Sensoterra
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Sensor Integration Guide

Version 1.1

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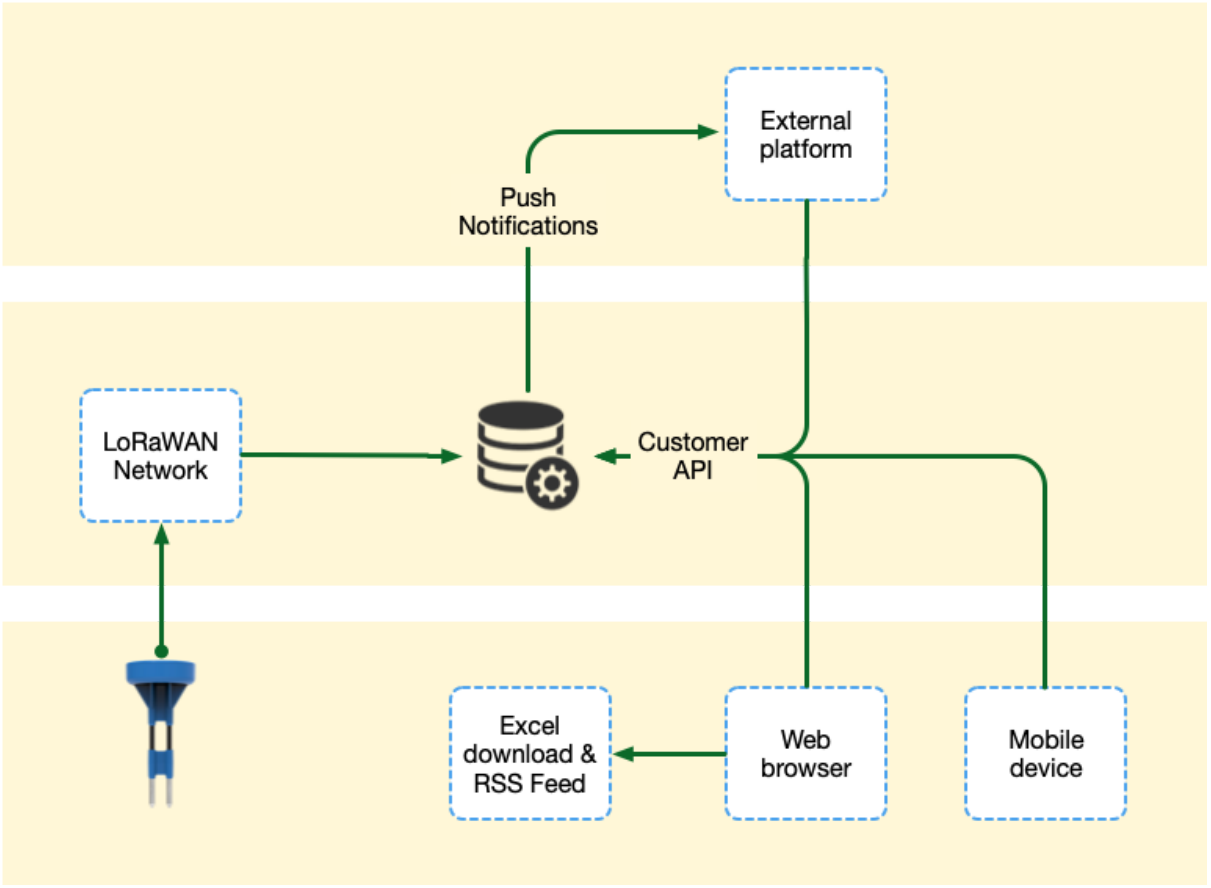
Introduction

This document describes how you can integrate Sensoterra sensors into your own environment. This can be as simple as downloading an Excel with all soil moisture data up to using the Sensoterra Customer API to fully control your or your customers' sensors.

Intended audience are Sensoterra customers and resellers who want to integrate the Sensoterra sensors into other applications.

Overview



Data flow is as follows:

- Sensor measurements are processed by the LoRaWAN Network which Sensoterra typically provides. All data is stored in a central database operated by Sensoterra.
- Sensor configuration and measurements are accessible by a Customer API. This API is used by the Sensoterra Android & iOS apps and by the web site monitor.sensoterra.com.

- Measurements can be downloaded from the website as an Excel file. A GeoRSS feed is also offered with all the latest sensor data.
- Exceptions like soil too dry/wet can be sent by mail or pushed directly to your mobile device.
- Measurements can be pushed in real time into an external platform. This is strongly preferred over polling the API.

In some cases the LoRaWAN network is not managed by Sensoterra or its partners, but by the customer or a third party supplier. Please consult the “Network integration guide” on how to integrate such a network with the Sensoterra sensors and infrastructure.

Customer API

The API is intended for:

- Sensoterra Android and iOS apps
- Sensoterra customer site
- External platform integration

This API is a RESTful webservice using JSON as the message format. The API can be used for various management tasks like:

- Account creation
- Sensor registration
- Get all sensor data
- Download Excel
- Location management
- etc.

Documentation

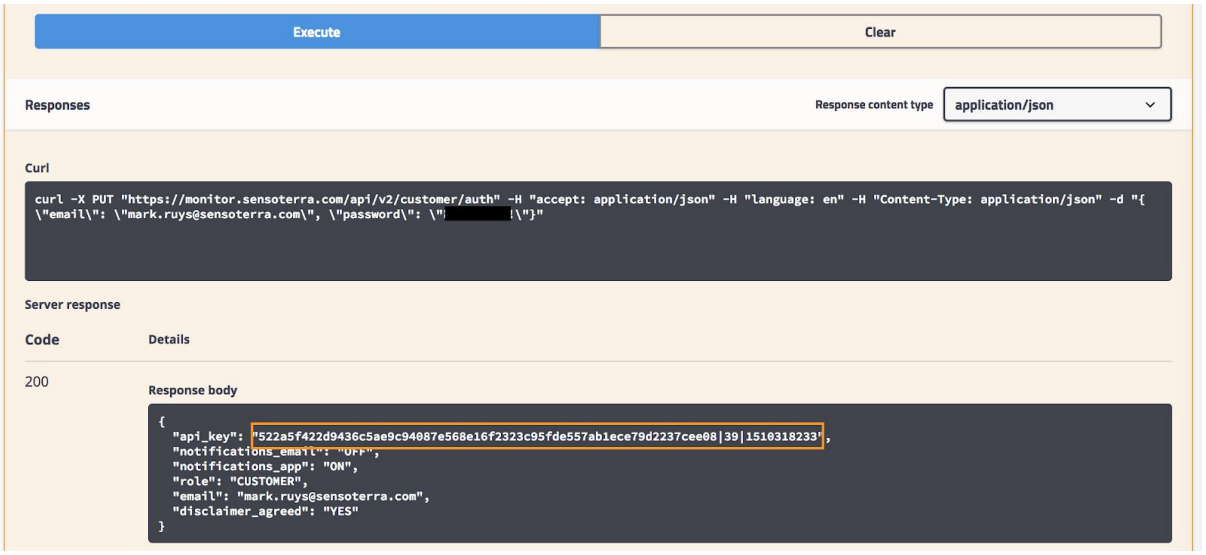
The customer API documentation can be found at https://monitor.sensoterra.com/api/v3/.

To test drive the API, the documentation can be used. Preparation:

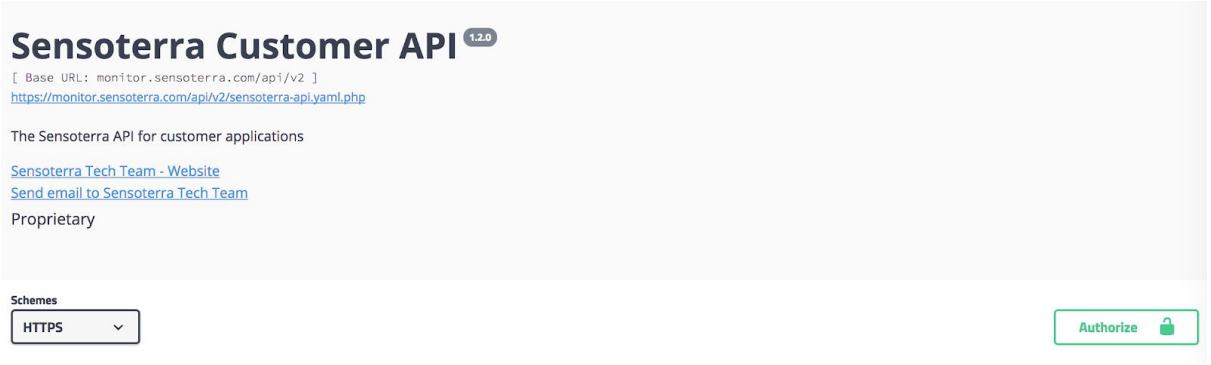
1. Create an account in the Sensoterra app (can be done in the API too).
2. Get a temporary API key in the API
3. Authorize the API with this key

To get a temporary API key, use the Customer Auth PUT call, click on “Try it out” and fill in your credentials:

Press “Execute” to get the key:



Click on “Authorize” to paste in the API key.



From now on, all API calls are performed in the selected account.

Security

Although the API does not reveal privacy sensitive data, it does contain sensitive business data as the geolocation of sensors, soil type, and historical soil moisture data. Therefore, the API is protected through a series of security measures.

Encryption

All communication to the servers providing the API is encrypted by TLS. Qualys Labs rates the encryption at the highest A+ level.

Authentication

The Sensoterra Customer API is protected by dynamic token authentication. To get access to the API the user requests a security token by handing over its username (typically email address) and password. After the credentials are verified the customer receives a token. For each API request, the user must add the token. A token has a limited lifetime of 30 minutes.

Authorisation

The API provides three different access levels:

1. Customers
2. Resellers
3. Partners

A customer only has access to their own data. A reseller has access to all data of all their customers. A partner is a reseller with read only access.

Server push notifications

Sensor owners (customers) and/or their resellers can implement an endpoint to receive real time push notifications of each sensor reading processed by Sensoterra.

Server push notifications use the standardized SenML format. The customer sets up an endpoint to which the SenML measurements are sent.

Format

Measurements adhere to the formal SenML specifications. We use JSON as the message format. An example of two soil measurements at 3:17pm and 2:17pm is:

```
[
  {
       "bver": 3, "bn": "urn:dev:mac:0024befffe804ff0_18000125819",
       "u": "rssi", "v": -116,
       "bt": 1505747862
  },
  { "u": "lat", "v": 52.5495116 },
  { "u": "lon", "v": 5.6128824 },
  { "u": "%EL", "v": 100 },
  { "u": "%vol", "v": 32.3, "depth": 30, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 32.0, "depth": 30, "soil": "SAND", "ut": 5400, "t": -3600 },
]
```

This encodes the following measurements:

- Sensor serial number is 18000125819 and DevEUI 0024befffe804ff0[1]
- At 18 September 2017 15:17:42 (basetime 1505747862) we have:
    - Radio signal strength (RSSI) of -116 dBm
    - Geolocation sensor of 52.5495116, 5.6128824
    - Soil moisture in sand of 32.3% at a depth of 30 cm
    - We expect the next value within an hour and a half
- At 18 September 2017 14:17:42 (time -3600) we have:
    - Soil moisture in sand of 32.0% at a depth of 30 cm

An example of a multi depth reading is:

```
[
  {
       "bver": 3, "bn": "urn:dev:mac:0024befffe804ff1_24000125828",
```

[1] Customers created before 2019-10-14 will have only the serial number as basename. Please contact support if you want to add the DevEUI to the SenML basename as shown in the example.

```
      "u": "rssi", "v": -116,
      "bt": 1505747862
  },
  { "u": "lat", "v": 52.5495116 },
  { "u": "lon", "v": 5.6128824 },
  { "u": "%EL", "v": 100 },
  { "u": "%vol", "v": 32.3, "depth": 10, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 32.0, "depth": 20, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 30.0, "depth": 30, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 28.0, "depth": 45, "soil": "SAND", "ut": 5400 },
  { "u": "%vol", "v": 32.1, "depth": 60, "soil": "CLAY", "ut": 5400 },
  { "u": "%vol", "v": 32.9, "depth": 90, "soil": "CLAY", "ut": 5400 },
  { "u": "Cel", "v": 16.9, "depth": 15 }
]
```


Notes:

- Part of the Base Name (“bn”) is the sensor serial number (as seen on the QR code label).
- The basetime (“bt”) is in Unix timestamps from 1970-1-1 in UTC and contains the date/time of the measurement.
- The following sensor values are supported (depending on the sensor model):

Unit	*Meaning*
%vol	Soil moisture content at a certain depth/soil type
Cel	Temperature in degree Celsius at a certain depth
%EL	Battery energy level based on voltage (0% = empty, 100% = full)
lat	Sensor latitude
lon	Sensor longitude
rssi	Radio signal strength, higher is better
esp	Estimated signal power, higher is better

For more details on SenML, please check https://tools.ietf.org/html/draft-ietf-core-senml-10.

Customer endpoint

When the customer has its endpoint in place, please contact support@sensoterra.com in order to let your sensor measurements delivered. Typically an endpoint will be some web service which accepts POST data. The content type is “application/senml+json”. Basic authentication or an optional header can be configured at request.

Testing

For testing, Sensoterra can set up a mail forward of SenML data to the customer. Please contact support@sensoterra.com to set it up.

Expiration

If a notification delivery times out, the measurements will be offered again to the end point, until the delivery succeeds, or after 35 hours when the measurements expires.

Hosting

Sensoterra production servers are spread over data centers in Amsterdam, the Netherlands, and Frankfurt, Germany. These data centers are operated by TelecityGroup and Interxion respectively and ISO/IEC 27001:2013 and PCI-DSS certified.