

LOW-COST LoRA IoT: USING THE WAZIUP DEMO KIT



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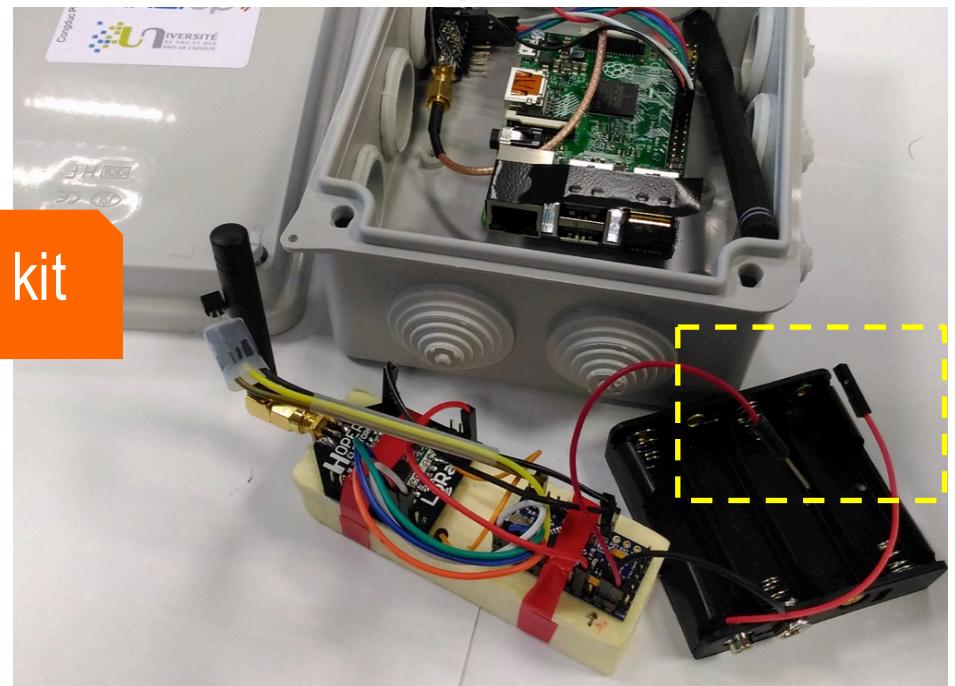
CONTENTS

- ❑ We will show how to use the low-cost IoT WAZIUP demo kit for demonstration purpose
- ❑ The demo kit consists of
 - ❑ A pre-configured LoRa gateway
 - ❑ The gateway will send data to the WAZIUP ThingSpeak demo channel
 - ❑ A pre-configured end-device
 - ❑ Equipped with a temperature sensor
 - ❑ When powered on, sends every 10 minutes a measure to the gateway
 - ❑ Has built-in low-power management: can run about 1 year with 4 AA batteries

FIRST TIME DEMO?

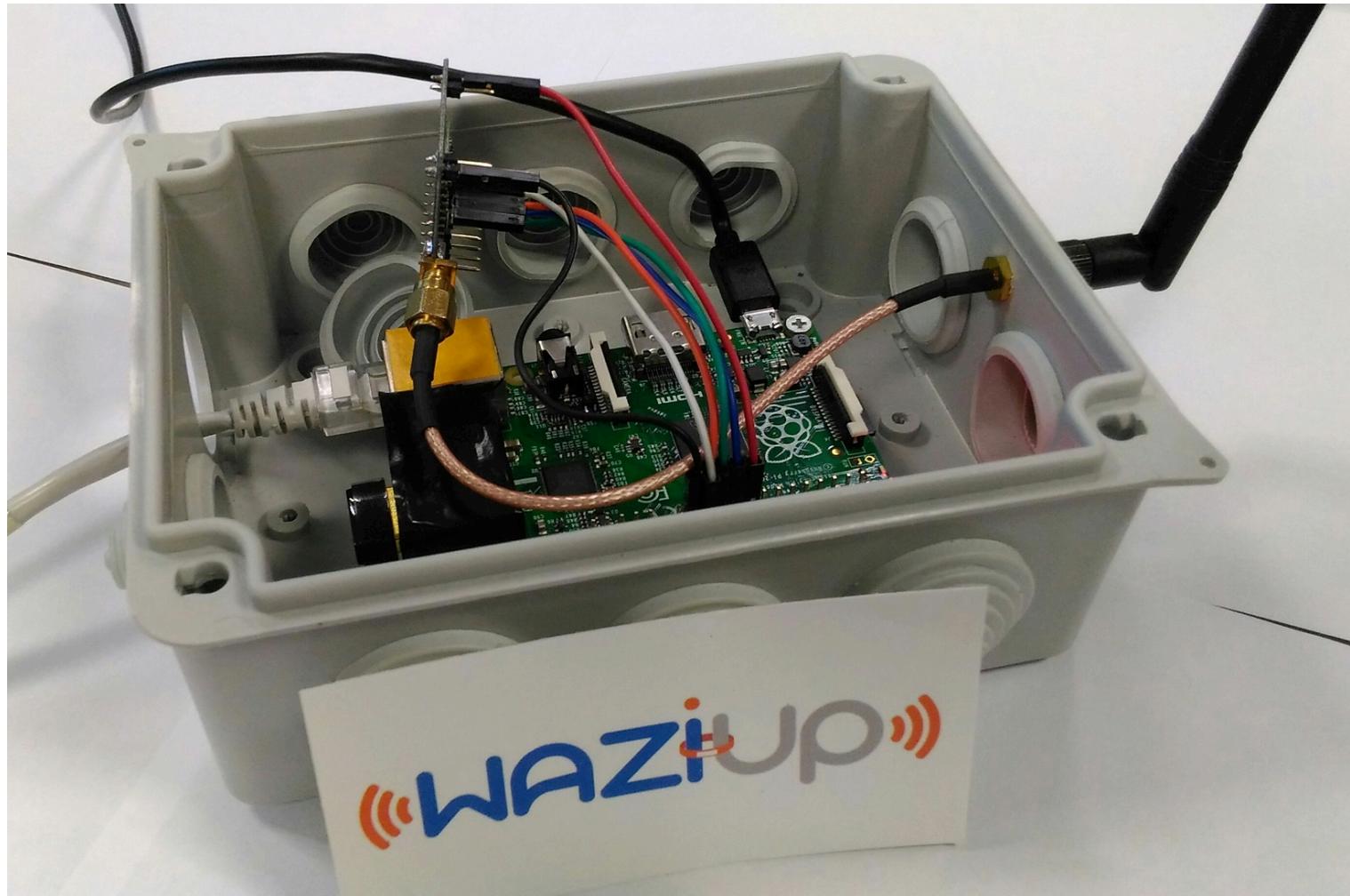


Unpack the demo kit



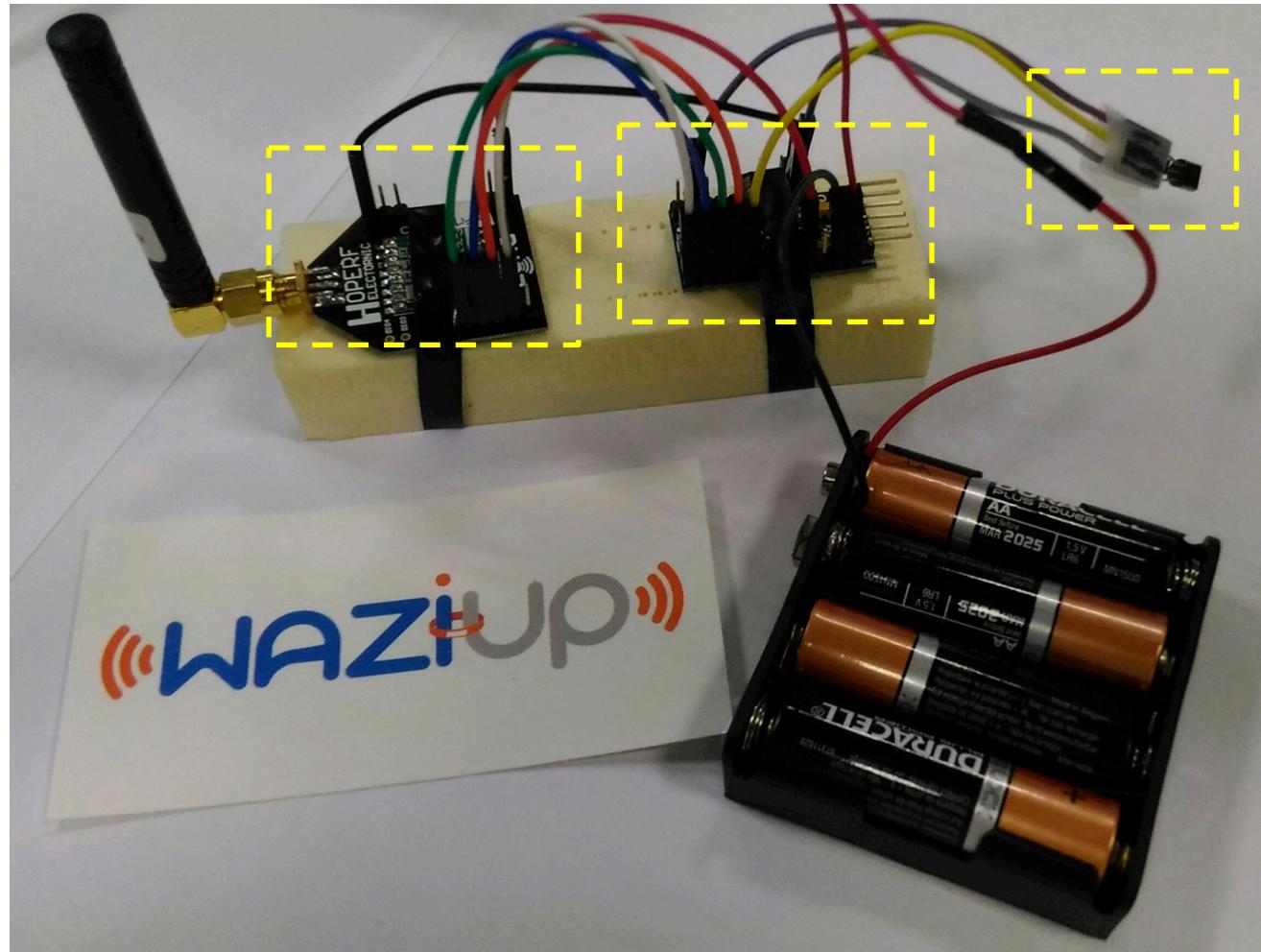
Be carefull, the wire are fragile. The floating red wire are normal, don't connect them now!

THE LORA GATEWAY



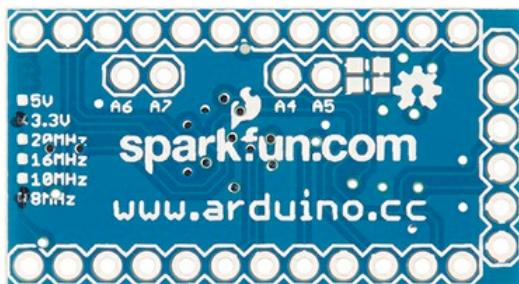
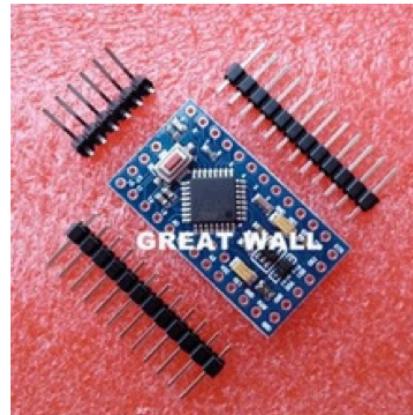
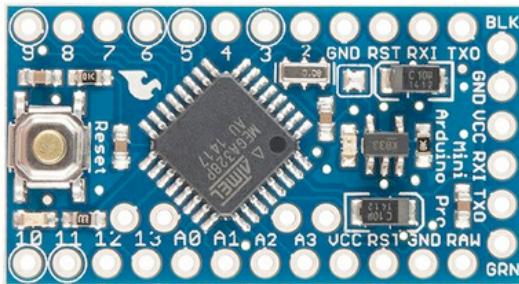
Raspberry PI with LoRa radio module and WiFi

THE IOT DEMO END-DEVICE



Arduino Pro Mini with LoRa radio module & temperature sensor

THE IOT END-DEVICE HARDWARE PLATFORM

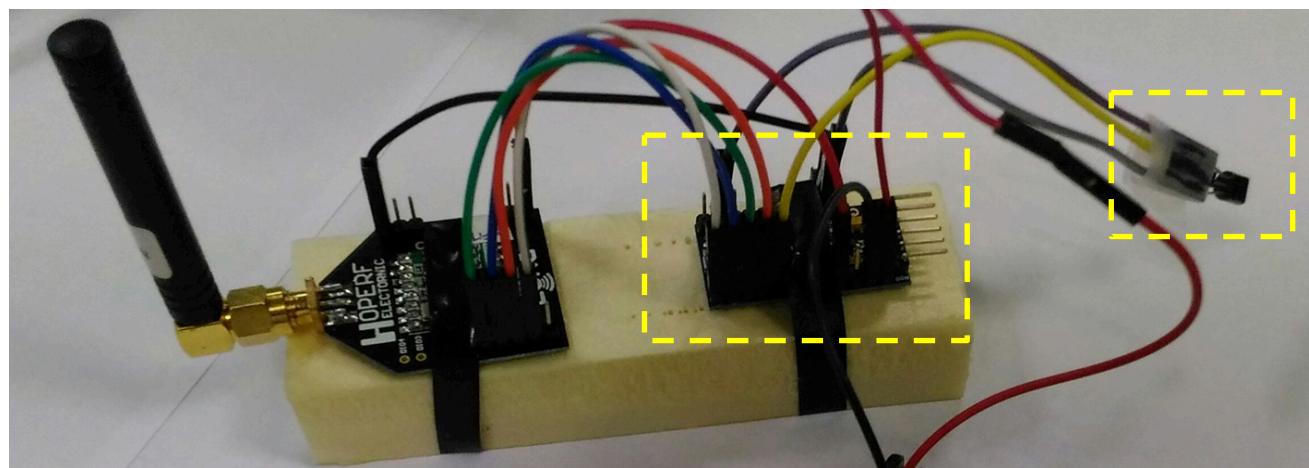


With the bootloader 1pcs pro mini atmega328
Pro Mini 328 Mini ATMEGA328 3.3V/8MHz for
Arduino

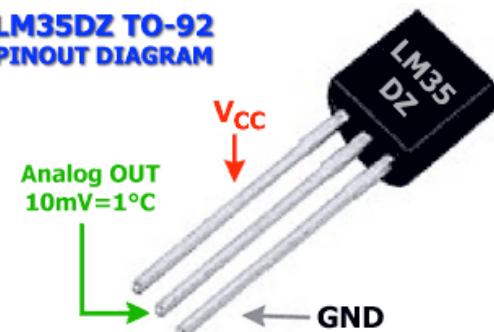
 GREAT WALL Electronics Co., Ltd.

 Chat now!

Arduino Pro Mini in the 3.3v and 8MHz version: ~2€



LM35DZ TO-92
PINOUT DIAGRAM



www.Vcc2GND.com

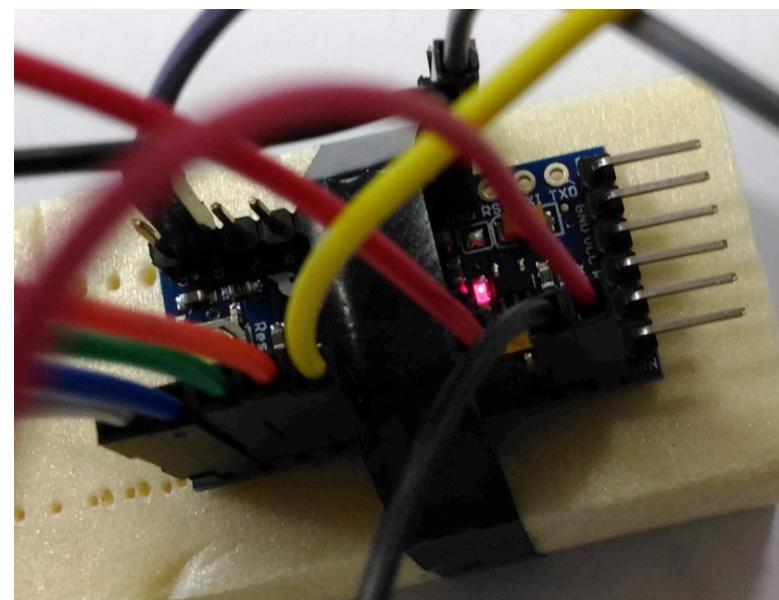
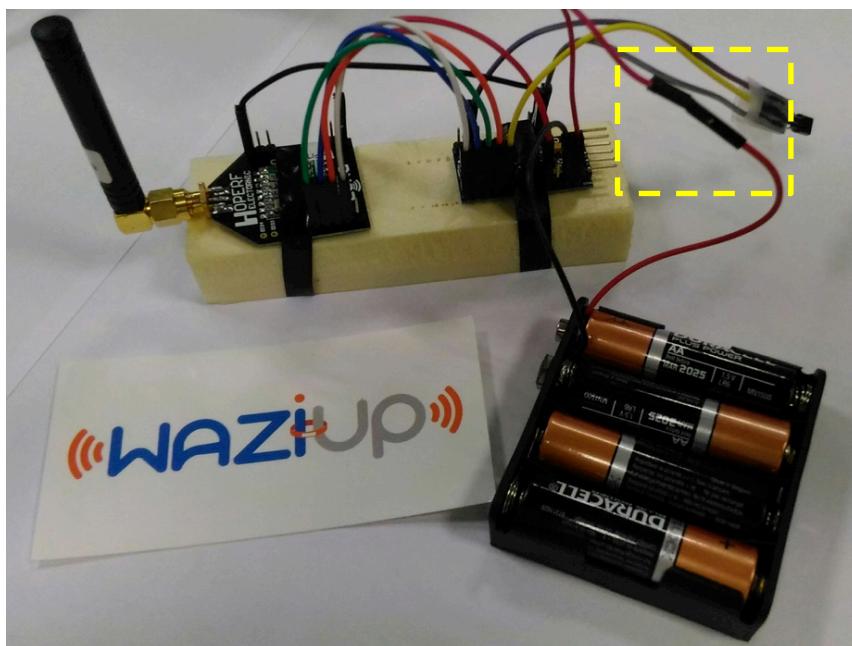
CONNECTING & POWERING THE GATEWAY

- Connect the antenna of the gateway!
- Connect the gateway with an Ethernet cable to your LAN that provides DHCP
- Alternatively
 - Configure a laptop to share a WiFi Internet connection on its Ethernet port
 - Connect the gateway to your laptop with an Ethernet cable
- Power the gateway with a USB cable connected to a 5V adaptor or a USB entry (e.g. laptop)
- Wait about 1 minute for the gateway to boot
- The gateway should get an IP address from your LAN/laptop DHCP server
- Normally the gateway has now Internet access
- Try to ping the gateway



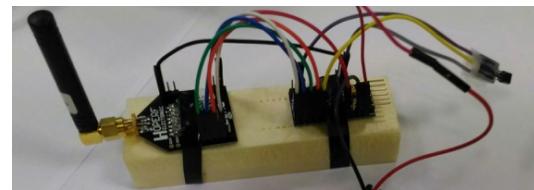
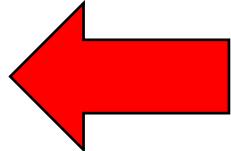
SWITCH ON THE END-DEVICE

- ❑ Put 4 AA batteries in battery pack if needed
- ❑ Connect the 2 floating VCC wire (red), don't touch the end side connected to the board
- ❑ Check that power led of the board is on



END-DEVICE BEHAVIOR

- Once switched on the end-device will
 1. Initialize the radio
 2. Take a measure (temperature)
 3. Send the measure to gateway
 4. Go to sleep for 10 minutes and repeat from step 2

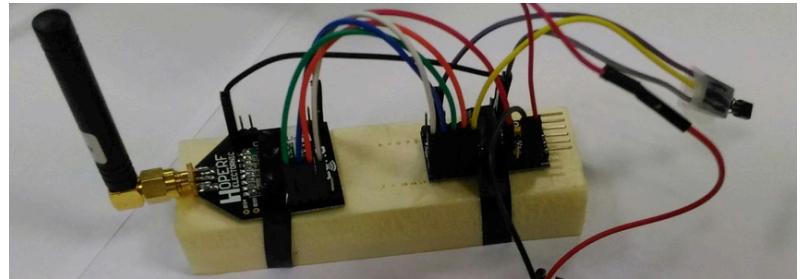
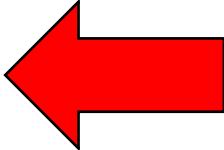


- After demonstration, just disconnect the VCC wires (red)
- No need to remove the batteries

DEFAULT CONFIGURATION



\!#4#TC/24.81



24.81 is an example, real temperature will be read by temperature sensor

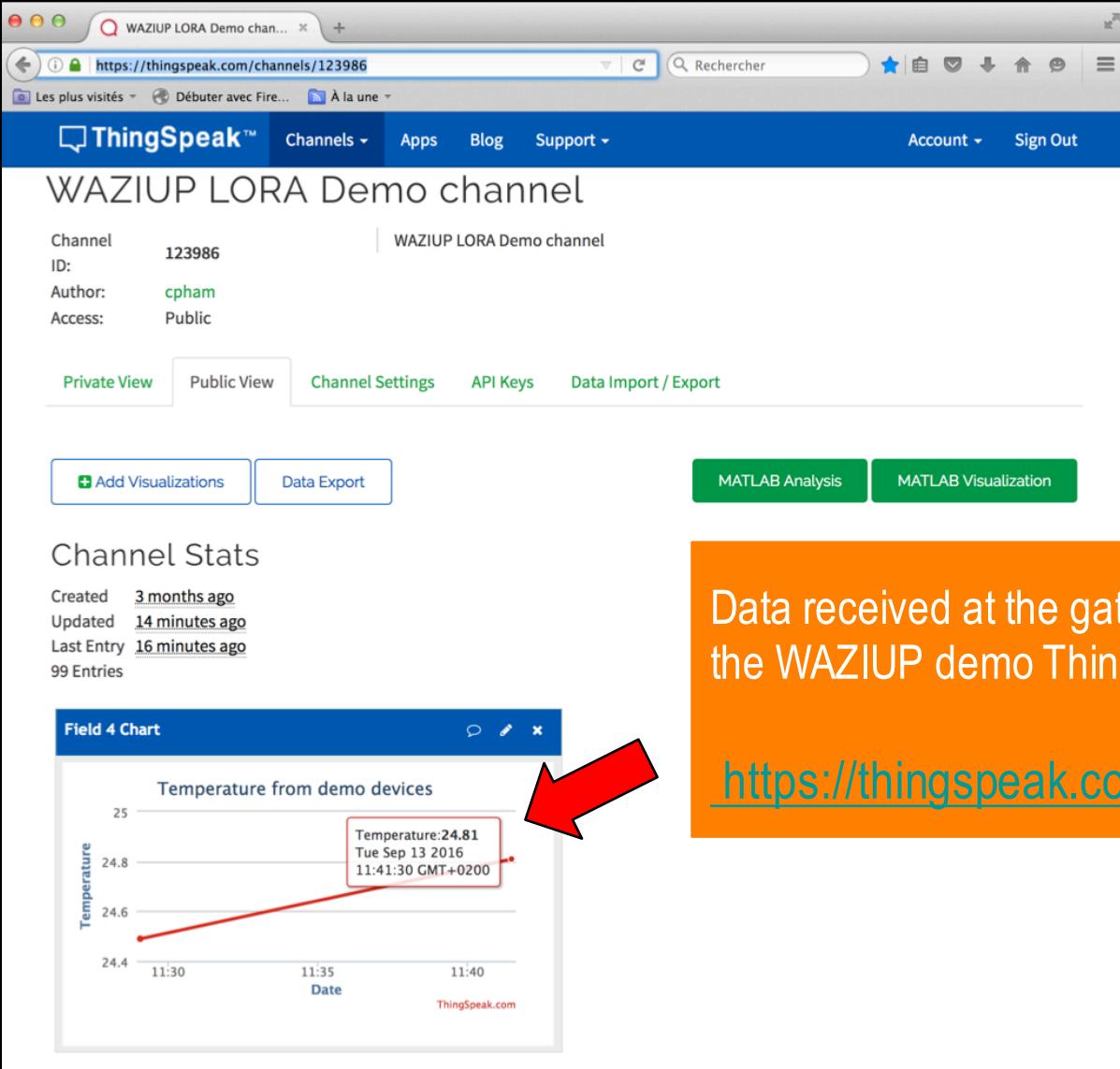
The default configuration in the Arduino_LoRa_Simple_temp example is:

Send packets to the gateway (one or many if in range)

Use LoRa mode 1

Node short address is 8

GATEWAY TO CLOUD



The screenshot shows a ThingSpeak channel page for 'WAZIUP LORA Demo channel' (ID: 123986). The channel has been created 3 months ago, updated 14 minutes ago, and the last entry was made 16 minutes ago. There are 99 entries. A red arrow points to a data point on a line graph titled 'Field 4 Chart' showing 'Temperature from demo devices'. The graph displays a single data series with a red line and markers, showing a temperature of 24.81 at 11:41:30 GMT+0200 on Tuesday, September 13, 2016.

Data received at the gateway will be pushed to the WAZIUP demo ThingSpeak channel

<https://thingspeak.com/channels/123986>

SSH TO THE GATEWAY

- ❑ If you connected the gateway to your LAN or laptop then the gateway got an IP address. Use this address to connect with SSH to the gateway
- ❑ Use ssh pi@RPI_ADDR, where RPI_ADDR is the IP address assigned to the gateway
- ❑ Login password is loragateway

SSH TO THE GATEWAY WITH WiFi

- ❑ The gateway is also configured as a WiFi access point with address 192.168.200.1
- ❑ Select the WAZIUP_PI_GW_xxxxxxxxxx WiFi
- ❑ WiFi password is loragateway
- ❑ Then ssh pi@192.168.200.1
- ❑ Login password is loragateway



```
cpham — pi@raspberrypi: ~/lora_gateway —
MacBookProRetina-de-Congduc-Pham:~ cpham$ ssh pi@192.168.200.1
pi@192.168.200.1's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Aug  4 17:19:00 2016 from 192.168.200.102
pi@raspberrypi:~ $ cd lora_gateway/
pi@raspberrypi:~/lora_gateway $ ll
total 864
-rw----- 1 pi    pi    44155 Aug  3 16:55 arduPi.cpp
-rw----- 1 pi    pi    16715 Aug  3 16:55 arduPi.h
-rw-r--r-- 1 pi    pi    35164 Aug  3 17:01 arduPi.o
-rw----- 1 pi    pi    43310 Aug  3 16:55 arduPi_pi2.cpp
-rw----- 1 pi    pi    14043 Aug  3 16:55 arduPi_pi2.h
-rw----- 1 pi    pi    77976 Aug  3 16:55 bcm2835.h
```

VIEW LOG FILE

```
> tail --line=30 -f /home/pi/Dropbox/LoRa-test/post-processing_00000027EB27F90F.log

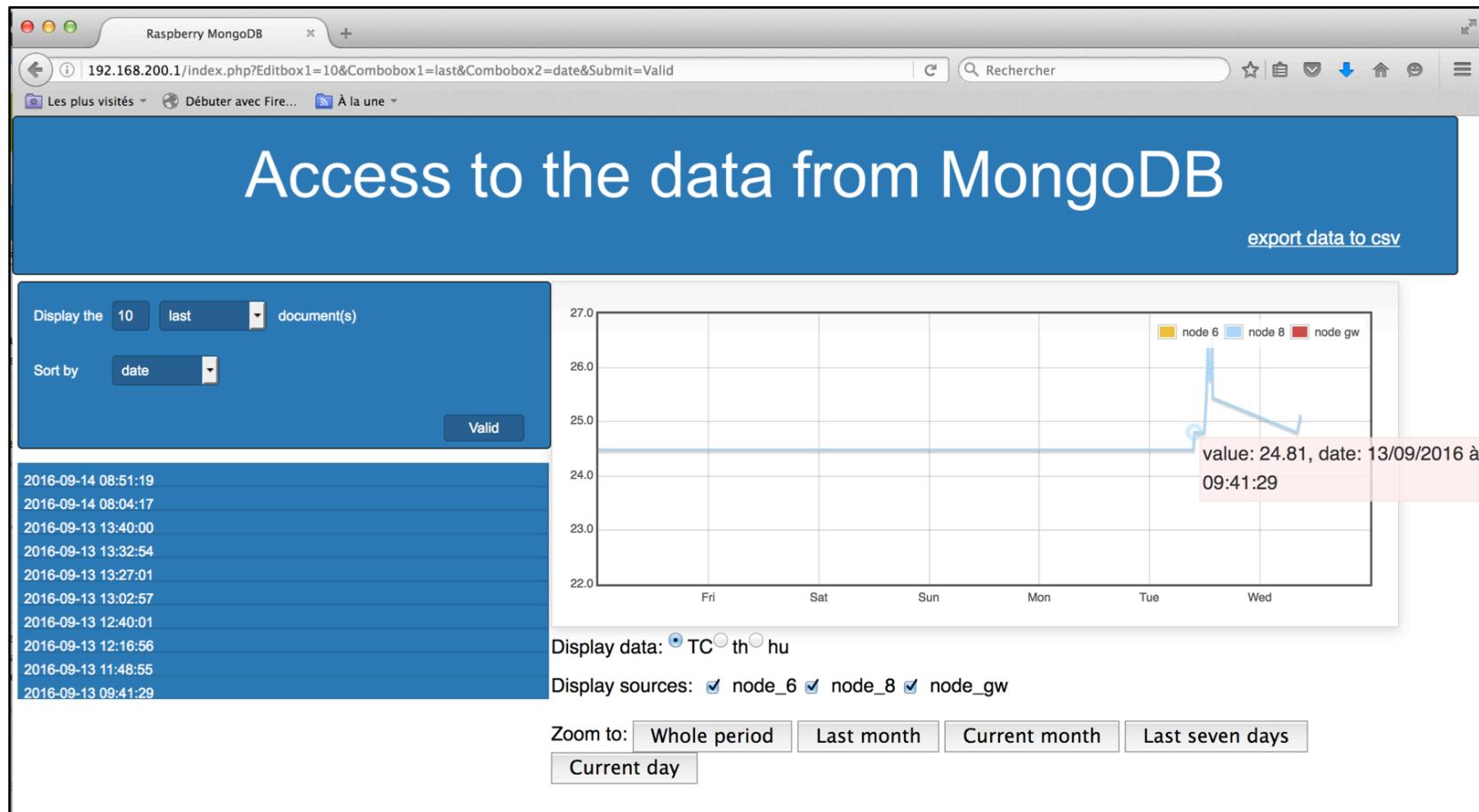
--- rxlora. dst=1 type=0x12 src=8 seq=154 len=17 SNR=5 RSSIpkt=-50 BW=125 CR=4/5 SF=12
2016-09-13T09:41:29.355078
rcv ctrl pkt info (^p): 1,18,8,154,17,5,-50
 splitted in: [1, 18, 8, 154, 17, 5, -50]
(dst=1 type=0x12(DATA WAPPKEY) src=8 seq=154 len=17 SNR=5 RSSI=-50)
rcv ctrl radio info (^r): 125,5,12
 splitted in: [125, 5, 12]
(BW=125 CR=5 SF=12)
rcv timestamp (^t): 2016-09-13T11:41:29.299

got first framing byte
--> got data prefix
--> DATA with_appkey: read app key sequence
app key is 0x05 0x06 0x07 0x08
in app key list
valid app key: accept data
MongoDB: deleting data older than 2 month(s)...
MongoDB: 0 documents deleted
MongoDB: saving the document in the collection...
MongoDB: saving done
ThingSpeak: uploading
rcv msg to log (\!) on ThingSpeak ( default , 4 ): 24.81
ThingSpeak: will issue curl cmd
curl -s -k -X POST --data field4=24.81&field8=154
https://api.thingspeak.com/update?key=ORE0DIFZIIPT61DO
ThingSpeak: returned code from server is 100
```

CONNECT TO THE EMBEDDED WEB SERVER

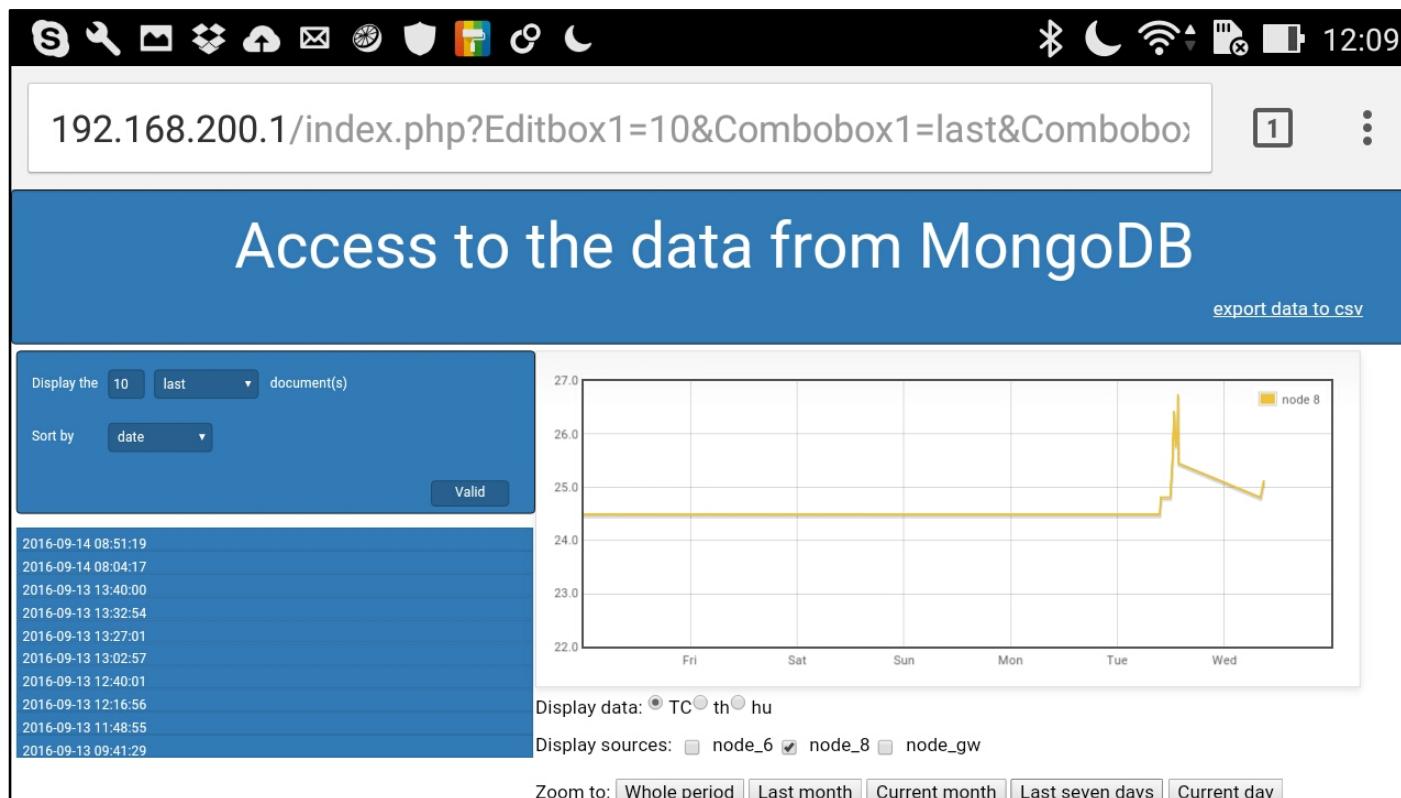
- On the WiFi interface
 - Gateway address is 192.168.200.1
- On the Ethernet interface
 - Gateway address is the IP address assigned by the DHCP server (of your LAN or laptop)
- Choose any of these solutions and open a web browser to enter the gateway IP address in the URL bar
 - <http://192.168.200.1>

DATA FROM THE LOCAL WEB SERVER



VISUALIZE IT ON YOUR SMARTPHONE!

- Don't forget to join the WAZIUP_PI_GW_xxxxxxxxxx WiFi



OUR PARTNERS



CTIC, Dakar,
Senegal



iSpace, Accra
Ghana



Woelab, Lomé,
Togo