

THE WAZIUP LoRA IOT KIT



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



CONTENTS

- We will show how to install/configure/use the WAZIUP LoRa IoT kit. The kit consists of
 - A pre-configured LoRa gateway
 - The gateway will send data to the WAZIUP platform
 - The gateway will also send data to a 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

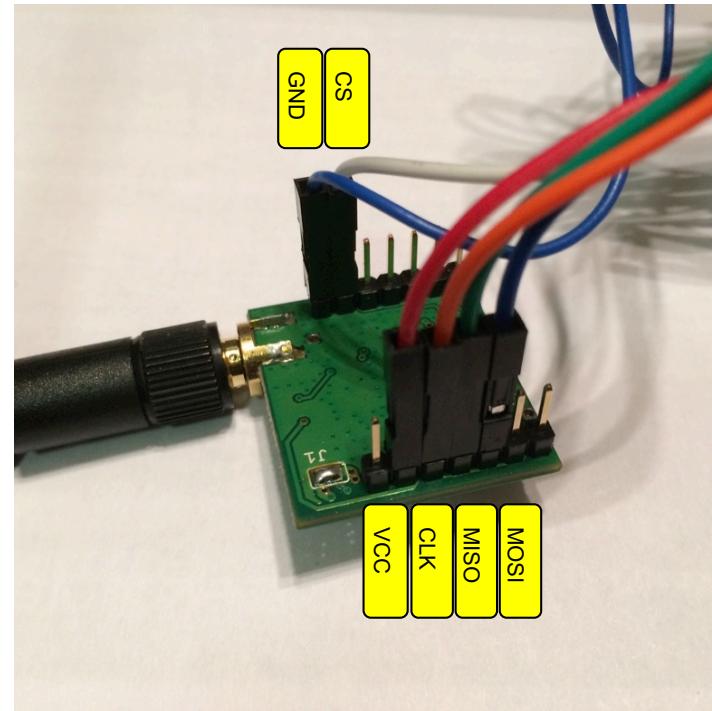
THE GATEWAY PARTS



Raspberry PI 3



The case

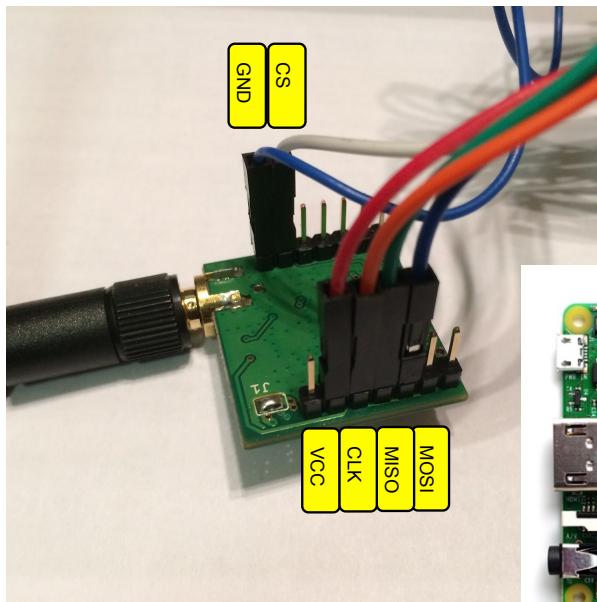


The LoRa radio module



The SD card

CONNECTING THE RADIO MODULE

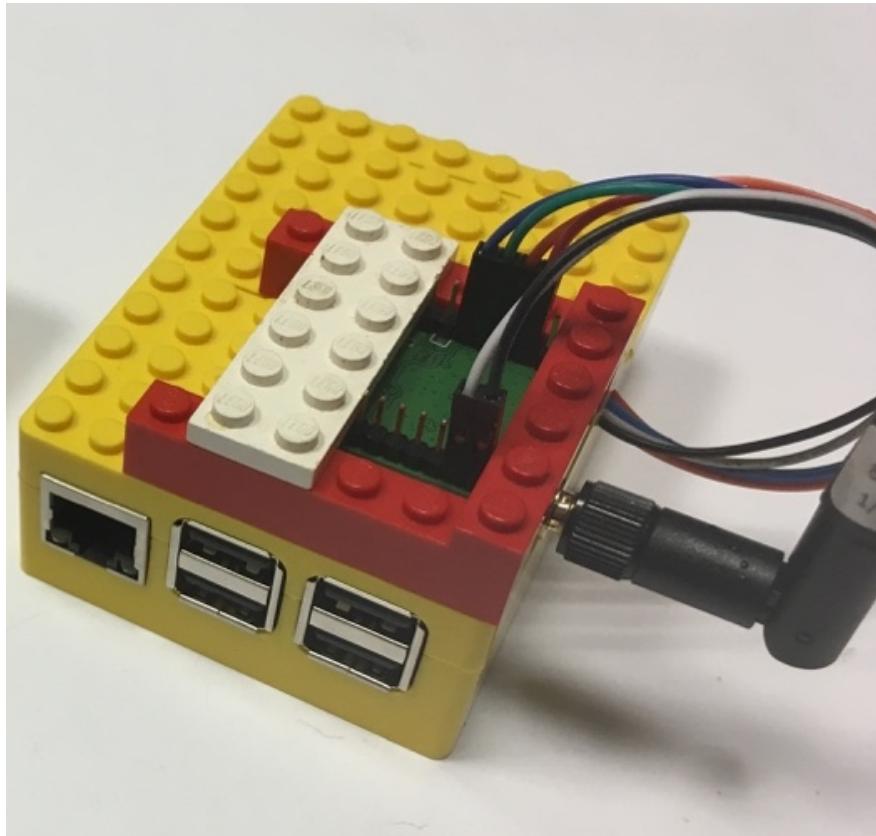


Raspberry Pi2 GPIO Header			
Pin#	NAME	NAME	Pin#
01	3.3v DC Power	DC Power 5v	02
03	GPIO02 (SDA1 , I ² C)	DC Power 5v	04
05	GPIO03 (SCL1 , I ² C)	Ground	06
07	GPIO04 (GPIO_GCLK)	(TXD0) GPIO14	08
09	Ground	(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)	(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)	Ground	14
15	GPIO22 (GPIO_GEN3)	(GPIO_GEN4) GPIO23	16
VCC	3.3v DC Power	(GPIO_GEN5) GPIO24	18
MOSI	GPIO10 (SPI_MOSI)	Ground	20
MISO	GPIO09 (SPI_MISO)	(GPIO_GEN6) GPIO25	22
CLK	GPIO11 (SPI_CLK)	(SPI_CE0_N) GPIO08	CS
GND	Ground	(SPI_CE1_N) GPIO07	26
27	ID_SD (I ² C ID EEPROM)	(I ² C ID EEPROM) ID_SC	28
29	GPIO05	Ground	30
31	GPIO06	GPIO12	32
33	GPIO13	Ground	34
35	GPIO19	GPIO16	36
37	GPIO26	GPIO20	38
39	Ground	GPIO21	40

Rev. 1
26/01/2014

<http://www.element14.com>

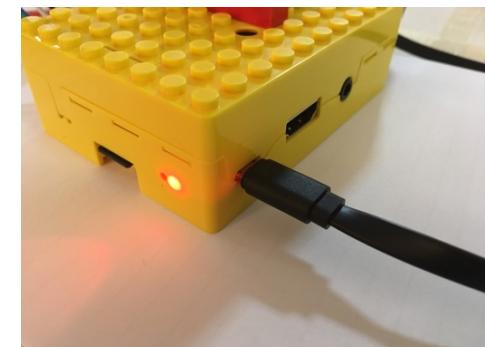
WHAT YOU SHOULD GET



Place the RPI3 in the case and insert the SD card

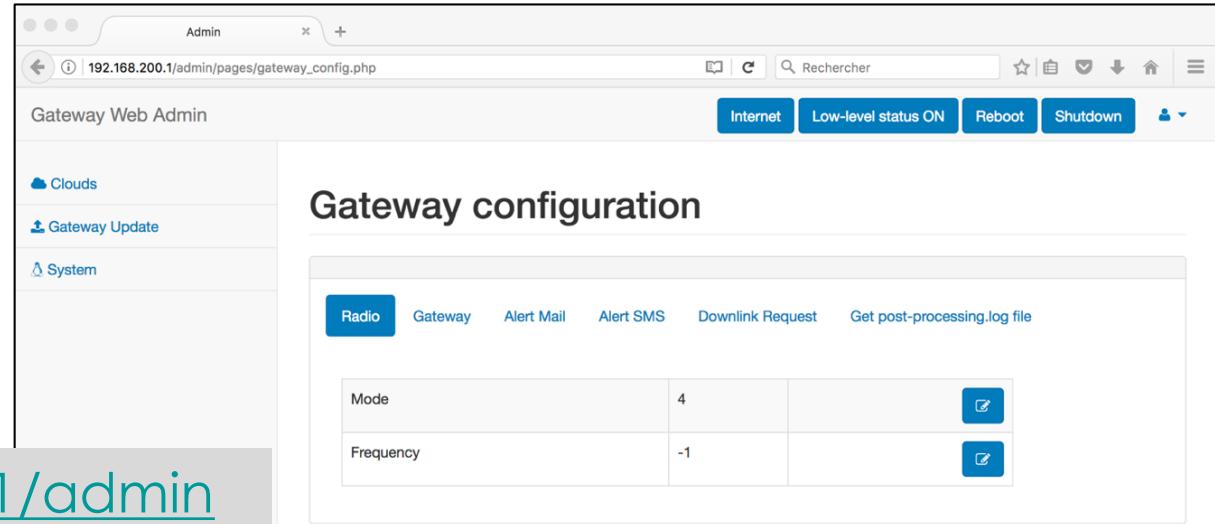
CONNECTING & POWERING THE GATEWAY

- 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
- Use dedicated tool to discover the gateway IP address
 - Angry IP scanner (MacOSX)



CONNECT TO THE GATEWAY THROUGH 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

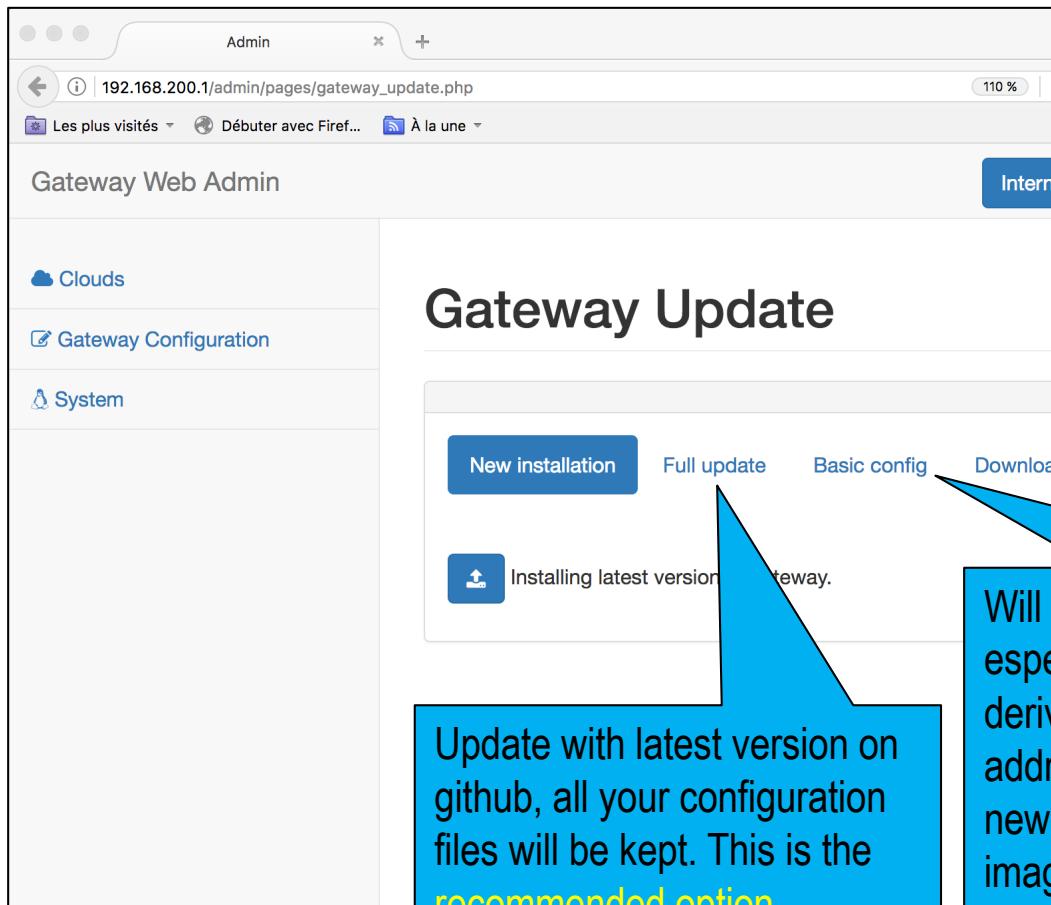


Mode	4	<input checked="" type="checkbox"/>
Frequency	-1	<input checked="" type="checkbox"/>

- <http://192.168.200.1/admin>
 - Login: admin
 - Password: loragateway

UPDATING THE GATEWAY

☐ Gateway update section

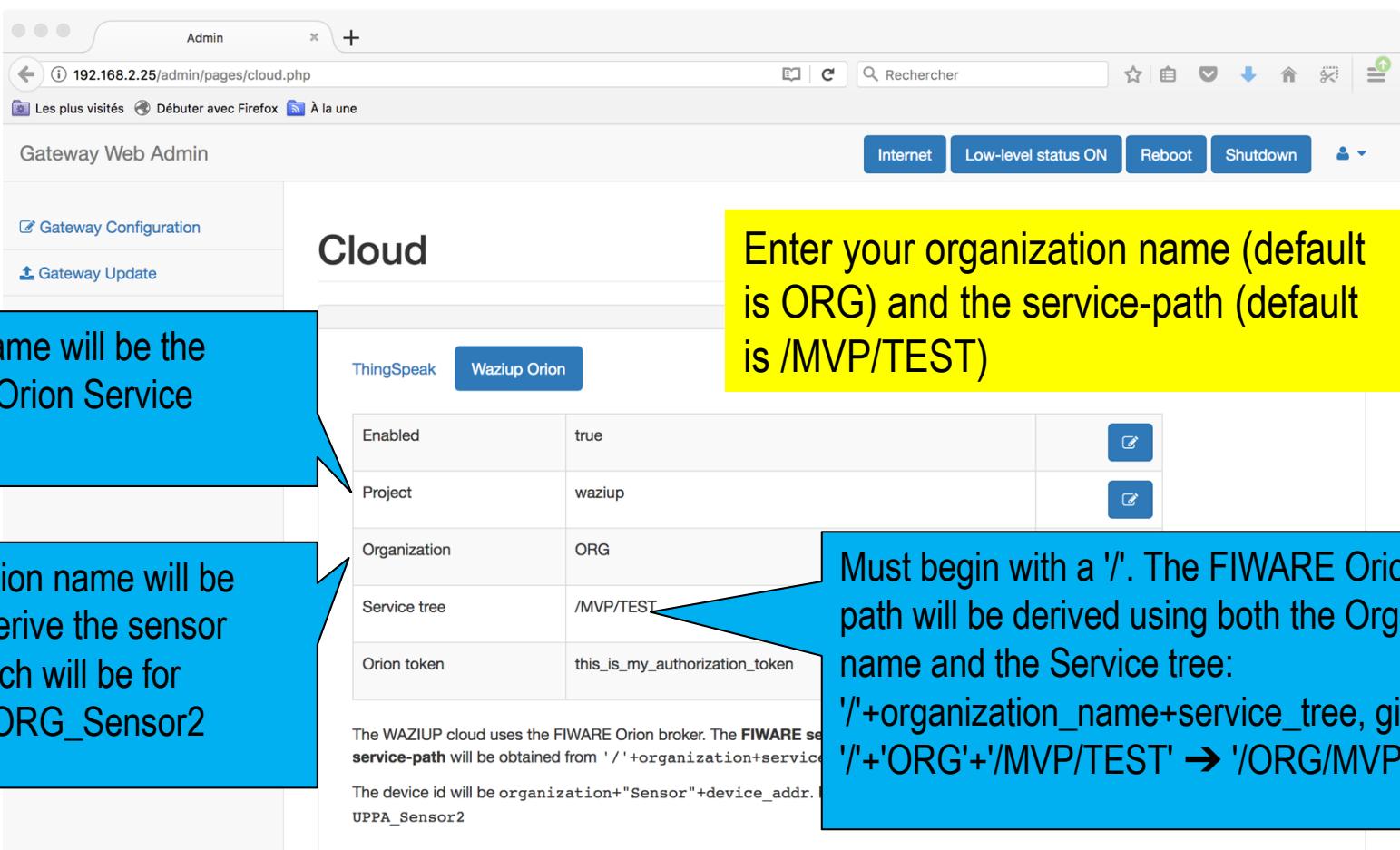


Update the web admin interface. Use this feature after an update of the distribution to install the last version of the web admin interface. It is recommended to run "Update web admin" after a "Full update". Then reload the page.

Will compile and configure the gateway, especially for the **gateway id** & the **WiFi SSID** derived from the last 5 bytes of the eth MAC address. This is also required if you install a new gateway using the provided SD card image. It is recommended to run "Basic config" right after "Full update".

CONFIGURE WAZIUP CLOUD

□ Configuring WAZIUP Orion cloud



The screenshot shows the 'Cloud' configuration page. It has two tabs: 'ThingSpeak' (disabled) and 'Waziup Orion' (selected). The 'Waziup Orion' tab contains the following configuration:

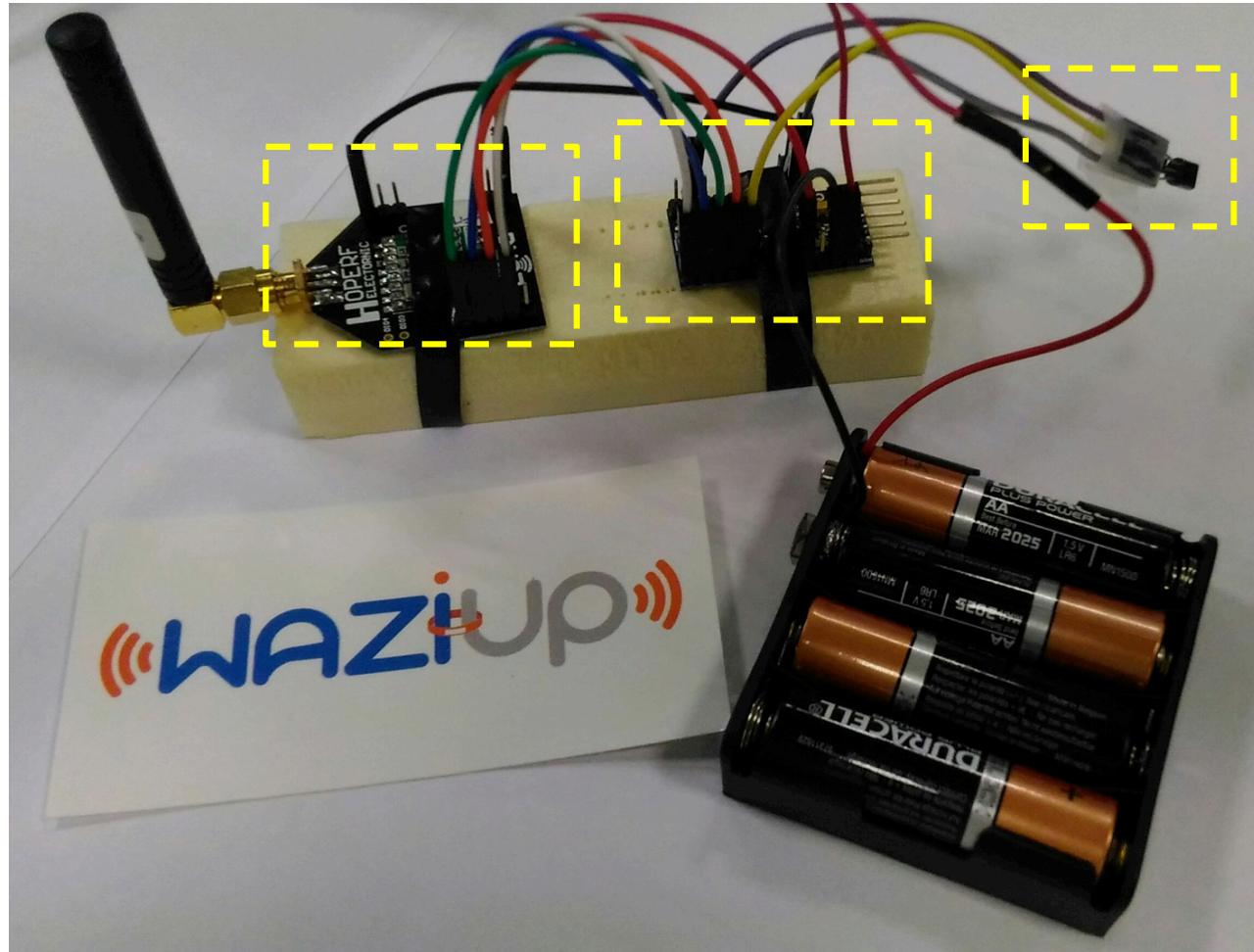
Enabled	true	<input type="button" value="edit"/>
Project	waziup	<input type="button" value="edit"/>
Organization	ORG	
Service tree	/MVP/TEST	
Orion token	this_is_my_authorization_token	

Annotations:

- A blue callout box points to the 'Project' field: "Project name will be the FIWARE Orion Service"
- A blue callout box points to the 'Organization' field: "Organization name will be used to derive the sensor name which will be for instance ORG_Sensor2"
- A yellow callout box points to the 'Service tree' field: "Enter your organization name (default is ORG) and the service-path (default is /MVP/TEST)"
- A blue callout box points to the 'Service tree' field: "Must begin with a '/'. The FIWARE Service-path will be derived using both the Organization name and the Service tree:
'/' + organization_name + service_tree, giving
'/' + 'ORG' + '/MVP/TEST' → '/ORG/MVP/TEST'"

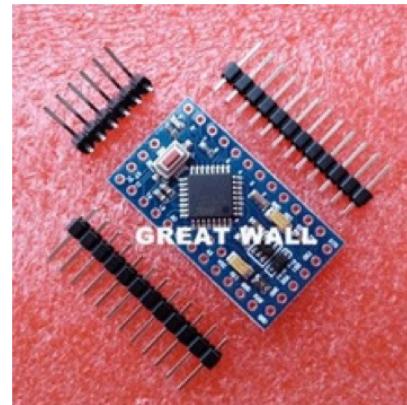
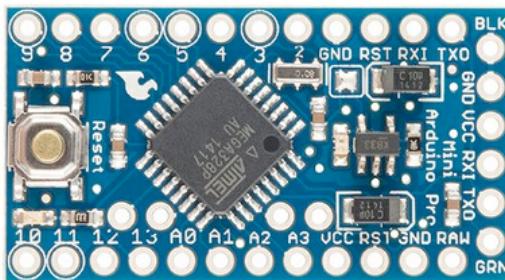
The WAZIUP cloud uses the FIWARE Orion broker. The FIWARE service-path will be obtained from '/' + organization + service-tree. The device id will be organization + "Sensor" + device_addr. For example: UPPA_Sensor2

THE IoT DEMO END-DEVICE



Arduino Pro Mini with LoRa radio module & temperature sensor

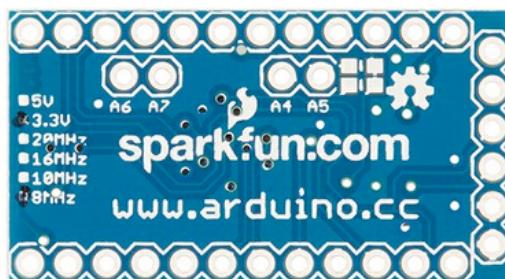
THE IOT END-DEVICE HARDWARE PLATFORM



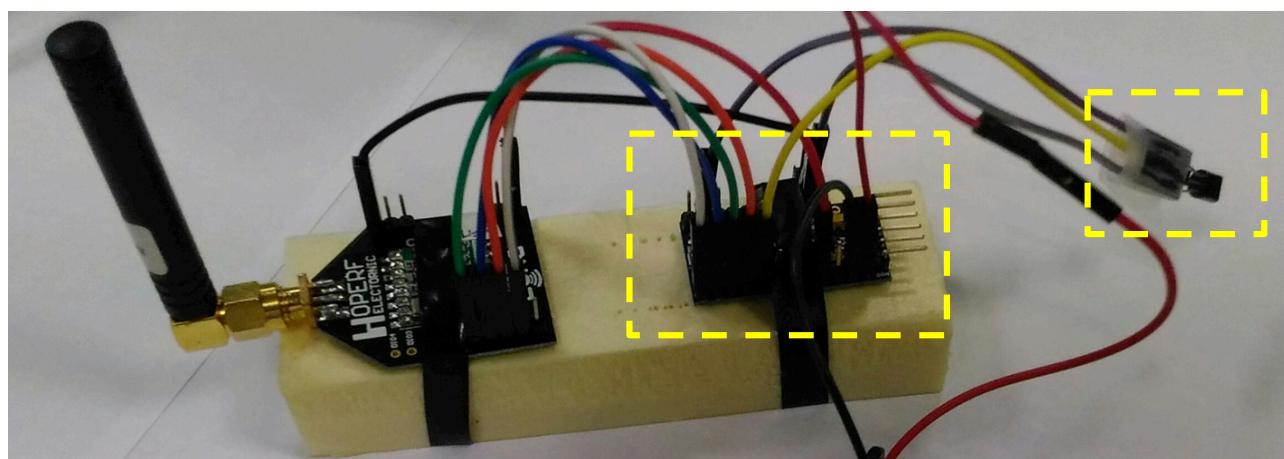
With the bootloader 1pcs pro mini atmega328
Pro Mini 328 Mini ATMEGA328 3.3V/8MHz for
Arduino

GREAT WALL Electronics Co., Ltd.

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



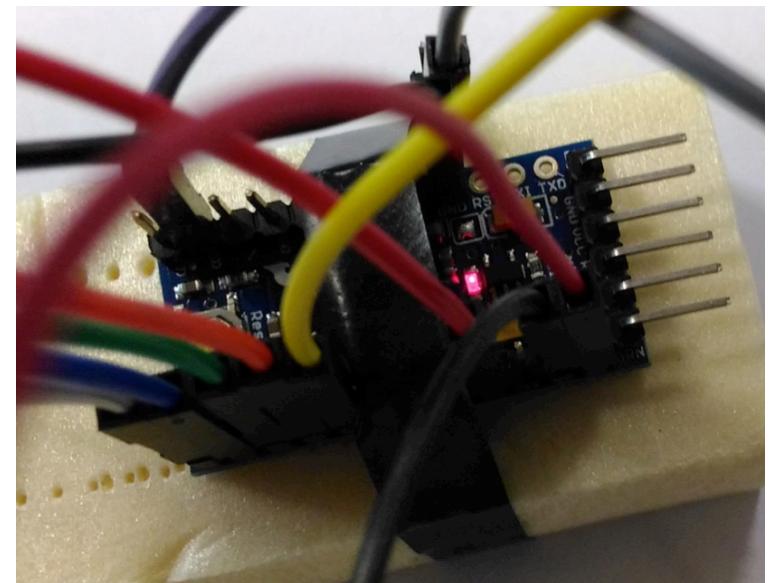
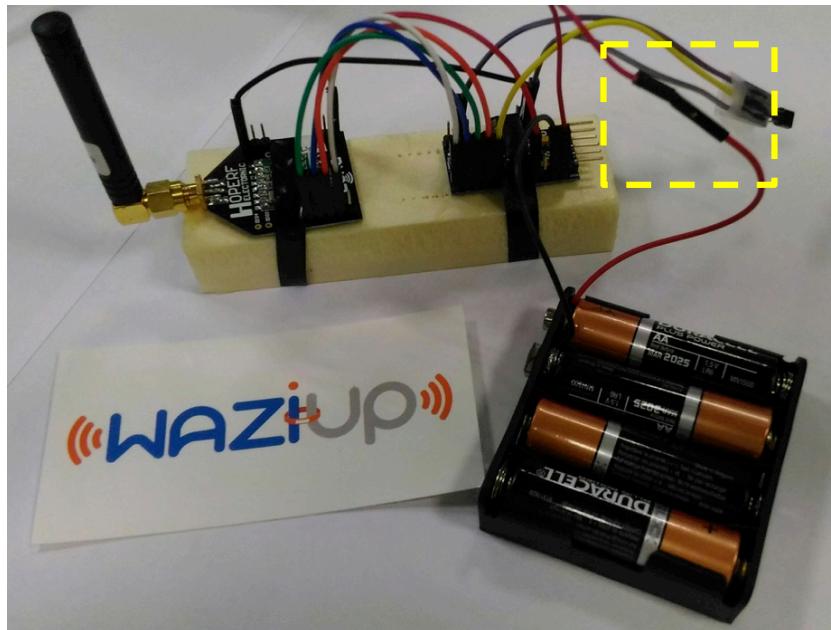
LM35DZ TO-92
PINOUT DIAGRAM



www.Vcc2GND.com

SWITCH ON THE END-DEVICE

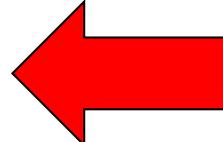
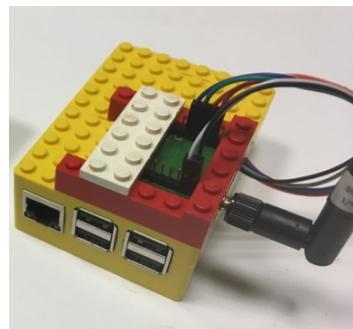
- Put 4 AA batteries in battery pack if needed
- Connect the 2 floating VCC wire (red), don't touch the end side connected to the board
- Check that power led of the board is on



END-DEVICE BEHAVIOR

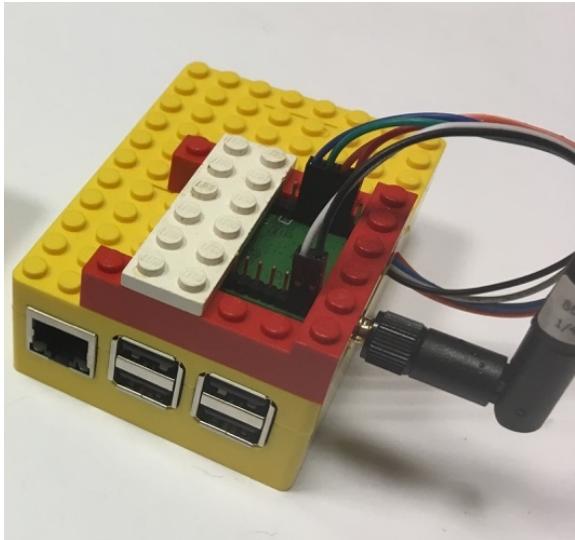
- Once switched on the end-device will
 1. Initialize the radio
 2. Take a measure (temperature)
 3. Send the measure to gateway
 4. Go to sleep for 10 minutes and repeat from step 2

Takes about 4s

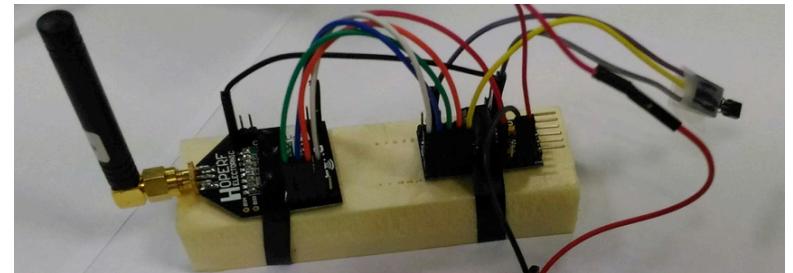
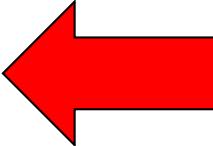


- After demonstration, just disconnect the VCC wires (red)
- No need to remove the batteries

DEFAULT CONFIGURATION



\!#4#TC/24.81

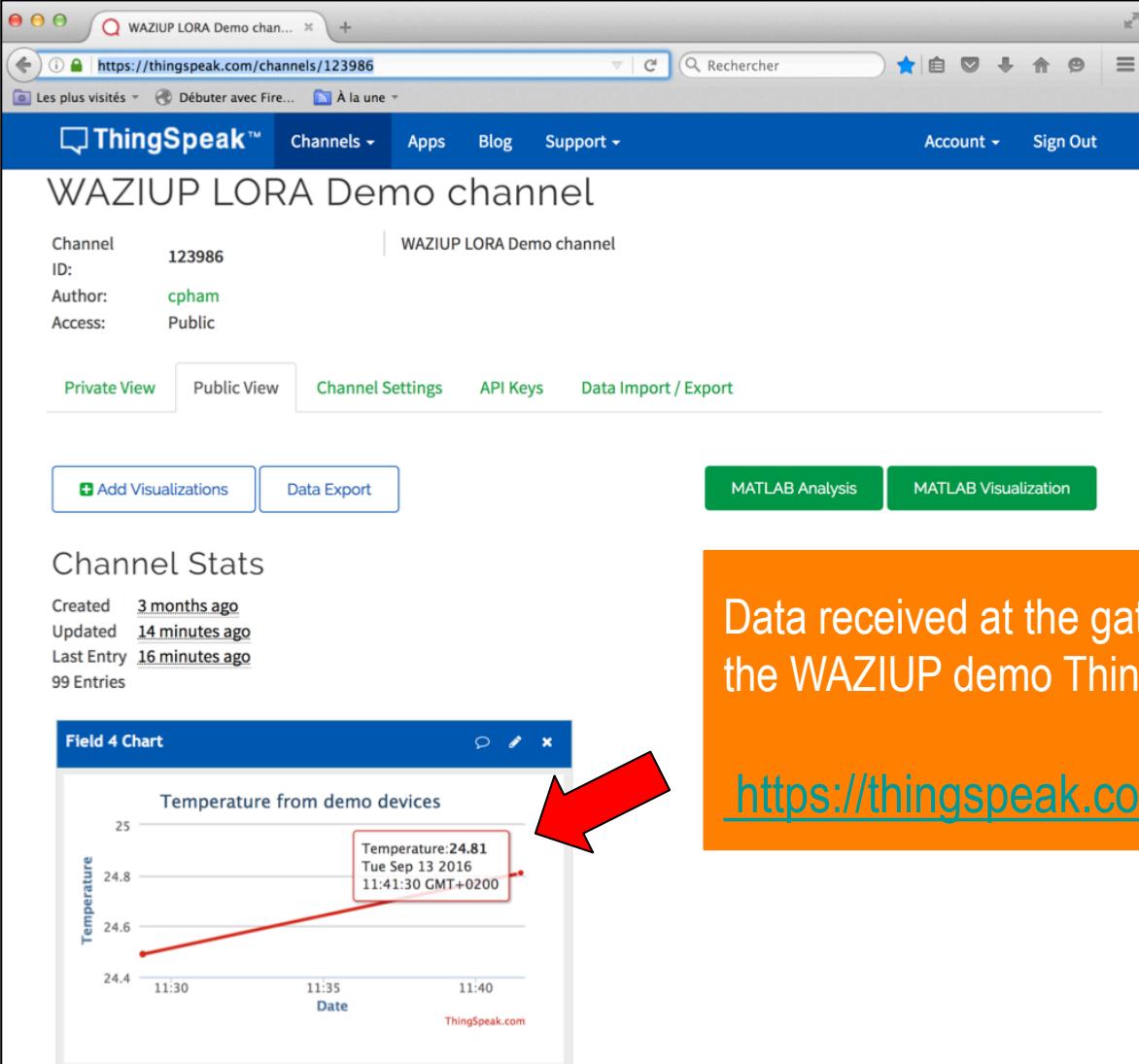


24.81 is an example, real temperature will be read by temperature sensor

The default configuration in the Arduino_LoRa_Simple_temp example is:

Send packets to the gateway
Use LoRa mode 1
Node short address is 8

GATEWAY TO CLOUD



The screenshot shows the ThingSpeak channel page for the "WAZIUP LORA Demo channel" (ID: 123986). The page includes details about the channel, navigation tabs (Private View, Public View, Channel Settings, API Keys, Data Import / Export), and buttons for Add Visualizations, Data Export, MATLAB Analysis, and MATLAB Visualization. A chart titled "Field 4 Chart" displays "Temperature from demo devices" over time, with a data point highlighted at 24.81 on September 13, 2016, at 11:41:30 GMT+0200.

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

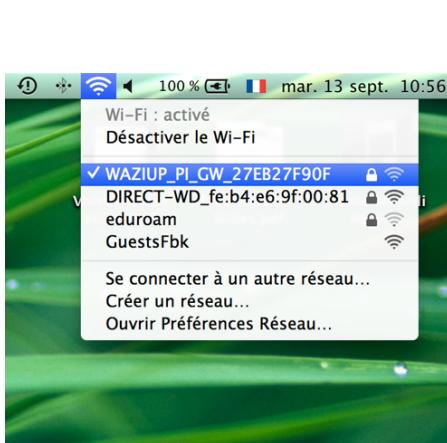
<https://thingspeak.com/channels/123986>

ADVANCED CONFIGURATION

- Use ssh to connect to the gateway
- Change the gateway WiFi password
- Change the web admin interface password

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



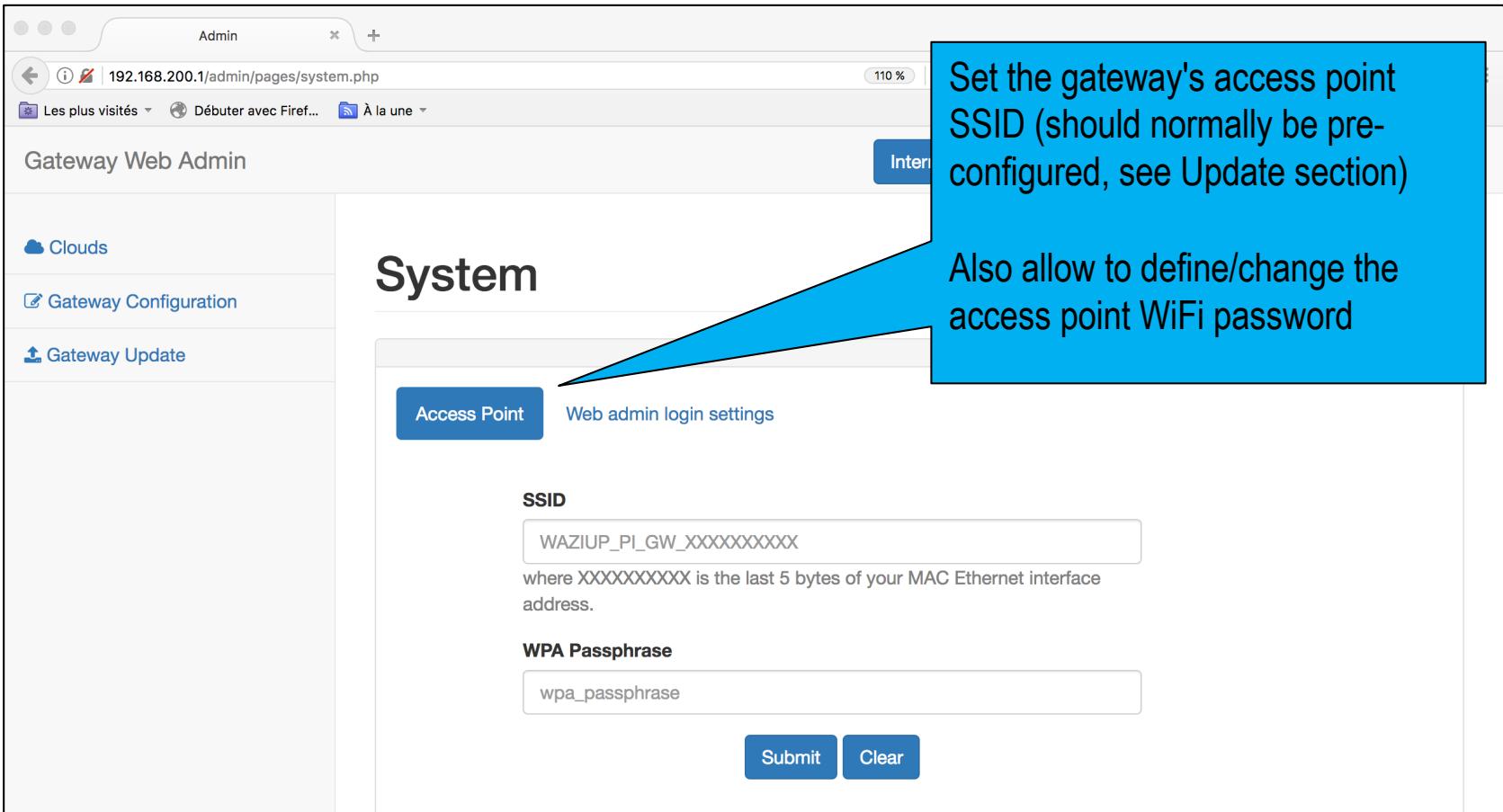
MacBookProRetina-de-Congduc-Pham:~ cpham\$ ssh pi@192.168.200.1
pi@192.168.200.1's password:

```
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
```

GATEWAY SYSTEM CONFIGURATION (1)

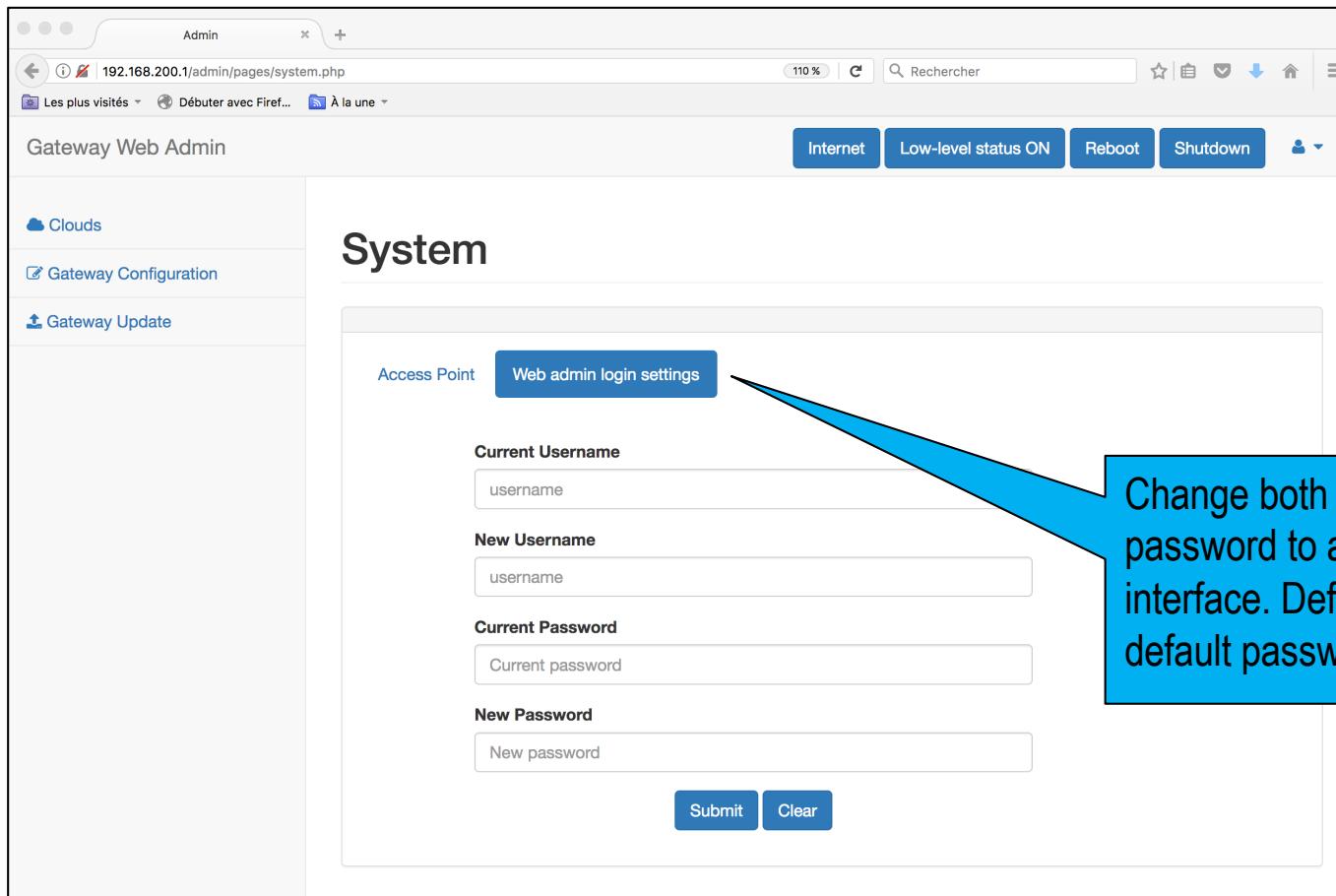
□ Gateway WiFi access point



The screenshot shows a web browser window titled "Admin" with the URL "192.168.200.1/admin/pages/system.php". The left sidebar includes links for "Clouds", "Gateway Configuration" (which is currently selected), and "Gateway Update". The main content area is titled "System" and contains two tabs: "Access Point" (selected) and "Web admin login settings". Under the "Access Point" tab, there are fields for "SSID" (containing "WAZIUP_PI_GW_XXXXXX") and "WPA Passphrase" (containing "wpa_passphrase"). A blue callout box points to the "SSID" field with the text: "Set the gateway's access point SSID (should normally be pre-configured, see Update section)". Another blue callout box points to the "WPA Passphrase" field with the text: "Also allow to define/change the access point WiFi password".

GATEWAY SYSTEM CONFIGURATION (2)

□ Gateway web admin interface



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CTIC, Dakar,
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iSpace, Accra
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Woelab, Lomé,
Togo