

SLgateway v2.1.x[©]

User Guide

SENSING-LABS
VERSION 02 - REV C / MARCH 2018

Table of contents

General overview	3
The Gateways range	3
SLgateway main features	4
LoRaWan	4
Graphical user interface (GUI)	4
Data APIs access	4
SLgateway specification	5
STEP 1: Configuration & Installation of gateway	6
SLgateway assembly	6
SLgateway positioning	6
First access to the GUI (over ethernet on 192.168.2.1)	7
Set SLgateway local time	8
Authentication password configuration	8
Ethernet interface configuration	8
GSM/GPRS configuration	8
STEP 2: Device provisioning into gateway	9
Add a new device	9
Add multiple devices at once	9
Remove a device	10
STEP 3: Activation of device	10
1. Device network activation	10
2. Device application start	10
3. Device data transmission	11
STEP 4: Device data access via APIs	12
Rest API	12
HTTP Callback	13
CSV to FTP	14
Modbus API	15
Troubleshooting	17
I don't succeed to activate my device onto the gateway	17
I have forgotten the current IP network gateway configuration	18
I have forgotten the user and/or password to access to the GUI	18
Do you have any other questions?	18
How to get technical support?	18
Annex - GUI	19
GUI structure	19

Application - device list	20
Application - device detail	20
Network - device list	21
Network - device detail	22
Tools - HTTP Ping alive	24
Tools - SLtester (since 2.1.0)	24
Maintenance - Network settings	27
Maintenance - Services	28
Maintenance - System	28
Annex - Modbus API	29
Default configuration	29
Data model structure	29
Resource format	30
Supported Modbus command	30
Modbus Register Table	30
Legals	31

Thank you for choosing our SLgateway product!

General overview

SLgateway is an IoT station developed with the aim to reduce the cost of deploying a radio network for small and medium size applications.



Figure 1 : SLGateway basic diagram

The gateway integrates the SLbase software designed to meet the need for a plug and play LoRaWAN™ local network solution:

- All in one LoRaWan solution with RF modem, Network & Application layers
- Graphical user interface for managing LoRa devices, accessing to application data (measures, payloads) and RF network information, and secured access to gateway
- Various types of API to access device data (Rest API, HTTP Callbacks, Modbus API)

The Gateways range

SL provides different gateways references, fitting different needs.

Part number	Gateway type	Protection level	Dimension (mm)
PIC-LAB-63NS	Pico GPRS	IP30 (indoor use)	100.7x43.6x42.8
GAT-LAB-6NN1	Multitech Conduit indoor	IP30 (indoor use)	161.3x107.4x42.8
GAT-LAB-6NN2	Multitech Conduit outdoor	IP67 (outdoor use)	292x91x257



Pico GPRS



Multitech Conduit



SLgateway main features

LoRaWan

- ✓ Support of LoRaWan 868MHz devices, configurable in ABP / OTAA for PUBLIC network with configurable AppEUI
- ✓ Network level supervision with highlight of disconnected devices
- ✓ Up to 200 devices with 1 message transmission every hour
- ✓ Storage of all received data for 100 days

For more information about the LoRaWAN concept and technology, we advise you to read these documents:

- General overview: [LoRaWAN™ What is it?](#)
- Technical description: [LoRaWAN™ 101 – A Technical Introduction](#)
(source: lora-alliance.org)

Graphical user interface (GUI)

- ✓ Add/Import/Remove devices
- ✓ Quick visualization of current device measures
- ✓ Quick visualization of current device network state
- ✓ Export all displayed data in CSV format file
- ✓ Distant downlink message management (reconfiguration for Senlab)
- ✓ Graphical configuration of system (IP network, log access, ...)
- ✓ RF range test dashboard and results export

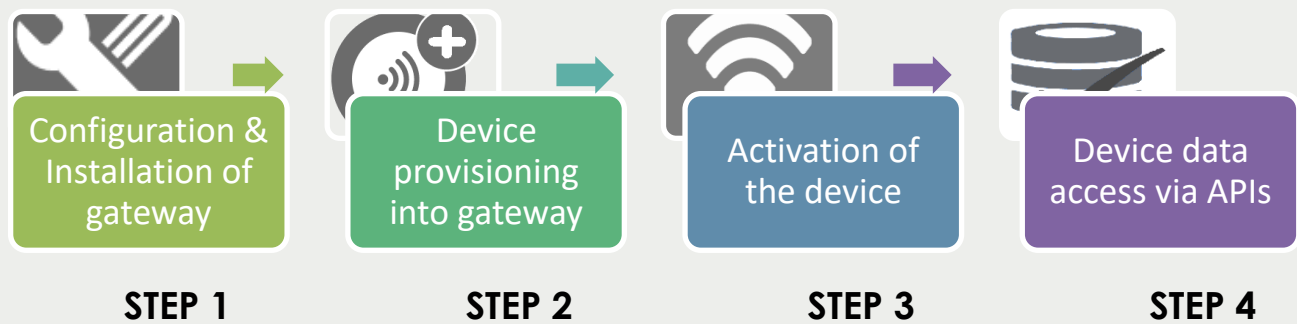
Data APIs access

- ✓ REST API v1: SLbase HTTP standard API for accessing all data in application/xml or application/json formats (refers to REST API chapter for more details)
- ✓ HTTP Callbacks: Real time customer listener notification of received data/payload in application/json format
- ✓ Modbus API: SLbase TCP Modbus slave API for getting data (measure or payload) threw a PLC system (refers to MODBUS API chapter for more details)
- ✓ CSV to FTP: Periodic transfer of CSV format file on a FTP/SFTP server of last received data (for Senlab only)

SLgateway specification

Specification	Description
Operation system	Linux Debian X.X for pico model
Ethernet	RJ45 plug
GSM/GPRS/3G	GPRS modem for pico / 3G for mtcddt
RF	868Mhz band (Power +14dBm / Sensitivity -137dBm)
Database	Storage of last 100 days data
Graphical User Interface	Light GUI for gateway configuration & management (400K on 1 st download)
HTTP security	Login/Password authentication
Software maintenance	SFTP link for update & advanced configuration
VPN	Easy activation for remote access for Sensing Labs support team (you can also request us to connect to your own OpenVPN server)
RF Range tester <i>(NEW in 2.1.0)</i>	Local LoRaWAN network coverage test dashboard (required a Senlab Test devices)
LoRaWan RF modem	Mono datarate for pico (3 channels) Multi datarate for mtcddt (8 channels)
LoRaWan network server	ABP or OTAA activation mode PUBLIC (default since v2.0.2) or PRIVATE network type
LoRaWan application server	Application messages Decryption & Encryption Integrated Codecs for Senlab

Before starting, remember the 4 steps to make the global system fully operational:



This document describes all these 4 steps.

STEP 1: Configuration & Installation of gateway

SLgateway assembly

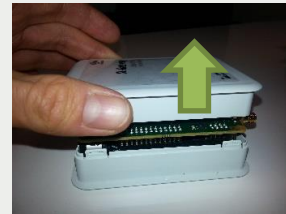
The delivered package includes:

1. A GSM/GPRS antenna (**the smaller**)
2. An 868MHz LoRa antenna (**the longer**)
3. An ethernet cable (Cat 5.e - 1m)
4. A 230V power adapter
5. The SLgateway
6. The "Getting started" document



Assembly of the SLgateway:

1. Insert SIM card:
 - ✓ open the upper side of the gateway casing
 - ✓ LOCK the grey cap by pushing it outwards
 - ✓ Close the upper side of the gateway casing
2. Screw both antennas
3. Plug the power supply
 - ✓ To prevent electronic damage, the gateway must not be powered without antennas

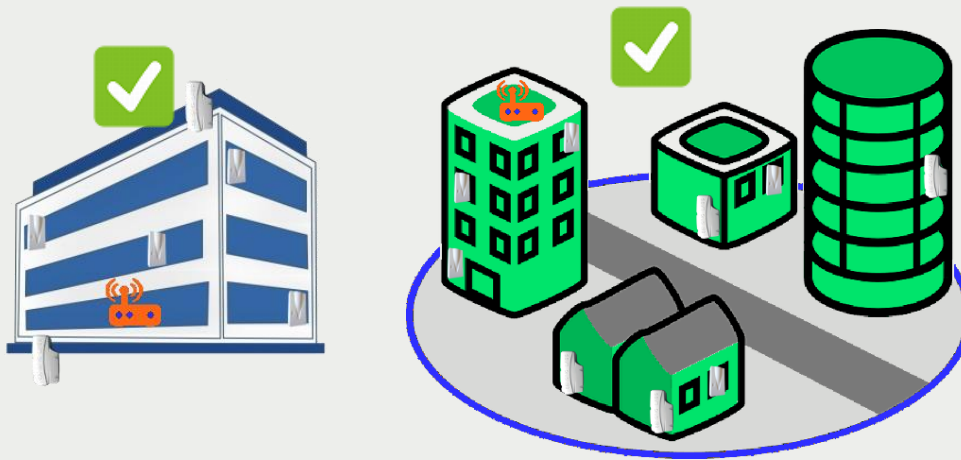


SLgateway positioning

- ✓ Position both antenna with 90° elbow and its main part upwardly (vertical) in free space area
- ✓ Avoid positioning the SLgateway against or inside metallic/electric elements
 - If not possible, use RF cable extension to position outside the LoRa antenna



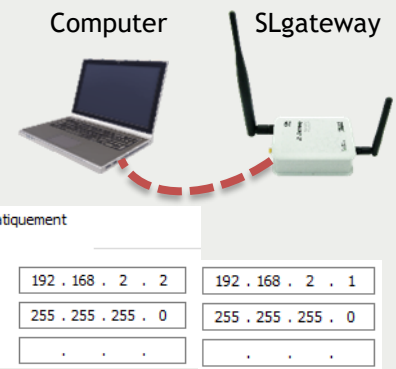
- ✓ If LoRa devices are in a different building than or outside the building where the gateway is installed, it is recommended to deport antennas (at least LoRa antenna) and/or SLgateway on a higher position.



First access to the GUI (over ethernet on 192.168.2.1)

Steps to follow with default configuration¹:

1. Start your SLgateway (power up)
2. Configure your computer¹
IPv4 static address: 192.168.2.2
subnet mask 255.255.255.0
(PC network Ethernet properties)
3. Connect your computer to SLgateway using the Ethernet cable
4. Access to <http://192.168.2.1> ²
5. Enter default user/password when asked: **public/public**



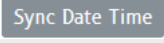
Congratulations! You are now connected to the SLgateway.

¹ Default configuration of SLGateway is static IP 192.168.2.1

² SLgateway has been tested with *Chrome* browser

Set SLgateway local time

After 1st boot, the SLgateway can have a wrong time, so you need to update it:

1. Check if your computer local time is OK?
2. Access to the “Maintenance → System” page
3. Click  and confirm at the pop-up screen.
4. Check the new SLgateway UTC time in the right bottom part of the GUI screen.

Authentication password configuration

We advise you to replace the default password from “Maintenance → GUI Settings”

- In case of password lost, please create an online ticket [here](#)
- You can also change the friendly System Name into the same page


Ethernet interface configuration

You can change the default Ethernet configuration to fit to your local network from

“Maintenance → System”, with button 


- If you lost the current IP address, you can use the Over USB connection (refer troubleshooting section in this User Guide)
- You can “ping” a server to check your configuration (result is in “Network log”)

GSM/GPRS configuration

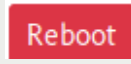
1. Check the SIM card and GSM/GPRS antenna are well installed (cf. “STEP1”)
2. Access to “Maintenance → System” page
3. In section “GSM configuration”, fill the fields with GSM/GPRS information (given by your SIM card provider):
 - ✓ **PIN code** (optional)
 - ✓ **APN** (required)
 - ✓ **Username** and **password** (for PAP or CHAP authentication)
4. Apply new configuration with  (see “network log” screen for detail)

(if you enter a PIN code, you will need to reboot with ).

If successful, “ppp0” appears in IP network interface.



Network	
Interface	Address
eth0	192.168.1.108
ppp0	77.136.147.236

5. Once the settings are OK reboot with  to save definitely into the gateway.



After a boot or reboot, all configuration and stored data can take 2 minutes to be fully loaded.


You can stop the GSM/GPRS connection when you want with button .

STEP 2: Device provisioning into gateway

SLgatewayV2 is configured in PUBLIC LoRaWan network with appEUI 70B3D580A0000000

- It supports both OTAA & ABP activation type.
- You have to check that your devices are commissioned in PUBLIC mode (with SLsetting v1.3.2 for Senlab)
- **For any other configuration, please please create an online ticket [here](#)**

Add a new device

1. Access to "Network" page & click on button 
2. Enter device provisioning information
 - Name: friendly name of device displayed into GUI
 - Activation: OTAA or ABP
 - DevEUI: Unique identifier of LoRa device (IEEE EUI64 address)
 - For ABP: devAddress, NwkSKey & AppSKey
 - For OTAA: Application key

3. Confirm with button 

The new device will appear into "Application" and "Network" page.

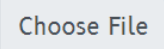

You can now immediately install and activate it! (see device User Guide)



If you don't have the device keys, contact your distributor/reseller with devEUI.

Add multiple devices at once


For importing multiple devices at once, you have to use the SLsetting import feature. It allows you to add all new devices contained into a CSV file (generated with SLsetting).

1. Access to "Tools → SLSetting import" page
2. Select the csv file to import using button 
3. Check device list (Fw type, Activation, ...) and add them with button 

The new device will appear into "Application" and "Network" page.

You can now immediately install and activate it! (see device User Guide)

Remove a device

To remove a device, you have to go into Network device detail page, and to confirm the suppression with button 



When you remove a device in SLgateway, the device still “keep” the NetworkSessionKey and if OTAA, you will need to “disconnect” the device itself or recommission it again. You can also send a “STOP application” request to the Senlab before to remove it from SLgateway.



Before to remove device, check device behavior in this case, especially if you want to move the device to another network.

STEP 3: Activation of device

You have now to install & activate your device

- Do not activate devices too close to the gateway
 - keep a minimum distance of 1 meter
- For Senlab activation process, refer to Senlab User Guide

1. Device network activation

On SLgateway, open “Network” page

- None message has been received yet (“RF Level” column is empty)

Name	DevEUI	Type	Version	Integration	Activation	RX Rate	Data Rate	RF Level	Last Message
Device 70B3D580A010373E	70B3D580A010373E	SenlabA		Outdoor	ABP	NaN %		0	

On activation, device must send a **join request or equivalent message** (depending of activation type)

- Network will answer with a join accept or equivalent message
- “RF Level” & “Last Message” columns will be updated

Name	DevEUI	Type	Version	Integration	Activation	RX Rate	Data Rate	RF Level	Last Message
Device 70B3D580A010373E	70B3D580A010373E	SenlabA		Outdoor	ABP	100 %	SF12	3	a few seconds

Device ACTIVATED if not empty

2. Device application start

After network activation, device will send application data

- Senlab device will first send a **Start** message with its current configuration
- Check application status into the device details page from the “Application” view

Name / devEUI

Device 70B3D580A010373E

70B3D580A010373E

87 %

Device STARTED if not empty

Type version

SenlabP 010300

→ Network Data

0

Application Configuration

Log Period

3 minutes

Tx Period

3 minutes

Integration type

Outdoor

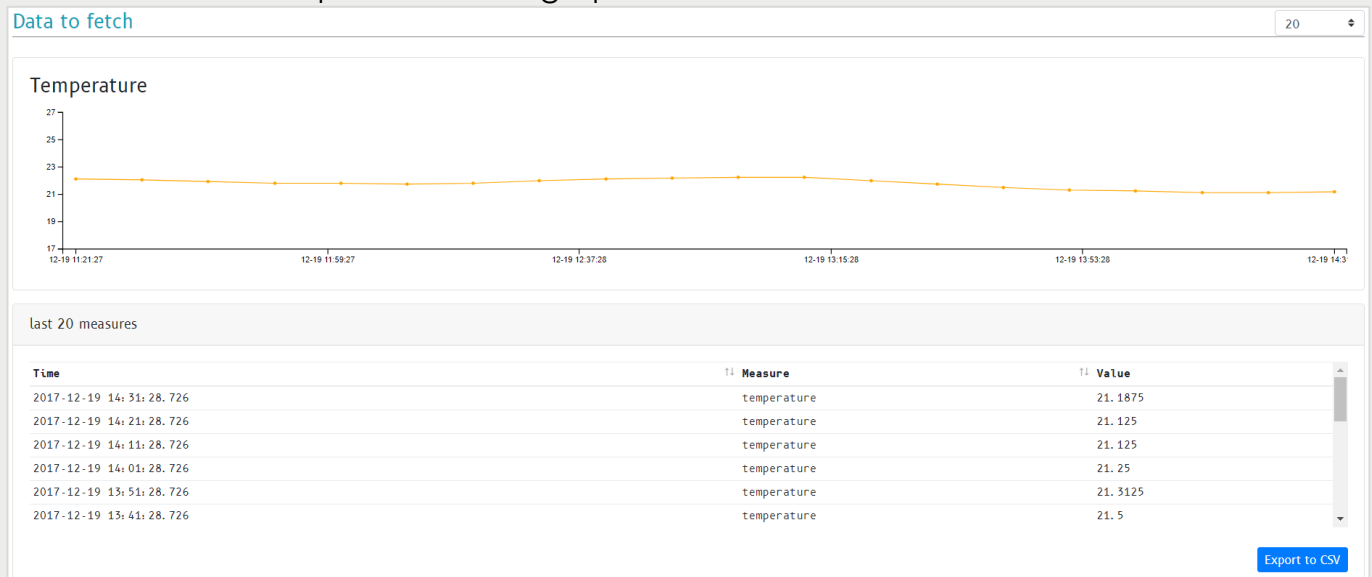
Redundancy

1

3. Device data transmission

Application data is accessible into the device details page from the “Application” view

- Last measure is displayed into the list of devices into the “Application” view
- Measures are presented via graphics & tables



- For non Senlab devices, received payload are available into the device details page from the “Network” view.

last 50 payloads

Time	Dir	Fport	Payload
2017-12-19 14:35:17.726	↑	3	01FD8165845801530200050307
2017-12-19 13:32:48.198	↑	3	01FD508458015C0909000202
2017-12-19 12:33:32.904	↑	3	01FD7D845801600602030005
2017-12-19 11:35:03.746	↑	3	01FD8158845801610303050500
2017-12-19 10:36:27.390	↑	3	01FD822C845801670204040604
2017-12-19 10:00:00.000	↑	3	81000701010101010101010101010101

Export to CSV

STEP 4: Device data access via APIs

The following APIs are available for recovering application data from SLgateway. More than one API type can be used at once but the Rest API is always available.

Rest API

SLgateway Rest API is natively available on all SLgateway.

Detail documentation is published online <http://sensing-labs.com/apis/rest>

- You will be able to select your language & see how to interface with the API.
- If you want to test easily the API with Postman tool, you can download the [API REST SLgateway V2 tools.zip](#) and follow README file instructions.
- All HTTP responses are encoding in GZIP

Request	URL	Description
DEVICE PROVISIONING		
PUT	com.sl.auth.server/AppV1.0/DEVICE	Add device with ABP/OTAA activation
DELETE	com.sl.auth.server/AppV1.0/DEVICE	Remove device
DEVICE STATUS		
GET	com.sl.application.server/V1.0	Get list of devices with activation status
GET	com.sl.application.server/V1.0/{{devEUI}}	Get device global status
PUT	com.sl.application.server/V1.0/{{devEUI}}?name=xxx	Set device name
GET	com.sl.application.server/V1.0/{{devEUI}}/{{applicationId}}	Get device application detail
SENLAB DATA ACCESS		
GET	com.sl.application.server/V1.0/{{devEUI}}/{{applicationId}}/{{measureId}}	Get device measureId values
GET	com.sl.application.server/V1.0/{{devEUI}}/{{applicationId}}/MEASURES	Get all device measures values
GET	com.sl.application.server/V1.0/{{devEUI}}/{{applicationId}}/EVENT/{{eventId}}	Get device eventId value
DEVICE DATA ACCESS		
GET	com.sl.application.server/V1.0/{{devEUI}}/{{applicationId}}/PAYLOAD_UP_HISTORY	Get device payloads hexadecimal values
SENLAB DOWNLINK OPERATION		
POST	com.sl.application.server/V1.0/{{devEUI}}/{{operationId}}	Send Senlab downlink request
DEVICE DOWNLINK REQUEST		
POST	com.sl.application.server/V1.0/{{devEUI}}/PAYLOAD_DOWN	Send device downlink request

HTTP Callback

“HTTP callback” service allows the SLgateway to push received data to an HTTP listener deployed onto your own server, in real time.

- Callback default format is json but you can choose xml by ending with #xml
- Content-encoding is **gzip**



2 types of callbacks can be configured:

- Data Callback notifies decoded data (measures/events) for Senlab devices only
- Payload Callback notifies hexadecimal payload for Senlab & non-Senlab devices

For HTTP Callback configuration, access to “Tools → HTTP Callback” page

1. Enter the callback URL you want to use (both if needed)

With default port (80)	http://192.168.1.68/callback
With specific port	http://192.168.1.68:8000/callback
In xml format	http://192.168.1.68:8000/callback#xml
With authentication	http://username:password@www.yourdomain.com/callback
With https	https://192.168.1.68:8000/callback

2. You can test the Callback URL accessibility using the button
3. Save configuration with button (modification will be applied in 30'' max)



We strongly advise to put the IP address of the HTTP listener server instead of the DNS name



To disable the callback function, just empty the form and click SAVE button

CSV to FTP

“CSV to FTP” service allows the SLgateway to push periodically all measures received since the previous transmission, in a CSV format, to a FTP/SFTP/FTPS server.

This service will notify only Senlab decoded data.

3 formats are proposed:

Format 1 : `siteID_YYYYMMDD'Thhmmss'Z'.csv`
`siteID;deviceID;timestampYYYY-MM-DD 'T'hh:mm:ss.sss 'Z';measureType;measureValue`

Format 2 : `siteID_AAAAMMJJ-HHMMSS.csv`
`siteID;measureID_deviceID;dataType;timestampJJ/JJ/AA hh:mm:ss;measureValue`

Format 3 : `siteID_YYYYMMDDhhmmss.csv`
`siteID;timestampYYYY-MM-DD 'T'hh:mm:ss 'Z';deviceID_measureType;measureValue`

Examples for Site ID “SITE_001”

Format1 « SITE_001_20170116T103000Z.csv »

```
SITE_001;70B3D580A0100190;2017-01-16T10:05:00Z;temperature;19.8
SITE_001;70B3D580A0100190;2017-01-16T10:05:00Z;humidity;38
SITE_001;70B3D580A0100439;2017-01-16T09:42:35Z;raw_index;10023
```

Format2 « SITE_001_20170116103000.csv »

```
SITE_001;2017-01-16T10:05:00Z;70B3D580A0100190_temperature;19.8
SITE_001;2017-01-16T10:05:00Z;70B3D580A0100190_humidity;38
SITE_001;2017-01-16T09:42:35Z;70B3D580A0100439_raw_index;10023
```

Format3 « SITE_001_20170116-103000.csv »

```
SITE_001;temperature_70B3D580A0100190;D;27/10/2016 10:05:00;19.8
SITE_001;humidity_70B3D580A0100190;I;27/10/2016 10:05:00;38
SITE_001;raw_index_70B3D580A0100439;I;27/10/2016 09:42:35;10023
```

For CSV to FTP configuration, access to “Tools → CSV to FTP” page

CSV to FTP

FTP Protocol

FTP Server

Port

Username

Password

path

ftp

192.168.2.1

21

your_username

empty for root directory

Site ID

CSV Format

Sent every [hours]

your_siteID

format 1

off

get last file



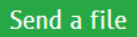
save

then

Test ftp connection

or

Send a file

- Enter your server configuration and validate with button 
 - Site ID can be used to identify your gateway ID
 - Periodicity off (Sent every (hours)) → Service deactivated
- Use button  to check the connection to your server
- Use button  to force the transmission of a csv file

Modbus API

“Modbus API” service allows the SLgateway to be exposed as a TCP Modbus slave.

In this mode, last payload & decoded data will be exposed into specific Modbus registers

- Modbus is not activated by default and next configuration must be done before
- Only the last received payload or decoded measures are exposed into Modbus registers, so you have to adapt your request period to the device transmission periodicity (minimum recommended 1 min)
- Data model structure:
 - `hx0000` to `hx00FF` are dedicated to the gateway data
 - For each device `YY` (Modbus address), a zone `hxYY00` to `hxYYFF` is reserved

For more details about Modbus API implementation, refer to the “Annex - Modbus API”.



This step must be executed only once devices are provisioned into the gateway, and anytime you change your device list.

For Modbus mapping configuration, access to “Tools → Modbus mapping” page.

Modbus mapping

Modbus Address	DevEUI	Name	New Modbus Address
0	70B3D580A010373E	Device 70B3D580A010373E	<input style="width: 100px;" type="text" value="0"/>

Download mapping
Auto map
Save

restart
back

Device with Modbus address "0" means that the device is not mapped to a Modbus address.

1. You can assign address manually (from 1 to 200) or call button Auto map to let the system assign them.
2. Valid the mapping with save
3. You can download in a csv file the current mapping with button Download mapping
4. To apply the new mapping, you have to restart Modbus service with button restart

Next step:

Once the Modbus API is well configured and activated on SLgateway, you can refer to the “

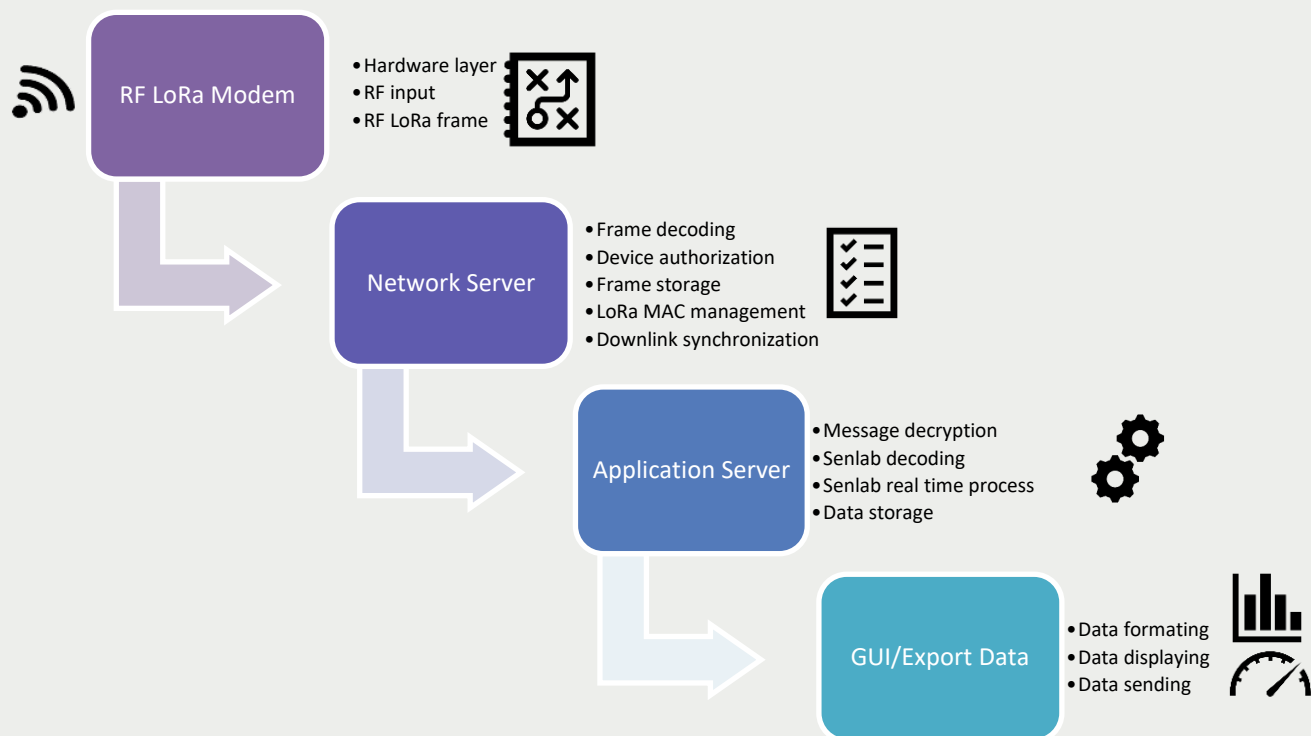
Annex - Modbus API" to find useful information to configure your Modbus software or PLC to get SLgateway Modbus data.

Troubleshooting

I don't succeed to activate my device onto the gateway

Keep in mind the following process of radio message reception to try to find where the issue comes from?

- You can activate real time "logs" (into "Maintenance→ Services" page) to observe received and sent frames when you try to activate your device



I have forgotten the current IP network gateway configuration

You can access to a permanent Ethernet interface of the gateway by using a USB cable.

- You need:
 - ✓ a "Type A to mini-B USB cable"
 - ✓ To install USB/virtual Ethernet driver:

OS

Link for driver

Windows 64 bits [Download here](#)

Windows 32 bits [Download here](#)

MacOSX

[Download 1 here](#) and [Download 2 here](#) and read help [here](#)

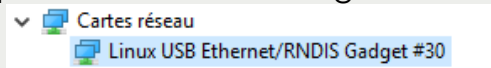


- ✓ In some cases, you would need to set your local emulated ethernet IPv4 to 192.168.7.1 (sub network 255.255.255.0).

Adresse IP :	192 . 168 . 7 . 1
Masque de sous-réseau :	255 . 255 . 255 . 0
Passerelle par défaut :	. . .

Follow this process:

1. Turn ON the SLgateway (with power supply plug)
2. Wait for the 2 leds blinking (under LoRa antenna)
3. Plug the USB cable between computer and gateway
4. Wait for Linux USB ethernet / RNDIS connection into your computer network configuration (driver self-extracting)
5. Access to <http://192.168.7.2> with your internet browser and check your IP network configuration into "Maintenance → System" page



I have forgotten the user and/or password to access to the GUI

You to follow the process describe in FAQ page [here](#) to restore "public/public" access.

Do you have any other questions?

You can check FAQ page [here](#) and read useful answers.

How to get technical support?

More information (tutorials, FAQ, document, news), are available on the SLgateway V2 support site <http://support.sensing-labs.com/slgateway-v2>

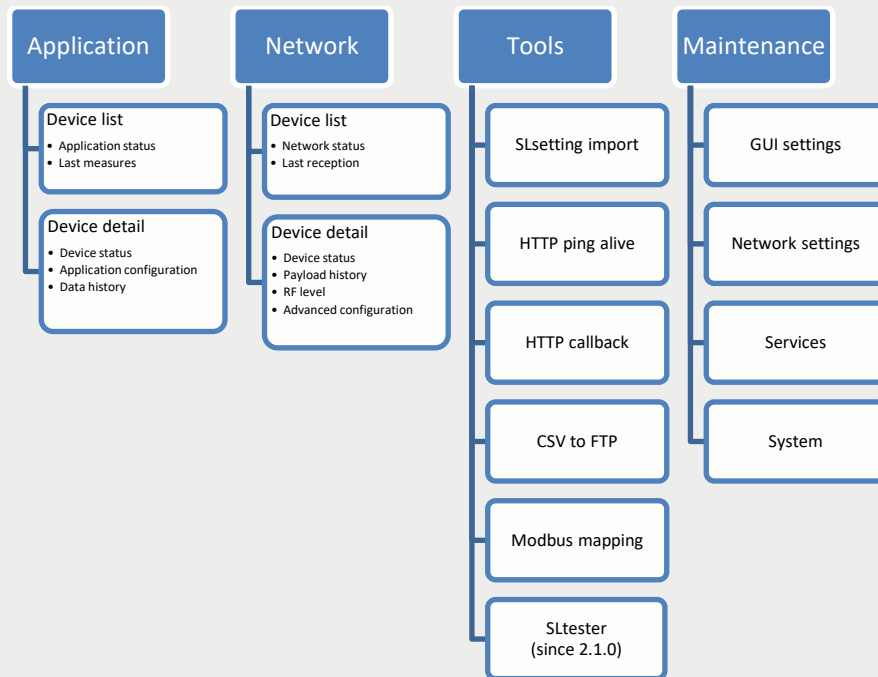
- You will have to register first [here](#)
- If you have as specific question, or doesn't found the solution to an issue, please create an online ticket [here](#)



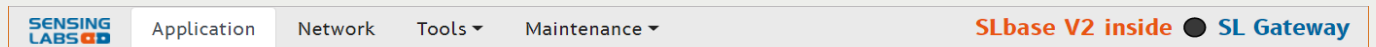
Thank you for given maximum information about the issue to get a faster response from support (services logs, device ID / type, APIs configuration / Remote access support)

Annex - GUI

GUI structure



Header contains the global menu to access to all pages and displays the gateway friendly name.



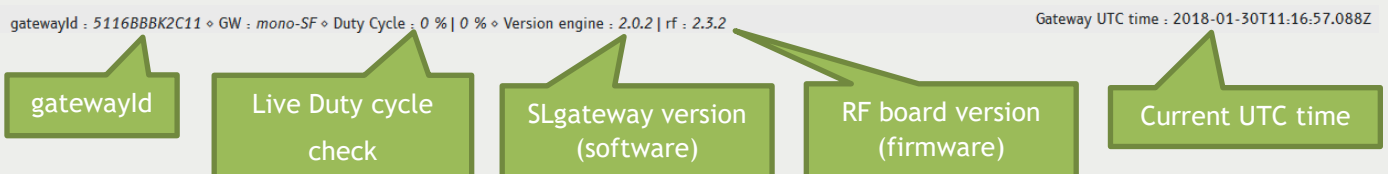
Footer indicates:

- ✓ The unique identifier of the gateway "gatewayId":
 - For picoGW, ID is written onto the back label (last 10 digits at the end of BBB line)
 - For mtcDt, ID is written onto the back label (Node ID line)
- ✓ The last hour Duty Cycle counter (%)
- ✓ The version of the engine (also called SLgateway version)
- ✓ The Radio Frequency Board Firmware version
- ✓ The current gateway UTC time.



All this information can be useful when you ask for technical support

You can follow



Application – device list


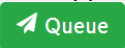
This page gives an overview of application status for all device:

The screenshot shows the 'Application' tab in the Sensing Labs SLgateway interface. At the top, there are navigation tabs: Application, Network, Tools, and Maintenance. A 'Demo' button and 'SLGateway' label are on the right. Below the tabs, there's a 'Rows' dropdown set to 20, a 'Filter' input field with a callout 'Filter on all columns', and a 'Refresh' button set to 5 min with a callout 'Take care if the connection is GPRS/3G'. The main table has columns: Name, Type, DevEUI, Battery, Measures, and Last Reception Frame. The table lists several devices, including 'Demo THY' and 'Device 70B3D580A01034C2'. Callouts point to the 'Name' column as 'Friendly name', the 'Type' column as 'Application Type (automatically detected for Senlab / Unknown for other)', and the 'Measures' column as 'Last received measures (if there is)'. At the bottom, there's a status bar with 'HWID : 3416BBBK0644', 'GW : mono-SF', and 'Gateway UTC time : 2017-11-15T14:55:01.472Z'.

- Click on a “device row” to access to device application detail
- For “Unknown” application Type, you will be redirect to device network detail

Application – device detail

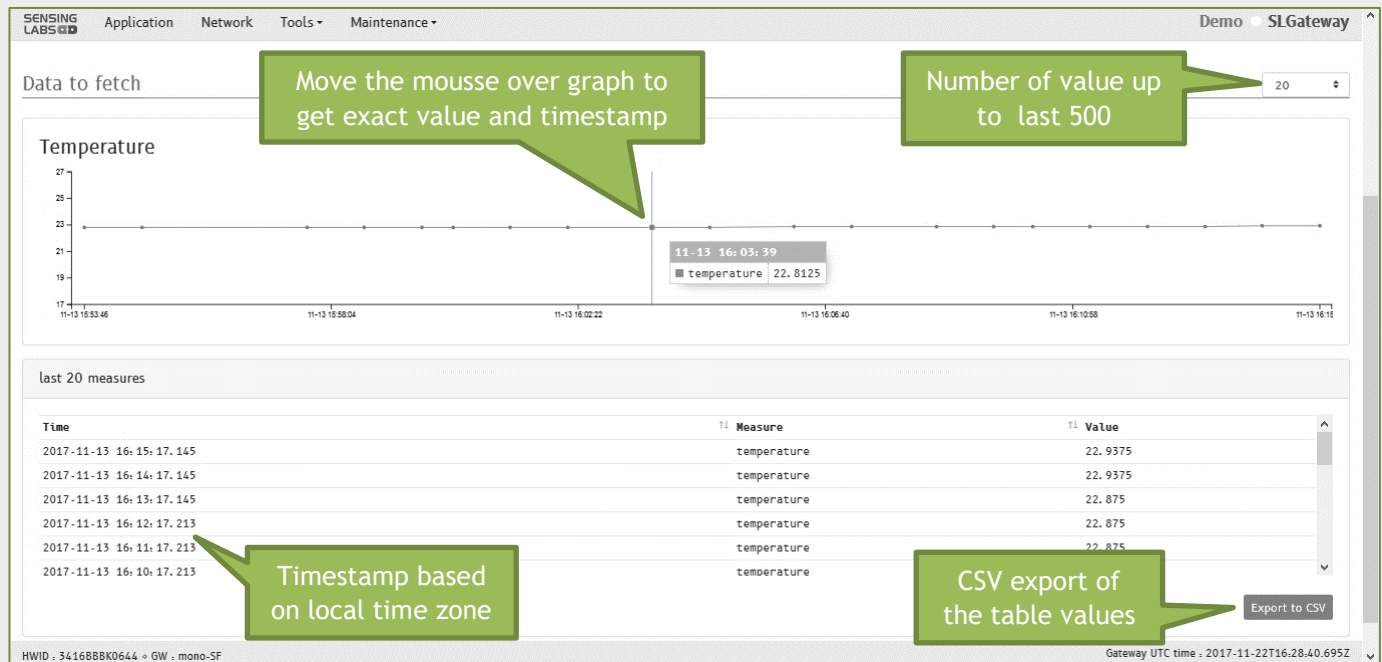
The screenshot shows the 'Device detail' page for device '70B3D580A01034C2'. The page displays the device name, DevEUI, battery level (98%), and current temperature (22.93 °C). There are callouts for 'Device application status recall', 'current application configuration', 'Shortcut to device network detail', and 'Edit configuration'. The page also shows 'Log Period 1 minutes', 'Tx Period 3 minutes', and 'Integration type Outdoor'. A 'Queue' button is visible at the bottom right.

- to Edit application configuration, click on button 
 - Configuration field depends on application Type
 - Send the new configuration with button 



New configuration will be transmit as soon as new uplink message will be received.
You can follow downlink status into Network detail page.

- Data history are visible into a graphical & a table



Network – device list

This page gives an overview of network status for all device:

The screenshot shows the 'Network' tab with a table of device network status. Callouts highlight: 'Filter on all columns' (pointing to the search bar), 'Take care if the connection is GPRS/3G' (pointing to the 'Type' column), and three specific metrics: 'Senlab Firmware version' (pointing to 'Version'), 'Reception rate (based on up counter)' (pointing to 'RX Rate'), and 'Radio link quality' (pointing to 'RF Level').

Name	Type	Version	DevEUI	Type	RX Rate	Data Rate	RF Level	Last Frame
4E09	SenlabH	010332	BB5E1A005E1A4E09	ABP	99.37 %	SF7	87.0%	3 minutes
18b8	SenlabP	010300	70B3D580A01018B8	OTAA	98.22 %	SF12	89.0%	a few seconds
Device 70B3D580A0000001	Unknown		70B3D580A0000001	OTAA	NaN %		0%	
Device 70B3D580A0100FDF	SenlabV	010300	70B3D580A0100FDF	ABP	98 %	SF12	49.0%	a minute
Device 70B3D580A0100FF7	SenlabT	010220	70B3D580A0100FF7	OTAA	92.86 %	SF12	80.0%	2 months
Device 70B3D580A010059A	SenlabT	010223	70B3D580A010059A	OTAA	100 %	SF12	85.0%	2 months
EC0	SenlabM	010331	70B3D580A0100EC0	ABP	99.72 %	SF7	97.0%	a few seconds

- Click on a "device row" to access to device network detail

Network – device detail

➤ Device status

Name / devEUI / devAddress

Device 70B3D580A010373E

70B3D580A010373E
A010373E

RF Level Advanced settings

Type version
SenlabP 010300

→ Application Data

Link to down page informations

Shortcut to device application detail

➤ 50 last Payload history

last 50 payloads

Time	Dir	Fport	Payload
2017-12-14 10:37:50.797	↑	2	82028213813400000000
2017-12-14 10:35:23.651	↓	2	0200
2017-12-14 10:35:22.461	↑	3	02FE59813400000000
2017-12-14 10:32:29.439	↑	3	02FE60813400000000
2017-12-14 10:29:17.396	↑	3	02FE54813400000000

Timestamp based on local time zone

Frame direction
Uplink: from device to gw
Downlink: from gw to device

CSV export of the table values

Export to CSV

➤ RF level history

Network level over the last 50 messages

Green: RSSI
Blue: Signal Noise Rate
Orange: cumulated RSSI + SNR

Network data over the last 50 messages

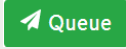
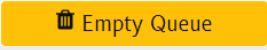
Time	Dir	FCnt	F0pts	Fport	SF	Freq	RSSI	LSNR
2017-12-14 10:45:15.924	↑	348		3	SF12BW125	868.1	-99	6
2017-12-14 10:42:47.520	↑	347		3	SF12BW125	868.3	-103	7
2017-12-14 10:40:19.110	↑	346		3	SF12BW125	868.1	-98	6
2017-12-14 10:37:50.797	↑	345		2	SF12BW125	868.3	-102	7
2017-12-14 10:35:22.461	↑	344		3	SF12BW125	868.3	-124	-5
2017-12-14 10:32:29.439	↑	343		3	SF12BW125	868.3	-112	1

Timestamp based on local time zone

CSV export of the table values

Export to CSV

Refer to RF LEVEL RESULT INTERPRETATION section for interpretation of RF level data.

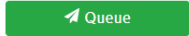
- Downlink frame can be send to device
 - Send the hexadecimal payload with button 
 - Sending status can be follow into bloc "Downlink queue"
 - Waiting for uplink frame / Sent to device / Success / Failed
 - You can remove all "Not sent" frame using button 

Send a raw payload

Port

2

Payload



New configuration will be transmit to device when next uplink message will be received


Downlink queue

Last sent payload

Last down frame status

Wait for uplink frame

Port	Payload
2	0107010100960070020096002509004b



- Advanced settings display expert information of Network, Application & Commissioning part

Technical info

Network

FCnt Up

352

FCnt Down

8

RX1 Delay

3 s

ADR

false

Last message

2017-12-14T09:56:25

Rate

SF12

Freq

868.3

RSSI

-103

LSNR

7

Application

Restart message timestamp

2017-12-13 17:41:28 / 17 hours

Missed message

162

Total message

352

Reception Rate

53.98 %

Log Period

3 minutes

Tx Period

3 minutes

Integration type

Outdoor

Commissioning

DevEUI

70B3D580A010373E

devAddress

A010373E

Mode

ABP

netId


AA5E1A


Network Session Key

A4610020982B95C21249ADDA6FE28D19


Application Session Key

A289B2DCDE76EB1C3479EEBF49972AE3





Changing advanced configuration can break the link with device. Take care before changing it!

- You can change friendly name using button 
- Network advanced configuration must not be changed (only for experts)



Any bad setting in Network advanced configuration can definitely lost the connection with device.

Tools - HTTP Ping alive

HTTP Ping alive allows you to be notify periodically of the current IP of your gateway

- An HTTP(S) PUT Request will be done with parameters ipAddress & gatewayId

1. Enter your URL configuration and validate with button
 - a. Periodicity off (Every (hours)) → Service deactivated
2. Use button to check the connection to your server

Tools – SLtester (since 2.1.0)

SLtester allows to test your local LoRaWAN network coverage with high reliability.

Why using SLtester ?

- Radio Range validation before deployment
- Same RF performance as deployment site
- Devices and gateway position validation
- Indoor and/or Outdoor test devices
- Simple status interpretation

If you get the package SLtester kit:

- You can register your mobile phone to receive each test status in live by SMS
- Your Senlab Test device(s) are already associated with the gateway
- Test can be made in standalone mode (no need to access to GUI during test)



You need to get at least one Senlab Test device(s) to make test coverage. Contact us if needed.
You need to be sure your Test device is not already registered into another SLgateway.



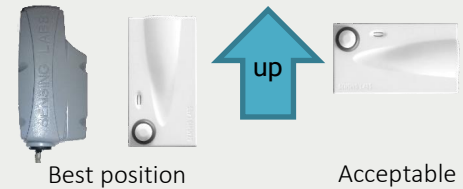
STEPS to follow for making a test session (without SMS option)?

1. Install your gateway
 - ✓ Respect installation recommendation
 - ✓ Turn it ON (with power supply) and wait for starting (1min)
2. Access to "Tools → SLTester" page to add your Test device
 - ✓ The Senlab ID is on the front sticker of the device casing
 - ✓ At the end of the Test session, Test device must be removed and RESET



3. Position your Senlab Test device at the expected location (*without holding the device with hand*)

- ✓ Prefer vertical position (antenna part upwards) in a free space area (higher place if possible)
- ✓ Avoid positioning the Senlab Test device against a metallic element



4. Press the device push button 2 seconds (until LED starts blinking)
- ✓ Wait for 20 seconds during range test processing (LED blinking)
5. Check Quality level on "SLtester" page

Senlab ID [devAddress]	Test	Quality	Date / Time
A0100C01	1	fair	2018-03-21 16:09:18

- ✓ If level is **GOOD** → **you can go to the next place test** and start from step 5
- ✓ If level is **FAIR** → you **can try to improve the sensor position** and **launch a new test point** and start from step 5
- ✓ If level is **BAD** → **you have to improve the gateway position** and **launch a new TEST session from the beginning** (step 1)



- ✓ If Senlab LED blinking doesn't finished by 2" ON or if you didn't receive the TEST status -> TEST status has to be considered **BAD**
- ✓ If you received a **BAD** status, it's recommended to launch a new TEST to confirm the result
- ✓ The gateway must be kept in the same position during all this test session.

Using SLtester collecting field form is recommended for an easy coupling of location and quality, for each Test in a single document.

1. Describe the exact place and position of the SLgateway in top part of the "SLtester collecting field form".

SENSING LABS		SL tester collecting field form	
People (name/company)	Sam J. / XXXX corp		
Date	22 march 2018		
Site name	Sam J. / XXXX corp		
Test Environment (inside, outside, weather)	Outside, raining		
Gateway environment (location, position, antenna)	SW on top of Bob's desktop Classic antennas		

2. For each test, fill a new line table with
- ✓ *Test Location (more precise is better)*
 - ✓ *Time for easy post-processing interpretation*
 - ✓ *Test device ID (devAddress printed onto the device)*
 - ✓ *Test Number & Quality level (appears in the report page)*

Tests Location (description)	Time	DevAddr		Test ID	Quality
		3C03 Senlab INDOOR	186A Senlab OUTDOOR		
Corner north/west of parking	15:06	X		4	Fair
2 meters from main door	15:07		X	5	Good
Building 2 : 4st floor (room 45)	15:24	X		6	Good
Top of the door (indoor side)	15:25		X	7	Good
Cross "paradise street" and "jones street"	15:43	X		8	Bad
Under the tree	15:44		X	9	Fair

Senlab Test device location

Test NUM (= Test ID)

For **OUTDOOR RANGE TEST**, we recommend to use a **GPS tracking tool**



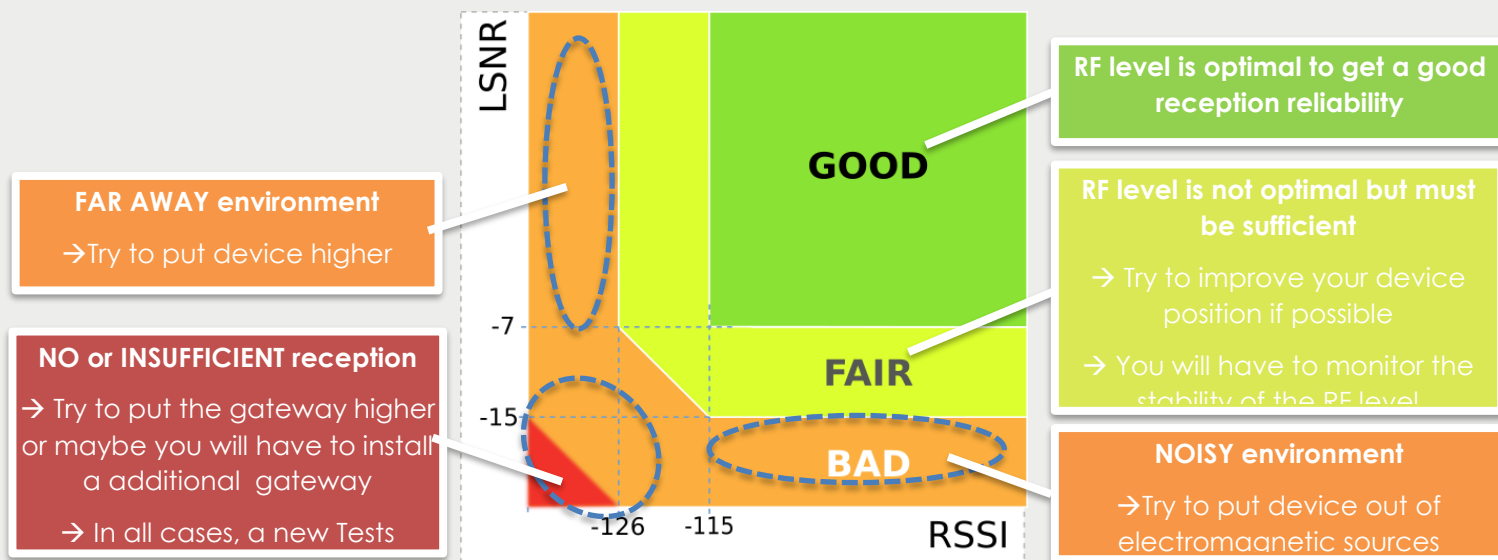
You can use the Android free app "[Quick Position Save](#)" with this process :

- Name the point with Test number
- Export kmz file at the end of the TEST session
- Display GPS point on a map and associate to Test points

RF LEVEL RESULT INTERPRETATION

Into "Tools → SLTester" page, select your Test Senlab ID to filter results for this ID

- **A Quick interpretation status is indicated based** on multiples uplink and downlink received level during each Test point.



- **Details RF levels for each Test point are** available into bottom part.

Senlab ID [devAddress]	Test	#	dtr	RF Level	freq	rssl	lsnr	Date / Time
A01029CB	5	2	↑	46.0	868.5	-79	8	2018-03-16 16:43:38
A01029CB	5	1	↓	30.0	868.3	-96	8	2018-03-16 16:43:38
A01029CB	5	1	↑	48.0	868.3	-77	9	2018-03-16 16:43:34
A01029CB	5	0	↓	44.0	868.1	-81	8	2018-03-16 16:43:34
A01029CB	5	0	↑	49.0	868.1	-76	7	2018-03-16 16:43:30

Frame #ID for a given Test

Uplink: from device to gw
Downlink: from gw to device

RSSI and LSNR level

- **You can export table result with** [Export details to CSV](#) to process them with your own tools.



- ✓ Don't change the friendly name of Senlab Test device
- ✓ If you want to remove a Test device from your gateway (Network tab), you will have to RESET it before the association with another gateway → Keep the magnet 20'' until LED stay ON 5''

Maintenance - Network settings

You can customize the LoRaWan **appEUI** and **netID** code for your local radio network from “Maintenance → Network Settings” page

- Be sure you have your own LoRaWan alliance codes to use them.

Network settings

appEUI

70B3D580A0000000

netID

AA5E1A

← back

Save



New network configuration will be applied to new devices only

You can check the **network type**: PUBLIC (by default) or PRIVATE and the **current channels** of the gateway (frequency, bandwidth, Spread Factor).

- These parameters can be customized by uploading of a new config file.
For any other configuration, please please create an online ticket [here](#)
- This screen is only available since SLgateway v2.0.2

Frequency Plan

Network mode

Public

Current Channels

Freq	Bandwidth	Spread Factor
868.1 MHz	125 KHz	mono
868.3 MHz	125 KHz	mono
868.5 MHz	125 KHz	mono

Upload a new config

No file chosen

Choose File




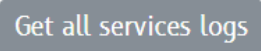
← back



These parameters need to be changed only before a new installation (communication with previous attached devices will be lost).

Maintenance - Services

The “Maintenance → Services” page give status of SLbase services



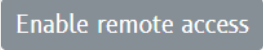
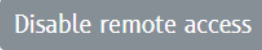
- In case of trouble, you can check if they are active and the uptime.
- “Logging” bloc allows you to redirect services logs to a graylog server instance
 - Refer <https://www.graylog.org/> for more details
- “Network & Applications logs” allows to see in real time services logs
 - Use buttons    to activate them
 - You can also download logs to send them to support with button 



We recommend you to let the default “Logging – console level” configuration

Maintenance - System

In addition, with “IP network” & “GSM configuration”, the bloc “Support remote access” in page “Maintenance → System” allows you to activate remote access for support investigation:

1. Buttons   will activate/deactivate the remote access until the next gateway reboot
2. Buttons   will register/unregister the remote access when gateway is turn ON.

Annex - Modbus API

In version Modbus API v1.1, only Modbus over TCP/IP is supported.

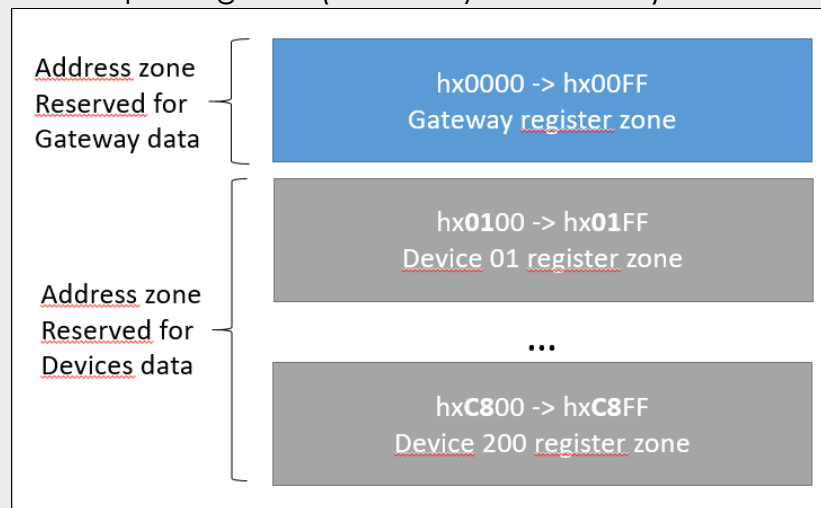
Default configuration

Slave address	1
Port	502
Modbus Mode	TCP/IP

Data model structure

Data model is separated into address zone to manage independently the gateway specific information and data for each device:

- hx0000 to hx00FF are dedicated to the gateway data
- For each device, a zone hxYY00 to hxYYFF is reserved
- h prefix information refers to one of the four Modbus register types:
 - 1 for coils (read /write bit data)
 - 2 for discrete inputs (read only bit data)
 - 3 for holding registers (read/write word data)
 - 4 for input registers (read only word data)



- ✓ Each device register zone contains specific sub zone to separate device description information: device measure data, device event data, and device parameter data (YY in hex)
- ✓ Refers to “Modbus Register Table” section to see specific interpretation

Resource format

Except if mentioned, all device data are coded into one of the following format and processed as MSB first byte array.

- ✓ INT_16 : signed integer value on 16 bits
- ✓ UINT_16 : unsigned integer value on 16 bits
- ✓ INT_32: signed integer value on 32 bits
- ✓ UINT_32 : unsigned integer value on 32 bits
- ✓ UINT_64 : unsigned integer value on 64 bits
- ✓ FLOAT_32: Real value (IEEE 754 floating-point "single format" bit layout)
- ✓ BOOL : boolean (0 is false, 1 is true) information on 1 bit
- ✓ INV_BOOL : boolean (1 is false, 0 is true) information on 1 bit
- ✓ Enum : set of bits (correspondence between the bits values and the applicative meaning must be done using the device user guide.
- ✓ ASCII : String in ASCII code. The number of character is specified. When ASCII string are not full, they are completed with null bytes.
- ✓ HEX : String in hexadecimal format. The number of bytes is specified. When Hexadecimal string are not full, they are completed with null bytes.
- ✓ TIMESTAMPS : number of sec or ms (depend of the version) since the 1st jan of 1970 at 00h00 and the event on 64 bits :
 - (sec) for v2.0.0 to v2.0.2
 - (ms) for v1 and v2.1.x and later

Supported Modbus command

The SLgateway Modbus supports the following Modbus commands, dependant from the register address (in decimal):

- ✓ 2- Read multiple discrete inputs (read n bits)
- ✓ 3 - Read multiple holding registers (read/write n words)
- ✓ 4 - Read multiple input registers (read only n word)
- ✓ 16 - Write multiple holding registers (n words)

Modbus Register Table

Modbus Register table is published online and automatically updated when new Senlab version is available.

- <http://sensing-labs.com/apis/modbus>

Legals

SENSING LABS SAS reserves the right to make corrections, modifications, enhancements, improvements and other changes to its products and services at any time and to discontinue any product or service without notice.

SENSING LABS products is not authorized for use in safety-critical applications (such as life support) where a failure of the product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use.

Buyers confirm that they have all necessary expertise in the safety and regulatory ramifications of their applications, acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of the product in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by SENSING LABS SAS.

© 2018 SENSING LABS SAS. All rights reserved. Sensing Labs logo, are registered trademarks of SENSING LABS SAS. All other brands and product names mentioned in this document are the property of their respective holders.
This is a non-contractual document and specifications are subject to change at any time without notice.

For more information about this software:
website - <http://www.sensing-labs.com>
Support – <http://support.sensing-labs.com>

Headquarters:
SENSING LABS SAS.
CAP OMEGA,
rond point Benjamin Franklin
34960 Montpellier cedex 02 – France

