USER MANUAL

Cloud BOX

Micro Scada
Industrial IoT BOX

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Date	***Revision***	***Notes***
06/10/2016	100	First revision.
24/02/2017	101	Aligned to Cloudbox rev 1.0.8
15/03/2017	102	Changed firmware update chapter
20/02/2018	103	Changed upper title
06/03/2018	104	Added support to model “C” Upgraded to 5000tags/200 devices for Model “C”
08/03/2018	105	Added info on Chapter 4
22/10/2018	106	Cloudbox V2
27/02/2019	107	Disk usage and API specification
11/04/2019	108	New Email/Telegram templates, Virtual Devices, new append command on integration api
09/03/2021	109	Updated requirements for VMWare

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Seneca Cloud BOX

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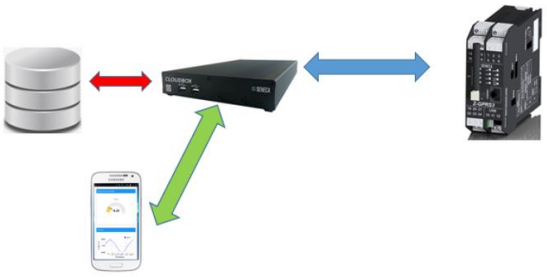
1.1 Software Open Source

The Cloud Box software and firmware contain open source software. You can get the source code of such software by requesting them via email to support@seneca.it.

2 Introduction

Cloud BOX is a server that allows you to:

- *Receive, store on a database and display the RTU events and data*
- *View real-time and historical data on web pages in graphic mode*
- *View the realtime and historical events / alarms on web pages in graphic mode*
- *Send commands to the RTU even if these do not have a static IP*



2.1 Compatible Devices

Device
Z-GPRS3, Z-LOGGER3, Z-UMTS, MyAlarm3, Z-PASS, Z-PASS2

The number of compatible devices is constantly increasing. For more information contact the SENECA technical service.

2.2 Hardware specifications (model "C")

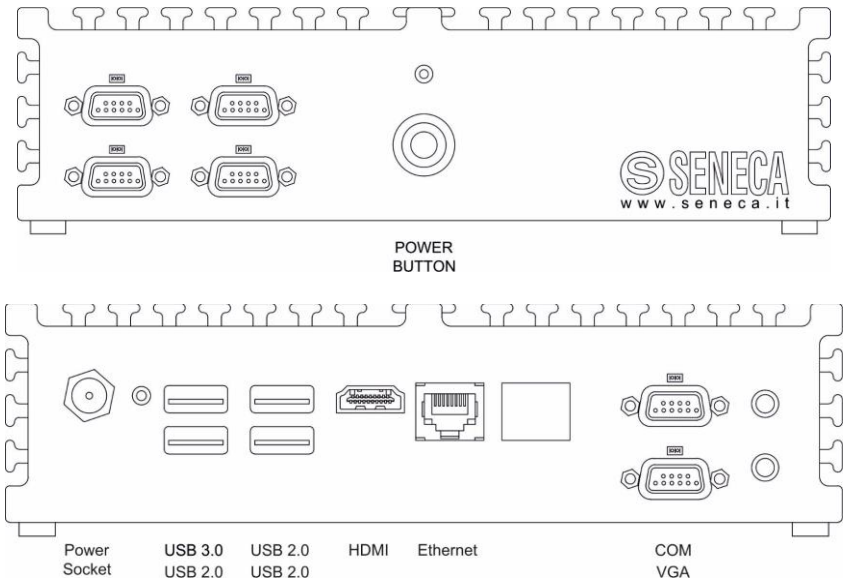
Type of device	**Industrial server**
Motherboard Form Factor	Mini-ITX
Cooling	Passive (fanless)
USB	3 x USB 2.0
	1 x USB 3.0
Other	1 VGA
	1 HDMI
	1 Gb LAN
	1 Jack DC
Processor	Intel Celeron J1900
Processor speed	2.00 – 2.42 GHz

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Number of cores	4
Type of memory	DDR3 SO-DIMM
Amount of memory	4 GB 1333MHz
Supply connector	Jack DC Onboard
Operating temperature	0°C ~ 40°C
Dimensions (WxHxD)	165 x 185 x 48 mm (DxWxH)
Certifications	CE, FCC, RoHS
Storage	64 GB SSD Drive

3 Cloud BOX Installation

3.1 Front/Rear (Model "C")



3.2 Installation

To install Cloud BOX, proceed as follows: place the server horizontally, resting it on a flat surface or with the brackets that make it attachable to a wall (supplied in the package).

Connect the power supply (on the round plug of the back) and the network cable. The device doesn't need keyboard or mouse, these are only necessary in case of maintenance and can therefore be left unconnected.

Boot the device with the front power button, no further settings are needed to the device.

CAUTION: Cloud Box is a server device, so it is necessary that the switch off it's make in a correct way, without lifting the power when the server is turned on. It's recommended, therefore, to connect an electrical device such as a UPS rescue to prevent surges and / or power blackout.

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Shutdown it's make through the front button that must be pressed once briefly, the long press of the button makes the immediate shutdown without possibility, for the operating system, to shut down their processes and could make Cloud Box unusable.

3.3 VmWare Image

If you have the virtualized version you will need a VMWare server with this minimum compatibility:

Versions	Maximum Capacity
ESXi 6.0, ESXi 5.5, ESXi 5.1, ESXi 5.0, Fusion 8.x, Fusion 7.x, Fusion 6.x, Fusion 5.x, Fusion 4.x, Workstation 12.0, Workstation 11.x, Workstation 10.x, Workstation 9.x, Workstation 8.x	64 GB memory, 8 processors, 10 network adapters, 2 TB disk size, No SATA devices, no virtual camera support, No DirectX 10 support

The minimum specification is 4 CPU, 8GB of Ram and 256Gb of ssd disk space with dynamic allocation; ssd technology is strongly suggested. To monitor system resources and link the machine to the host on board the image support **open-vm-tools - Open VMware Tools for virtual machines hosted on VMware (CLI)**.

4 Configuration

4.1 Default Network Address

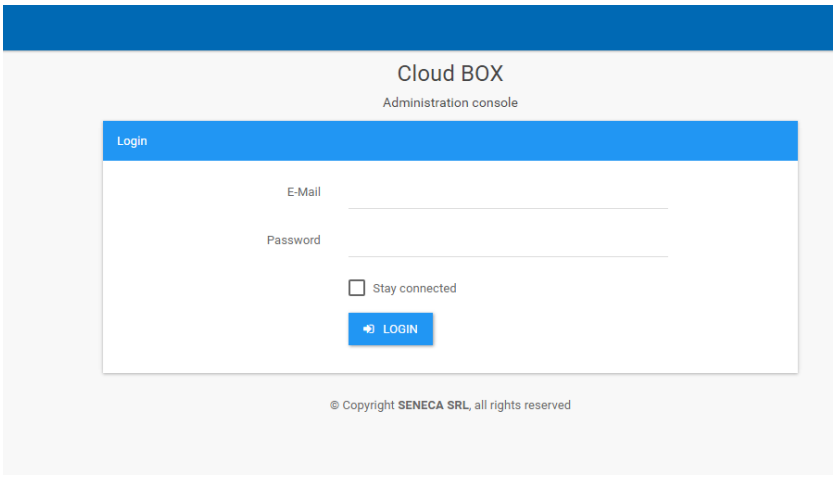
The Cloud Box is configured by default with the network settings obtained by DHCP, then, when connected to a network Cloud Box will try to automatically acquire an IP address from the DHCP Server (very often the Router). If this operation is not successful, the following network parameters are set:

IP Address 192.168.90.101, Subnet-mask 255.255.255.0, Gateway 192.168.90.1

4.2 Access to the administration section

The first IP address acquired is viewable through Seneca Device Discovery software (available in the CloudBox section at https://www.seneca.it/products/sdd).

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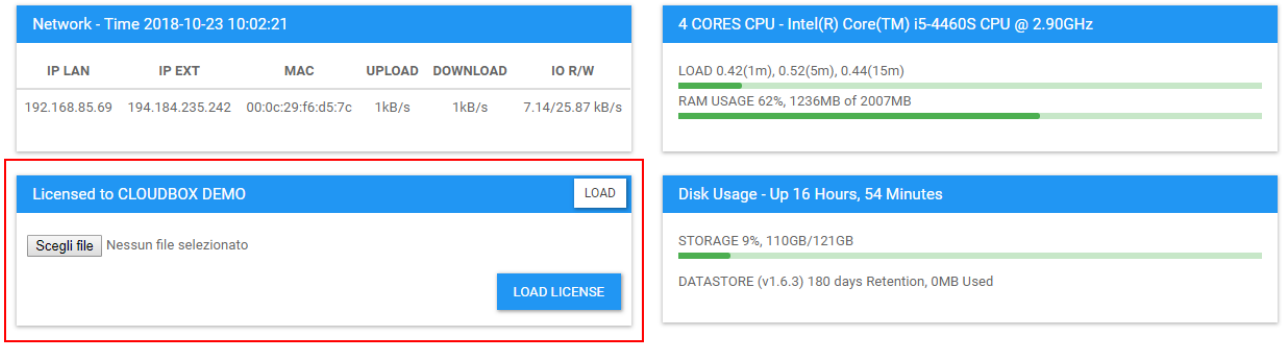
You can then access the administration section via a PC with a browser using the following credentials:

Name	Parameter
USERNAME	cloudbox@seneca.it
PASSWORD	seneca
URL	https://<<ADDRESS>>/admin/

CAUTION: the text "<<ADDRESS>>" is only a placeholder: you need to replace this text with the IP of your Cloud BOX, as you can read on the chapter 4.1.

4.3 License

By default, the server will run with a demo license that comprehend 1 device with 150 tags. To expand that capability, you need to load a license in the dashboard section. Press load in the top right corner of the license box and select the file from your local disk.

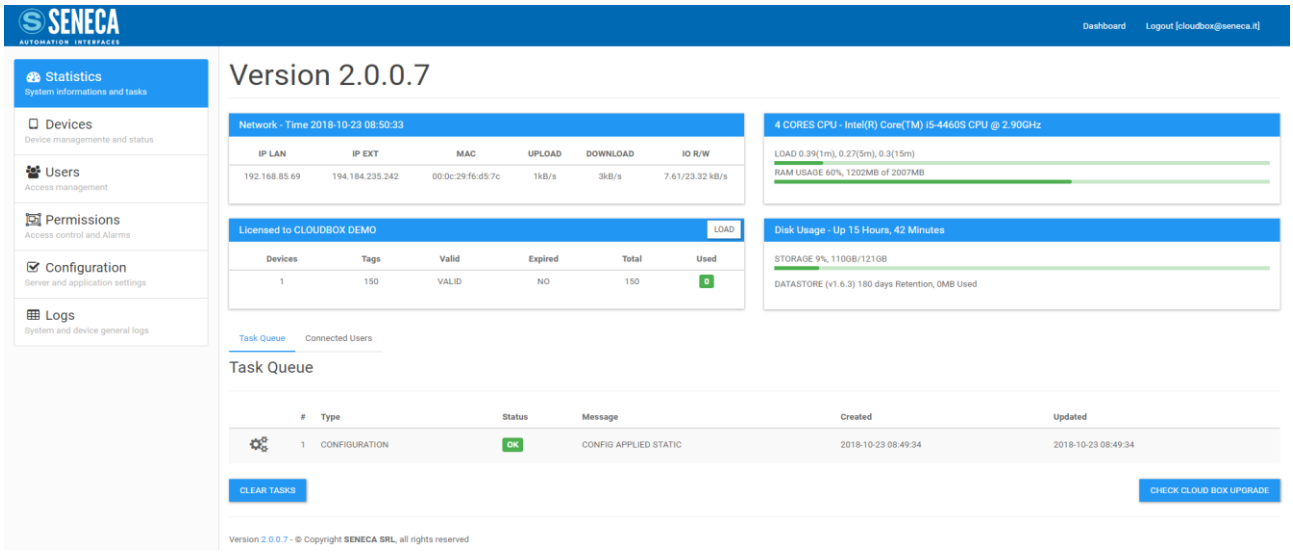


The license is always linked to mac address so, in case of virtual machines, remember to avoid mac regeneration.

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5 CloudBox Administration Section

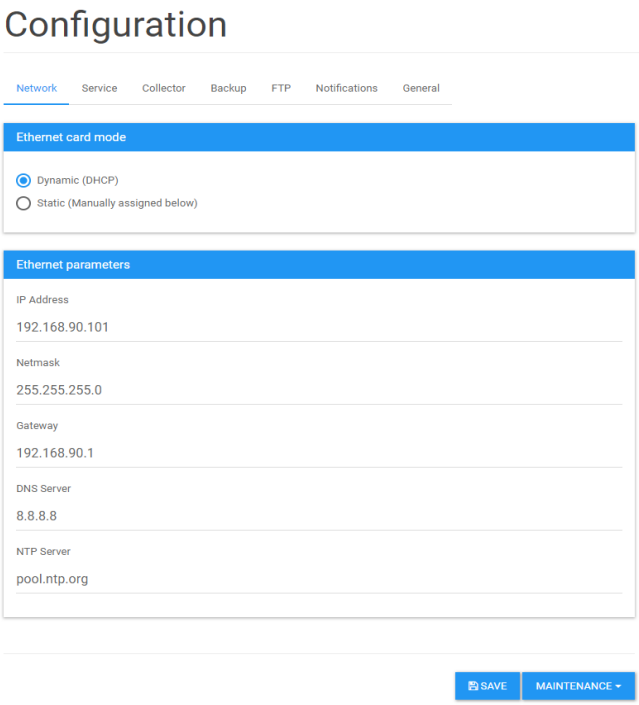
The administration section presents a navigation menu of this kind:



5.1 Configuration

For the first configuration, you must go to the "Configuration" section.

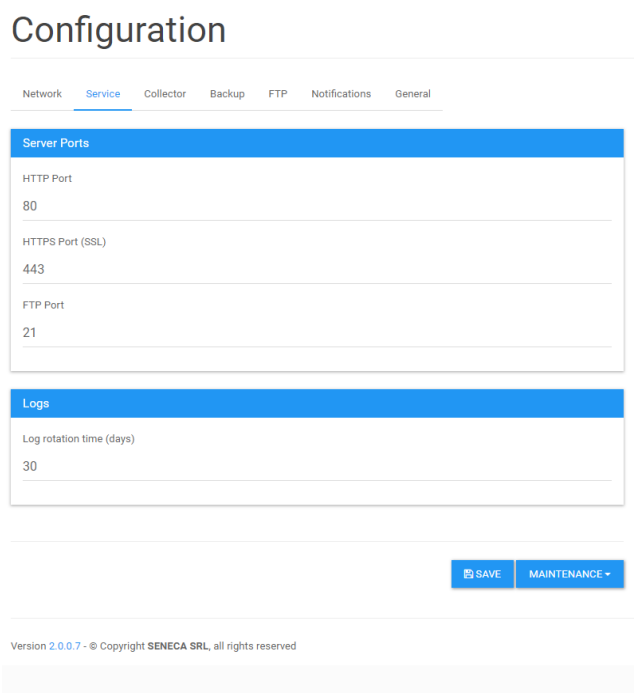
5.1.1 Network



The “Network” tab is for the network configuration parameters: classic IP address, netmask, gateway, DNS and NTP server.

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5.1.2 Service



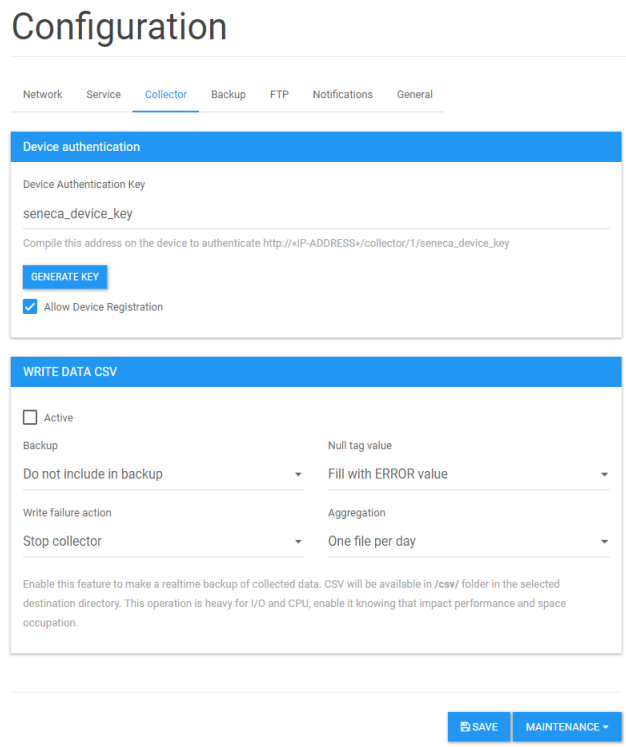
The "Service" tab, allows you to configure:

HTTP Port: The communication port that the device can be used for not encrypted communication, the default is 80.

HTTPS Port: The communication port protected by SSL certificate (self-signed), the default is 443.

Log rotation time is the number of days after which the data logs are deleted; attention to the fact that the logs instead of system (not visible from the panel) does not come influenced by this parameter.

5.1.3 Collector



The “collector” tab allow to make a real-time backup to csv files with the incoming data:

Device Authentication Key: This parameter is the authentication key that they will use the device to send data. It can be generated by the system or manually written. Pay attention to the value that you set because, being in fact a password, you must choose it with a safety criterion. The surest way is to randomly generate it with the appropriate button.

Allow device registration: if checked, the system allows new devices to self-register, or they will be discarded instead.

Write Data CSV Active: *Enable or not the real time CSV export data (when data arrive it’s automatically converted and save in csv format)*

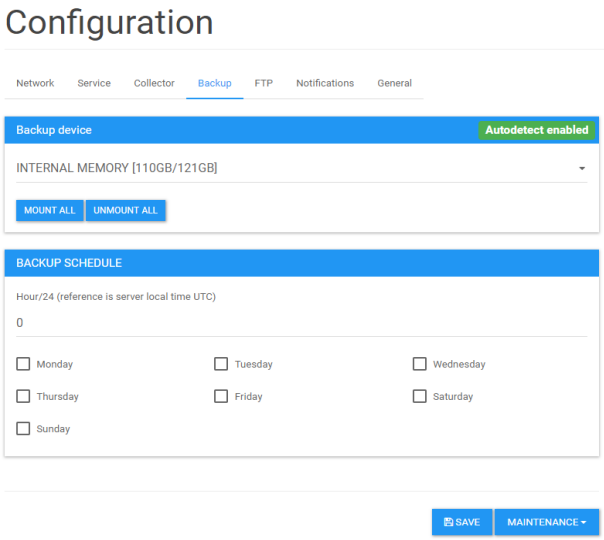
Backup: *Select if the* CSV exported data are or not included in the backup

Null TAG value: *Select what value must have the TAG if input data is “NULL”*

Write Failure action: *Select the action in case of write failure*

Aggregation: *Select if you want to obtain a unique csv file for a day or not*

5.1.4 Backup



The “backup” section covers all configuration and data backup parameters:

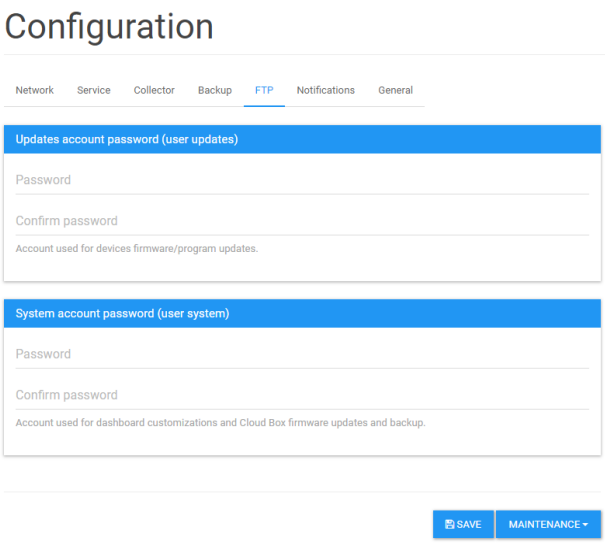
Backup device: the system automatically identifies a local device (the main disk) and, if Autodetect is enable (green label), any connected USB devices. If you press "Mount to" the system will hook them to the filesystem making them available; on the contrary if you press "Unmounting all" the device will be dropped. From a drop down, you can select on which device you want to make the backup and then the restore.

Backup schedule: here you can set the system to automatically start a backup at the expiration of a certain time (0-23) and, in certain days of the week. Time is represented in accordance with the UTC Convention.

Beware that the backup operation can be heavy for the server (depending on the data present in the system). This operation, if the server is running, it will block other batch, like the csv exports, until the completion.

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5.1.5 FTP

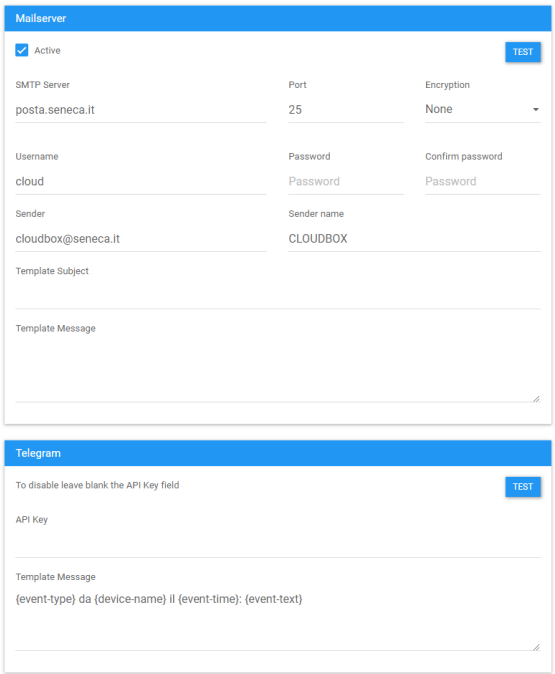


The "FTP" section contains the configuration parameters of two accesses that allow the following functions:

Updates: is a simple ftp access that you need to update devices remotely. RTU devices such as Z-GPRS3 may, in fact, update the firmware or a SEAL program from an FTP server.

System account: With this access you have visibility of the root of all FTP folders (including access updates). Here you can load a remotely restore or upgrade an application for Cloud BOX (this if you use the local disk, see section Backup and Restore for more information). In addition, there is a custom folder where you can upload a custom logo (named logo.png or logo.jpg, in lower case). This logo will be applied to both the login to the dashboard (replacing the title in text format). It's also possible to upload a file custom.css with which modify the dashboard style, see the personalization chapter for more info.

5.1.6 Notifications



The "SMTP" section allows you to configure the event Cloud Box e-mail dispatcher:

Active: Enable or not the Cloud box e-mail dispatcher.

SMTP Server: is the server that Cloud box will connect for send e-mail (for example "smtp.gmail.com").

Port: is the port to be used for access the SMTP Server (for example 587).

Encryption: is the Encryption method to use with the SMTP Server.

Username: is the username for the account to use with the SMTP Server (for example example@gmail.com).

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Password: is the password for the account to use with the SMTP Server.

Sender: is the e-mail account from wich the e-mails are sent (for example example@gmail.com).

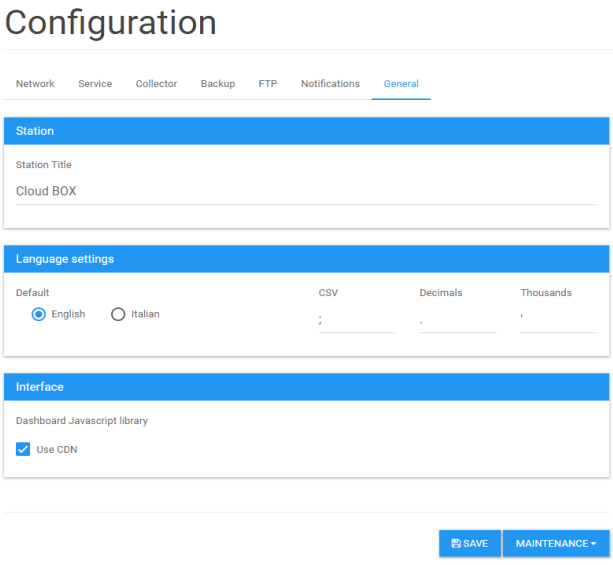
Sender Name: is the name that appears in the e-mail.

Template Sender/Message: there you can customize the standard text, refer to the bottom of the page for placeholders.

Telegram API Key: with this you can address your telegram bot and receive push notifications.

Template Message: there you can customize the standard text, refer to the bottom of the page for placeholders.

5.1.7 General



The "general" section, however, allows you to modify the operating parameters not strictly connected to the system:

Station title: this parameter is the name of the station, useful if you have more than one Cloud Box.

Language: the default language to be assigned to each user. You can also redefine numeric separator and CSV delimiter.

Use CDN: This flag enables the use of an external Content Delivery Network, allowing the browser to download the libraries from internet without using the Cloud BOX bandwidth.

Decimals separator: you can set the decimal separator in the number values.

Thousands separator: you can set the thousand separators in the number values.

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When you go to save the Cloud BOX recognize whether they were or not modified system parameters that require a reboot. In this case the machine will restart within 30 seconds; This behavior is also possible in the absence of changes by checking the option at the bottom of the page. ***The restart is possible only if there are no pending batch, in this case the system will wait until the processing is complete to avoid failure or data loss. After Cloud BOX restarts, remember to remove every USB device connected on.***

5.1.8 Retention policy

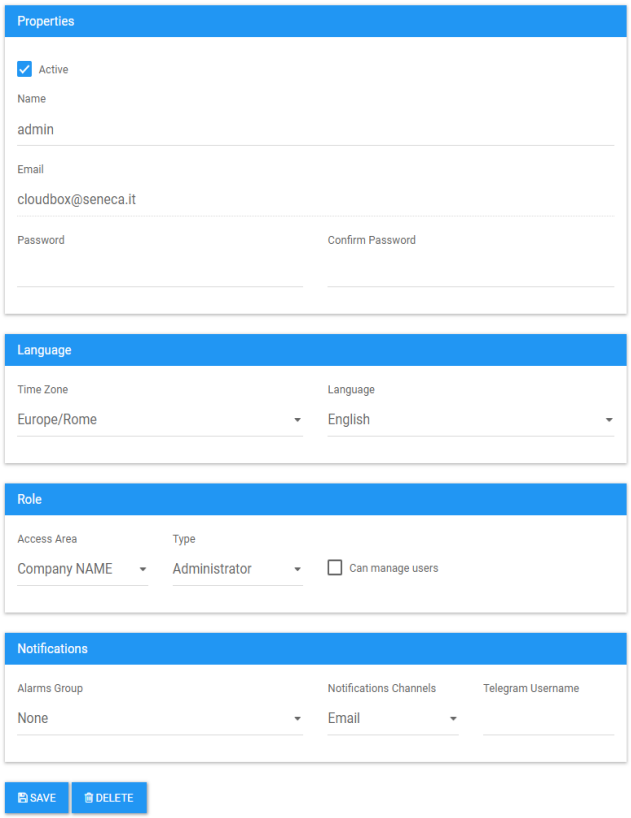
You can change the amount of time the storage will maintain your data available before deleting. The system will try to give you an estimation of the amount of disk space needed with a projection of what is registered at that instant.

WARNING!!! Changing this value cause data store reset so, samples stored, may be lost, use with CAUTION.

WARNING!!! This value impact on server performance, be warned that changing this value beyond hardware limit can cause performance loss, malfunctions and data loss.

WARNING!!! The storage indication is an estimation and may vary. Remember that this value is not comprehensive of the rest of the machine data like logs and metadata.

5.2 Users



Cloud Box provides a user management panel (Users link on the left); each user can be freely configured with these parameters:

Active: Indicates whether the user is on or off.

Name: is the user name, an abbreviation that allows only letters and numbers.

Email is the email address linked to the user, will be used for the login.

Password: This is the credential that you will use with the email or name to access the resources allocated. There are no limits or specific constraints, it is recommended to follow the basic safety rules.

Time Zone is the time zone where the user is located and is a fundamental parameter. When you view the times, in fact, the system will adjust the displayed time taking account of this time zone and not that of the server or device.

Language: is the language that will be set as the default for this user (for future use).

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Area: it's the area of users that belongs to this credential access, for more details see the areas management.

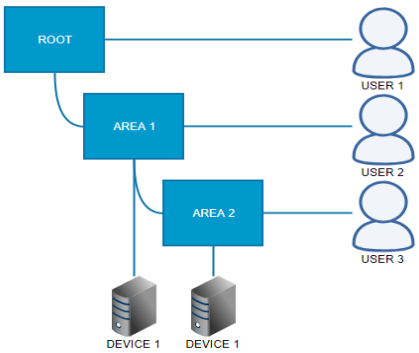
Role: Administrators can modify all the system core settings in admin panel, Users can access the dashboard only. For the dashboard you can choose to let the user to manage area users and edit dashboard projects.

Alarms Group: it's the group of users that will receive the configured Alarms, for more details see the group management.

Telegeam username: the username setted in the telegram app options that identify the specific user.

5.3 Areas

Dashboard access are managed throught Areas, every area represent an access gate where resource are located. You can point users, devices and alarms groups to a specific area. The positioning is gerarchic so you can manage positions like a tree and every leaf can be linked to one or more sub area.

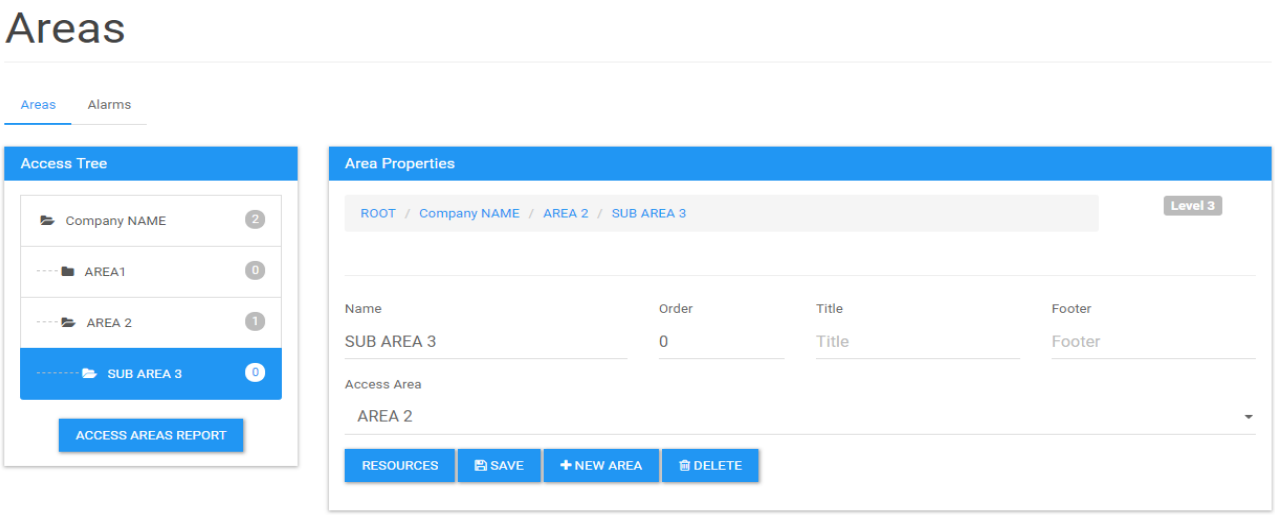


When you point a user to a specific area that poit is his home when he login into the dashboard, because is a tree that user will have access to all sub areas:

- *User 1 can see everything.*
- *User 2 can see Area 1 and Area 2.*
- *User 3 Can see Area 2 only.*

Every user can have access to his areas resources and all that is liked below, this comprehend the pages that can be added to every single area.

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In the administrative console you can manage areas with a visualization tree, in this section you can change the name, the linked area, order title and footer: this last couple of options is displayed on the user dashboard. Area assignation of user, devices and alarm groups can be changed in respective edit sections, here you can visualize what is visible from here. A report is available to have a complete view of the access and resource situation.

5.4 Alarms

Cloud BOX can send alarms to users using email or telegram, both parameters are discussed in configuration settings paragraph. An alarm group can filter events arriving from devices and send it to certain users thant were assigned. You can choose a name, select the alarm type, the area linked: than list of devices can be selectd and linked to this alarm group.

5.5 Logs

The screen shows in a descending time order the Cloud Box application logs, here we show the notifications, and errors. Each line can contain a navigable detail through its right button. This log can be manually cleared or will be cleared automatically as configured.

Warning! Cloud BOX is a server machine, so the log section must be monitored to become aware of any problems.

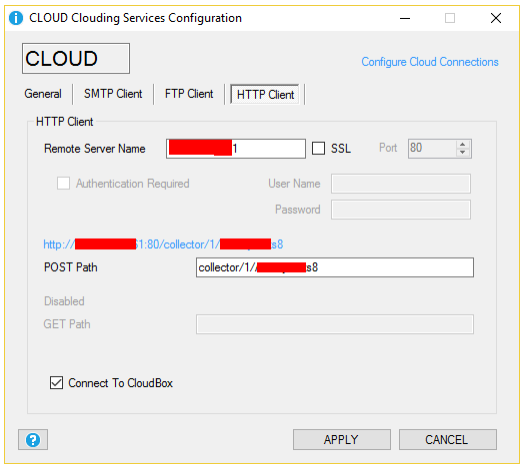
5.6 Devices

The programmed devices must point to the Cloud BOX using a device credential making using this type of URL:

HTTP://<<IP ADDRESS>>/collector/1/<<KEY>> *OR (if availbale)* ***HTTPS://<<IP ADDRESS>>/collector/1/<<KEY>>***

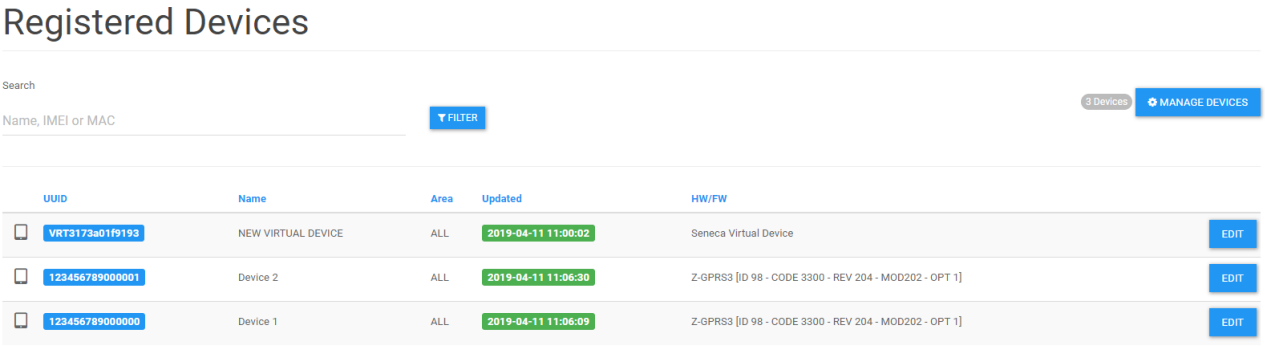
On SeAL this url must be inserted in the Cloud section:

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Once configured and started the device will make a first send that will provide data on the beginning of the Cloud BOX datalogging session. This recording operation is automatic, but linked to the flag of the new registrations (as seen in the basic configuration paragraph).

This flag can be changed on the fly from this screen with the right button. The device management shows in tabular form all devices registered successfully.

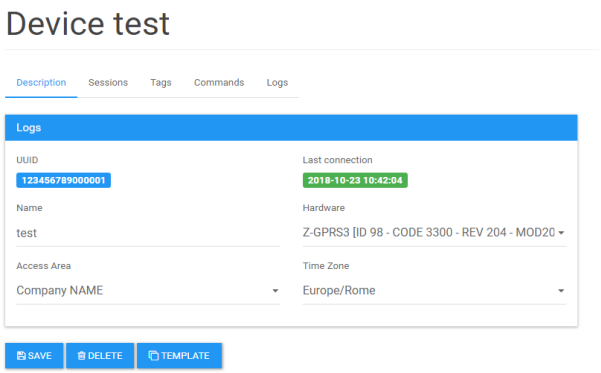


A registered device is stored with a generic name linked to its own unique identifier (Modem IMEI or MAC address), for example devices such as Z-GPRS3 will arise with the modem IMEI. Of each device you can change the configuration in the device tab.

Warning! Cloud BOX can recognize the model of the device, this is needed to know the capability of the device. Due to this necessity all devices that are not recognized are refused by default. Different models are update nightly during firmware upgrade check.

Device models are downloaded during night autonomously but you can force the refresh for the console, click “Manage Devices” and “Upgrade Targets”, this operation can take several seconds.

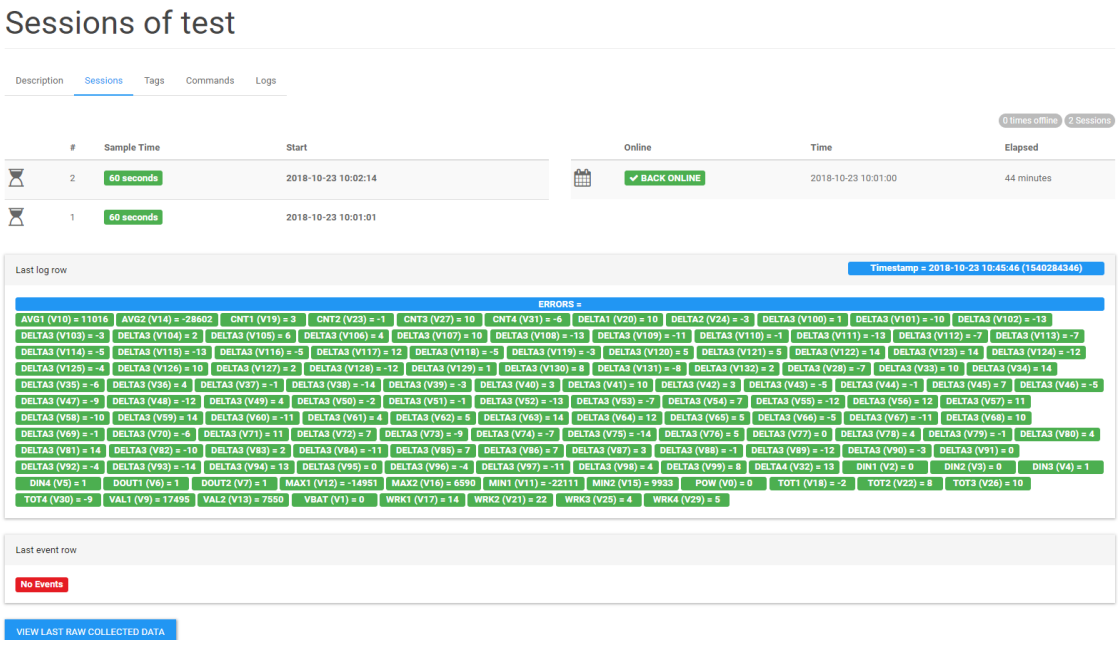
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The first tab manages the description, here you can see the time stamp of the last time the Cloud BOX recorded data from this device.

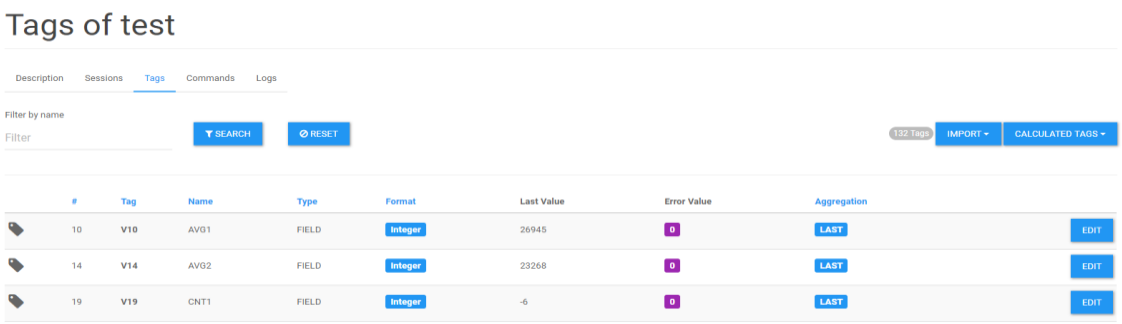
The device name is set automatically, then you can customize it. You must then go to assign the device model that is sending data, this parameter is very important because the editor will put or not a set of commands that the device can execute. The timezone, like for the user, specify the time zone of the device and Area specify the visibility of this item for users.

Can happen that in fronted you need that an area act as a template to build new areas, like a blueprint. Every device can be assigned to a single area so you may need dummy devices to fill and edit template dashboard. To do this you can create a template device from every device.



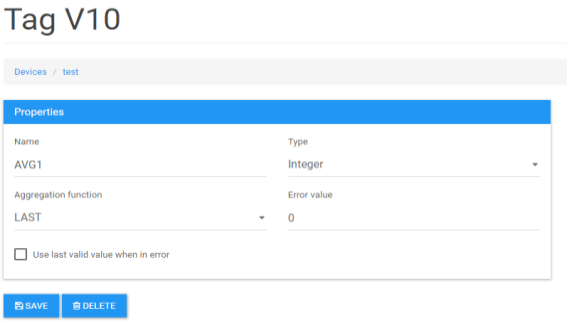
When the device is programmed from scratch a new session is initiated, these parameters are then sent along with the new sampling time and are recorded by Cloud BOX. For convenience, on the left, are shown the last log line and the last recorded event. In the top right corner there is a monitor that display every online/offline change, this help to see connection problem.

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The tag data is the configuration of the variables sent from the device to Cloud BOX. Initially, this table is empty or can vary due to a reprogramming.

Pressing the "import from data" button the system analyzes the last log line and, based on this, the tags are populated. Import from device allow user to copy calculated tags from another item, this because these optional tags are user generated.



This tag set is always updated in additive way, this to preserve the integrity of the data. One thing to watch out is that a tag that changes the data type from integer to floating point does not lose the previous, but any widgets will be updated in floating point mode.

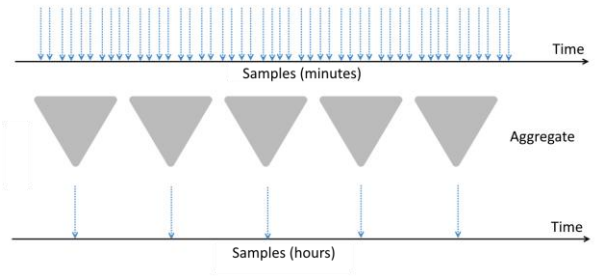
The tab of each tag can be changed by writing a variable name and a data type to be set in accordance with this project in the device. The data types are general and are needed from the editor in order to enable a better choice based on the type.

Name	Type
Integer	Integer with or without sign
Boolean	True / False
Floating Point	It's a floating point type
Latitude	GPS Latitude
Longitude	GPS Longitude

The aggregate function is essential for the representation of historical graphs (trend). When you want to view long periods of time on a graph you run into the problem that the number of points is huge. To overcome this drawback, is used the operation of decimation (downsampling). The system automatically understands what the minimum resolution is displayed on the selected time window. If we want to see a full week of a

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device sampling once a minute we will have 1440 samples for 7 days (10080 samples). To allow a view not too dense (and therefore difficult to read) are imposed for example up to 300 samples; it follows that we will have to group data in the sections of about 34 minutes. By grouping the data for this resolution there is the need to choose how to represent with a single sample this group of samples.



It's therefore necessary to take these groups of samples (groups of 34 samples) and translate them into one sample to represent all of them. If it were an analog value as a temperature, the aggregate function could be for example an average.

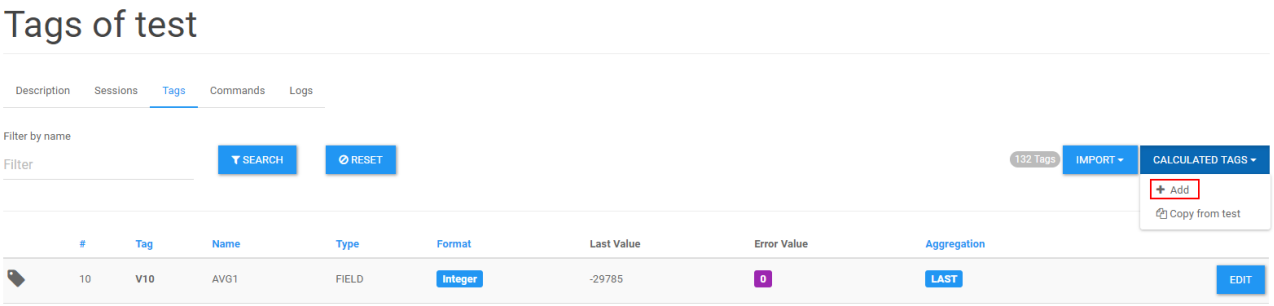
Case studies can be very different as the needs. For this it is possible, in addition to the data type, also describe the function that aggregates them when necessary. These functions are coded as follows:

Function	Description
Count	Number of samples in the time interval
Min	Minimum value in the time interval
Max	Maximum value in the time interval
Mean	Average value in the time interval
Sum	The Sum of values in the time interval
Stddev	Standard Deviation in the time interval
First	First value in the time interval
Last	Last value in the time interval

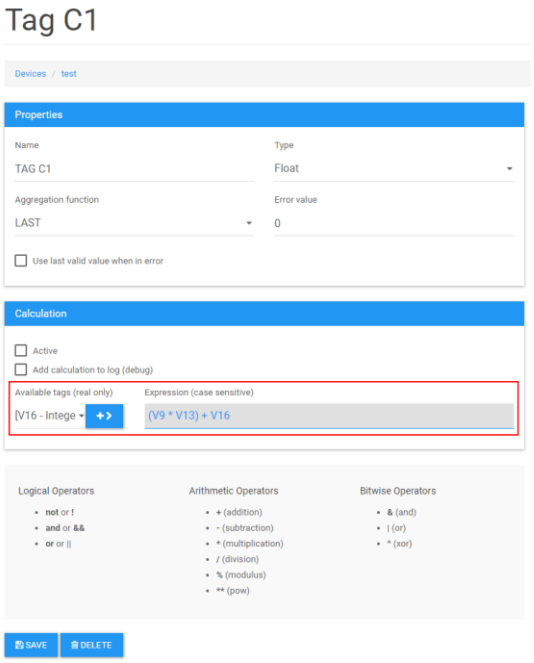
In the last tab, logs, are a subset of the general log, here are visible only the rows of logs related to the specific device.

5.7 Calculated Tags

You can Add a Calculated Tags, a calculated tag can be composed by one or more tags from the same device.



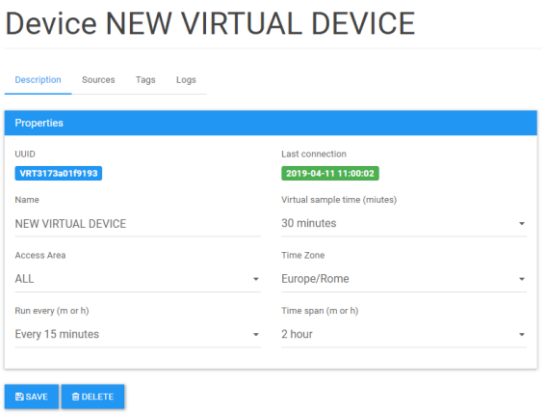
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Here you can create a new tag that is (for example) a calculation of 3 Tags: ***(V9 * V13) + V16***

5.8 Virtual Device

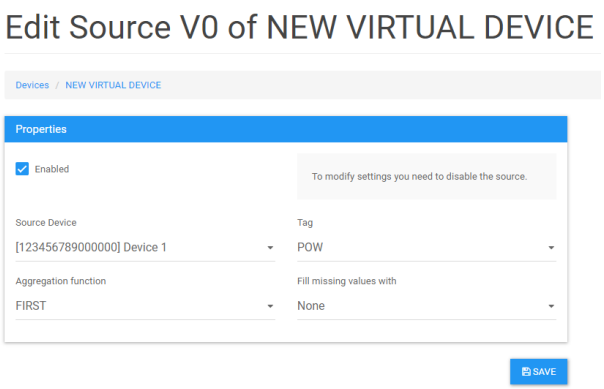
With calculated tags you can create virtual tags but is limited to the tag of the device itself: you can add one from “Devices” > “Manage Devices” > “New Virtual”. There are situations where you need to do some calculation between devices, to sum power of different plants for example. To do so Cloud BOX have virtual devices that use other device as sources of data. The problem is that different devices may have different sample time so the system need to normalize data to a unique sample time. For this reason a vitual device have different params and does not gave sessions or commands sections.



In this type of device, you need to choose a sample time, for an energy calculation you typically need less samples than normal devices. The “Run Every” parameter represent the scheduler time when the system do the calculation, virtual devices are a heavy-duty task so you may need to lower the pace between calculations without lose samples: you can leave a 10 minutes sample time but do the calculation every hour. The “Time span” field represent how many time to go back to do the calculation: if you do the calculation at 12:00 and tell the system to use a 2 hours’ time span the system will do the calculation using the data from 10:00 to 12:00. With this parameter you can leave a time window to let devices recover data when lose

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connectivity, normally you can leave this parameter low.



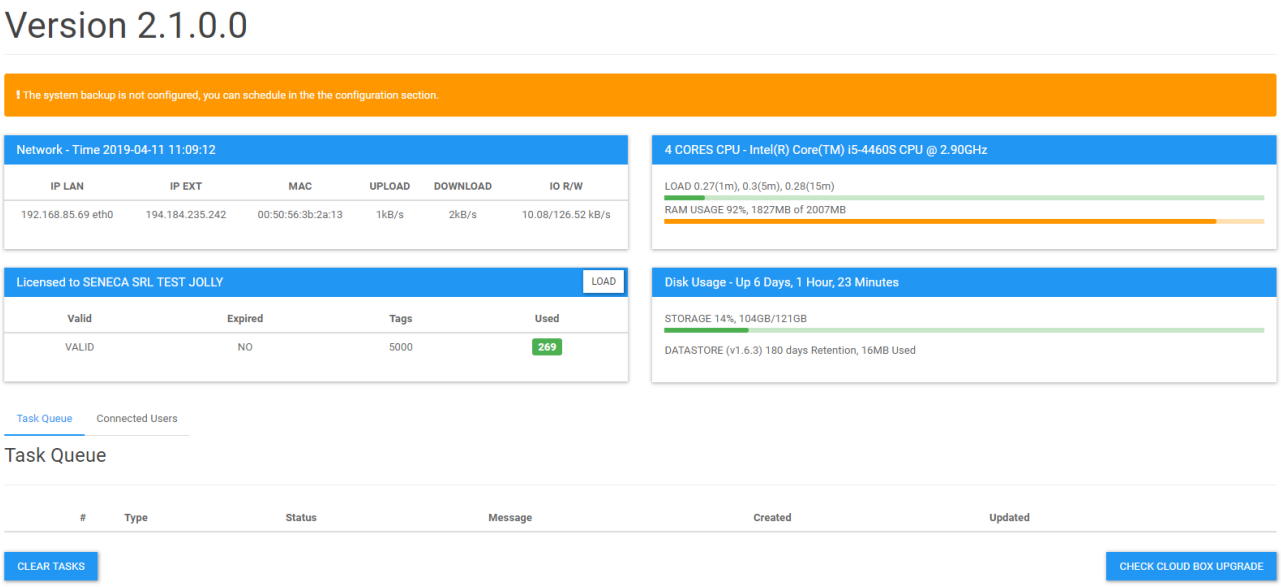
Every source can take data from one tag of a device and represent a tag for the virtual device. To modify values you need to disable the tag and choose a device and its tag. As told in the precedent paragraph data need to be normalized to be synched to the virtual device sample time. To do so you need to aggregate data and extract a value for that period. Here you can select an aggregation function and a behavior when data is missing.

To resume the process: virtual devices have other device as source tags, the first elaboration is the sample time normalization. When data is all at the same pace you can define calculated tags on these sources in the same way you do in the real tags on normal devices.

***Be careful** to add virtual devices, is a cpu/disk consuming feature so **performance** can be affected from the usage: do not push sample time and/or refresh too low. Always tend to prefer a higher sample timer than the sources devices. A virtual device and calculated tags contribute to the total sum of the license limit calculation.*

5.9 Statistics

This screen provides an overview of the server status, offers a number of indexes to be monitored. The upper part is made up of several panels that show static data such as network and firmware version of Cloud BOX.



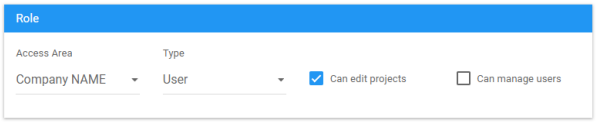
Other indicators provide for example the load of the machine RAM and hard always represent the consumption of server resources; If the RAM gets too close to the upper limit it is likely that the server can

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freeze or slow down dramatically. The disk is critical if approaches to filling, in this case it is likely to have inconsistent data in the system and subsequently the block of all applications.

6 Dashboard

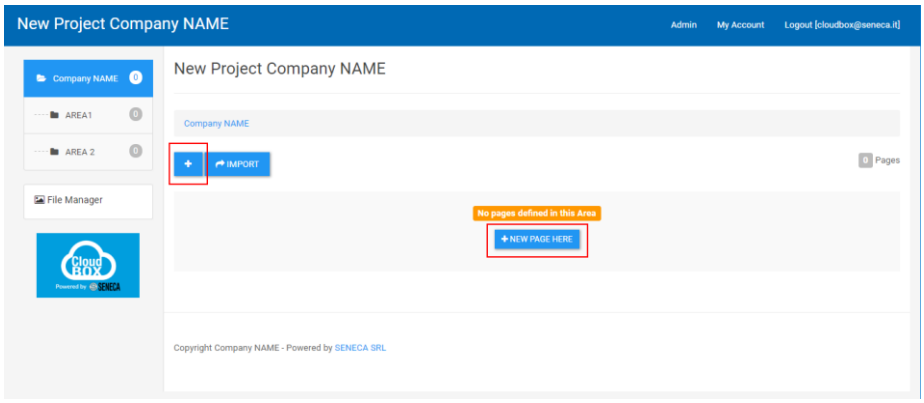
6.1 Edit Project



The project configuration can only be modified by users with authority to modify the pages. The dashboard has been tested using the following browsers:

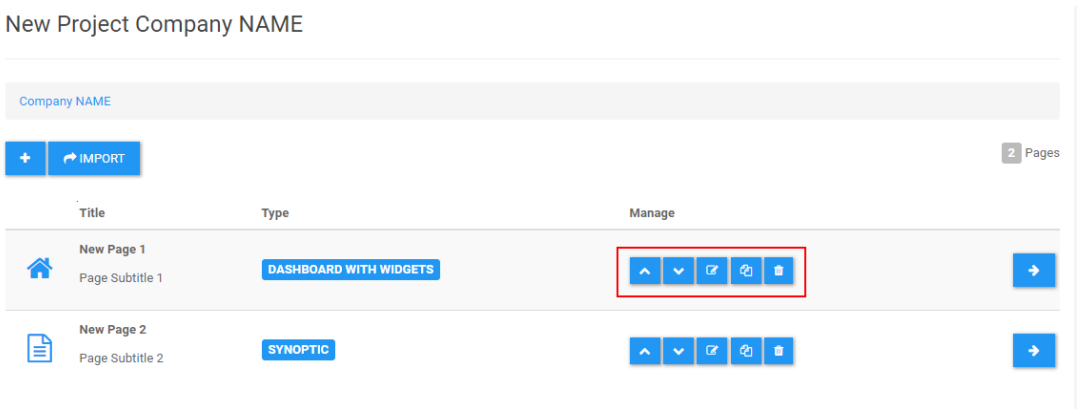
- ***Chrome 50 or later for Windows, Android, iOS, MacOS***

Each Area may contain several pages of different types. The different types of pages do not require configuration of the contents, have specific uses and do not required further parameters in addition to the basic parameters. You can add content using the plus button in the center (if empty) or in the top left corner.



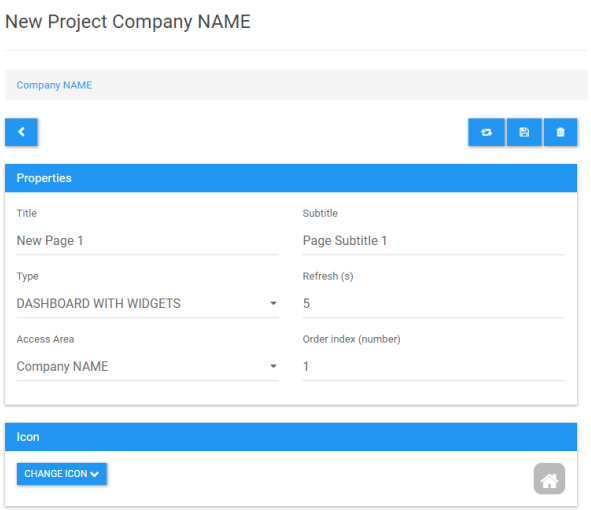
6.2 Edit Page

Every page has a toolbar with this sequence of commands: move upper, move lower, edit, clone and delete.



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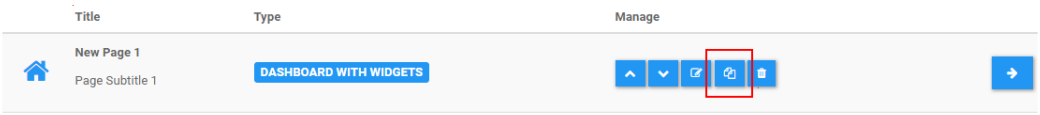
In this page you can not only modify single page but also import an entire area content from another area with the import button.



The parameters of the page are first of all the title that appears in the link and as label in the page itself. The refresh time is only useful for dashboard with widgets type pages (grid) where it is possible to include components that display data in real time. Here, it is possible to set the refresh time for the data displayed. This parameter applies to the whole page, and the widgets will therefore all be updated based on this parameter. Type indicates the type of page to create. Pages can be of the following types:

- *Dashboard with widgets*
- *Events page*
- *CSV export page*
- *Synoptic*

The tick at the end indicates that the page is the home page for the previously specified group. It is important to remember that it is possible to have several home pages for different groups. This is because during the login process, the system checks what group the user belongs to and directs him/her to the correct page. With “CHANGE ICON” button you can assign an icon to the current page. A Page can be simply cloned with the icon:



In the clone section you can use the function clone/substitute for clone the page for different devices with the same tags. So create multiple page for similar devices is fast and easy.

6.3 Manage Users

If user is enabled you can modifiy users that are under this area and below, the section is the same of the admin interface but limited to user capability.

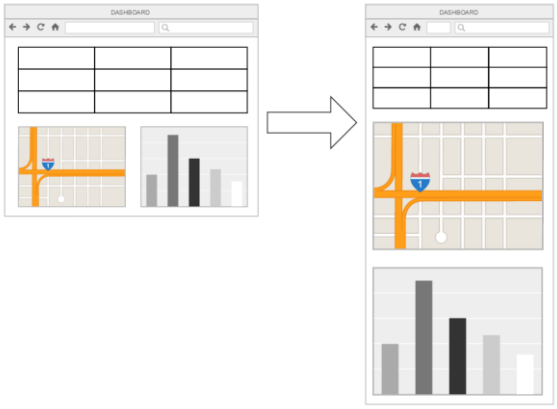
6.4 File manager

Here you can upload, rename and delete imeges that than can be used within dashboard and synoptics.

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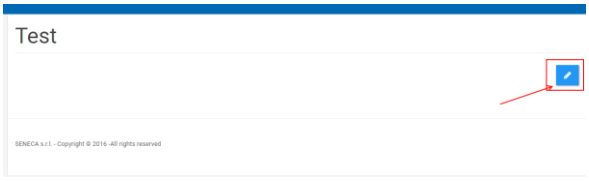
6.5 "Dashboard with widgets" page

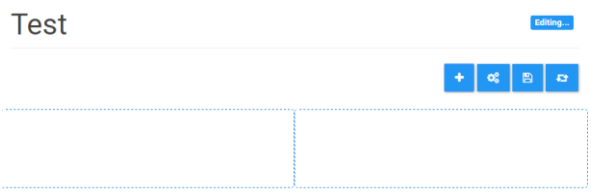
The dashboard is a web application that can be opened from a desktop or smartphone and can be fully configured by the user. The pages that can be configured on the server are arranged into a grid with cells containing elements called widgets. Each of them performs a specific function, such as for example a chart, or a needle indicator. The editor gives the possibility of arranging these elements from left to right, grouping them by rows, in a grid format. Each row may contain a certain number of widgets. It is not necessary for all rows to have the same number of columns.



When creating a new page, it is possible to include an arbitrary number of rows, and a preset number of columns. This system ensures automatic adaptation of the display based on the platform being used (Desktop or Smartphone). In case of Desktop, the format will be as shown on the editor. With the display getting smaller, form a PC to a Tablet, or a Smartphone, the system moves the widgets one on top of the other, with the ones on the left in the uppermost positions.

Only authorized users may add and edit widgets:





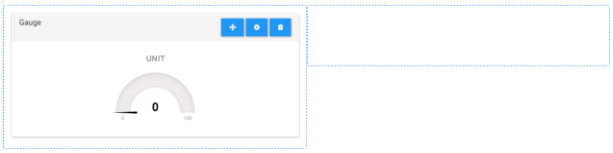
By clicking Edit, it is possible to add widgets, selecting them among those available.

Click  to add a Widget

Click  to change the page grid

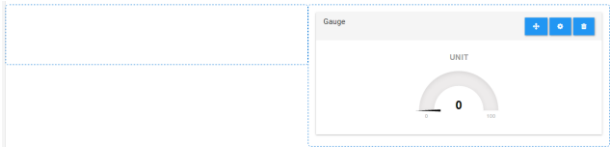
Click  to save the changes to the page

Click  to cancel the changes to the page



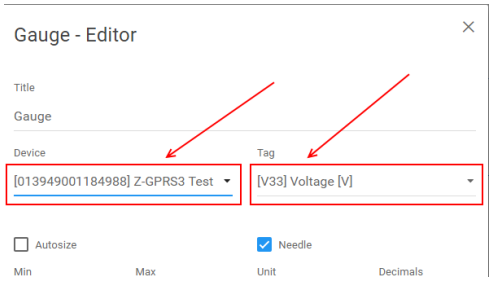
Once a widget had been added to the grid, it can be moved by clicking  and dragging it to the desired position.

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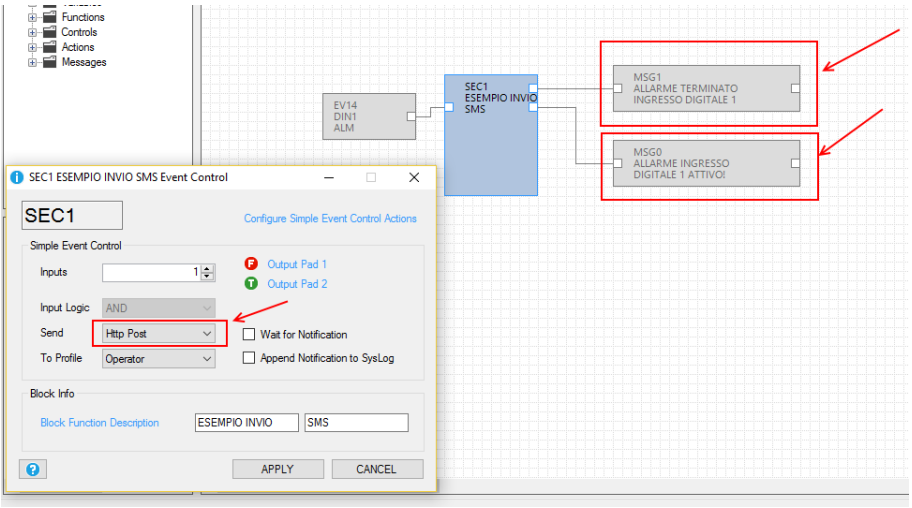
From the left to the right container.

Each widget has its own configuration, which can be accessed using the  icon. Each widget must be aware of the variable it is associated to, and where to recover it from.



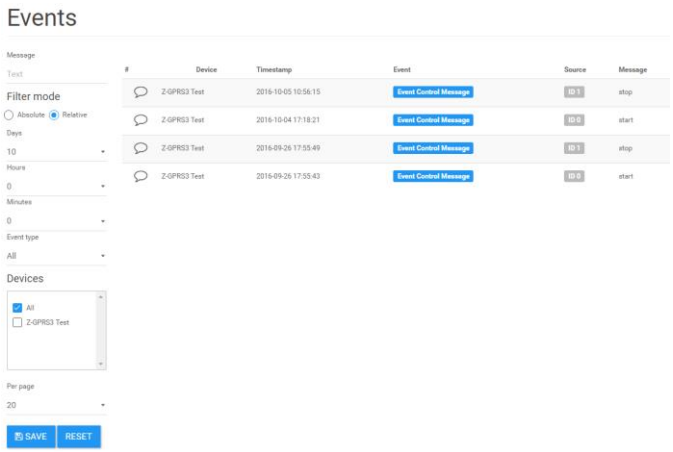
6.6 "Events" page

The events page consists of a filter and a table display of events/alarms received from the RTUs. In SeAL, these events correspond to MSG (message) type blocks:

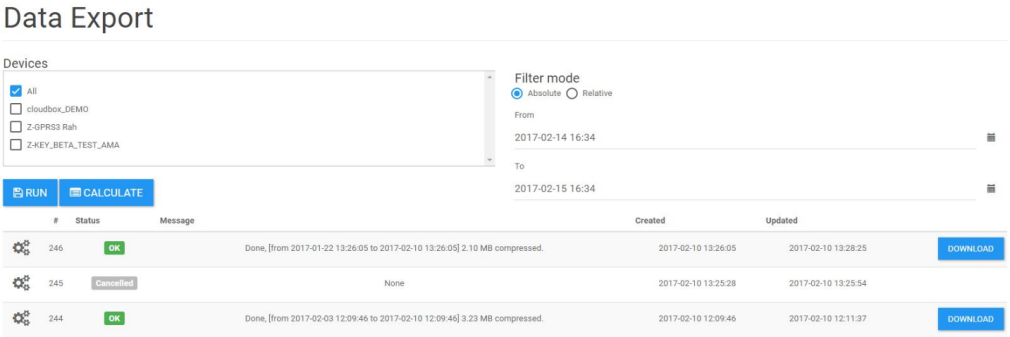


Also the execution of commands appears in this page. Data, type and content filters can be applied. The date filter can be set as absolute, meaning that precise dates are selected. As an alternative, the relative real time filter can also be selected, in which case the end date will be the current date, going back for a selected time period.

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6.7 "CSV Export" page



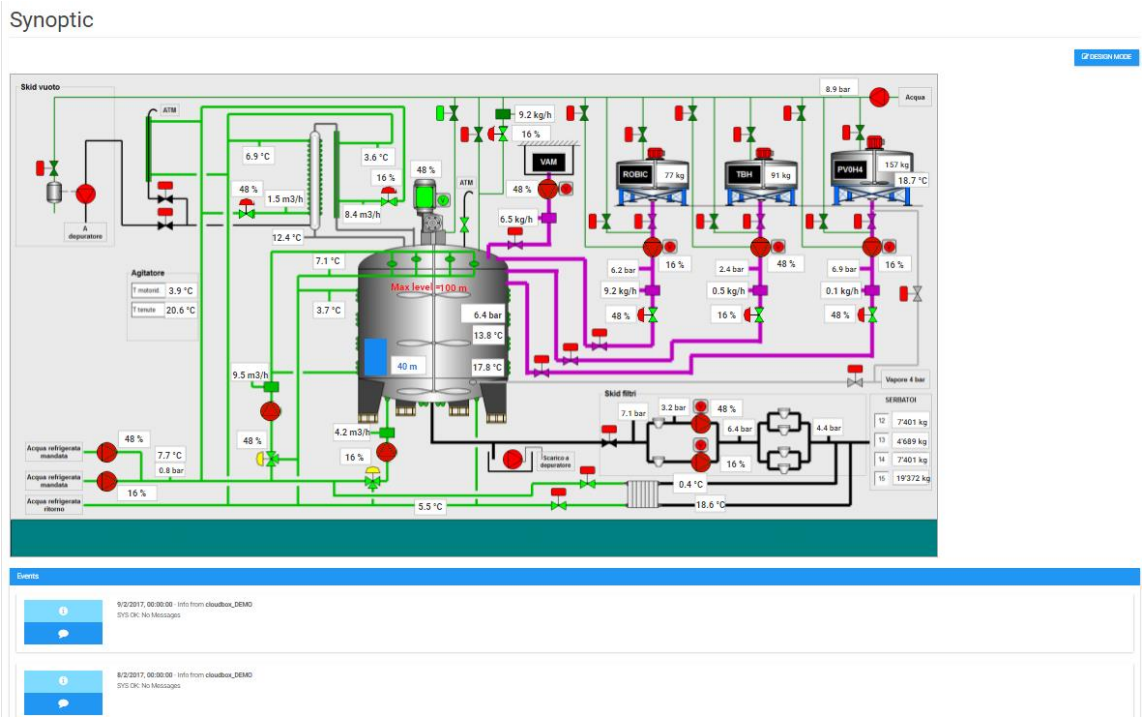
This page can be used to export the data of a device in csv format, so that they may be edited using and external software (e.g. excel).

It includes a device and a time filter, through which a group of data can be selected. It is possible to calculate in advance the amount of data that will be selected with the set filter. This gives an idea of the final size. This operation is extremely important, as it gives the idea of how much time will be needed for the export procedure, and the required CPU for supplying the required data. This operation is completed in batch mode. This means that the request is included in a queue of tasks to complete in the system that will carry out the operation and return the data at a later stage. It is possible to queue several requests. These will be completed one at the time and can be cancelled. As they are not of fundamental importance for the operation of the server, export batch tasks may be paused if the CPU load exceeds the alarm levels. Backup tasks have priority over batch tasks.

6.8 "Synoptic" page

With the synoptic page you can create a graphic synoptic. Generally, you must upload a background image and then add widgets for animate or view data, for example:

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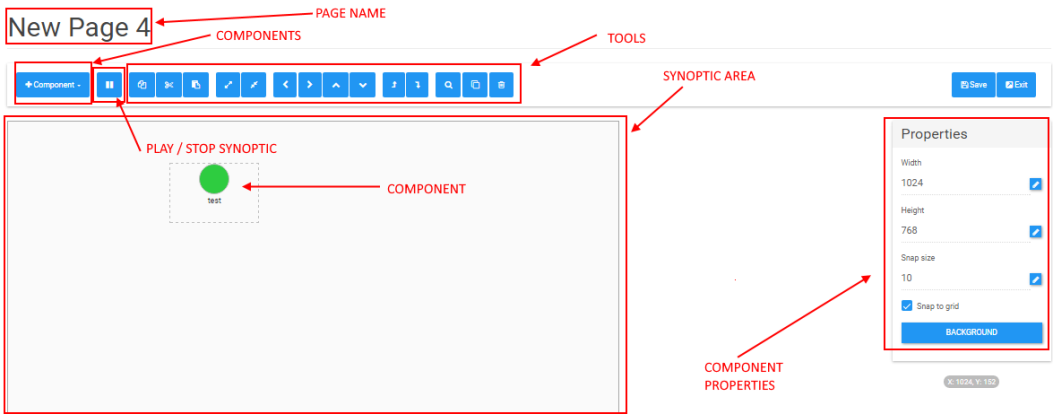


For create a Synoptic use the button “Design mode”:



The design mode will change the synoptic page in edit mode. In edit mode you can:

- *Select a component*
- *Move the component in the Synoptic Area with mouse / arrows keys*
- *By clicking on a component you can change the component Properties*
- *Associate a TAG to the to the component*



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7 Storage of data and performance

The important parameters to consider when talking about the capabilities of the server are the number of devices, the sample time, the number of tags, and the time during which they must be maintained. The server resources to monitor are CPU, disk space and RAM.

Parameter	Resources	Description
Number of devices	CPU, DISK	It affects how many requests are made every minute to the server (CPU), and how much disk space will be required.
Sample time	CPU, DISK	The more sending operations and the more requests are made to the server, the more samples and disk space are required.
Number of Tags	CPU, DISK	It has a strong effect on disk space; less during data processing.
Holding time	DISK, RAM	The main factor is disk space; performance levels decrease with the increase of data, as it becomes more demanding to carry out researches, and therefore display the data on the dashboard.

SUMMATION (SAMPLE TIME) / (60 * 24)

This is the calculation required for the number of daily records where the sample time is expressed in seconds. The calculation provides the daily records received from the RTUs. This is a neutral parameter in relation to the number of Tags, as the time series database creates a unique data table, in which the columns consist of all the Tags collected from each device.

7.1 Devices and Tags Limitation

Cloud BOX Model "C" is limited to (examples):

Devices	TAGS	Retain time	Sample Time
50	100 x device	6 months (= 5000 Tags)	1 minute
200	25 x device	6 months (= 5000 Tags)	1 minute
50	50 x device	3 years (= 2500 Tags)	15 minutes

There are a lot of variables that influence this number, so those are only example of test configuration that we provide. Different retention period, devices and tags are available but not tested, take this numbers as reference. You can extend data retention lowering device numbers, tags count or sample time.

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7.2 Cloud BOX VMWare

Due to the elasticity of the configuration of a virtual machine an upper limit cannot be provided, the minimum run configuration is 2 CPU, 2gb of ram.

7.3 Disk usage chart

This is an estimation of disk space usage for 5000 tags configurations, remember that this is an estimation and may vary. This calculation contemplate only pure data, not logs, system, backups or other system/user data.

Years	From (GB)	TO (GB)
1	13	16
2	25	31
3	37	46
4	49	60
5	62	75
6	74	90
7	86	104
8	98	119
9	111	134
10	123	148

8 Router Configuration

When connecting Cloud BOX to a Router, for example an ADSL router, to make it visible through the internet it will be necessary to open some ports and set them to the Cloud BOX internal IP address.

Port	Description	Compulsory
HTTP	Needed for devices that do not support SSL. Default is 80, but it can be changed.	Yes
HTTPS	Needed for administration purposes. Default is 443, but it can be changed.	Yes
SSH	Port 22 is only necessary if access from Seneca support is required.	No

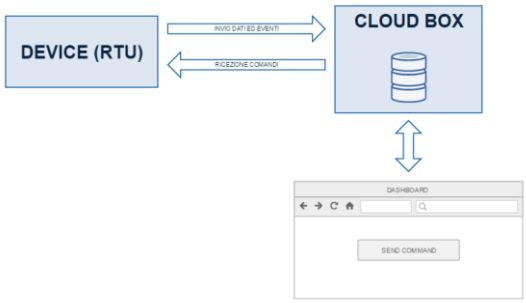
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FTP	Port 21 is required for access to the devices, for downloading firmware, or a new program.	No

The server must also be able to communicate with the outside in order to synchronize with the clock. Check that this is possible and that the time is correct, otherwise malfunctioning might occur.

9 Data collection (Collector)

This component is "invisible" to the user. It's the section of the software that receives data from the devices and saves them on the database. When it receives the data, it checks if the device is authorized and already present. Otherwise, it saves it and starts recording the data. During normal operation, each record is tagged with its timestamp, which is received directly from the RTU. The server timestamp will only be tagged if the RTU does not have an internal clock (see the specific device manual). If this timestamp received is in the future (as far as Cloud BOX), the system will generate an error, and data saving will not be possible. In this case, the log will contain an error, to indicate that the server or the device clock is not synchronized correctly. Other specific cases can be "recovery" cases (when supported by the RTU). These occur when for any reason whatsoever the device is unable to reach the server, for example if the mobile phone line is disconnected. The device that supports this function will store the data locally for a certain amount of time, and upload will resume once connection is re-established. In this case, the server will consider the device "in recovery". In this condition, the device is not off line, but the data themselves are, and therefore marked in orange until alignment is re-established. Lastly, the device is considered offline if it does not reconnect to Cloud BOX for a period of time exceeding its sampling time.



The devices don't just send data to Cloud BOX, but also alarm messages, which are asynchronous in relation to the sampling time, and arrive when they occur, rather than during the next data upload window (polling). During each connection, Cloud BOX can send commands to the device based on the needs of the user and how the dashboard was programmed.

10 Cloud BOX maintenance

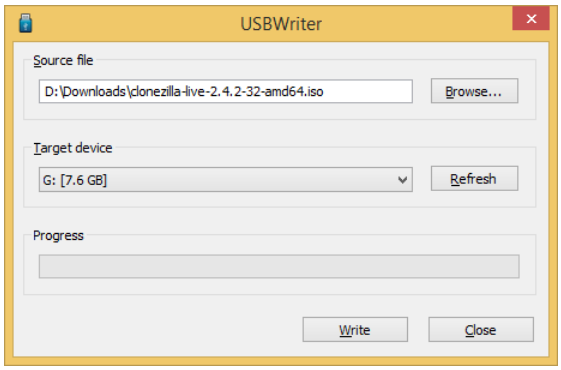
10.1 Resetting the Cloud BOX hardware

Factory resets are performed by resetting a factory image. In both cases, do a configuration backup first, to be used for the reset. To perform these operations, the following is required:

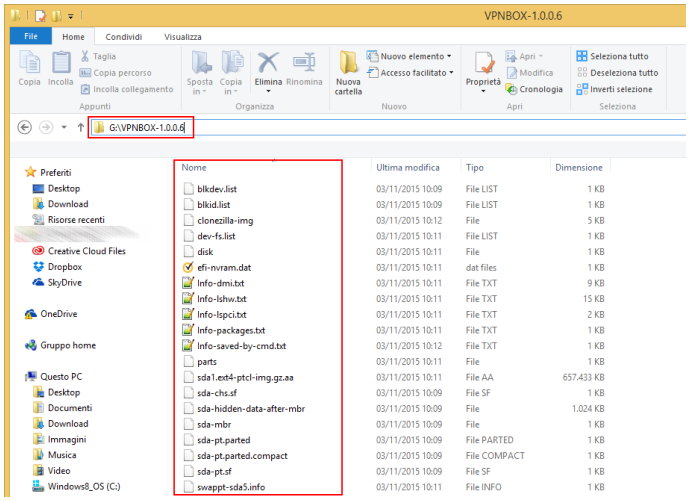
- ***USB keyboard and Monitor with HDMI socket***

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- ***1 x 2Gb minimum USB stick for the UPDATE software***
- ***1 x 2Gb minimum USB stick for the firmware***

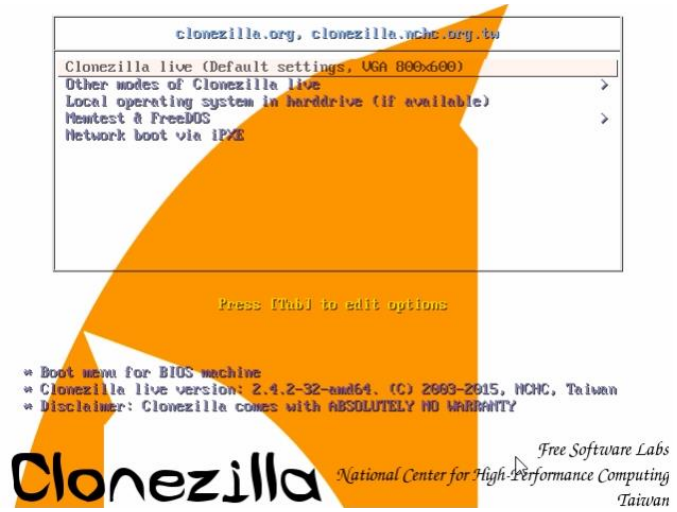


The software required for the update is Clonezilla, which can be downloaded from http://clonezilla.org/downloads.php; make sure to download the Debian version in ISO 64bit format. To prepare the first USB stick with the Clonezilla reset program, download the program for the creation of the stick from http://sourceforge.net/projects/usbwriter/. Now insert the USB stick, open the previously downloaded USBWriter program, select the ISO image and underneath the unit the stick is connected to. ATTENTION! All the data on the stick will be erased.



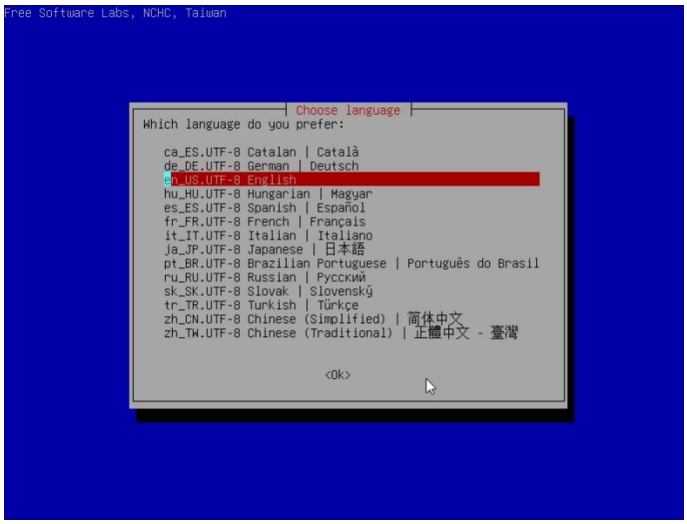
When writing is complete, close the program, disconnect the Clonezilla stick and insert the second stick. The firmware must be saved on this stick, and it can be obtained from the Seneca support site or server. The firmware packet must be unpacked in root, where there must be just one folder containing a series of files as per the following figure: ATTENTION! The folder must not be renamed, its name must not contain any spaces, and it must be of the CLOUDBOX-1.0.0.0 type. Once the second stick is disconnected, reset can be performed.

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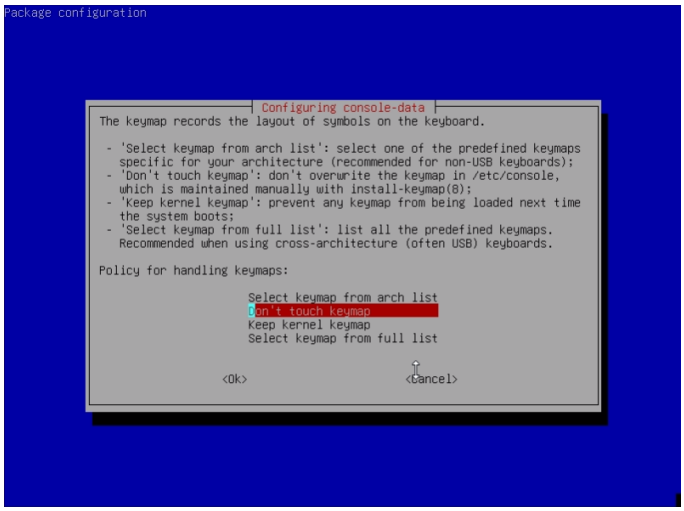


Connect Cloud BOX to a monitor and to a keyboard and insert the first stick with the Clonezilla reset program in the front left port. Start Cloud BOX and wait for the stick to boot, a selection screen will be displayed, select **“Clonezilla live (default settings , VGA 800x600)”.**

Press Enter and wait for the operating system to boot, which might take a few minutes depending on the speed of the stick used. A selection screen for the keyboard layout will be displayed first.

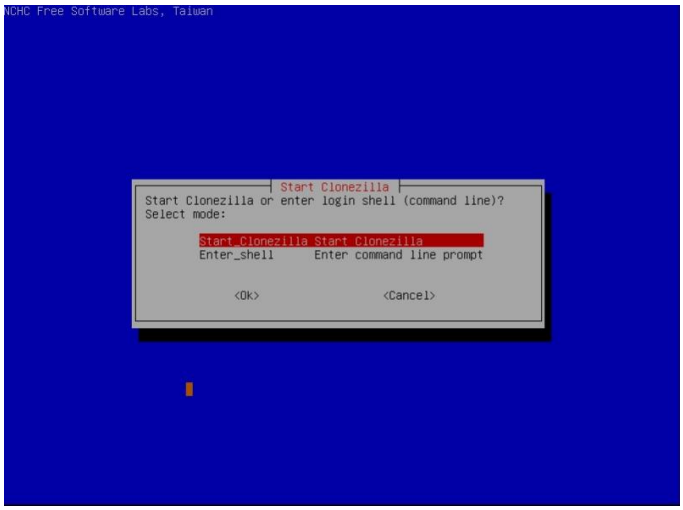


Select “en_US.UTF-8 English”, press Enter and continue with the English configuration; the system will continue by asking for the keyboard to be remapped; press Enter again and continue.

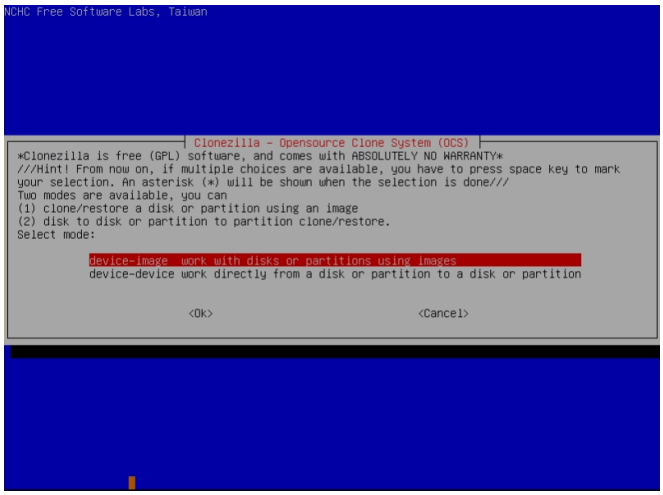


If not needed don’t touch keymapping.

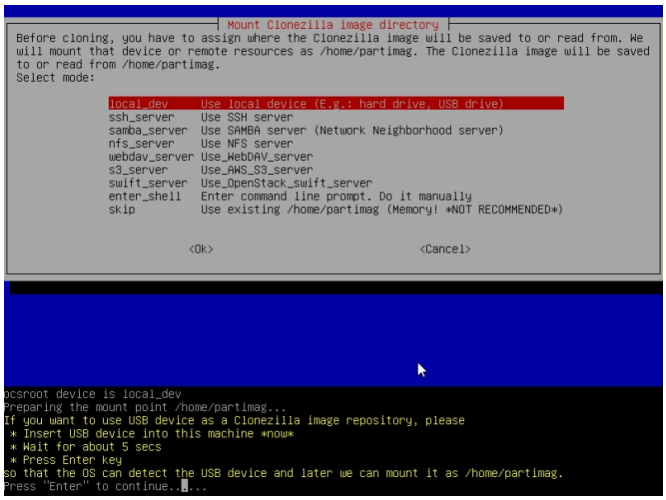
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The system is now ready and will ask if you want to start with the wizard program or enter the shell, select the first option as in the figure.

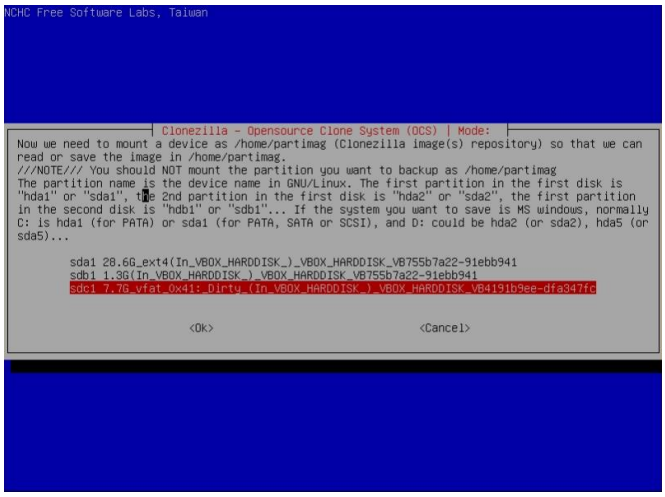


The reset is image based, so proceed with the selection of the first item as per the following figure.

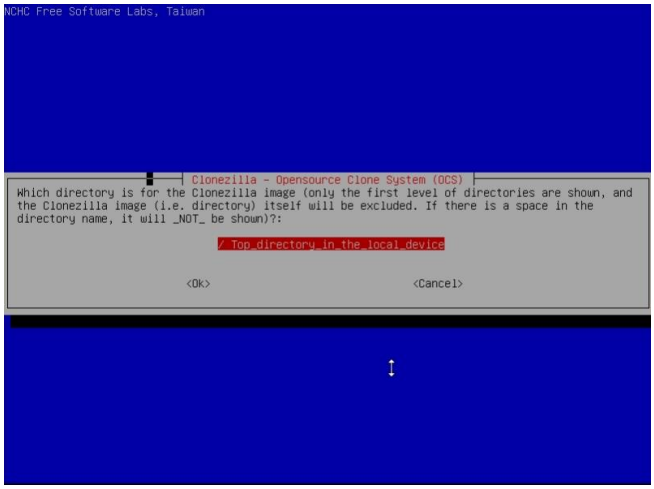


The operation carried out is a reset from local device, which means from the USB peripheral; for this reason, "local_dev" must be selected in the screen shown below. After pressing Enter (bottom yellow), the system will ask to insert the peripheral to use for the reset. Insert the stick with the firmware into the second front right USB port, wait 5 seconds and press Enter. The connected devices will be assessed, wait for the procedure to complete.

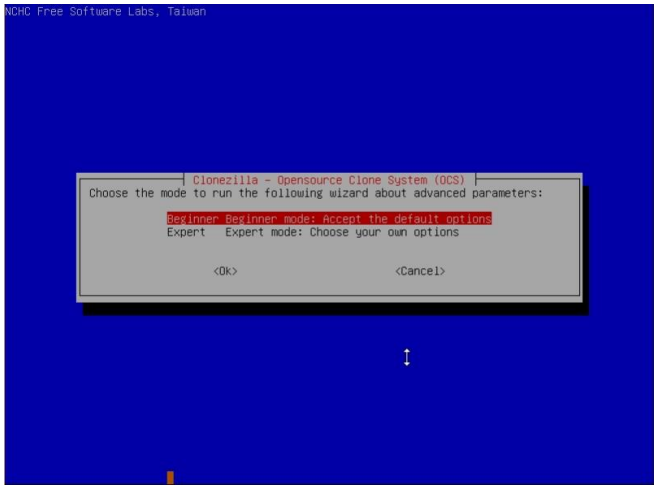
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When scanning is completed, a window appears where you are asked to select the device containing the firmware. The situation should be as follows: SDA1 is the fixed disk of Cloud Box, SDB1 is the Clonezilla update program and SDC1 is the firmware. Choose the last one to carry out the reset.

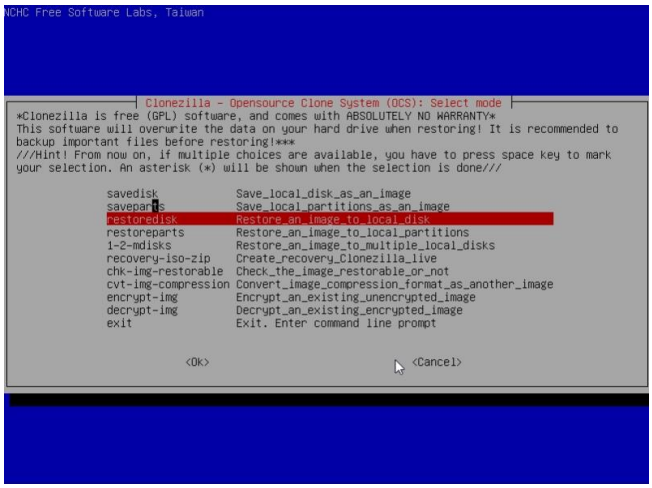


A window will then appear, as per the following picture, asking what folder must be used; since everything is in root, select “Top directory_in_the_local_device”. Once selected, press Enter and its contents will be shown, continue by pressing Enter again.

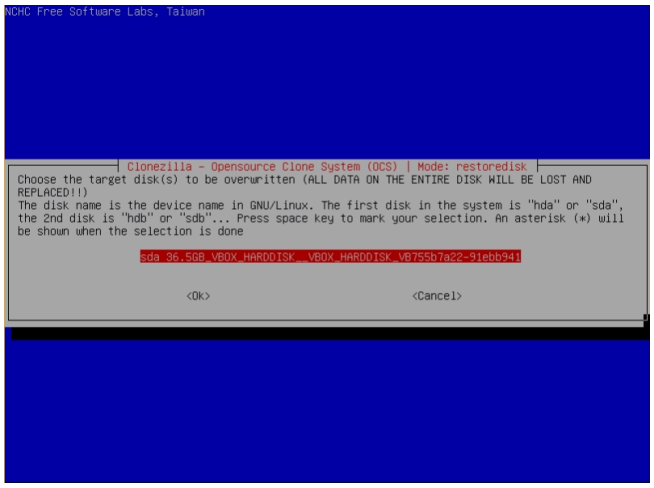


You are then asked for the level of details of the options, which in this case must be left as "Beginner". Press Enter and continue.

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Having to reset the firmware, proceed by selecting "restoredisk" followed by the unit to reset.



The system is now ready to be reset and will ask what unit to carry it out on: the disks compatible with the restore will be displayed, as shown in the figure below; only one compatible disk should be displayed, the 32Gb system disk (model “B”) or 64Gb system disk (model “C”), the main Cloud BOX disk, an SSD that should take the name SDA

Once the disk has been selected, the procedure starts and further confirmation to proceed will be requested (by pressing Y or Enter), as the operation causes the complete loss of all stored data. At the end you will be asked how you want to proceed, select "poweroff" and then take the USB sticks out. Restart the Cloud BOX and wait for the machine to reboot. Once the operating system has been reloaded, the encryption keys will be created: this is a long operation, so leave the Cloud BOX switched on until it restarts automatically. *ATTENTION! The machine must not be switched off and restarted during this configuration operation.*

10.2 Firmware upgrade

10.2.1 Updating with "Check Cloud Box Update"

To check a new upgrade version:

1. You have to sign in to Cloud BOX in admin section (https://<Cloud-BOX-IP-Address>/admin)
2. Enter in Statistics page
3. On the bottom you can find “Check Cloud BOX upgrade” button. Press it
4. In this page, Cloud BOX notifies you if a new version was available
5.

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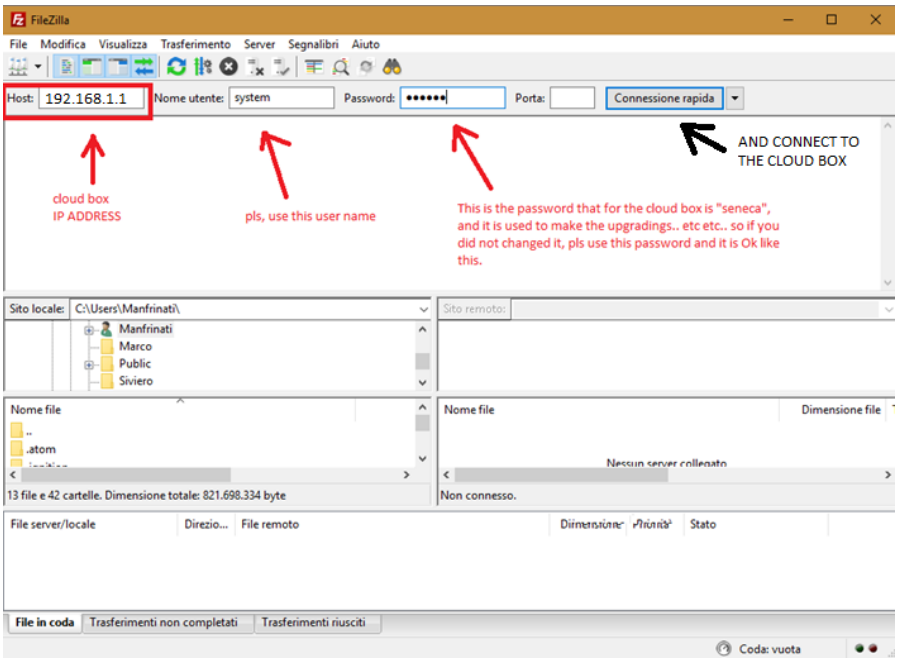
10.2.2 Updating with a manual operation

This operation only updates the Cloud BOX server application, leaving the system and the data intact. For a full formatting use the reset procedure. Firmware upgrade is carried out remotely by FTP connection to Cloud BOX through the system. During the operation, all the services are stopped. The update of the operation status is performed on the physical console of the server.

You should have the new firmware file available on your PC, otherwise to obtain the new firmware please contact SENECA support at supporto@seneca.it.

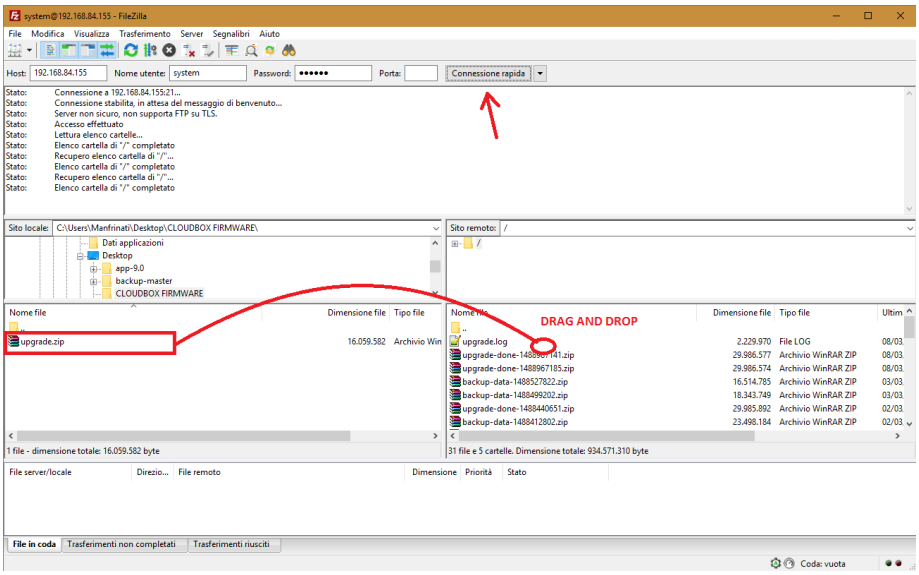
Please follow the steps:

1. Rename the file containing the firmware in “upgrade.zip”
2. Please install FileZilla (or similar FTP client software program) on your PC, in order to create an FTP client.
3. Connect your PC to the Cloud BOX, via FTP. Please use the user “system” (using “system” user’s password, default password is “seneca”)



4. Connect to the Cloud BOX by pressing the button “Fast connection = Connessione rapida”
5. Upload upgrade.zip in the user “system” root directory (it is the directory that you can see when you just logged in). You can do this by dragging and dropping the file upgrade.zip (please see following image)

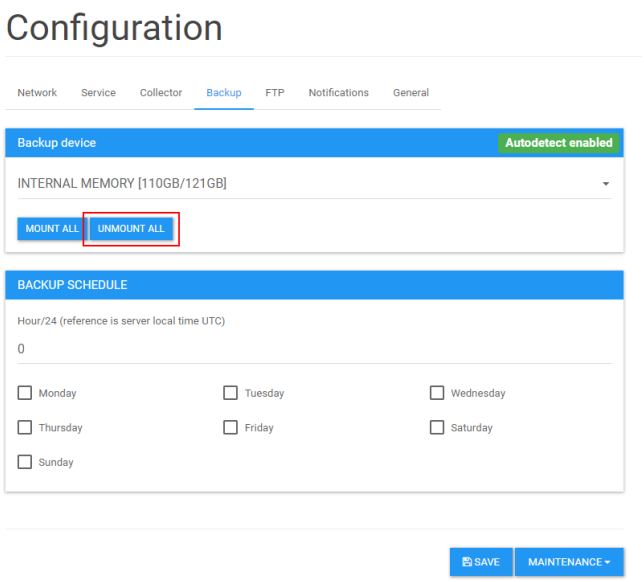
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6. You can disconnect from FTP client.
7. ***Please connect to the cloud box, through the browser (Chrome / Firefox) with IP address = https://<Cloud-BOX-IP-Address>/admin***

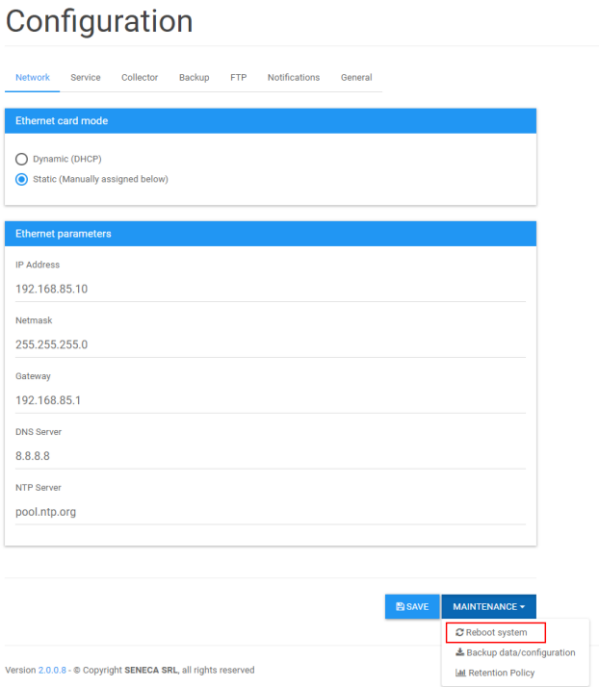
Now we have to reboot the system. This can be done via browser – in the sense that there are no physical buttons to do this step.

8. Enter in Configuration page.
9. In Backup section, remove ALL external USB DEVICE using the button UNMOUNT ALL (and disconnect physically any USB device that could be connected to the device – just in case!)



10. ***Press REBOOT SYSTEM button on the bottom***

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11.
12. Wait at least 2 minutes: Cloud BOX is performing the upgrade
13. After upgrade, you can see the version number changed on page bottom in Admin section (Version W.X.Y.Z - © Copyright SENECA SRL, all rights reserved).

10.3 Backup

Backups can be scheduled or forced using the panel as indicated in the basic configuration section. If the destination of the backup is a local destination, make sure that it does not fail due to lack of sufficient space.

Warning! When selecting a backup peripheral, especially if the amount of data is significant, it will be necessary to ensure that the storage disk is of good quality. For this reason, a USB key, even if 3.0 and/or of large size, is not recommended. A slow backup activity will last for a long time, with possible freezing of the server during the backup period, making it impossible to display data, or for them to be saved by the RTUs.

Warning! When doing backups, keep several copies of data and regularly check their content. The backup file is a zip file.

Warning! For increase security is recommended to export csv data files to the backup. For more info refers to chapter 5.1.3.

10.4 Restore

Restore is performed in the same way as the upgrade, by uploading a previously created backup zip file called restore.zip in the root, followed by the restart command. The process will start automatically 15 seconds after restart has been completed. In case of positive outcome, a row will be added to the logs, with the results of the operation. If this operation is performed from an external hard disk (see relevant section), upload the zip file in the root of the USB hard disk. During the operation, all the services are stopped. The update of the

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operation status is performed on the physical console of the server, and the final result is then recorded in the logs.

10.5 Use of an external disk

It is possible to connect a USB hard disk and use it to store backups. In this case the whole disk will be used. To use an external hard disk, go to the configuration section and select service. This will show the USB hard disk units recognized by the system. Select the desired one from the menu and press use. From this moment on, all backups will be performed on that unit. Remember that usb sticks can be used too but are less reliable.

11 Advanced customization

The section that can be customized is the Dashboard, or the appearance of the user panel. The title and the footer that appear at the top and bottom of the panel are strings that can be customized from the project options in the editor. The title may be replaced by a PNG or JPEG logo (to be loaded through the FTP server to the Custom folder). Its size depends on the top bar, which by default is 64 pixels. For page setup, the dashboard uses the Version 3 CSS Bootstrap framework. In addition to the basic style page, it also uses a default theme, which is only loaded if there is no custom style page that can be loaded. It is possible to load a custom style page with the name custom.css to the Custom folder, which can be reached through the FTP server using the System account. In this page it is possible to override the style. Each widget has the following appearance:

```
<widgetNAME class=”widget widgetNAME”>
        <div class="widget-heading">
                <h3 class="widget-title">WIDGET TITLE</h3>
        </div>
        <div class="widget-body">
        ……
        </div>
</widget>
```

The widget has a different HTML tag depending on the type and is connected to a general style called widget. A specific class is applied in cascade with the same name of the tag, so that the style can be customized. For the main container with the tag name, an in-line style is applied, which regulates the minimum height. This allows the widget to expand but maintain a minimum space requirement in terms of height. The height parameter reflects in fact the row height, set by the editor. The content is split in two sections: heading and body. The heading may not be present in two cases: if the title is empty, or if the widget is a label widget, which being in itself a title does not need a heading. The body of the widget is the content, which represents the widget itself. The editor also contains a box that makes it possible to change the unique widget ID, which can then be sent with the CSS.

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12 Upgrade from version 1.x

An upgrade from this version can be done only with the support of SENECA, please contact our technicians for further assistance.

13 API Specification

13.1 Introduction

Integration API are meant to let third party system to interrogate the Cloud BOX, all data are read only. With these calls you can retrieve device data, logs events and properties.

13.2 Authentication

All requests are GET so there is no payload to send, the authentication is made through headers, you need ad administrative user and send username and password with these header fields:

CBOX-USERNAME, CBOX-PASSWORD

The first username must be a valid active admin user, the secondo parameter is the api key that you can generate in the user admin section.

13.3 Status Codes

Code	*Description*
200	Result ok
400	Invalid parameters
403	Unauthorized
404	Element not found

13.4 Limitations

There is not limit on request rate or number of records but is strongly suggested to auto-limit the usage of this feature because can heavily influence performance of the Cloud BOX. Is not suggested to download high amount of data but limit intervals.

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13.5 API INDEX

13.5.1 List Devices

This requests list all registered devices with their properties.

URL */api/v1/devices*

VERB	GET
PARAMETERS	none

RESPONSE	{
	"success":true,
	"data":[
	{
	"uuid":"123456789000000",
	"name":"test",
	"timezone":"Europe\/Rome",
	"seen":"2018-11-06 15:22:36",
	"model":"Z-GPRS3 [ID 98 - CODE 3300 - REV 204 - MOD202 - OPT 1]"
	}
	]
	}

13.5.2 Get Device

Retrieve a Specific device property with all configured tags.

URL */api/v1/device/<<UUID>>*

VERB	GET
PARAMETERS	UUID = device unique id

RESPONSE	{
	"success":true,
	"data":{
	"uuid":"123456789000000",
	"name":"test",
	"timezone":"Europe\/Rome",

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```
    "seen":"2018-11-06 15:22:36",
    "model":"Z-GPRS3 [ID 98 - CODE 3300 - REV 204 - MOD202 - OPT 1]",
    "tags":[
      {
        "tag":"V0",
        "type":2,
        "name":"POW",
        "default":0,
        "aggregation":"LAST",
        "autodefault":false,
        "is_expression":false
      },
      {
        "tag":"V1",
        "type":2,
        "name":"VBAT",
        "default":0,
        "aggregation":"LAST",
        "autodefault":false,
        "is_expression":false
      }
    ]
  }
}
```


13.5.3 Get Device Events

Retrieve events of a specific device, the result is paged with a selectable size.

URL */api/v1/events/<<UUID>>?page=<<X>>*

or

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/api/v1/events/<<UUID>>/<<PER_PAGE>>?page=<<X>>

VERB	GET
PARAMETERS	UUID = device unique id, PER_PAGE = elements per page (default 50)
RESPONSE	

```
{
   "success":true,
   "data":{
      "current_page":1,
      "data":[
            { "id": 1,
            "timestamp" : "<<TIMESTAMP>>",
            "event_id": 7,
            "event_src": 0,
            "text": "EXAMPLE ALARM” }
      ],

"first_page_url":"https:\/\/192.168.85.69\/api\/v1\/events\/123456789000000?page=1",
      "from":null,
      "last_page":1,

"last_page_url":"https:\/\/192.168.85.69\/api\/v1\/events\/123456789000000?page=1",
      "next_page_url":null,
      "path":"https:\/\/192.168.85.69\/api\/v1\/events\/123456789000000",
      "per_page":50,
      "prev_page_url":null,
      "to":null,
      "total":0
   }
}
```


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13.5.4 Get Device Log

Retrieve the last log of a specified device.

URL */api/v1/log/<<UUID>>*

VERB	GET
PARAMETERS	UUID = device unique id

RESPONSE	{
	"success":true,
	"data":{
	"tms":1541517739,
	"V0":0,
	"V1":1,
	"V2":1,
	"V3":0,
	"V4":0,
	"V5":0,
	"V6":1,
	"V7":0
	}
	}

13.5.5 Get Device Logs

Retrieve historical log of a device selectable by period and/or variables; if from/to is null then a span period of 5 minutes is taken, if vars is null then all variables are selected.

URL */api/v1/logs/<<UUID>>?from=<<FROM>>&to=<<TO>>&vars=<<VARS>>*

VERB	GET
PARAMETERS	UUID = device unique id, FROM = epoch (ex 1541516400), TO = epoch (ex 1541547600), VARS = comma separated variables
RESPONSE	{ "success":true, "data":[

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```
      {
         "tms":1541517679,
         "V0":0,
         "V10":-29519
      },
      {
         "tms":1541517739,
         "V0":0,
         "V10":17257
      }
   ]
}
```


13.5.6 Get Device Commands

Retrieve current command queue of certain device and its status.

URL */api/v1/commands/<<UUID>>*

VERB	GET
PARAMETERS	UUID = device unique id
RESPONSE	


```
{
   "success":true,
   "data":[
      {
         "code": 123456,
         " status": 0,
         "created_at": 123456,
         "updated_at": 123456,
         "tag": " V0",
         "value": 100
      }
   ]
```


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```
}
```

Parameters

```
CODE = numeric action code, STATUS = the command status Waiting (0), Sent
(1), Cancelled (2), created_at/updated_at = timestamp in epoch format
(UTC), TAG = the tag name, VALUE = the tag value
```

13.5.7 Append Device Command

Append a new command or tag set point of a certain device.

URL */api/v1/commands/add/<<UUID>>*

VERB	POST
PARAMETERS	UUID = device unique id

PAYLOAD	A json data with this form: {
	"action" : 100,
	"tag": "V0",
	"value": 0
	}
	If you want to send an action put a code > 0 otherwise will be interpreted as a set point.

RESPONSE	{ "success":true, "data"; *null* }

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