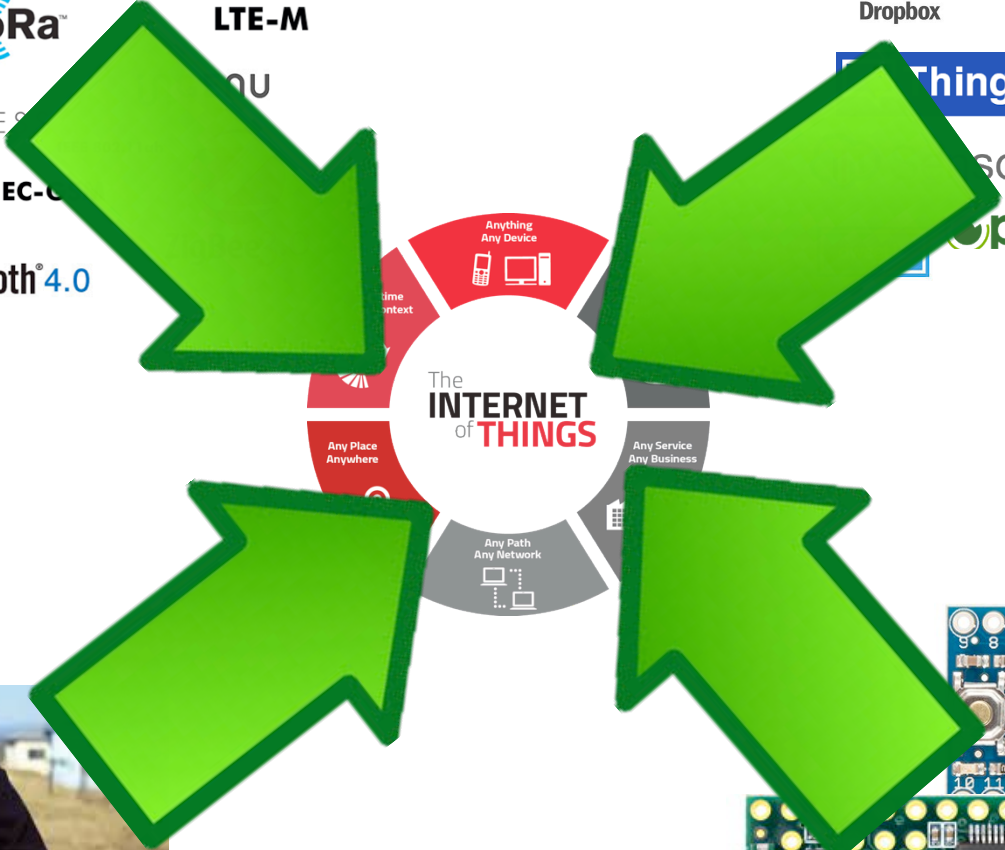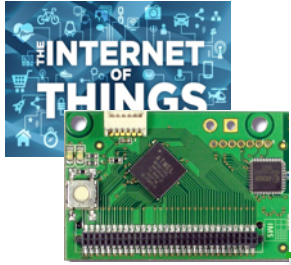
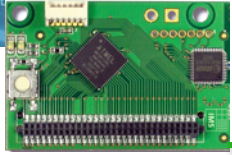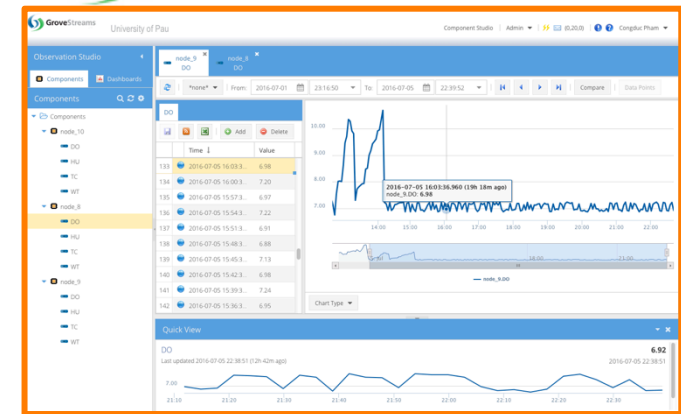# Use case: fish pond monitoring

❑ Farmerline in Ghana
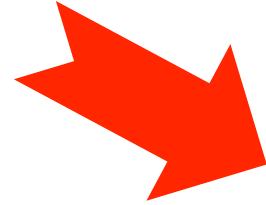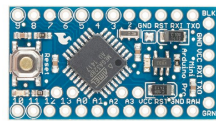❑ Water temperature and dissolved oxygen for monitoring fish ponds

Out-of-the-box !

Physical sensor reading

Physical sensor management
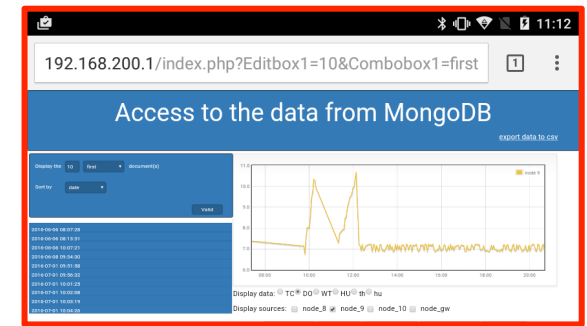
Activity duty-cycle, low power

Security

Long-range transmission

Logical sensor management

GroveStreams

University of Pau

Access to the data from MongoDB

192.168.200.1/index.php?Editbox1=10&Combobox1=first

Wi Fi
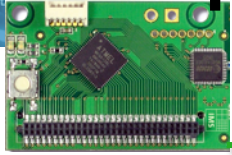
THINGS WE ARE DOING FOR RESEARCH

- ❑ To leverage the « single » connection gateway approach
  - ❑ Smarter radio channel access mechanism
- ❑ Image sensor
  - ❑ Transfer low-resolution images for context-awareness applications
- ❑ To handle larger amount of data (image)
  - ❑ Quality of Service mechanism
  - ❑ Activity sharing mechanism
- ❑ The proposed framework can be used to set-up your own LoRa test-bed for implementing advanced mechanisms

# Added-value
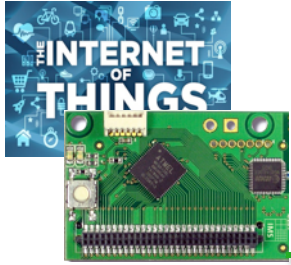
INVOLVING INNOVATION HUBS/STAKEHOLDERS

- **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 personaly & 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)
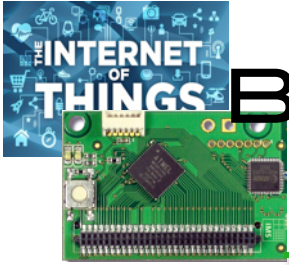

Credit: C. Vavasseur, CTIC Dakar
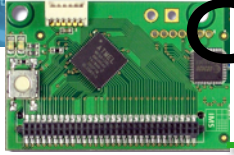
COMMUNITY ENGAGEMENT

	Hackathons	Innovation Lab Weeks	Startup weekends	Webinars	Conferences	Workshop	Participation to international events	Presentation events	Publications
Scientific researchers	☑	☑		☑	☑		☑	☑	☑
Developers	☑	☑	☑	☑	☑	☑	☑	☑	
Entrepreneurs	☑	☑	☑		☑	☑	☑	☑	☑
End-users	☑	☑				☑		☑	
Standardisation and policy makers					☑		☑	☑	☑
Application industries					☑	☑	☑	☑	☑
Investors					☑		☑	☑	☑

Credit: C. Vavasseur, CTIC Dakar

Building WAZIUP community and ecosystem

International Events
+ 20 organized & attended

Launch event (Ghana, iSpace)

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

Launch event (Senegal, CTIC Dakar)

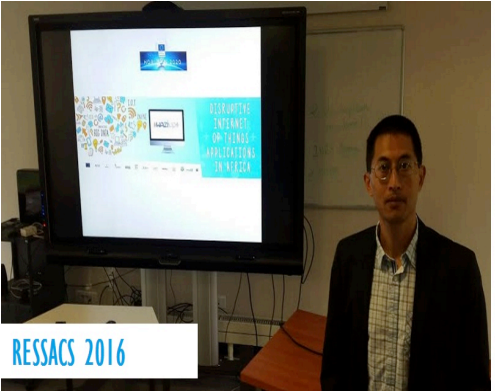**IoTWeek2016 (Belgrade, EGM)**

IoTBigData2016 (Italy, EGM)

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

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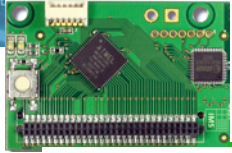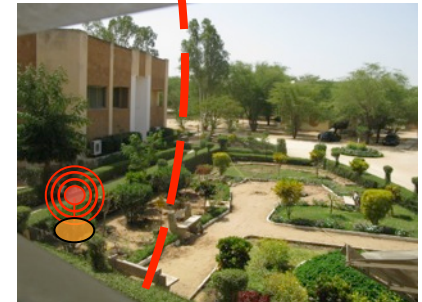
Credit: C. Vavasseur, CTIC Dakar
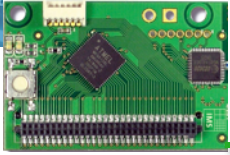
Workshop at the RESSACS 2016 (France, UPPA)

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Open Long-range test-bed & benchmark

Tutorials/resources

Tutorial on hardware & software for low-cost long-range IoT

((•)) WAZIup ((•))

LIUPPA T2i team

Prof. Congduc Pham
HTTP://WWW.UNIV-PAU.FR/~CPHAM
Université de Pau, France

Low-cost LoRa IoT device: a step-by-step tutorial

((•)) WAZIup ((•))

LIUPPA T2i team

Prof. Congduc Pham
HTTP://WWW.UNIV-PAU.FR/~CPHAM
Université de Pau, France

Building an IoT device for outdoor usage: a step-by-step tutorial

((•)) WAZIup ((•))

LIUPPA T2i team

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Université de Pau, France

Low-cost LoRa IoT device: supported physical sensors

((•)) WAZIup ((•))

LIUPPA T2i team

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HTTP://WWW.UNIV-PAU.FR/~CPHAM
Université de Pau, France

Low-cost LoRa gateway: a step-by-step tutorial

((•)) WAZIup ((•))

LIUPPA T2i team
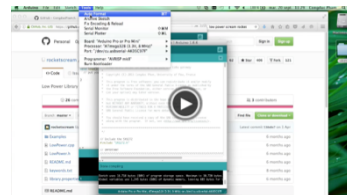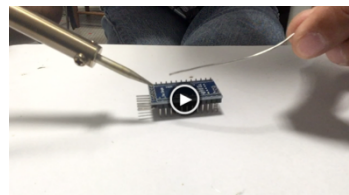
Prof. Congduc Pham
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Université de Pau, France

Low-cost LoRa IoT: using the WAZIUP demo kit

((•)) WAZIup ((•))

LIUPPA T2i team

Prof. Congduc Pham
HTTP://WWW.UNIV-PAU.FR/~CPHAM
Université de Pau, France

Thanks.
Let's keep in touch

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HORIZON 2020

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github.com/waziup