IOT Online Course

Developing low-cost & open-source IoT solutions

D-GW-4: Gateway Web Admin Interface (LowCostLoRaGw github version)

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

IoT – from idea to reality

IoT Online Course

⊙ http://diy.waziup.io

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Contents

- This tutorial presents the web admin interface which is an add-on to the low-cost gateway framework

- Refer to D-GW-1 to understand the gateway configuration and architecture

- Note that the SD card image has everything needed, including the web admin interface installed, so you may skip the installation procedure if you flashed our SD card image

- Let's get started...

Gateway web admin interface (1)

- To install the web admin interface, check if you have the `gw_web_admin` folder in your `lora_gateway` folder

- If you don't, then update to the latest version

- Then, go into `gw_web_admin` and run the `install.sh` script
  - `cd gw_web_admin`
  - `sudo ./install.sh`

Gateway web admin interface (2)

- http://192.168.200.1/admin (with WiFi connection)
  - Login: `admin`
  - Password: `loragateway`

Gateway main page

- Gateway main page (configuration page)

Gateway Web Admin   2020-01-09T13:35:39 [online] | Test Internet | pkt logger | Reboot | Shutdown |

Gateway configuration

- Check Internet connectivity & get github version
- Display a simple packet logger
- Reboot the gateway. Need to reboot after any update
- Shutdown the gateway

Radio | Gateway

After changing gate...

Date/Time: 2020-01-09T13:35:40

Radio configuration file is for single channel radio

last low-level status: 2020-01-09T13:35:34 0m-0d-0h-0min from current date

last rx: 2020-01-08T10:02:37.701447> +++ rxlora[868100]. lorawan type=0x40 src=0x2601172...

Mode	1	
Spreading Factor	12	
Frequency	-1	
PA_BOOST		true

Use mode=11 to indicate LoRaWAN mode

For single-channel gateways, the default LoRaWAN mode means SF12BW125 and sync word 0x34 . In this mode you can change the Spreading Factor SF.

Change frequency for a single-channel gateway if needed. Leave frequency as -1 to use default values (for LoRaWAN mode: 868.1MHz for BAND868, 923.2MHz for BAND900 and 433.175 for BAND433).

PA_BOOST is required for some radio modules such as inAir9B, RFM92W, RFM95W, NiceRF LoRa1276. After changing the PA_BOOST settings, run **Gateway Update/Basic config** to recompile the low-level gateway program.

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Main gateway configuration (1)

- radio configuration section

Gateway Web Admin — 2020-01-09T13:35:39 [online] — Test Internet — pkt logger — Reboot — Shutdown

- Clouds
- Gateway Update
- System

Gateway configuration

Radio | Gateway | Network Server | Alert Mail | Alert SMS | ... | Get post-processing.log file

After changing gateway parameters, you need to reboot for changes to take effect.

Date/Time: 2020-01-09T13:35:40

Radio configuration file is for single channel radio

last low-level status: 2020-01-09T13:35:34 0m-0d-0h-0min from current date

last rx: 2020-01-08T10:02:37.701447> +++ rxlora[868100]. lorawan type=0x40 src=0x26011721 seq=0 len=10 SNR=7 RSSIpkt=-41 BW=125 CR=4/5 SF=12

Mode	1	
Spreading Factor	12	☑
Frequency	-1	☑
PA_BOOST		true

Use mode=11 to indicate LoRaWAN mode

For single-channel gateways, the default LoRaWAN mode means SF12BW125 and sync word 0x34 . In this mode you the Spreading Factor SF.

Change frequency for a single-channel gateway if needed. Leave frequency as -1 to use default values (for LoRaWAN 868.1MHz for BAND868, 923.2MHz for BAND900 and 433.175 for BAND433).

PA_BOOST is required for some radio modules such as inAir9B, RFM92W, RFM95W, NiceRF LoRa1276. After chang PA_BOOST settings, run **Gateway Update/Basic config** to recompile the low-level gateway program.

Annotations:

- Indicate a single-channel or SX1301 concentrator hardware configuration
- Last status from low-level radio layer, normally every 10mins
- Last radio packet reception time
- Pre-defined LoRa mode. Mode 11 indicates LoRaWAN mode. Use Gateway / Configure for LoRaWAN
- Changing the Spreading Factor is only relevant in LoRaWAN mode
- Set to a customized frequency band, e.g. 433.3MHz
- Edit PA_BOOST setting. You must use Gateway update/Basic config to recompile

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Main gateway configuration (2)

○ Gateway configuration section

Easy configuration button to for LoRaWAN settings. Select which LoRaWAN network server to activate
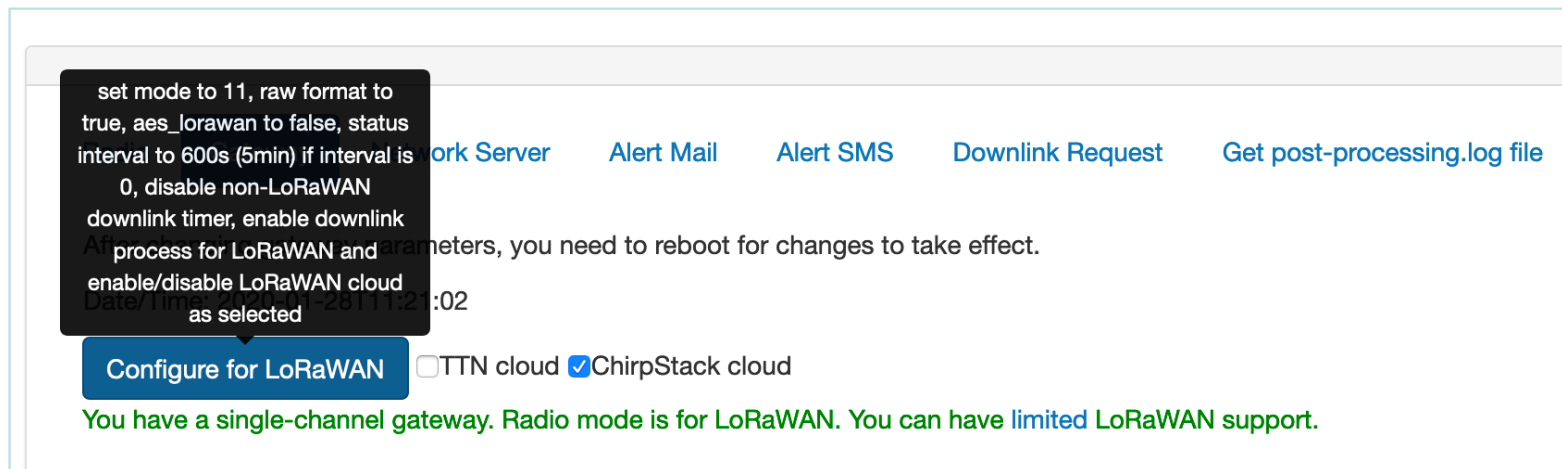
Set gateway ID (should normally be pre-configured)

Default id is 0000XXXXXXXXXXXX with the 6 bytes of the MAC address of the gateway network interface (e.g. B827EBD4F300)

Radio | Gateway | Network Server | Alert Mail | Alert SMS | Downlink Request | Get post-proc

After changing gateway parameters, you need to reboot for changes to take effect.

Date/Time: 2020-01-09T13:35:40

Configure for LoRaWAN ☐TTN cloud ☐ChirpStack cloud

Gateway ID	0000B827EBEFC4A6	
Gateway ID MD5 hashed	620dd0a7916e36f445086e22ae49af1d	not editable
IP address	192.168.2.3	not editable
MAC addresss	eth0: b8:27:eb:ef:c4:a6	not editable
GPS coordinates	Latitude : 43.314106 Longitude : -0.363887	✎
wappkey		false
raw format		true
aes_lorawan	for local decrypt	
aes	for local decrypt	
lsc	for local decrypt	false
downlink	0	✎
status	600	✎

The MD5 hash of the gateway's ID

Indicate raw format to handle customized packet format. Required for LoRaWAN mode

Enables local decryption at gateway. Decryption keys must be defined

Set the downlink timer in seconds -1 means no downlink support

Set the periodic status timer in seconds, 0 means no periodic tasks

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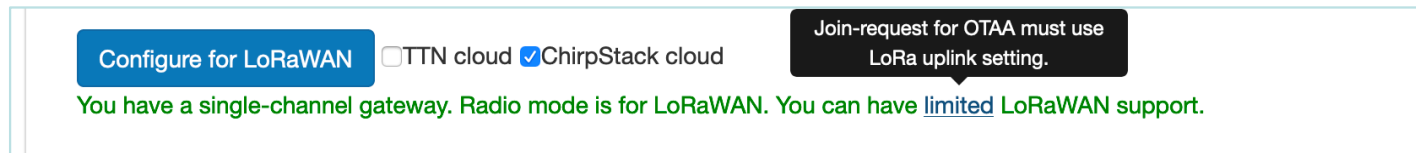
Main gateway configuration (3a)

- ⦿ Configuring for LoRaWAN mode
  - ⦿ LoRaWAN mode enables reception from LoRaWAN devices and LoRaWAN downlink support including Over-The-Air-Activation (OTAA)
  - ⦿ Select a LoRaWAN cloud
    - ⦿ TheThingNetwork (TTN)
    - ⦿ Local or remote open-source ChirpStack
  - ⦿ Use the Configure for LoRaWAN button to automatically change all relevant parameters for LoRaWAN mode

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Main gateway configuration (3b)

- ◉ Limited LoRaWAN support with single-channel gateway
  - ◉ Only 1 frequency and 1 Spreading Factor, e.g. datarate
  - ◉ When building DIY LoRaWAN devices with LMIC for instance, you can easily make the datarate of device and gateway to be similar
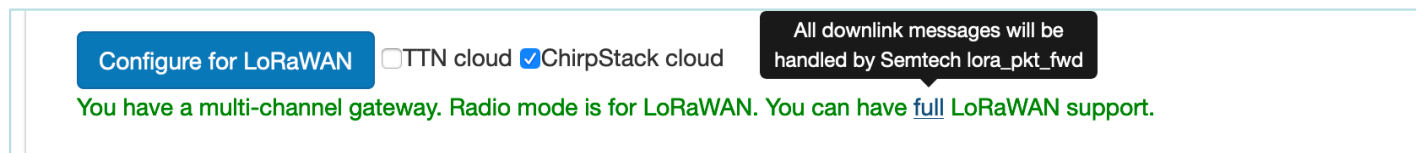 - ◉ For OTAA, join-request must use the same datarate than data uplink

  Configure for LoRaWAN ☐ TTN cloud ☑ ChirpStack cloud
  Join-request for OTAA must use LoRa uplink setting.
  You have a single-channel gateway. Radio mode is for LoRaWAN. You can have limited LoRaWAN support.

- ◉ Full LoRaWAN with multi-channel gateway
  - ◉ With an SX1301-based concentrator shield, you can have full LoRaWAN

  Configure for LoRaWAN ☐ TTN cloud ☑ ChirpStack cloud
  All downlink messages will be handled by Semtech lora_pkt_fwd
  You have a multi-channel gateway. Radio mode is for LoRaWAN. You can have full LoRaWAN support.

  - ◉ and still benefit from the versatility of our open gateway architecture to push to any cloud platforms as well as local edge processing capabilities

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Main gateway configuration (4)

- ◉ Network Server configuration section (open-source ChirpStack)

Radio　　Gateway　　**Network Server**　　Alert Mail　　Alert SMS　　Downlink Request　　Get post-processing.log file

After changing gateway parameters, you need to reboot for changes to take effect.

Date/Time: 2020-01-13T10:56:10

ChirpStack seems to be installed, OK.

Enabled	[go to ChirpStack web page]	true
CloudChirpStack.py		true
ChirpStack Server	127.0.0.1	✎
source list	Empty	✎

Show whether ChirpStack is installed or not

Enable/Disable message upload to the ChirpStack Network Server

127.0.0.1 indicates a local ChirpStack Network Server

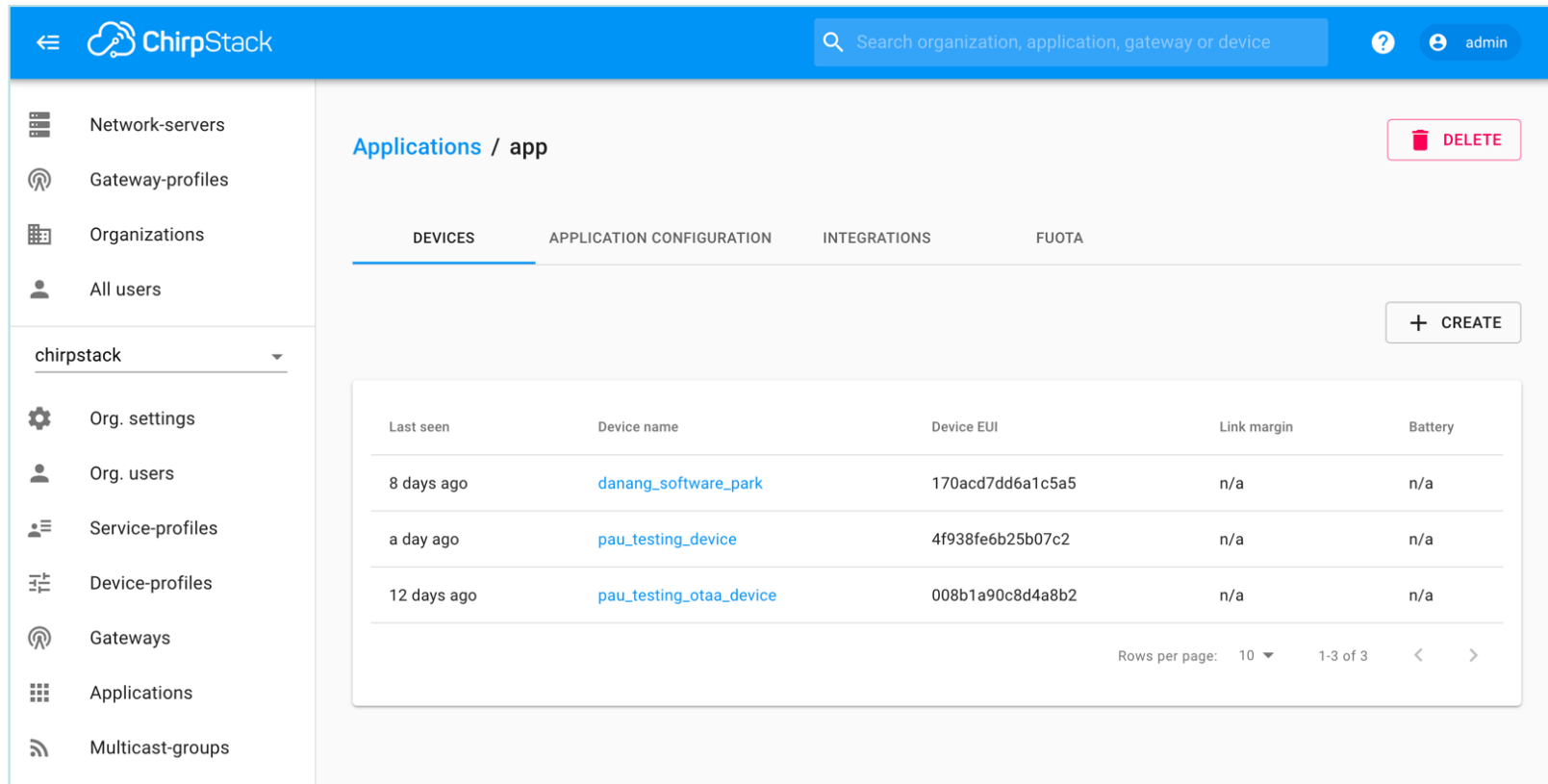Note that you can also use a remote ChirpStack Network Server by indicating its IP address

If ChirpStack is installed, it can be started (and enabled at boot)

Open the local ChirpStack web page

- For more information about the ChirpStack open-source LoRaWAN network server, see https://www.chirpstack.io/overview/
- For more information on using ChirpStack with our framework, see https://github.com/CongducPham/LowCostLoRaGw/blob/master/gw_full_latest/scripts/chirpstack/README.md
- You can use the (local) ChirpStack Network Server to register gateways, create devices, handle LoRaWAN downlink, …

ChirpStack example page (1)

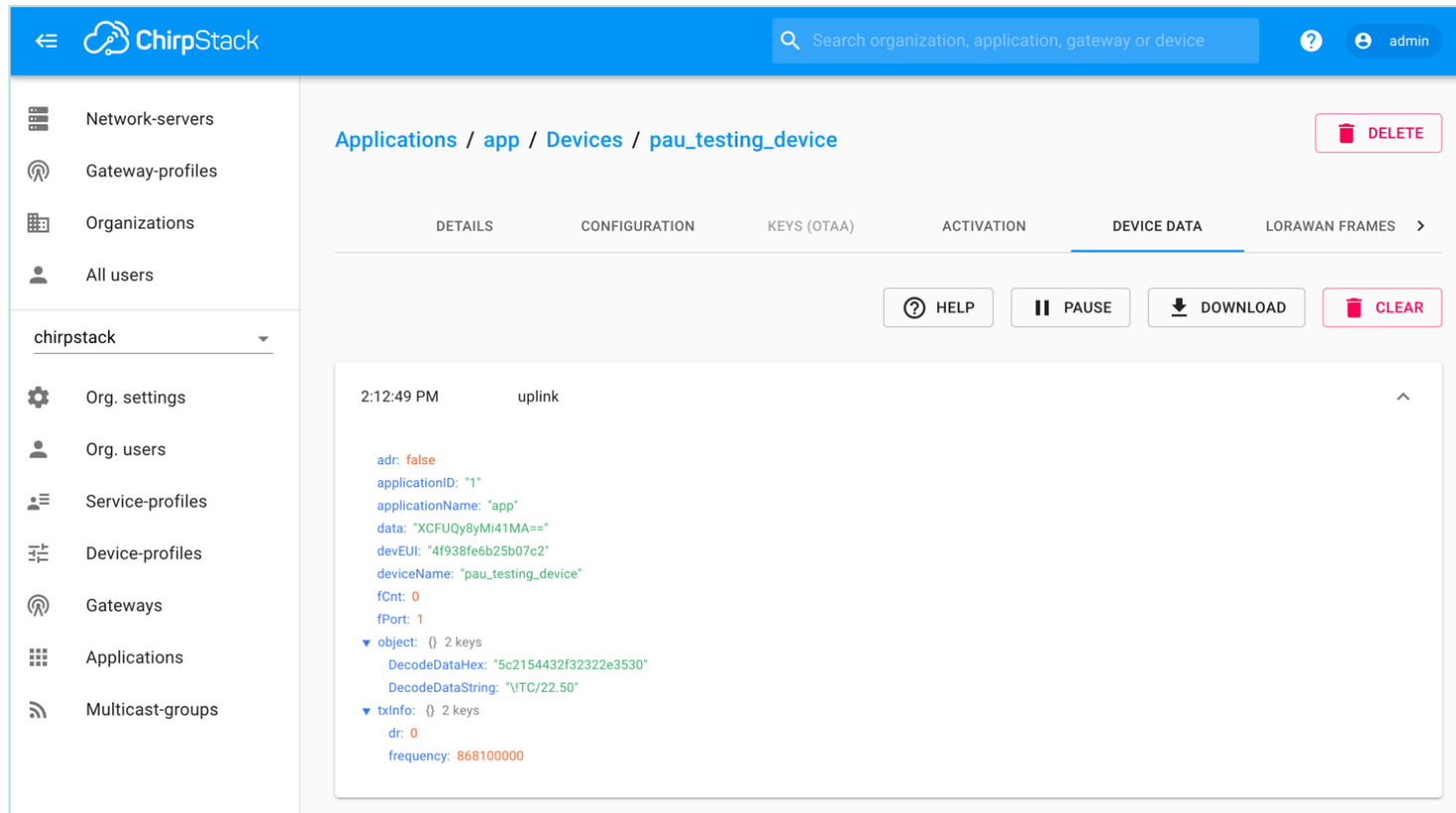- Local ChirpStack Applications page

ChirpStack example page (2)

- Local ChirpStack Device/Data page

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Main gateway configuration (5)

- Gateway email alerting section

Radio   Gateway   Network Server   **Alert Mail**   Alert SMS   Downlink Request   Get post-processing.log file

After changing gateway parameters, you need to reboot for changes to take effect.

Date/Time: 2020-01-09T13:51:03

Enabled		false
Mail Account	a_gmail_address	✎
Mail Password	7c9268550caa0e9c6b282d2fe9946e89	✎
Mail Server	smtp.gmail.com	✎
Contacts	the_contact_mail_address,another_contact_mail_address_if_needed	✎

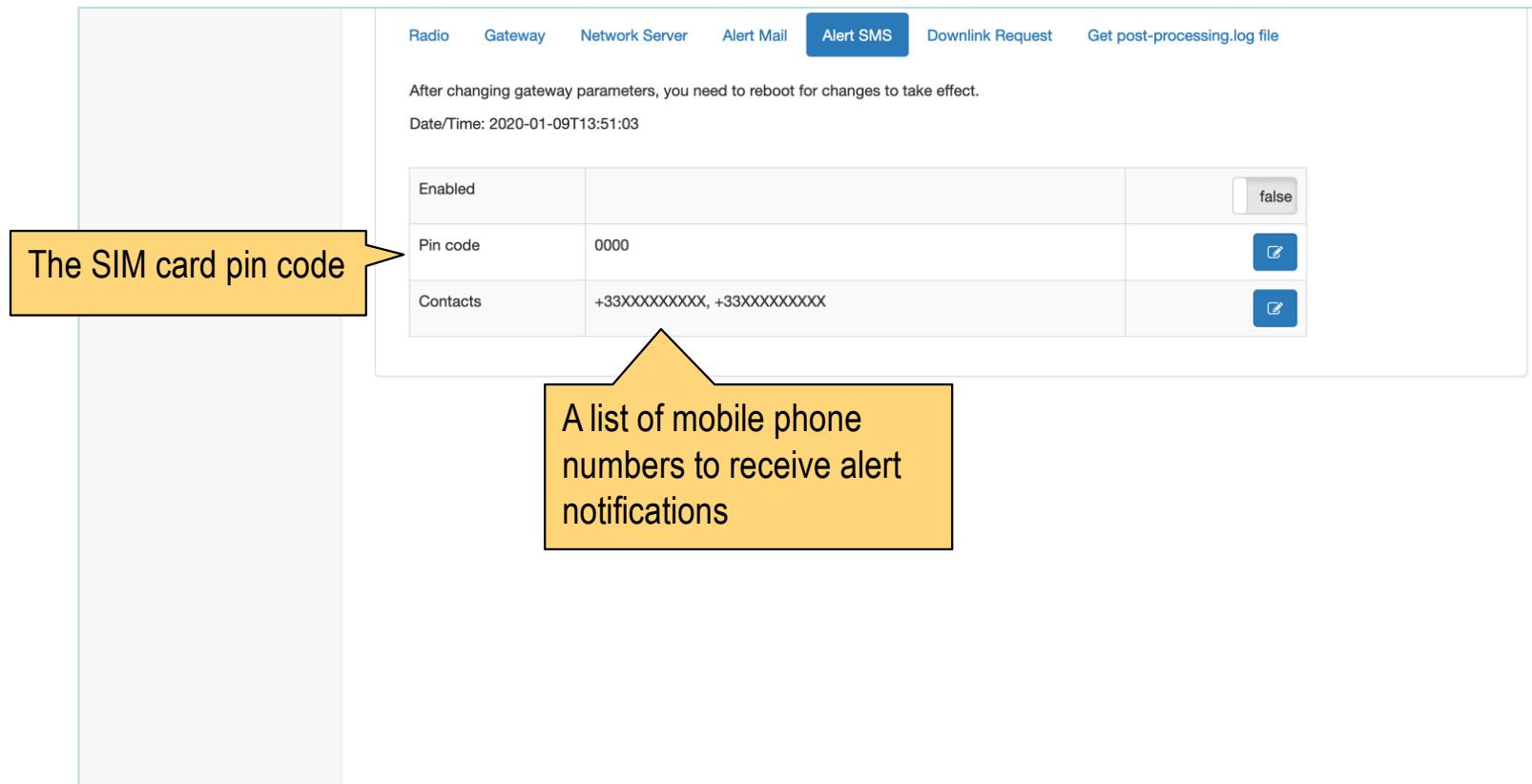Enter your mail address for sending emails

The SMTP mail server to send emails

A list of email recipient addresses to receive alert notifications

Your email account password, what is displayed is the MD5 hash version

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Main gateway configuration (6)

- Gateway SMS alerting section (needs cellular)
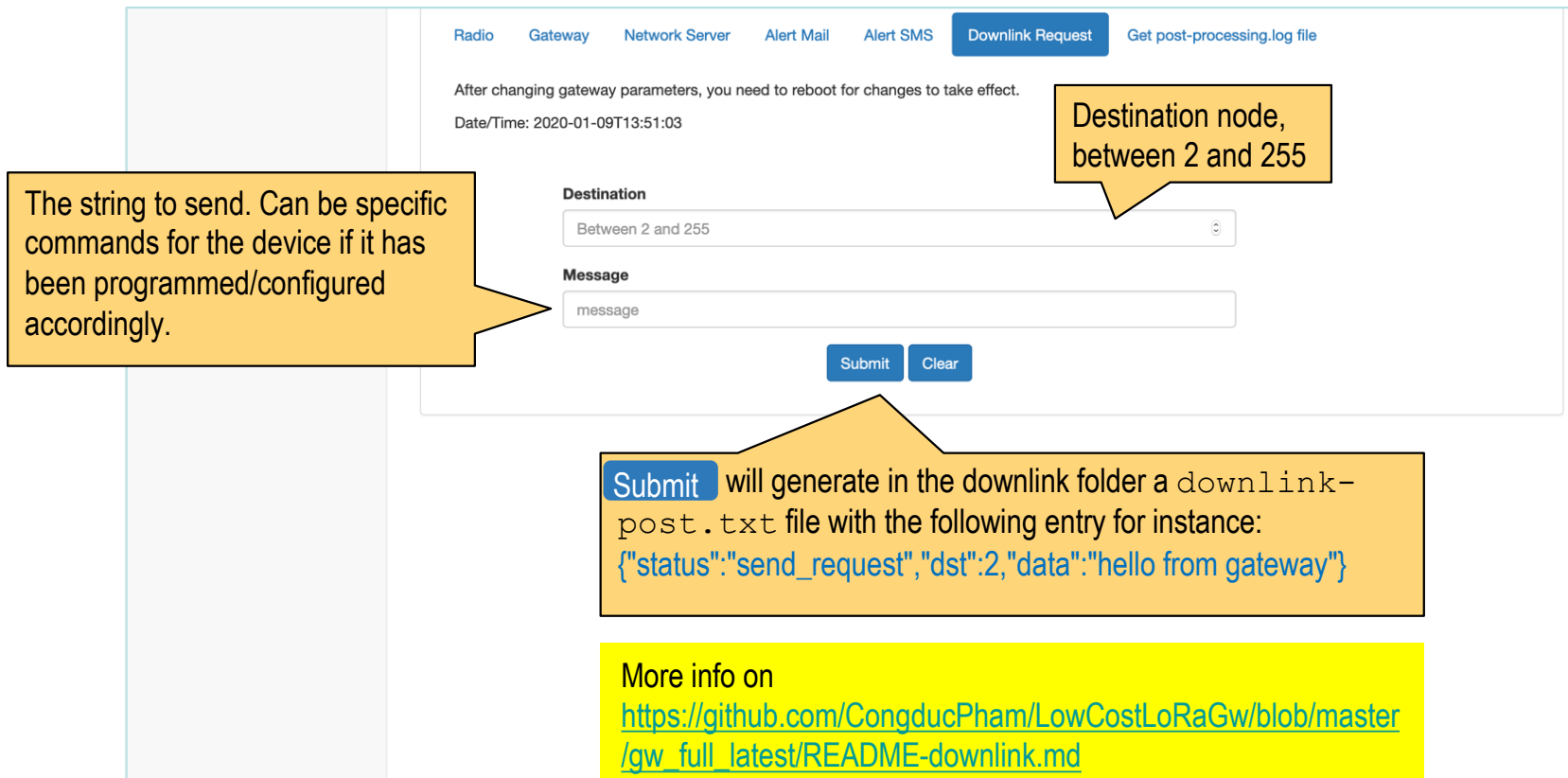
Radio Gateway Network Server Alert Mail **Alert SMS** Downlink Request Get post-processing.log file

After changing gateway parameters, you need to reboot for changes to take effect.

Date/Time: 2020-01-09T13:51:03

Enabled		false
Pin code	0000	✎
Contacts	+33XXXXXXXXX, +33XXXXXXXXX	✎

The SIM card pin code

A list of mobile phone numbers to receive alert notifications

Main gateway configuration (7)

- Generating **non-LoRaWAN** downlink messages
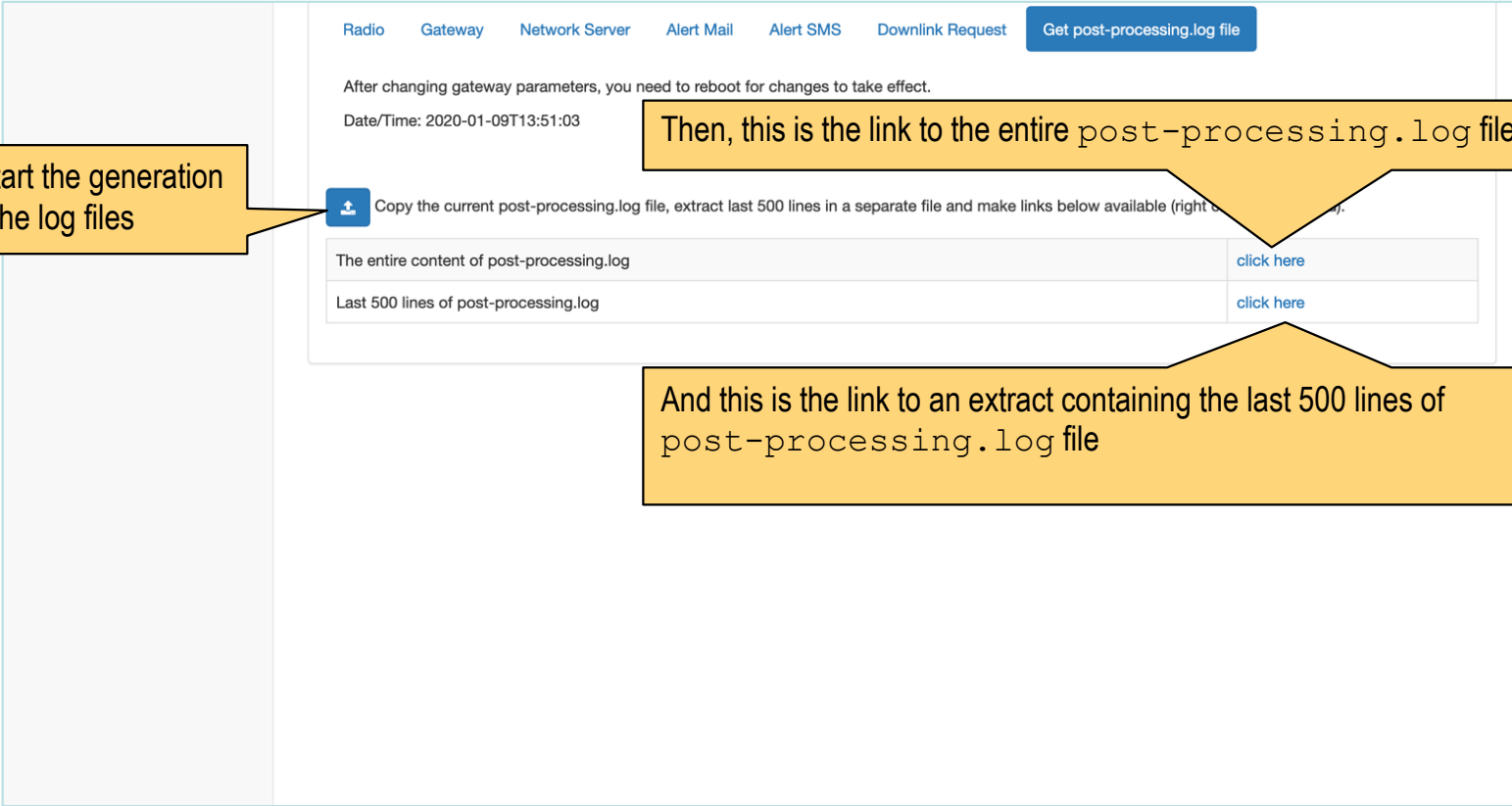
Radio   Gateway   Network Server   Alert Mail   Alert SMS   **Downlink Request**   Get post-processing.log file

After changing gateway parameters, you need to reboot for changes to take effect.

Date/Time: 2020-01-09T13:51:03

Destination node, between 2 and 255

Destination

Between 2 and 255

The string to send. Can be specific commands for the device if it has been programmed/configured accordingly.

Message

message

Submit   Clear

`Submit` will generate in the downlink folder a `downlink-post.txt` file with the following entry for instance: {"status":"send_request","dst":2,"data":"hello from gateway"}

More info on
https://github.com/CongducPham/LowCostLoRaGw/blob/master/gw_full_latest/README-downlink.md

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Main gateway configuration (8)

- Gateway log files section

(1) Select this tab

| Radio | Gateway | Network Server | Alert Mail | Alert SMS | Downlink Request | Get post-processing.log file |

After changing gateway parameters, you need to reboot for changes to take effect.

Date/Time: 2020-01-09T13:51:03

Then, this is the link to the entire `post-processing.log` file

(2) Click to start the generation of a copy of the log files

Copy the current post-processing.log file, extract last 500 lines in a separate file and make links below available (right ...)

| The entire content of post-processing.log | click here |
| Last 500 lines of post-processing.log | click here |

And this is the link to an extract containing the last 500 lines of `post-processing.log` file

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Get gateway log files

- The **Get post-processing.log file** option is a convenient way for an end-user to obtain the log file that can be sent (via mail for instance) to an experienced user for analysis or debug purposes

- The entire `post-processing.log` file can be obtained, or only the last 500 lines

- A simple packet logger page is more suitable to check in real time whether packets are received or not, see next slide

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Simple packet logger

- **Real-time packet logger**

Display the packet logger

Gateway Web Admin   («WAZIUP»)   2020-02-01T11:53:59 [online] | Test Internet | pkt logger | Reboot | Shutdown | 👤 ▾

- ☁ Clouds
- ✎ Gateway Configuration
- ⬆ Gateway Update
- ♨ System

Packet logger

rxlora

Show in real-time the last 20 packet receptions

LoRaWAN OTAA
Packet from newly joined
device: 0x2601298D

Showing last 20 packet receptions. Refreshing every 5s.

Non-LoRaWAN
From src=6

LoRaWAN ABP
From 0x26011721

LoRaWAN OTAA
join-request

LoRaWAN ABP
From 0x26041F24

2020-02-01T11:52:43.376347> +++ rxlora[868100]. lorawan type=0x40 src=0x2601298D seq=1 len=13 SNR=7 RSSIpkt=-39 BW=125 CR=4/5 SF=12
2020-02-01T11:50:22.099860> +++ rxlora[868100]. dst=1 type=0x10 src=6 seq=119 len=10 SNR=6 RSSIpkt=-48 BW=125 CR=4/5 SF=12
2020-02-01T11:49:50.441191> +++ rxlora[868100]. dst=1 type=0x10 src=6 seq=118 len=10 SNR=7 RSSIpkt=-46 BW=125 CR=4/5 SF=12
2020-02-01T11:49:15.655164> +++ rxlora[868100]. lorawan type=0x40 src=0x26011721 seq=0 len=15 SNR=7 RSSIpkt=-47 BW=125 CR=4/5 SF=12
2020-02-01T11:48:57.001111> +++ rxlora[868100]. lorawan type=0x40 src=0x26011721 seq=0 len=15 SNR=6 RSSIpkt=-42 BW=125 CR=4/5 SF=12
2020-02-01T11:47:28.369677> +++ rxlora[868100]. lorawan type=0x00 src=0xD0019A7C seq=46037 len=10 SNR=6 RSSIpkt=-37 BW=125 CR=4/5 SF=12
2020-02-01T11:46:52.540987> +++ rxlora[868100]. lorawan type=0x40 src=0x26041F24 seq=0 len=15 SNR=6 RSSIpkt=-49 BW=125 CR=4/5 SF=12
2020-02-01T11:46:39.671992> +++ rxlora[868100]. lorawan type=0x40 src=0x26041F24 seq=0 len=15 SNR=7 RSSIpkt=-48 BW=125 CR=4/5 SF=12
2020-02-01T11:46:18.848902> +++ rxlora[868100]. lorawan type=0x40 src=0x26041F24 seq=0 len=15 SNR=6 RSSIpkt=-37 BW=125 CR=4/5 SF=12

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Gateway update

- The gateway will be updated to the latest version

- Internet access for the gateway is necessary

- The update procedure can easily be done with the web admin interface, connect to the gateway WiFi first

- The update steps are

  1. Full Update
  2. Basic Config
  3. Update Web Interface

Gateway update page

○ **Gateway update section**
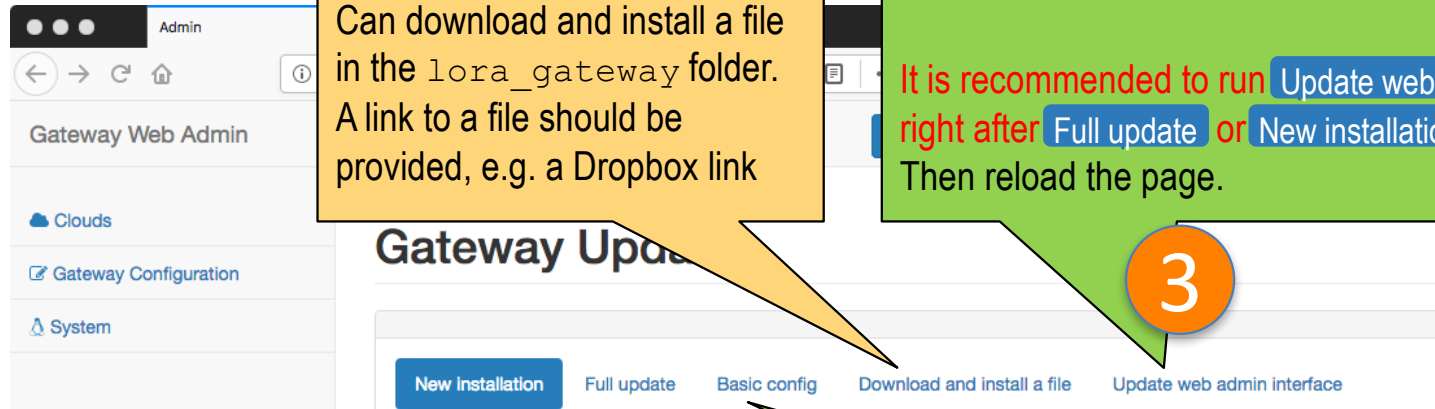
Can download and install a file in the `lora_gateway` folder. A link to a file should be provided, e.g. a Dropbox link

Update the web admin interface after an update of the distribution to install the last version of the web admin interface.

It is recommended to run `Update web admin` right after `Full update` or `New installation` Then reload the page.

3

Install a new gateway by removing the existing `lora_gateway` folder, all existing configuration files will be overwritten.

If you install a new gateway with our SD card image, you can use this option.

1

Update with latest version on github, all your configuration files will be kept. This is the recommended option.

2

Compile and configure the gateway (to set the gateway id & the WiFi access point SSID). 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` or `New installation`

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Software version number

Gateway Update

New installation | Full update | Basic config | Download and install a file | Update web admin interface

Run **Basic config** after any update and reboot for new version to be applied.

Install latest version of gateway, **erasing** all existing configuration file.
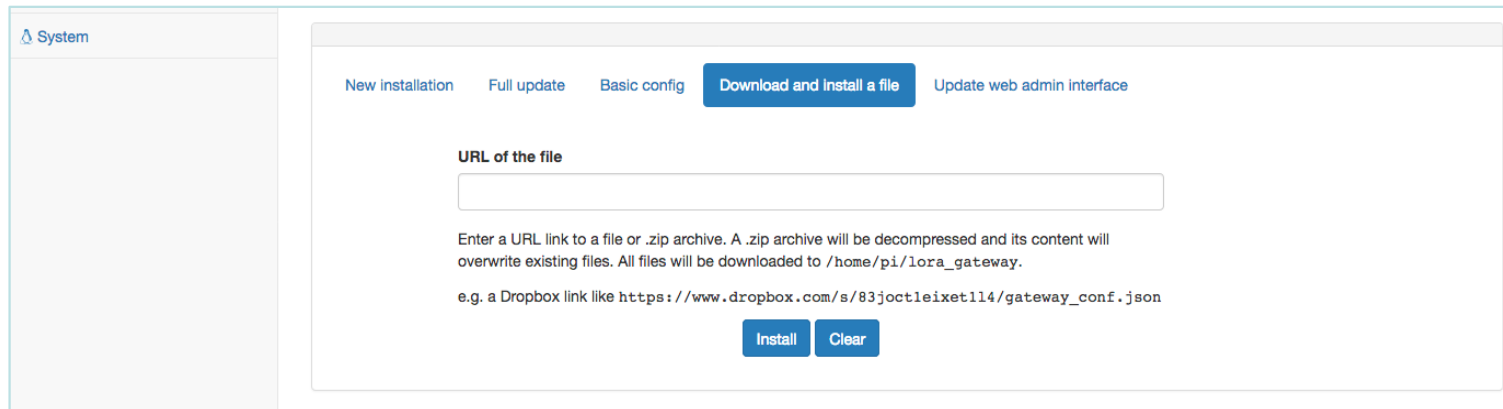Custom SSID will be preserved. May take minutes, wait for finish notification.

Git version: 476. Installed version: 476. Date of current distribution is 2020-01-07 15:50:37.937685972 +0100

- ⊙ The software version number on github and the installed version number are displayed
- ⊙ Click on [Test Internet] to obtain the latest software version number on github

Online. Got github version number. 2019-12-02T13:44:29 **[online]** [Test Internet] [pkt logger] [Reboot] [Shutdown]
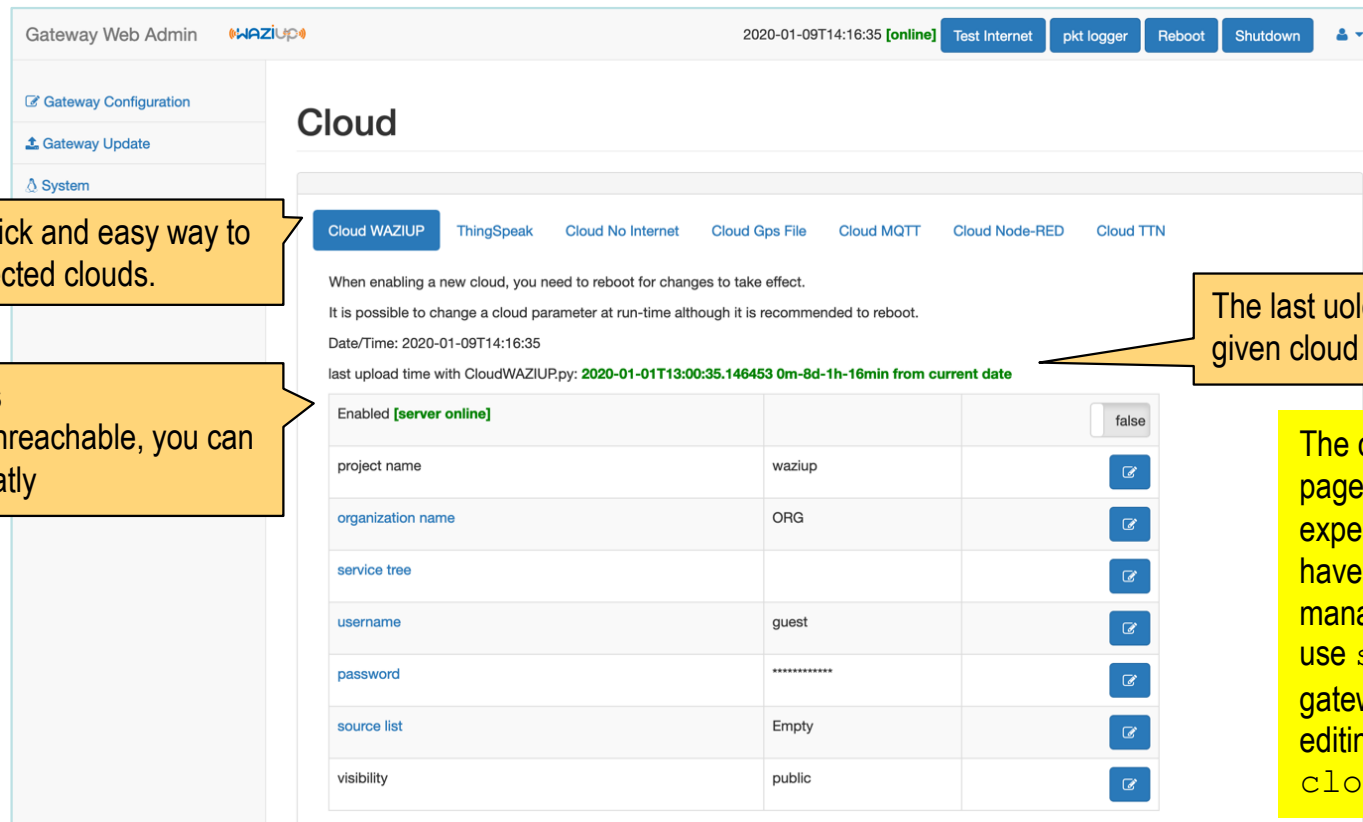
Download & install a file

- The **Download and Install a file** option is a convenient way to install a configuration file
  - For instance, a customized `radio.makefile` file can be edited by an experienced user, then put on Dropbox and the link provided to an end-user (mail, SMS,…)
  - When providing a link to a .zip file, the archive content will be installed
  - After installation, the end-user can use "Basic config" to recompile the gateway program and then reboot

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Gateway cloud pages

- Gateway cloud configuration section

Gateway WAZIUP cloud

- ◉ Configuring WAZIUP cloud

The WAZIUP cloud tab is only available when key_WAZIUP.py is found

Gateway Web Admin   WAZIUP   2020-01-09T14:16:35 [online]   Test Internet   pkt logger   Reboot   Shutdown

☑ Gateway Configuration
⬆ Gateway Update
⌀ System

Cloud

Cloud WAZIUP   ThingSpeak   Cloud No Internet   Cloud Gps File   Cloud MQTT   Cloud Node-RED   Cloud TTN

When enabling a new cloud, you need to reboot for changes to take effect.
It is possible to change a cloud parameter at run-time although it is recommended to reboot.
Date/Time: 2020-01-09T14:16:35
last upload time with CloudWAZIUP.py: **2020-01-01T13:00:35.146453 0m-8d-1h-16min from curre**

Enabled [server online]	
project name	waziup
organization name	ORG
service tree	
username	guest
password	************
source list	Empty
visibility	public

WAZIUP cloud uses FIWARE platform with the possibility to define domains. The domain will be defined as project_name+'-'+organization_name+service_tree, e.g. waziup-UPPA-TESTS if:
- project_name is waziup,
- organization_name is UPPA,
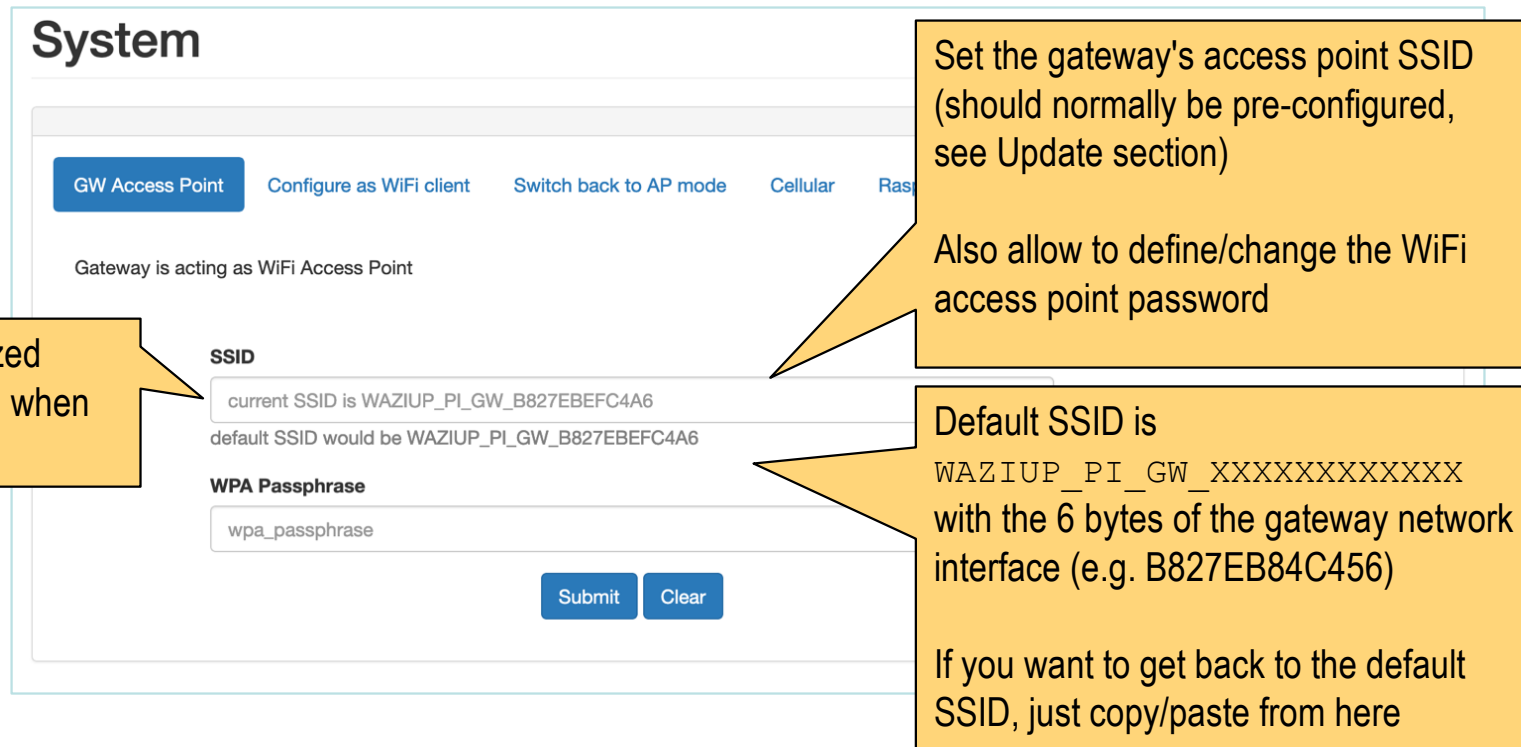- service_tree is –TESTS
service_tree can be empty otherwise it must begin with a '-'.

The device id will be organization_name+service_tree+"_Sensor"+device_addr. For instance, for sensor 2 hosted by UPPA: UPPA-TESTS_Sensor2.

Username and password of the WAZIUP account. If username is "guest" then all data will be public

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Gateway system configuration (1)

- Gateway WiFi access point

System

GW Access Point | Configure as WiFi client | Switch back to AP mode | Cellular | Ras...

Gateway is acting as WiFi Access Point

SSID

current SSID is WAZIUP_PI_GW_B827EBEFC4A6

default SSID would be WAZIUP_PI_GW_B827EBEFC4A6

WPA Passphrase

wpa_passphrase

Submit | Clear

Set the gateway's access point SSID (should normally be pre-configured, see Update section)

Also allow to define/change the WiFi access point password

If you indicate a customized SSID, it will be preserved when the gateway is updated.

Default SSID is WAZIUP_PI_GW_XXXXXXXXXXXX with the 6 bytes of the gateway network interface (e.g. B827EB84C456)

If you want to get back to the default SSID, just copy/paste from here

Gateway system configuration (2)

⊙ Configure as WiFi client

System

GW Access Point | **Configure as WiFi client** | Switch back t... settings

Gateway is acting as WiFi Access Point

SSID

your_wifi_network

Warning: if a valid WiFi network is not configured you will not be able to connect through the gateway's access point anymore. If that happens, use wired Ethernet to switch back to access point mode. You MUST reboot after submitting the command.
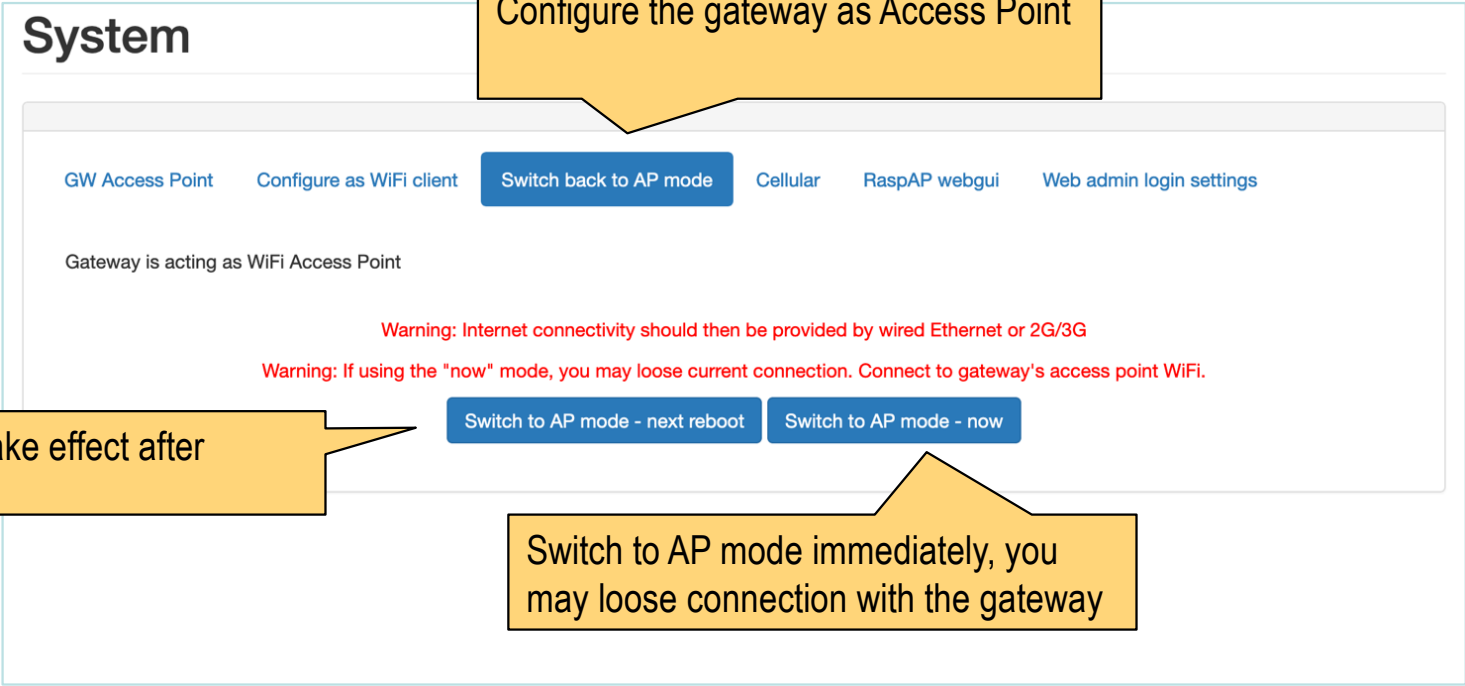
WPA Passphrase

••••••••••••••••

Submit | Clear

> Configure the gateway as WiFi client to connect to an existing WiFi network. Changes will take effect after reboot.

> Warning: if a valid WiFi network is not configured you will not be able to connect through the gateway's access point anymore. If that happens, use wired Ethernet to switch back to access point mode.

Gateway system configuration (3)

- ◉ Configure as WiFi Access Point

Configure the gateway as Access Point

System

GW Access Point | Configure as WiFi client | Switch back to AP mode | Cellular | RaspAP webgui | Web admin login settings

Gateway is acting as WiFi Access Point

Warning: Internet connectivity should then be provided by wired Ethernet or 2G/3G

Warning: If using the "now" mode, you may loose current connection. Connect to gateway's access point WiFi.

Switch to AP mode - next reboot | Switch to AP mode - now

Changes will take effect after reboot

Switch to AP mode immediately, you may loose connection with the gateway

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- Configure cellular for Internet access

Gateway system configuration (5)

- Run the RaspAP module

Run the RaspAP web module from
https://github.com/billz/raspap-webgui

Default login is `admin` and default password is `secret`

- RaspAP can configure some networking functions. It can be useful for dynamically select WiFi networks
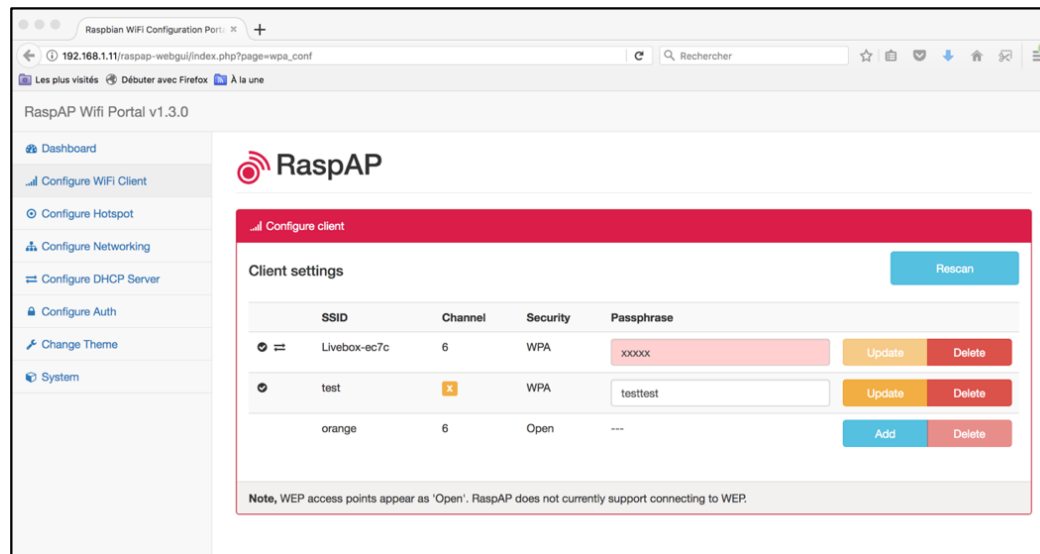
- However, it is recommended to use our web admin interface to control WiFi client <-> Access Mode feature

- Configure auth for web admin interface

System

| GW Access Point | Configure as WiFi client | Switch back to AP mode | Cellular | RaspAP webgui | **Web admin login settings** |

Gateway is acting as WiFi Access Point

Current Username

username

New Username

admin

Current Password

••••••••••

New Password

New password

Submit Clear

Change both the login and password to access the web admin interface. Default login is `admin` and default password is `loragateway`

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