Quick Start Guide

A. Login Procedure

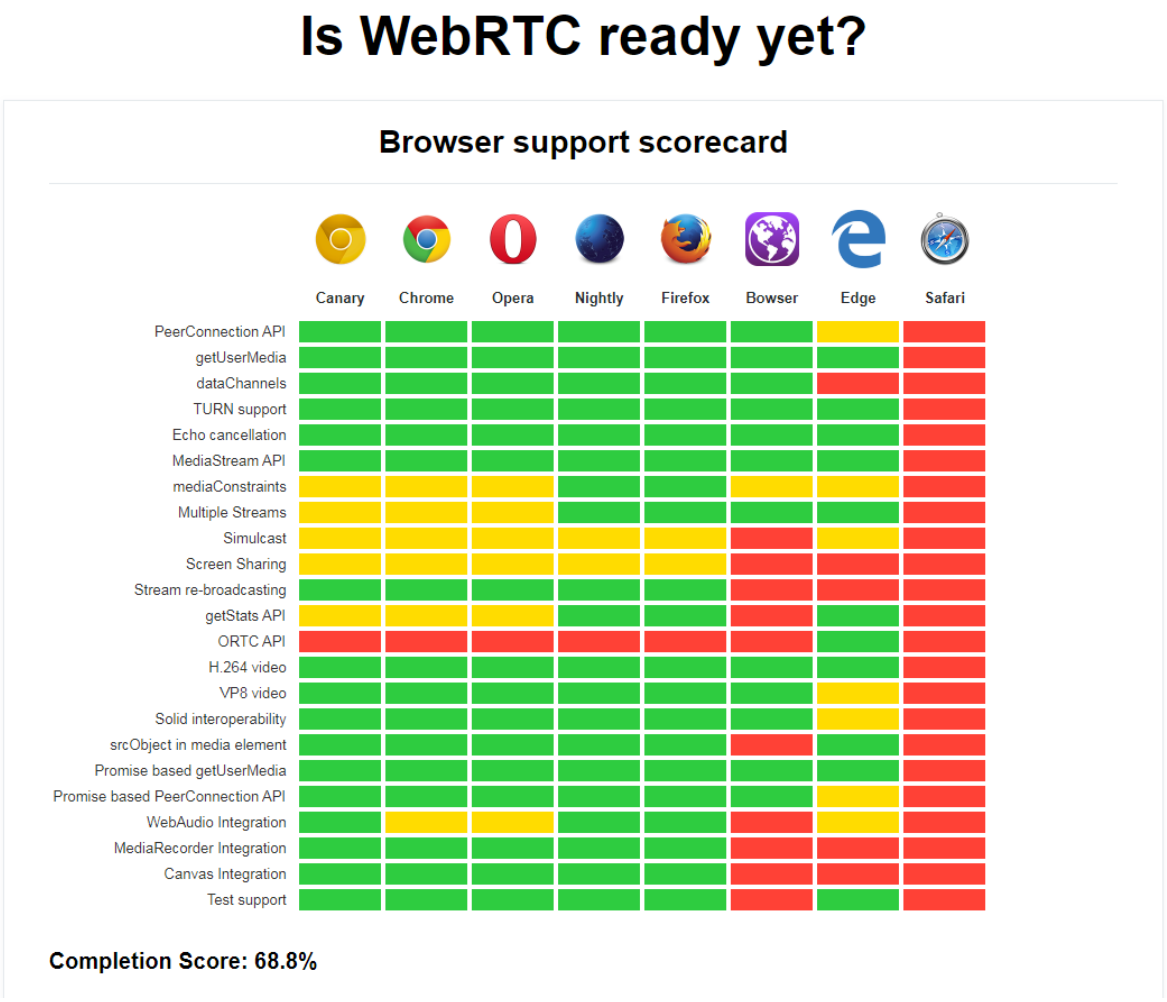
B. Sensor Dashboard (software version 1.2.5)

A. Login procedure iQunet sensor network

1. Install a browser which is supporting WebRTC

iQunet strongly advises to use the Google Chrome browser.

Note: Microsoft will not develop WebRTC for Internet Explorer. Microsoft Edge and Apple Safari are under development and not yet WebRTC ready. Please check http://iswebrtcreadyyet.com/ for the latest updates.

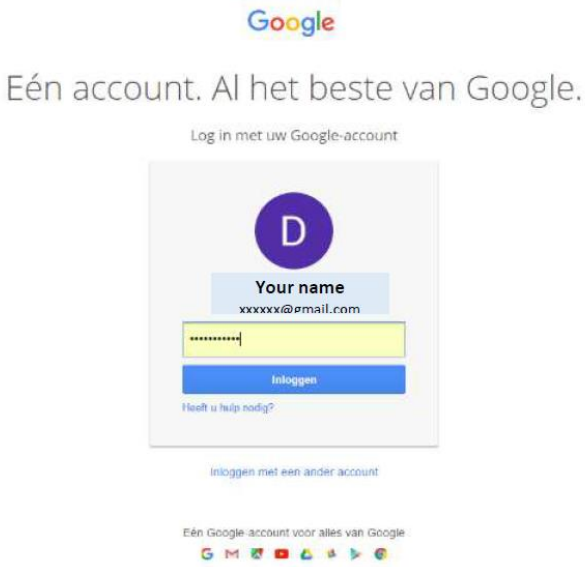


WebRTC is an open framework for the web that enables Real Time Communication in the browser. It includes the fundamental building blocks for high quality communications on the web, such as network, audio and video components used in voice and video chat applications. The WebRTC effort is being standardized on an API level at the W3C and at the protocol level at the IETF.

2. Surf to: rtc.iqunet.be

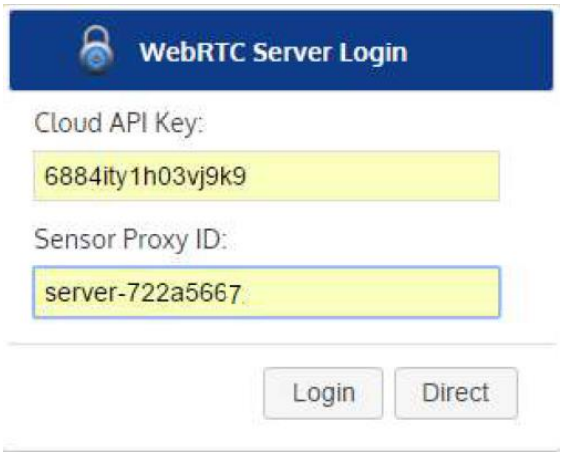
3. Identify yourself with your Google account

This identification is to verify you are not a web robot. Once logged in via a Google account, you will not be prompted anymore.



4. Logon to the iQunet Sensor Dashboard

You will be prompted for Key and ID as shown below (API Key and Sensor Proxy ID are provided by iQunet).

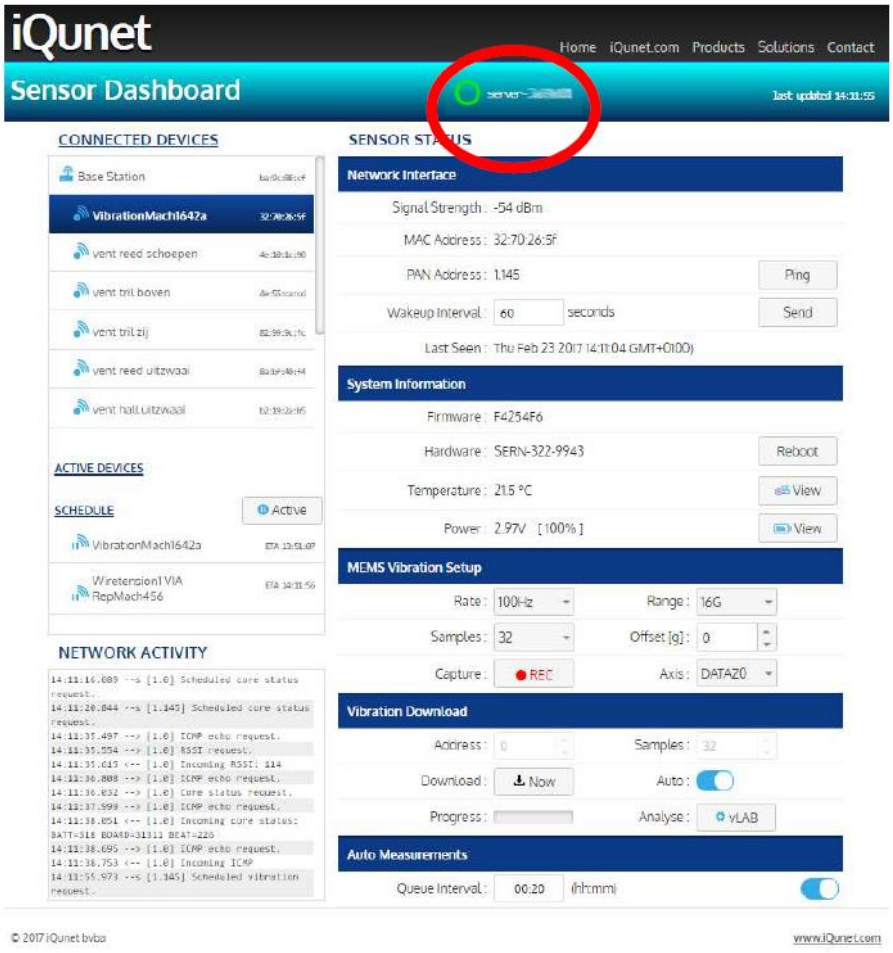


4.1. WebRTC Server Login

Cloud API Key: see distributed key (e.g. 6884ity1h03vj9k9)

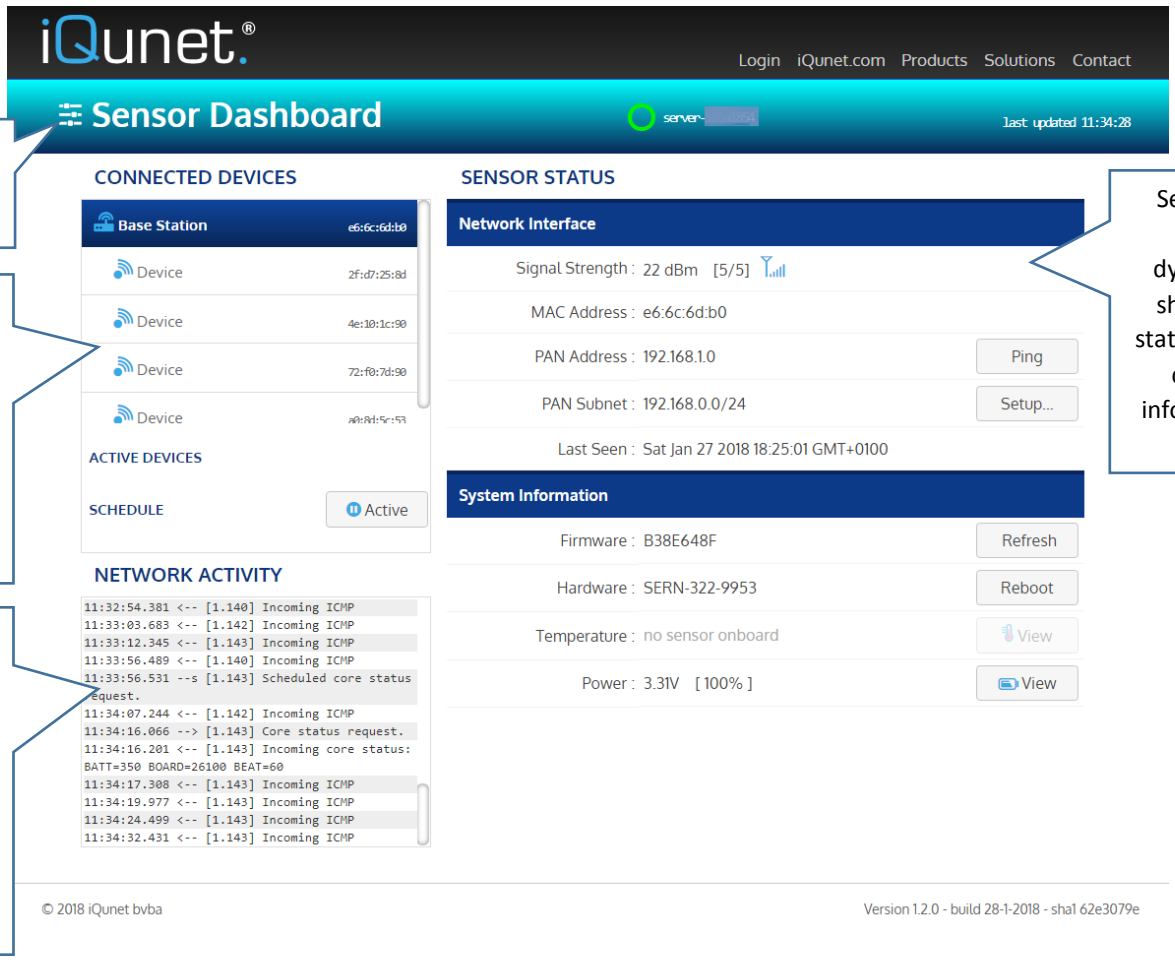
Sensor Proxy ID: see the ID on your UNIX server (e.g. server-xxxxxxxx)

5. You are connected to the iQunet Unix Server



B. iQunet Web GUI: Quick Start Guide

1. General



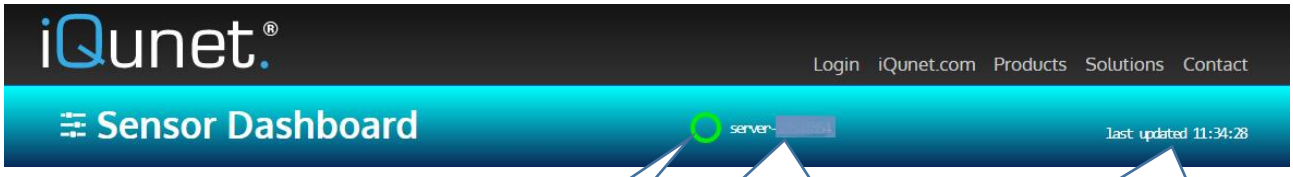
General information pane

Device pane: list of devices connected to the base station. Connected devices can become active or queued.

Network activity pane: this pane shows scrolling logs of sensor activity messages (sent and received messages per sensor).

Sensor status pane: this dynamic pane shows sensor status and device depending information and settings.

2. General information pane



Connection status to the iQunet UNIX server from sensor network.

Green: connected

Red: connection lost

Grey: connecting

Connected server

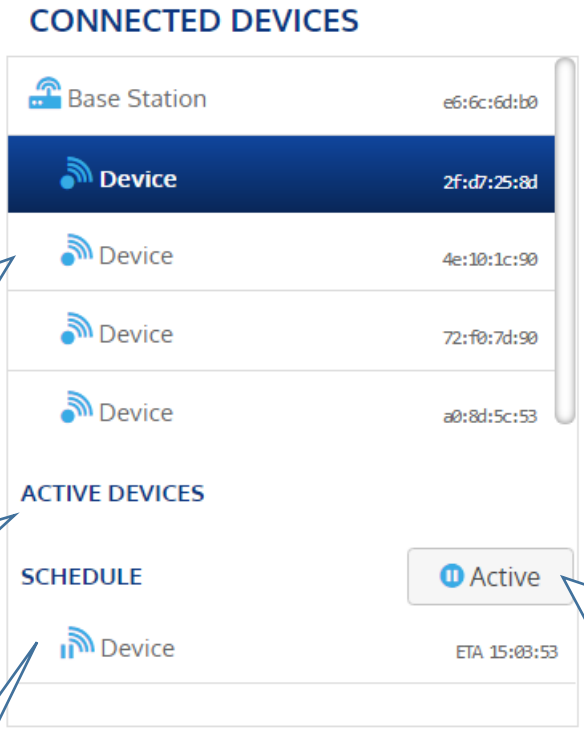
Time stamp of last screen refresh

3. Device pane

Devices connected to the base station. Once seen by the base station, the list remains intact until the device is deleted. Devices losing contact with the base station will show no updated network status (see Sensor Status pane) but remain linked with the base station (and remain in the list).

Active Devices list: this list is showing the devices currently measuring and sending data to the OPC.

Queued Devices list: this list is showing the devices from the connected devices list currently selected for measuring and sending data on preset time intervals.



Toggle for pausing or activating the complete queued devices list.

Paused: click to activate the complete queued list

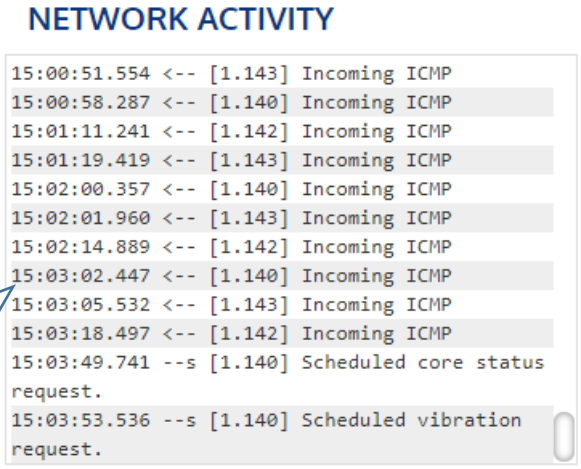
Activated: click to pause the complete queued list

4. Network activity pane

This pane shows scrolling logs of sensor network messages.

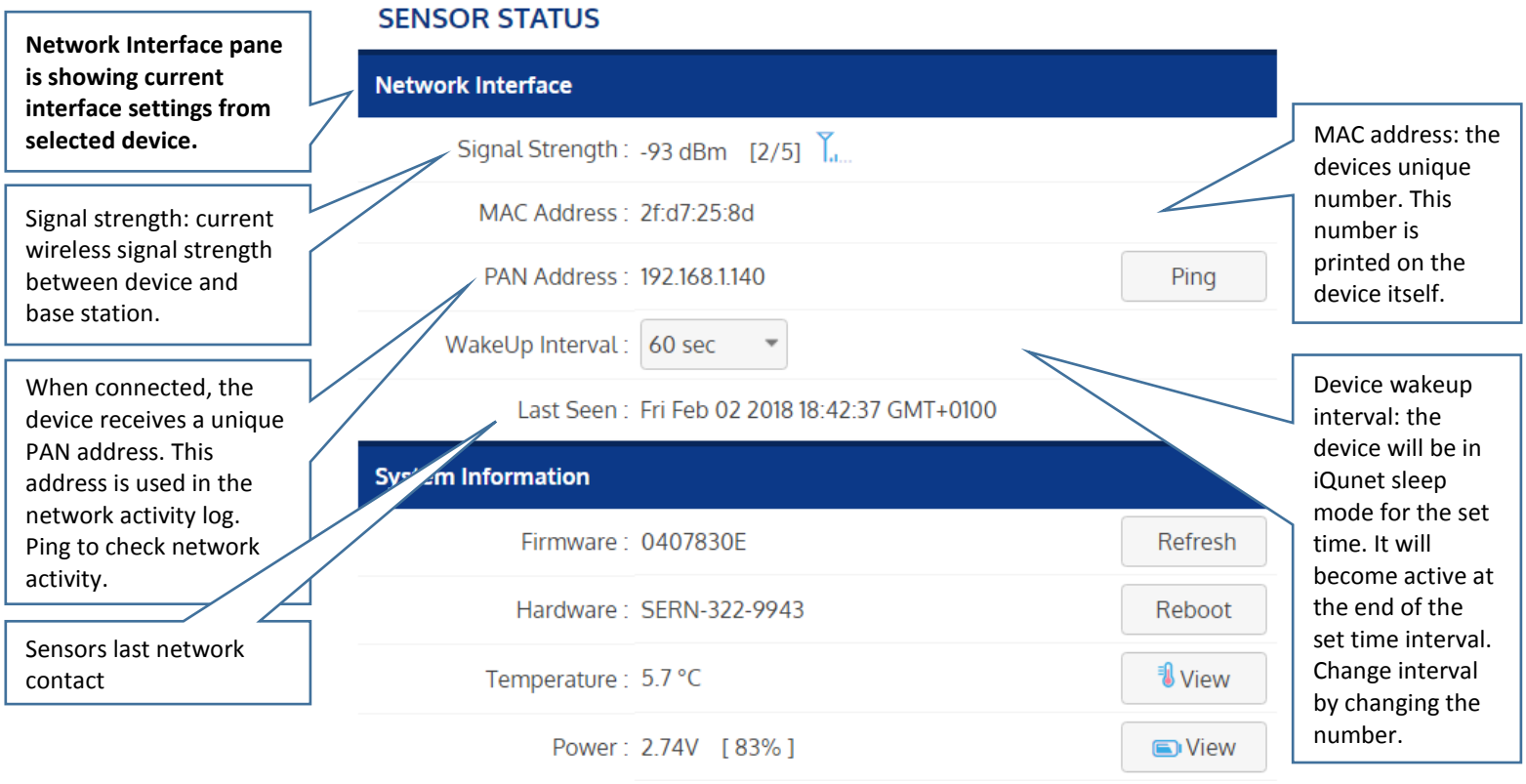
"<- -": incoming messages from connected sensor devices (seen sensors)

"- ->": outgoing messages to the sensor devices (will be received as soon as sensor is awake)

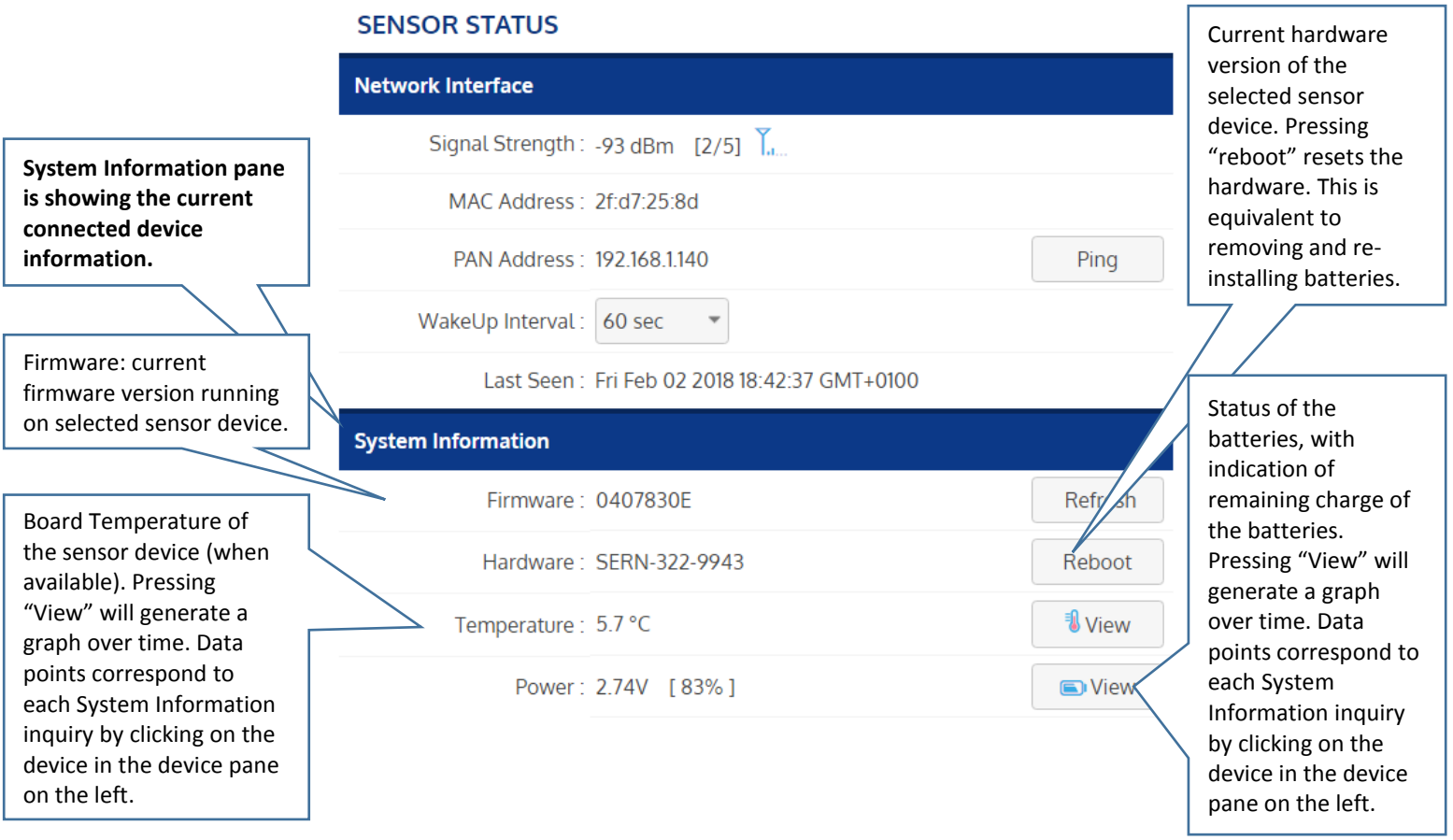


5. Sensor status

5.1. Network interface

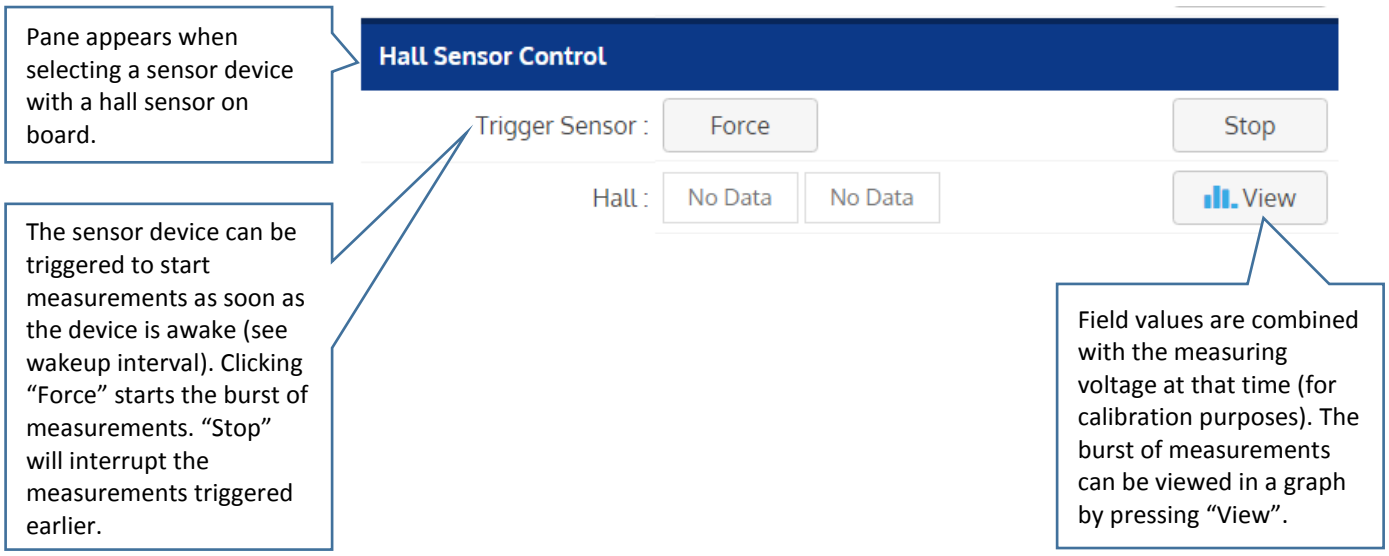


5.2. System information

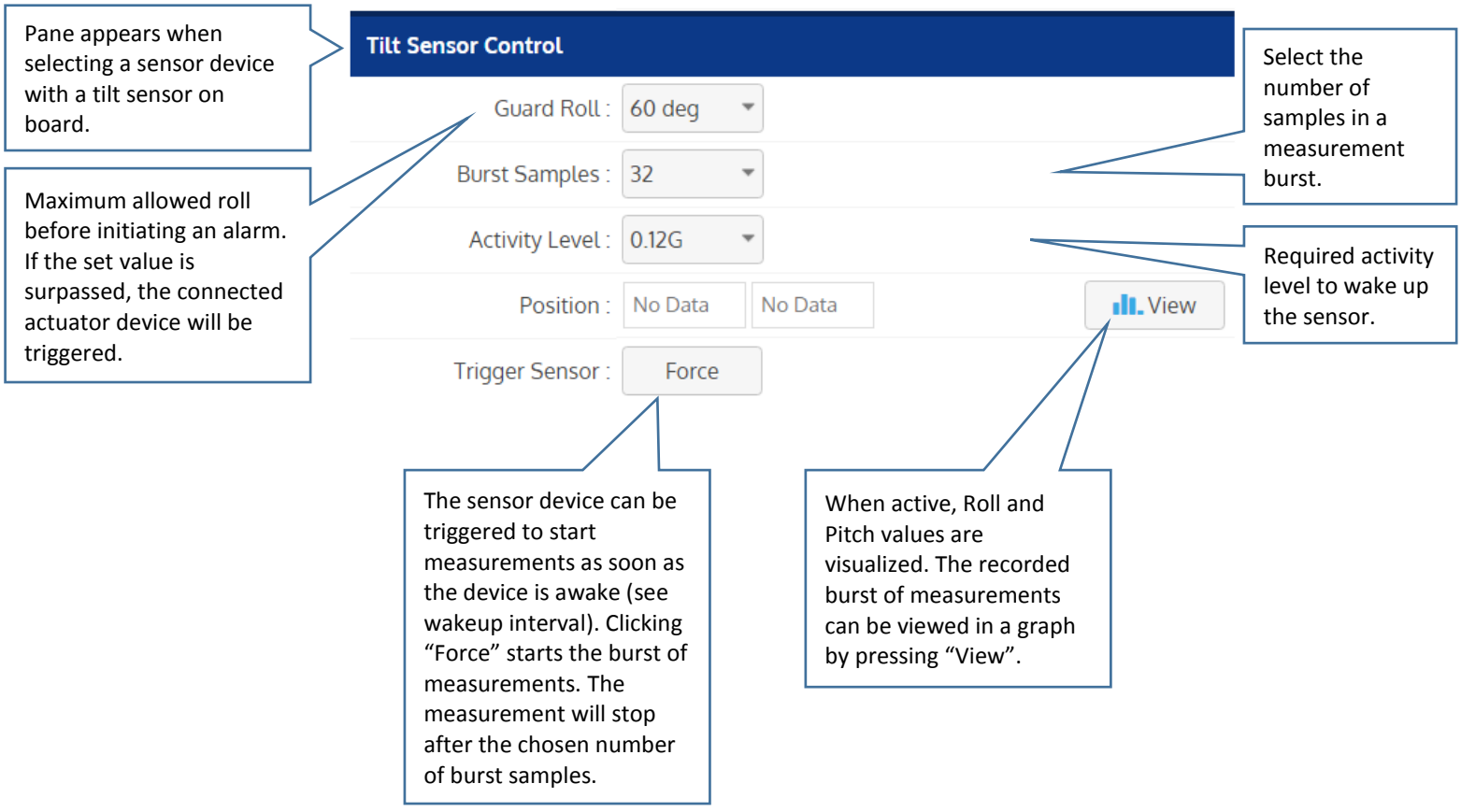


5.3. Sensor control

5.3.1. Hall sensor control (proximity sensor)

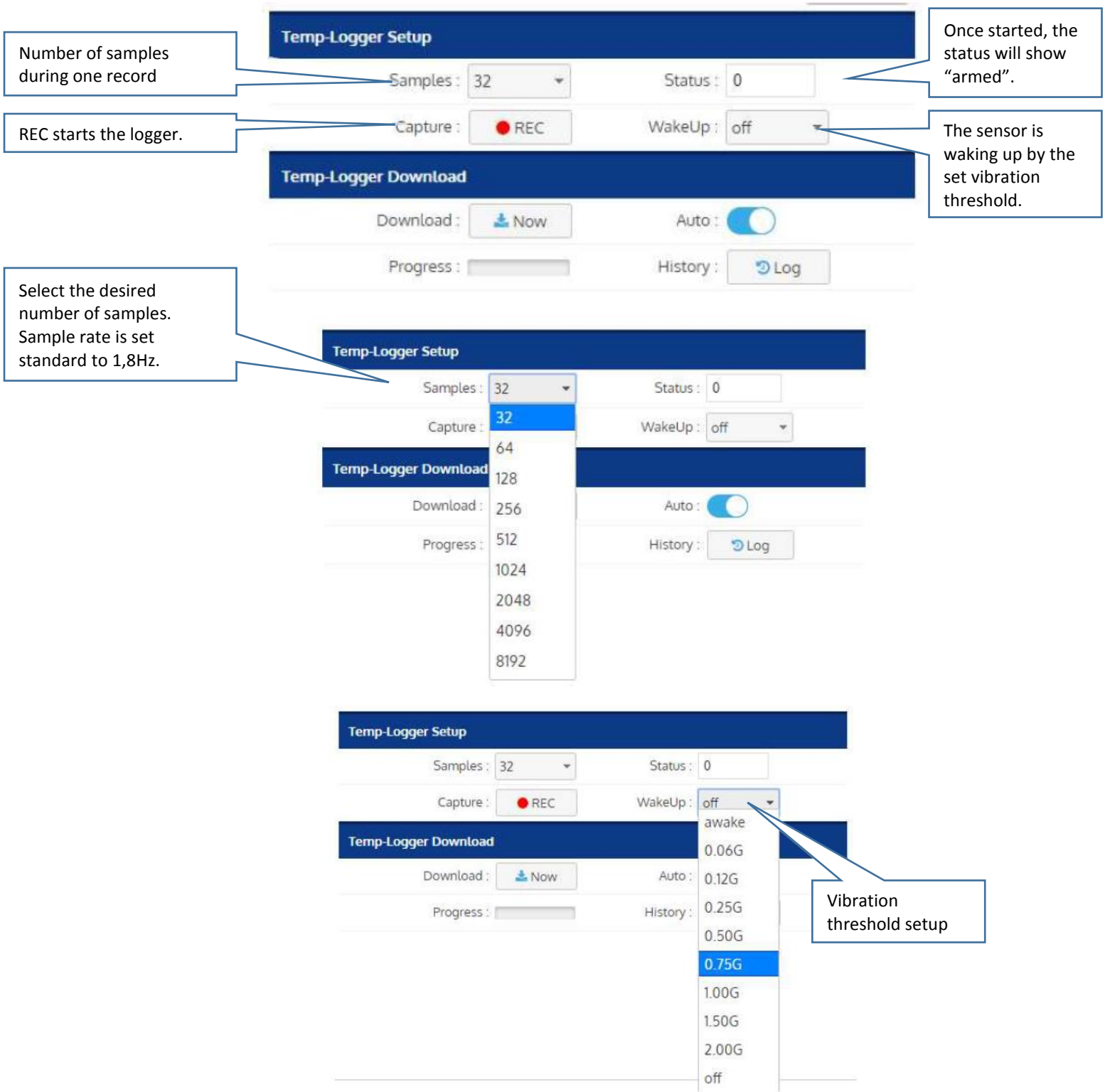


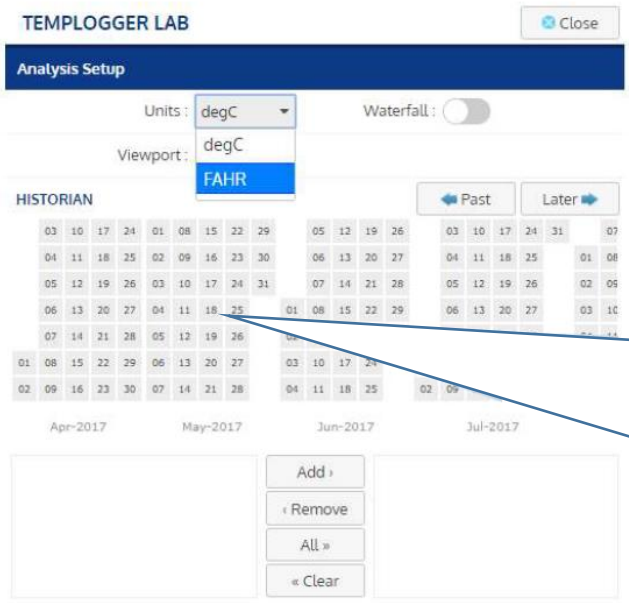
5.3.2. Tilt sensor control (inclination sensor)



5.3.3. Temperature logger

The temperature logger is a sensor that can operate away from the network. Once armed in the network, the sensor can be triggered by vibrations to start the measurement, even when there is no network connection. The measurements are logged on the sensor until the sensor comes back in the sensor network. The measurements are then downloaded to the OPC server database. The measurements can be viewed in the "Templogger Lab".

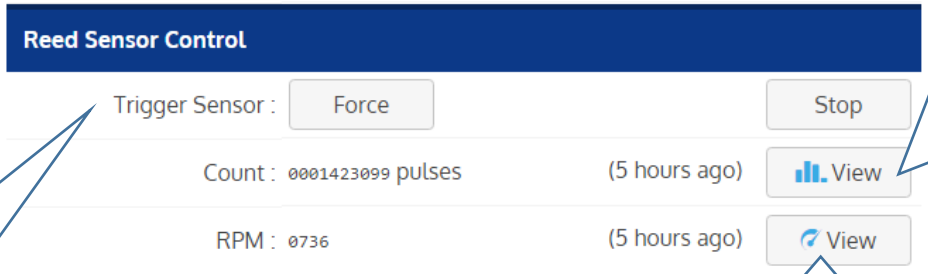




All measurements are stored in the OPC historian and can be viewed individually or compared to others in the waterfall graph. Graphs can be downloaded to Google Sheets and saved as Excel sheets for quick reference.

5.3.4. Reed sensor control (proximity switch sensor)

Pane appears when selecting a sensor device with a reed sensor on board.

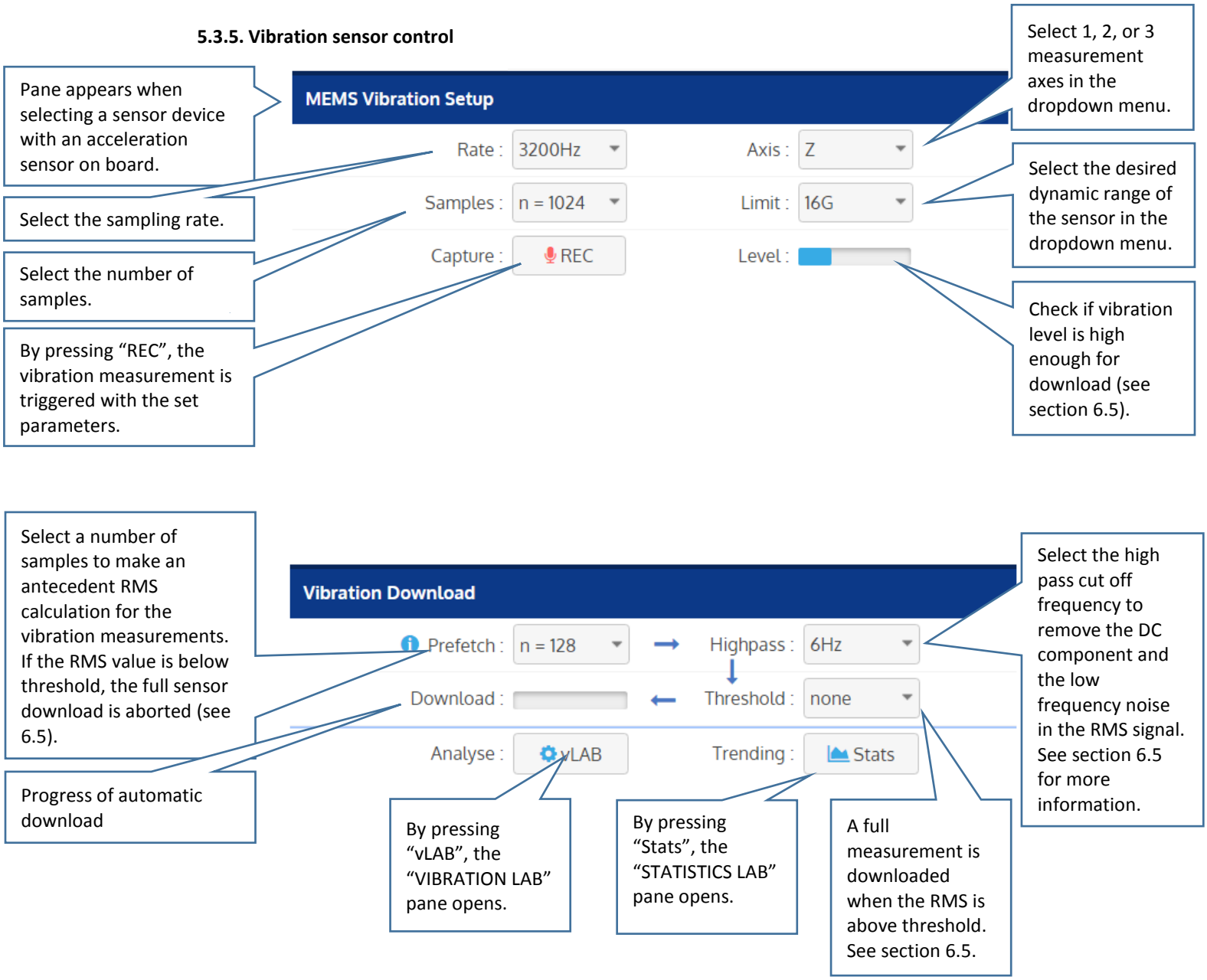


The sensor device can be triggered to start measurements as soon as the device is awake (see wakeup interval). Clicking “Force” starts the burst of measurements. “Stop” will interrupt the measurements triggered earlier.

The number of magnetic pulses is counted continuously. When the sensor is active, pulses are shown in this field. The counts are shown in a graph by pressing “View”.

Revolutions per minute value based on the count of magnetic pulses. When the sensor is active, rpm values are shown in this field. The rpm values are shown in a graph by pressing “View”.

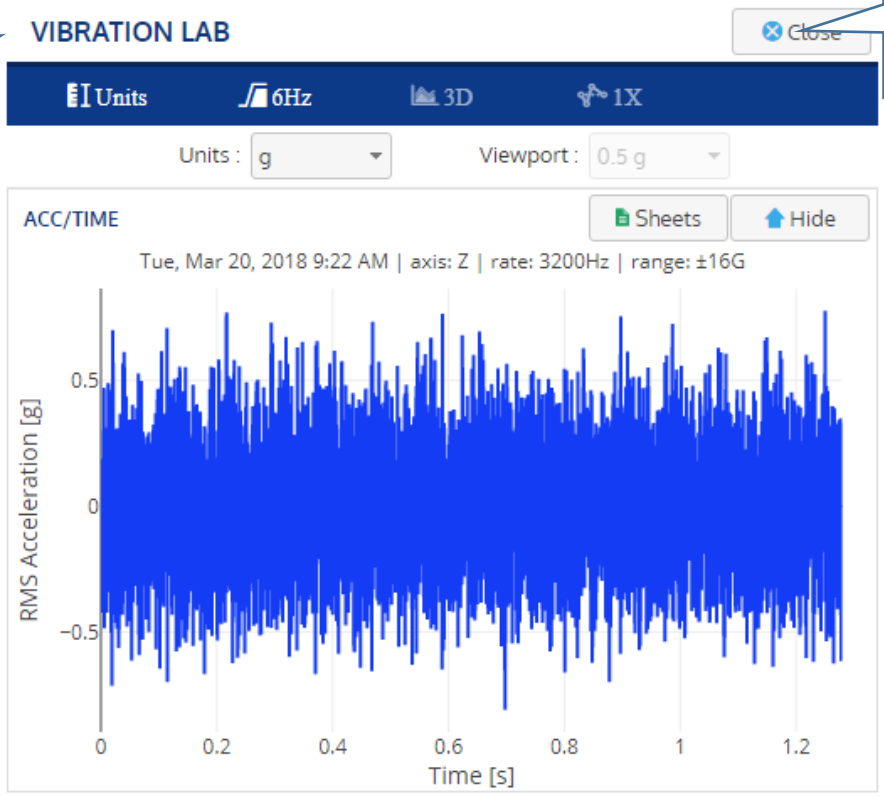
5.3.5. Vibration sensor control



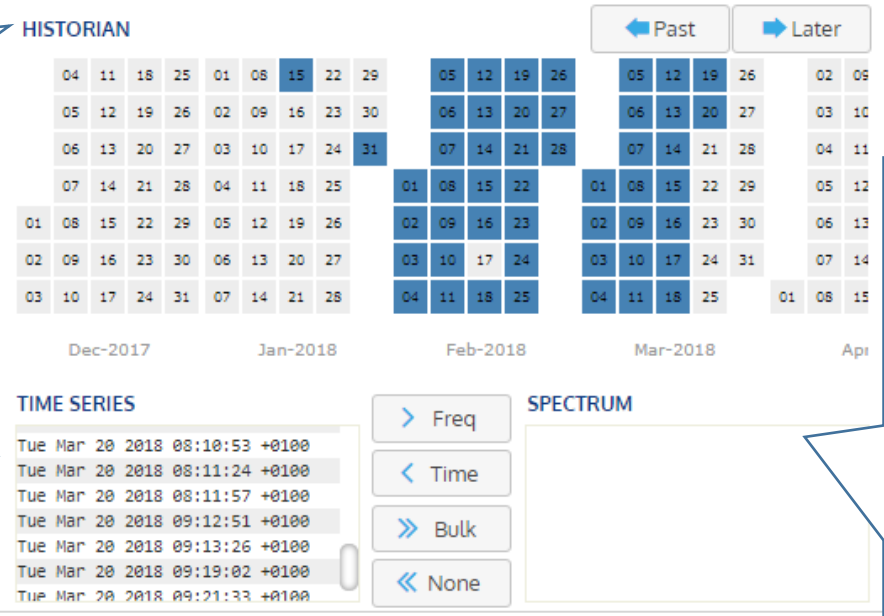
5.3.6. Vibration Lab (vLab)

Vibration Lab pane shows basic analysis of measured vibration signals.

Close Vibration Lab pane.



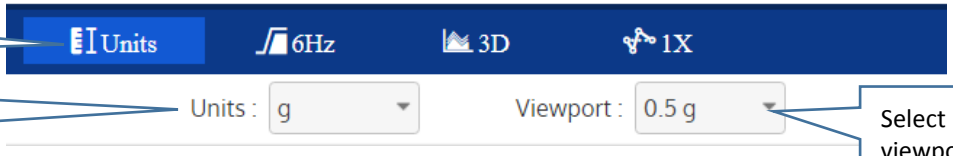
Measurements saved in the iQunet OPC historian. Click on the date to see the available measurements.



Time Series box: selecting 1 measurement in this box will show the respective time series graph. Select multiple time signals by dragging the mouse pointer. Click “Freq” to add the selected measurements to the box on the right. When only 1 measurement is selected, clicking “Freq” will automatically show the spectrum plot. Click “Bulk” to add all measurements to the box on the right.

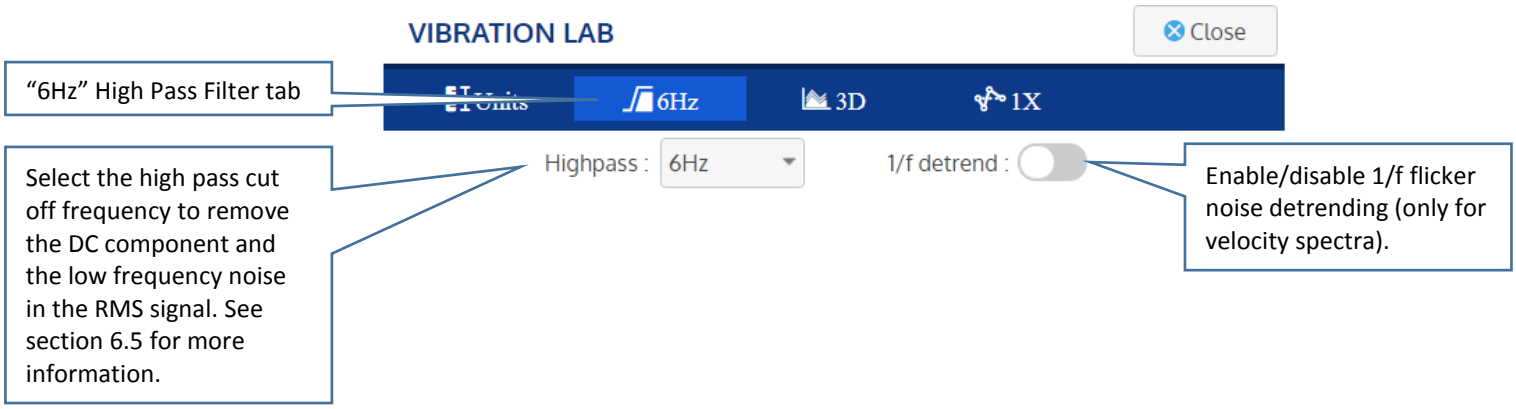
Spectrum box: select 1 measurement to show the spectrum of this measurement. Drag over the list to select multiple items for removing them back to the left box (click “Time”). Click “None” to remove all measurements in this box.

“Units” tab



Select graph units: g or mm/s.

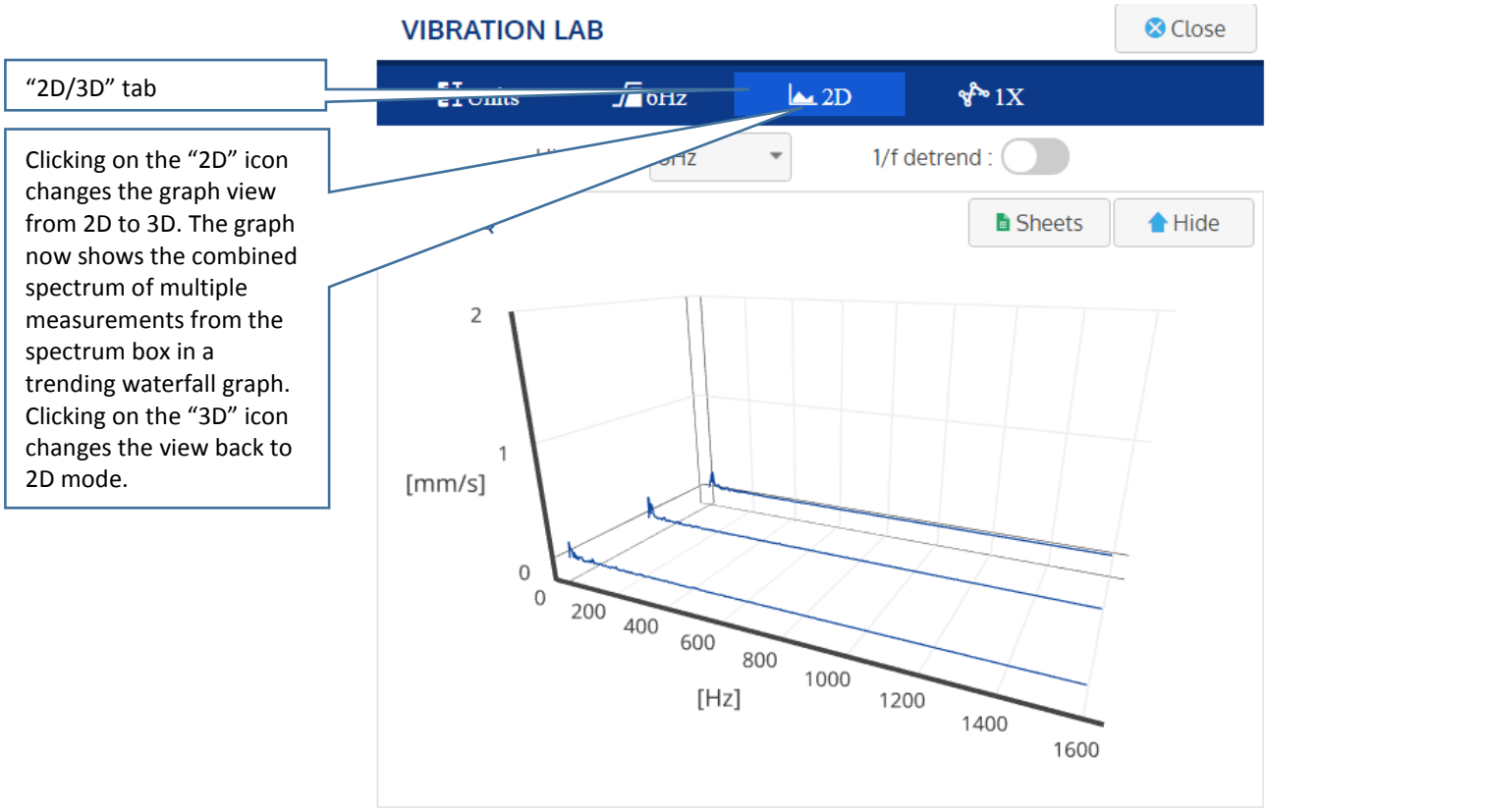
Select predefined viewport settings to alter graph format.



"6Hz" High Pass Filter tab

Select the high pass cut off frequency to remove the DC component and the low frequency noise in the RMS signal. See section 6.5 for more information.

Enable/disable 1/f flicker noise detrending (only for velocity spectra).



"2D/3D" tab

Clicking on the "2D" icon changes the graph view from 2D to 3D. The graph now shows the combined spectrum of multiple measurements from the spectrum box in a trending waterfall graph. Clicking on the "3D" icon changes the view back to 2D mode.

"1X" averaging tab

Enable/disable DFT averaging and select the number of averages. DFT averaging will decrease the noise level at the cost of a loss in resolution.

5.3.7. Statistics lab

STATISTICS LAB shows the recorded RMS and Kurtosis values during a selected time interval.

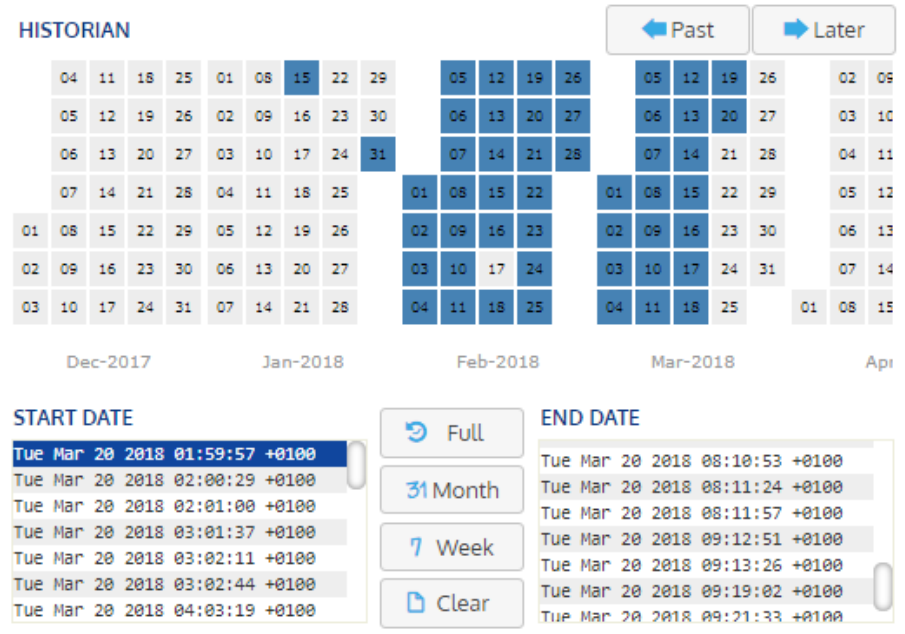
"Units" tab

Select the desired units: g or mms/s (acceleration/velocity).

Close Statistics Lab.

Select RMS or Kurtosis statistic.

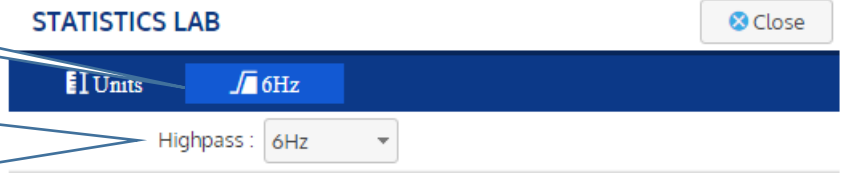
Select or unselect an axis by clicking on the colored square.



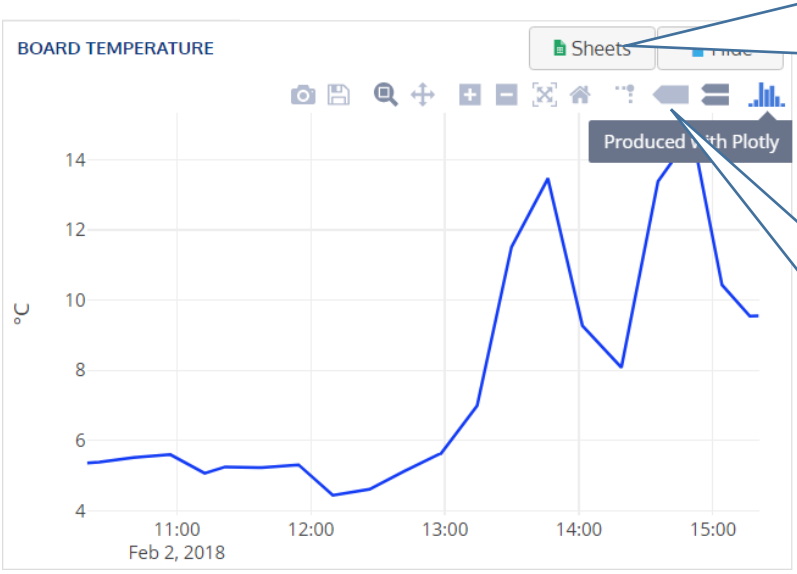
Select a start and end date in the proposed lists to create a graph. Click on a date in the historian to select a specific start or end day. Click "Full" to select all available data. Click "Month" to select the data of the past month. Click "Week" to select the data of the past 7 days. Click "Clear" to remove the chosen start and end date.

"6Hz" High Pass Filter tab

Select the high pass cut off frequency to remove the DC component and the low frequency noise in the RMS signal. See section 6.5 for more information.



5.4. Content based graph settings and data export



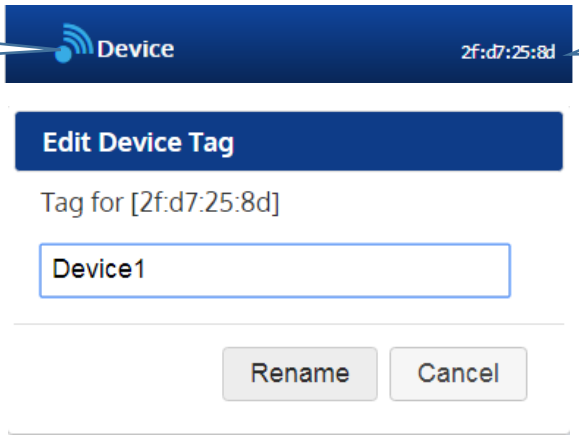
Pressing “Sheets” exports the OPC data to Google Sheets. By pressing the button again, the same sheet is updated with new values.

Graph buttons are content based and show up depending on the selected graph. Pointing to the icon will show the explanation of the button.

6. Functionality

6.1. Renaming a device

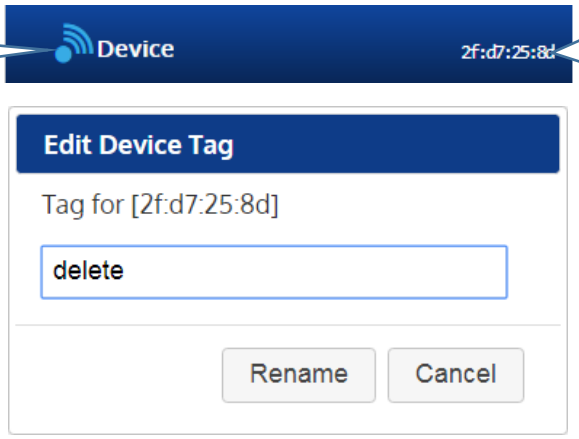
By pressing the icon, a popup appears. The device can be renamed.



The devices MAC address cannot be altered and remains unique.

6.2. Deleting a device

By pressing the icon, a popup appears. The device can be deleted by renaming it to “delete”.

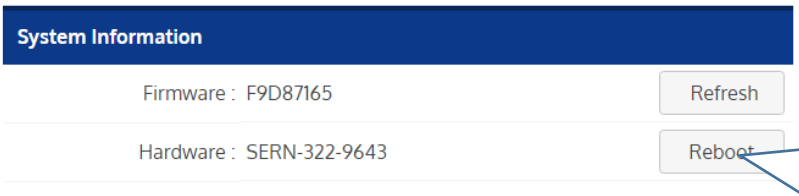


When deleted, the device will be removed from the sensor list. As soon as the battery is activated in the device, the device pops up again in the list and is automatically connected to the closest base station in the field when in reach.

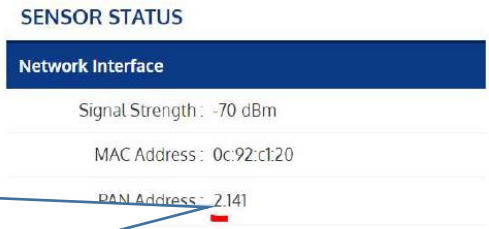
6.3. Relaying a device via a repeater or an actuator

To relay sensors via a repeater or actuator, simply rename the repeater or actuator and start the name with "RPT". The name of the repeater or actuator may NOT contain spaces.

To force the relay of a sensor device via a repeater or actuator, type "VIA" after the device name followed by the repeater or actuator name.

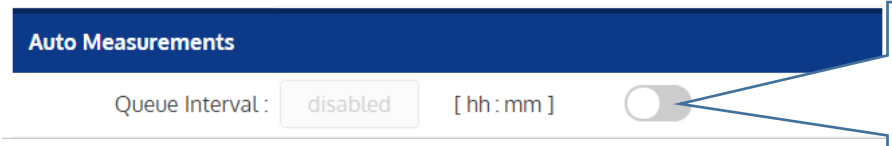


In the device pane select each device involved in the relaying (repeater, actuator and sensors), and press "Reboot" for each of them.

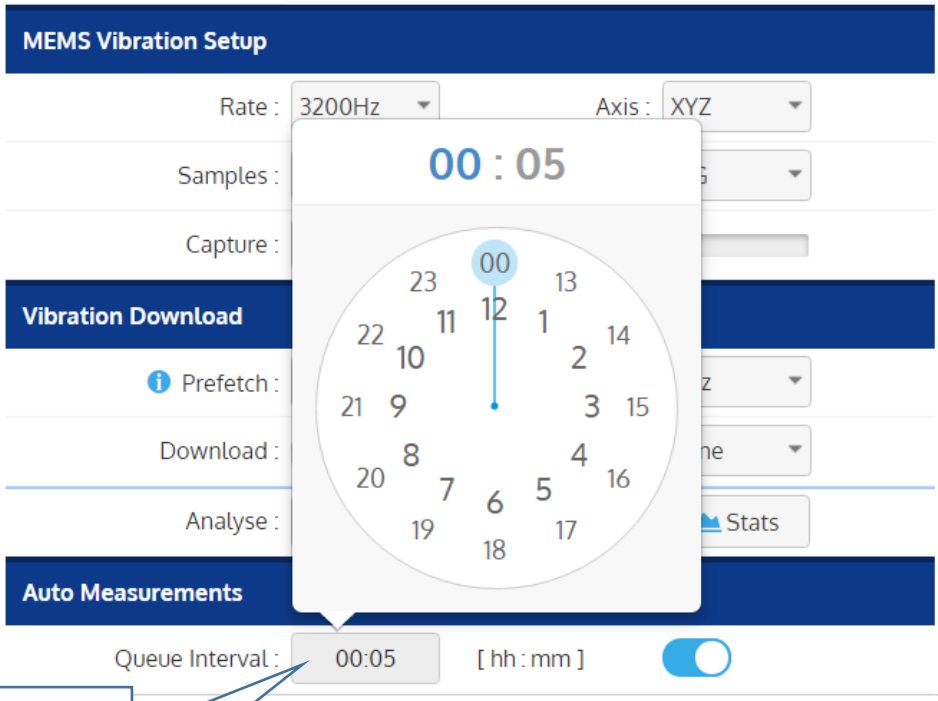


By clicking on each device, check if each repeater or actuator has received a new subnet like "2.xxx", "3.xxx", etc. In this example sensor 0c:92:c1:20 is fixed relayed via repeater "RPT RepMach456" under the subnet "2".

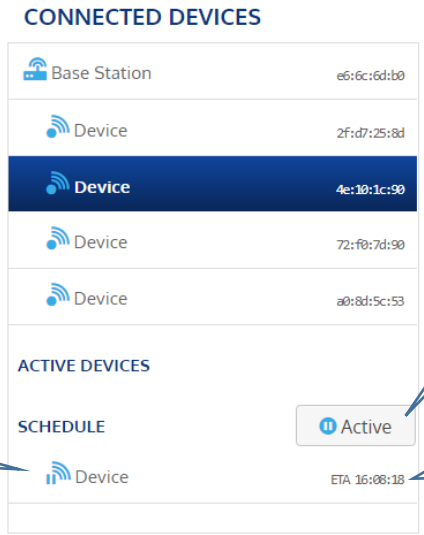
6.4. Auto measurement



A sensor device which is enabled for Auto Measurement will show this extra pane. To start queuing the sensor measurement, slide the button to blue. The queue interval can now be set.



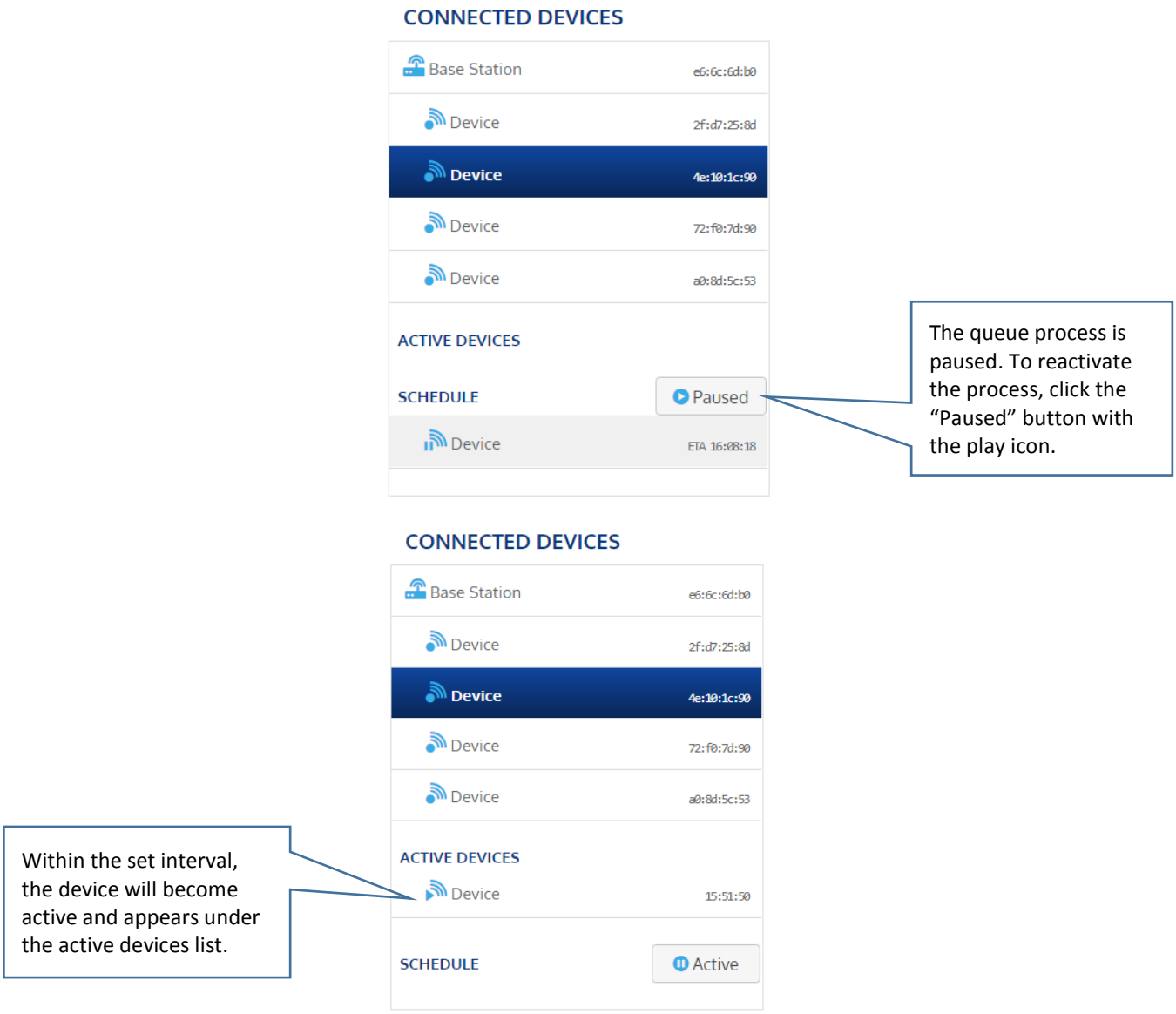
Select the queue interval in the dial pane. First select the hours by dragging the clock pointer over the desired number. Then repeat this action for selecting the minutes.



IMPORTANT: The total queue list is started by default. To stop the process, click the "Active" button with the pause icon. The process queue will become paused.

Queued devices will now appear in the "Queued devices" list.

When scheduled at the same time, devices will remain queued in the list until the active device list is free to host another device. This way avoiding interference in the radio channels of the wireless network.



6.5. Auto measurement and prefetch explained

Below is the explanation of the automatic vibration measurements and the correct use of 'prefetch' and RMS.

NOTE: RMS threshold does not apply for manually recorded vibrations with the REC button.

Automatic vibration measurements must be enabled, as shown above in section 6.4. The prefetch settings can be found and edited on 3 different places as shown in Figure 1 to Figure 3.

Note that the HPF value of 6Hz might not be the best setting. The choice of HPF value will be discussed below. Also, threshold=none is not recommended as explained below.

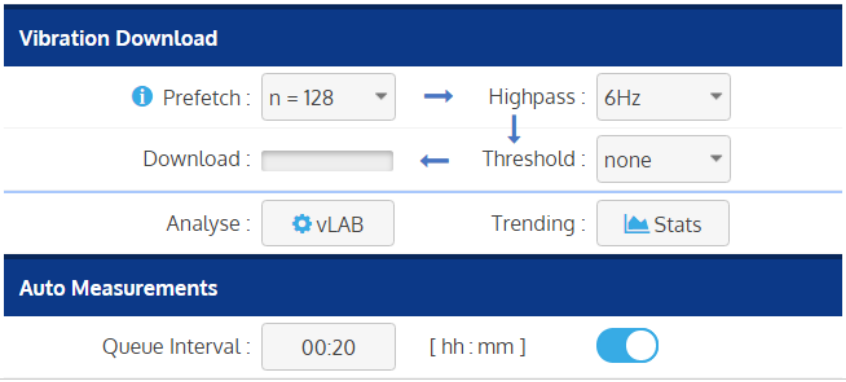


Figure 1: auto measurement setup and prefetch settings in vibration pane

Figure 2: prefetch settings in statistics lab pane

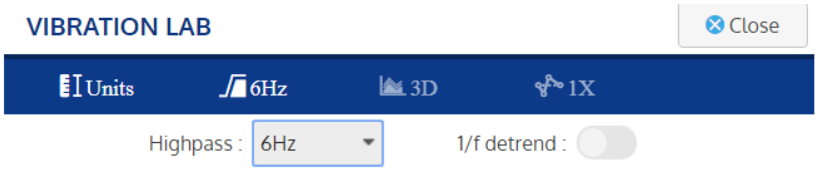


Figure 3: prefetch settings in vibration lab

These settings should be understood as follows:

1. The queue interval is 20 minutes, so each 20 minutes a new measurement is started.
2. After a measurement is completed by the sensor, 128 'prefetch' samples (set in the vibration pane) are downloaded from the sensor.
3. The RMS value is calculated on these 128 samples (the "prefetch").
4. If the RMS value is larger than the threshold, the full vibration data is downloaded from the sensor. If not, all axes are suspended.
5. The threshold is 0g (none), so besides the 128 prefetch samples the full 1024 sample data is always downloaded in this case.

A very important parameter is the RMS high pass filter. This filter removes the DC offset (gravity) and the low frequency noise from the RMS signal (see Figure 4).

The RMS value is the power in all frequency bins above the HPF cut-off frequency. The images below (Figure 4 and Figure 5) are taken with no vibrations, just gravity and the sensor noise floor are seen.

However, with very few samples, such as in the case of a prefetch value of 128 samples, part of the dc offset and low frequency noise (plus the startup transient of the compression algorithm) may leak into higher frequency bins, due to the coarse resolution of the DFT. This can be seen below in Figure 5, for 128 prefetch samples. It can be seen here that a HPF value of 3 Hz is too low for a correct RMS value. In this case a better choice would be 6Hz or even higher.

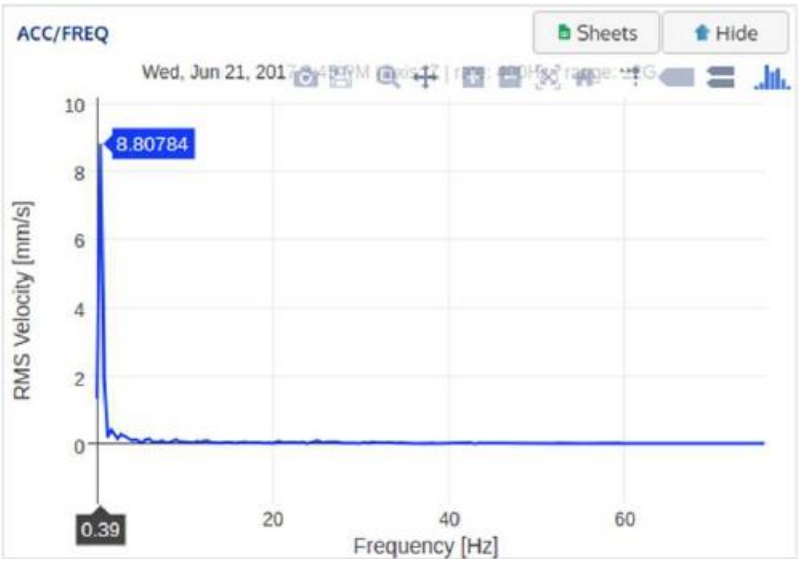


Figure 4: choosing the best setting for the high pass filter

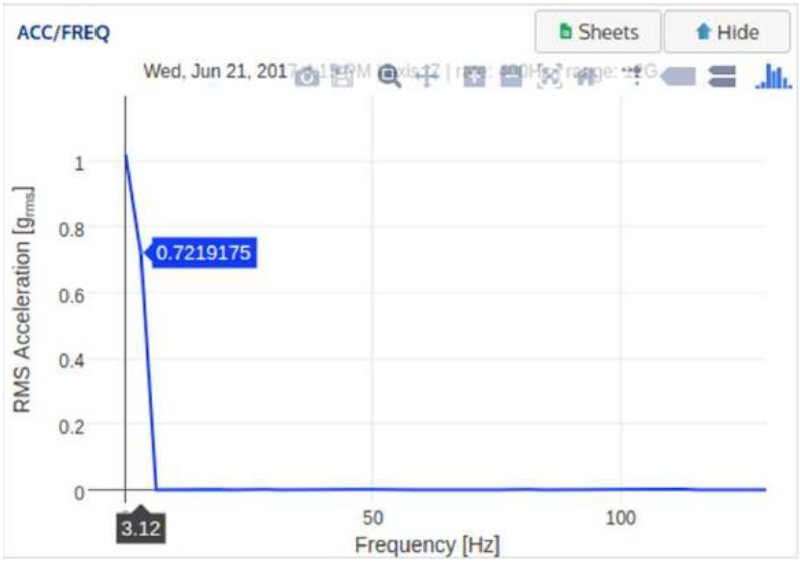


Figure 5: choosing the best setting for the high pass filter

iQunet recommends using the settings in the following table, based on the selected number of prefetch samples.

Table 1: recommended high pass filter settings

Number of prefetch samples	HPF value
256	6Hz or higher
128	12Hz or higher
64	25Hz or higher
32	50Hz or higher

Finally, to conserve battery power, it is important to set the threshold value to something higher than 0g (none) to prevent full downloads when the DUT is not active. It prevents the complete download of the 1024 samples in the example above. The result is that the battery lifetime may be extended at least one order of magnitude, since 10 times less data must be transmitted.

Clicking the information icon will show the flowchart of the Auto Measurement procedure. The values in the flowchart change dynamically with the vibration/prefetch settings in the panes.

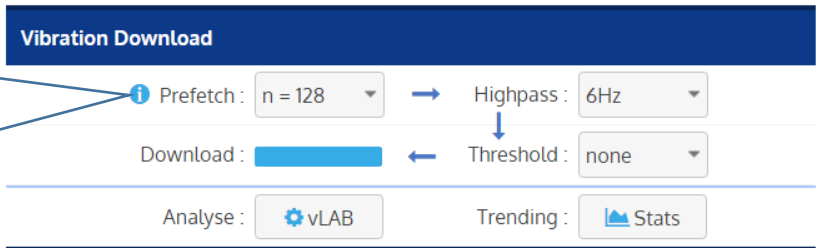


Figure 6: vibration pane

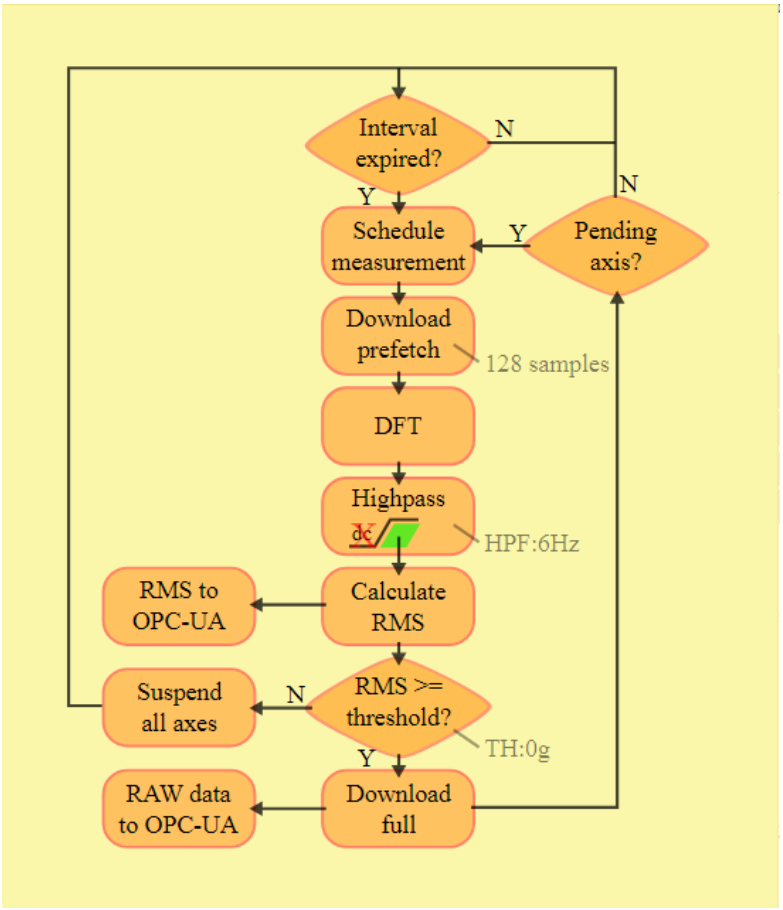


Figure 7: How data is send to OPC UA and unwanted measurements are suspended (e.g. if the DUT is inactive)

7. Export of data

7.1. Using OPC UA functionality

By connecting to the embedded OPC UA server on the iQunet UNIX server installed in connection to the Base Station, you can read the data gathered by the iQunet sensors. Data is stored for a longer period, but the oldest data will be overwritten when the memory is full. It is strongly advised to install an OPC UA historian server in order to save the data permanently. Please contact your network administrator for more information on how to access the data. By connecting an OPC UA client to the running iQunet OPC UA server, you can read the data as they are gathered by the sensors. The graphs in the iQunet dashboard are using the same OPC UA data from the same source. Figure 8 and Figure 9 show the same temperature data on the iQunet dashboard and in the OPC UA client.

Figure 8: OPC UA data (board temperature of sensor 32:70:26:5f) viewed in the iQunet dashboard

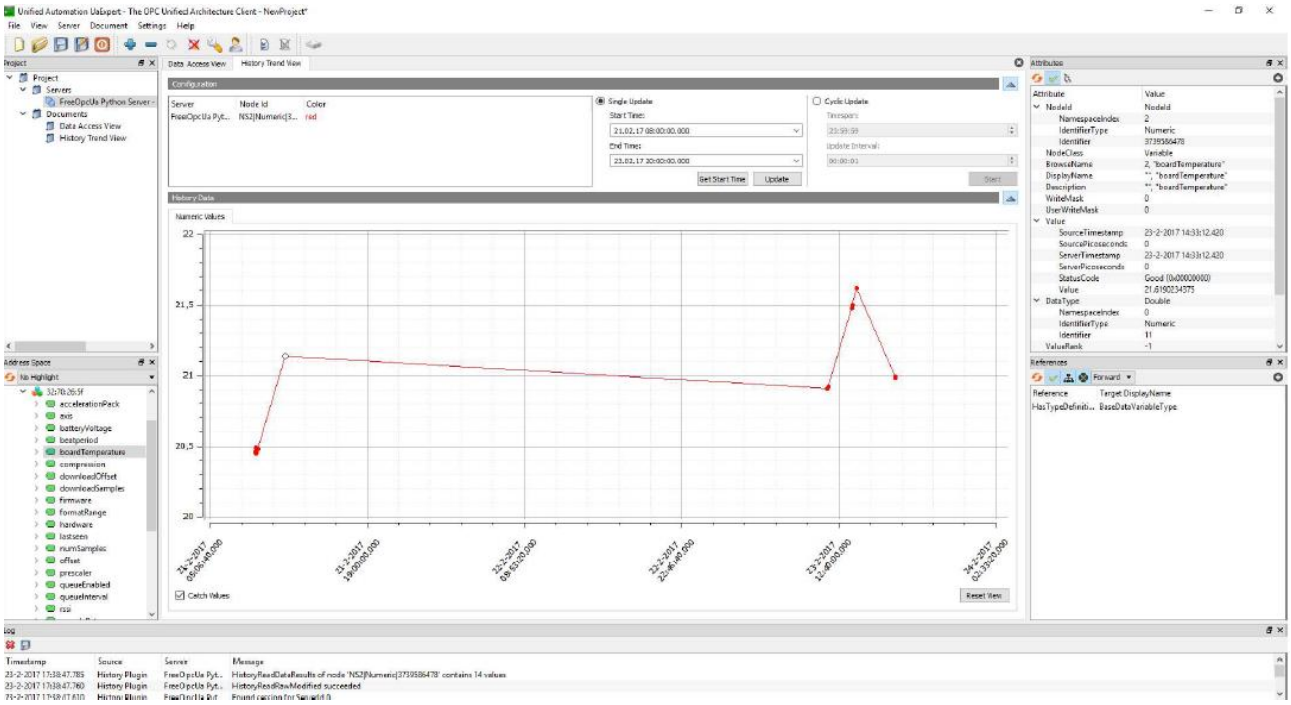
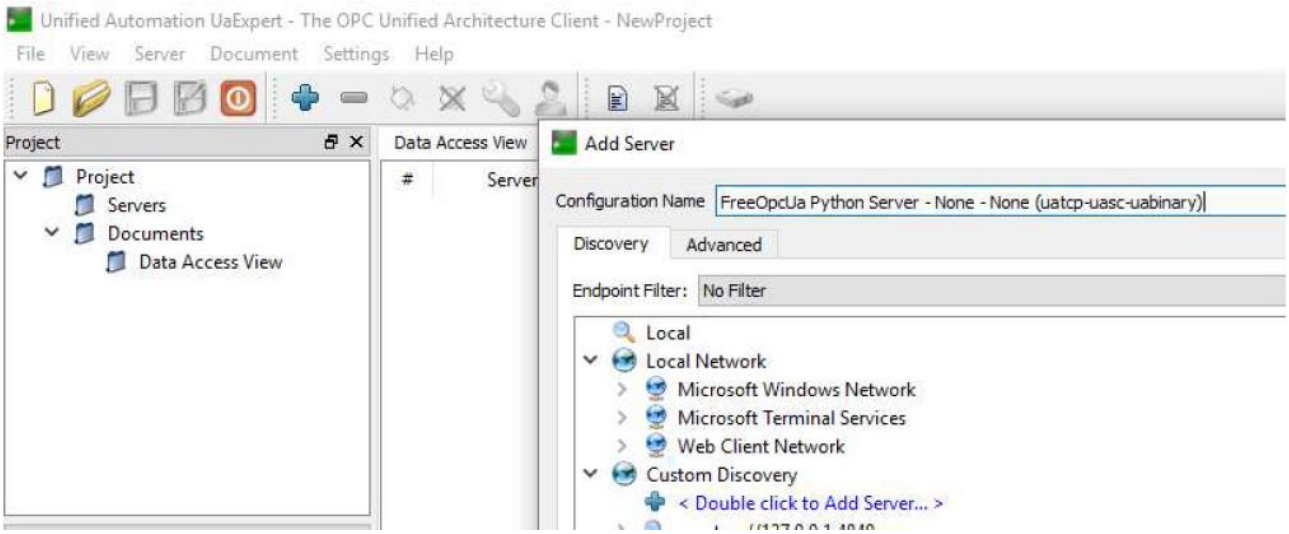


Figure 9: OPC UA data (board temperature of sensor 32:70:26:5f) viewed in an OPC UA client

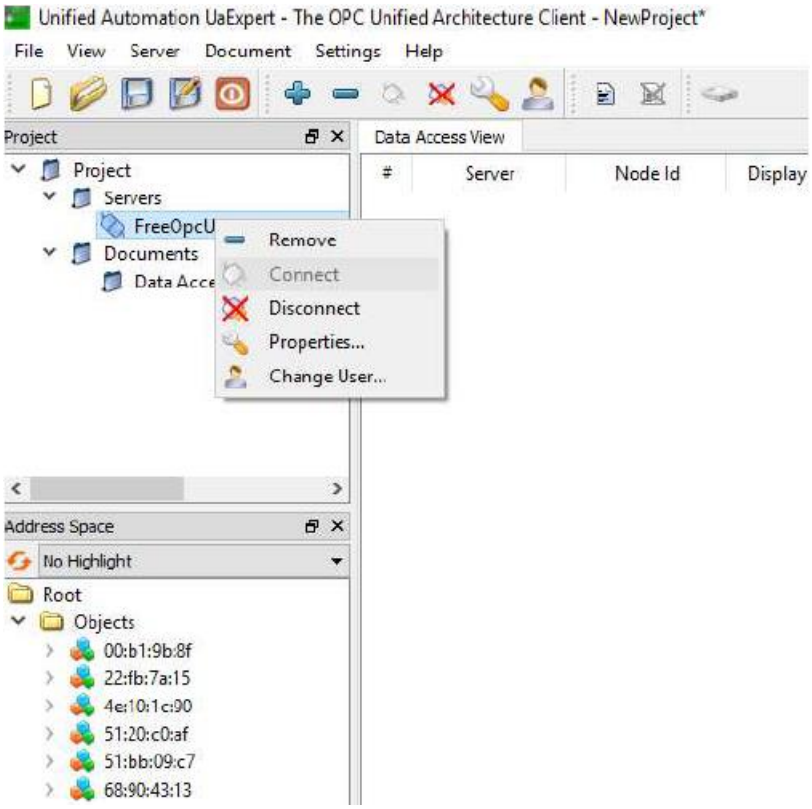
7.2. Setting up OPC UA client

For test purposes it is possible to set up an OPC UA client with free OPC UA client software.

1. Download the free OPC UA client software and install it from the following link: https://www.unified-automation.com/products/development-tools/uaexpert.html.
2. Open the software and add a new server.

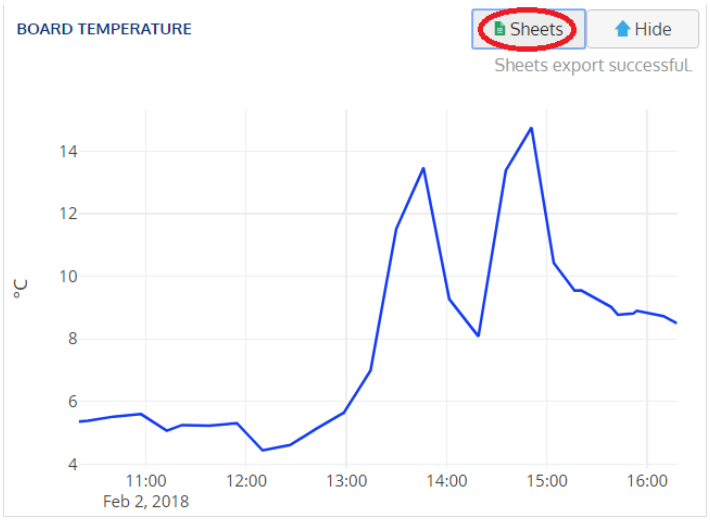


3. Edit the URL to e.g. opc.tcp:// 192.168.8.102:4840 (see also section 9.2)
4. Connect to the server.

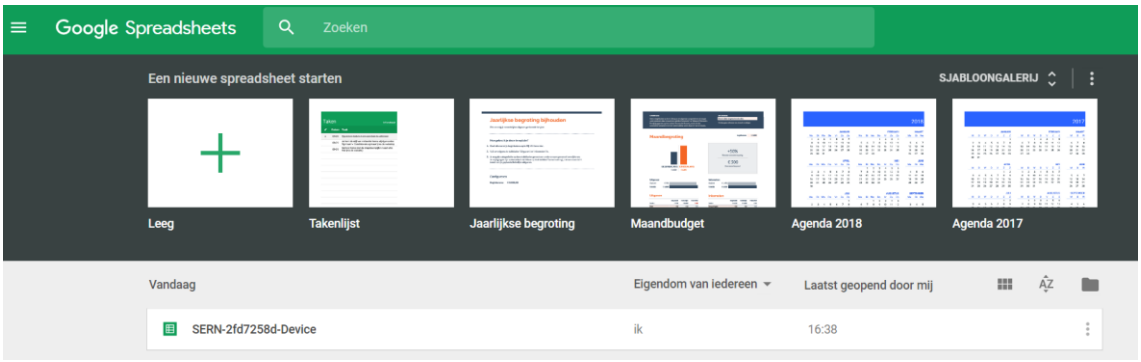


5. The iQunet sensors will appear in the object list.
6. Browse the attributes of the sensors by clicking on the tags.

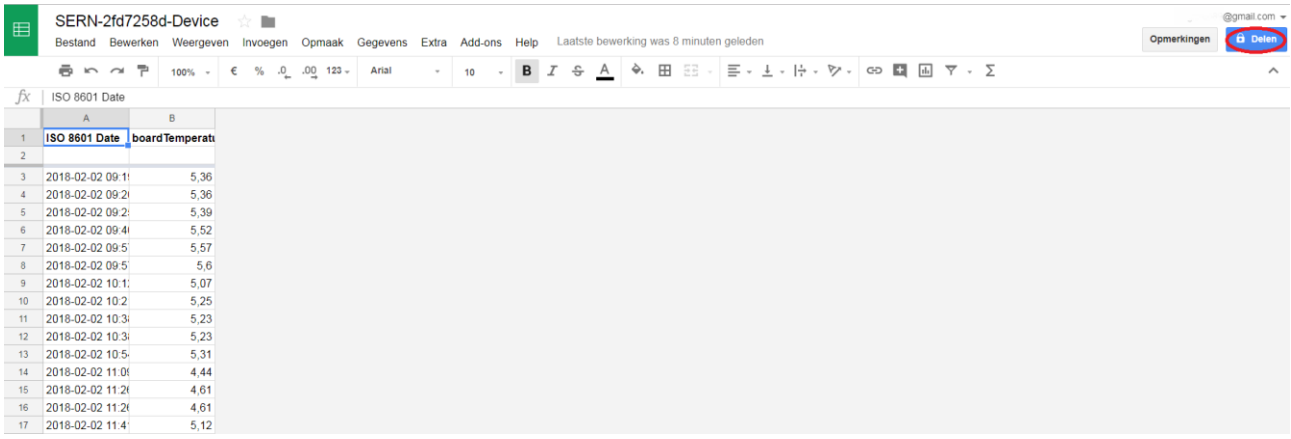
7.3. Using Google Sheets Export functionality



By clicking “Sheets”, a Google spreadsheet is created in the account you used to identify yourself at login.



Go to Google Sheets, and you will see the file you created from this sensor by clicking the “Sheets” button. The data is updated every time you click the “Sheets” button in the same graph. Exporting new data parameters of the same sensor will create new tabs in the same file.



Open the file you created, and you can explore the data points or use plug-ins to analyze the data. Share the file with others by clicking the right upper blue button. Shared files will also be updated with new data once created. It is also possible to save the data in MicroSoft Excel format.

8. APIs (as from version 1.1.16)

8.1. General

GraphQL is a query language for APIs and a server-side runtime for executing queries by using a type system that is defined for the data. GraphQL isn't tied to any specific database or storage engine and is instead backed by the existing code and data. GraphQL is typically served over HTTP via a single endpoint which expresses the full set of capabilities of this service. This contrasts with the REST APIs which expose a suite of URLs each of which exposes a single resource. Many different programming languages support GraphQL. A GraphQL spec was open sourced in 2015 and is now available in many environments and used by teams of all sizes. Some introduction can be found on http://graphql.org/.

Features:

- Syntax highlighting
- Intelligent type ahead of fields, arguments, types, and more
- Real-time error highlighting and reporting
- Automatic query completion
- Run and inspect query results

8.2. Starting with APIs

Before starting, we strongly recommend reading the "learn" section on the GraphQL website: http://graphql.org/learn/.

All APIs can be reached via http://xxx.xxx.xxx.xxx:8000/graphql where "xxx.xxx.xxx.xxx" refers to the current iQunet server IP address (see section 9). Please note that all documentation is included and can be found here.

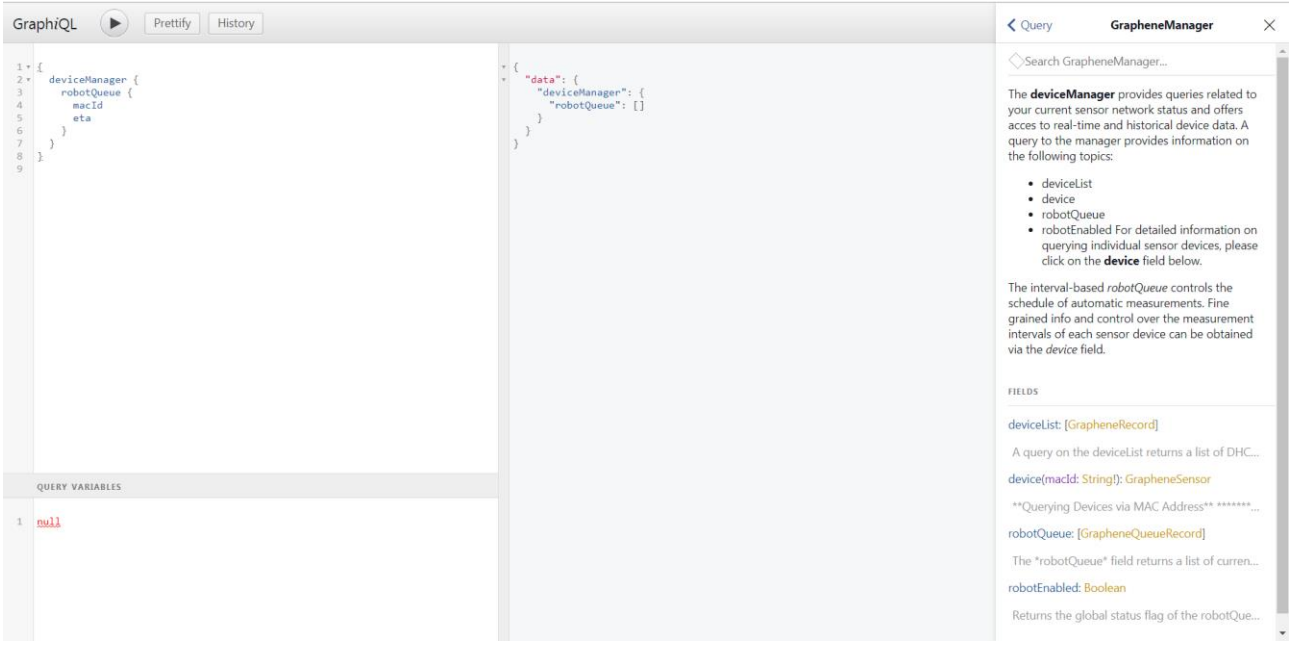


Figure 10: The iQunet graphical interactive in-browser GraphQL IDE (Integrated Development Environment)

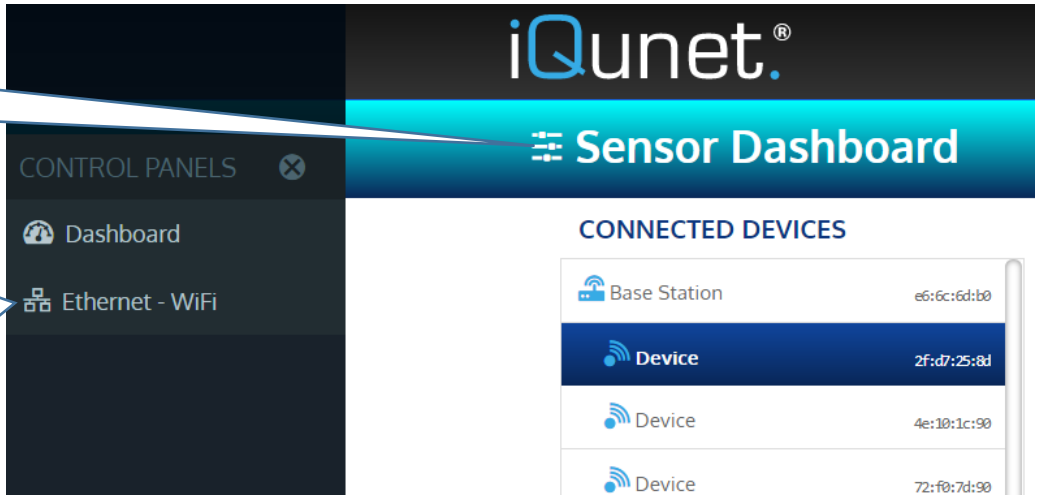
9. Wireless connection (as from version 1.1.16)

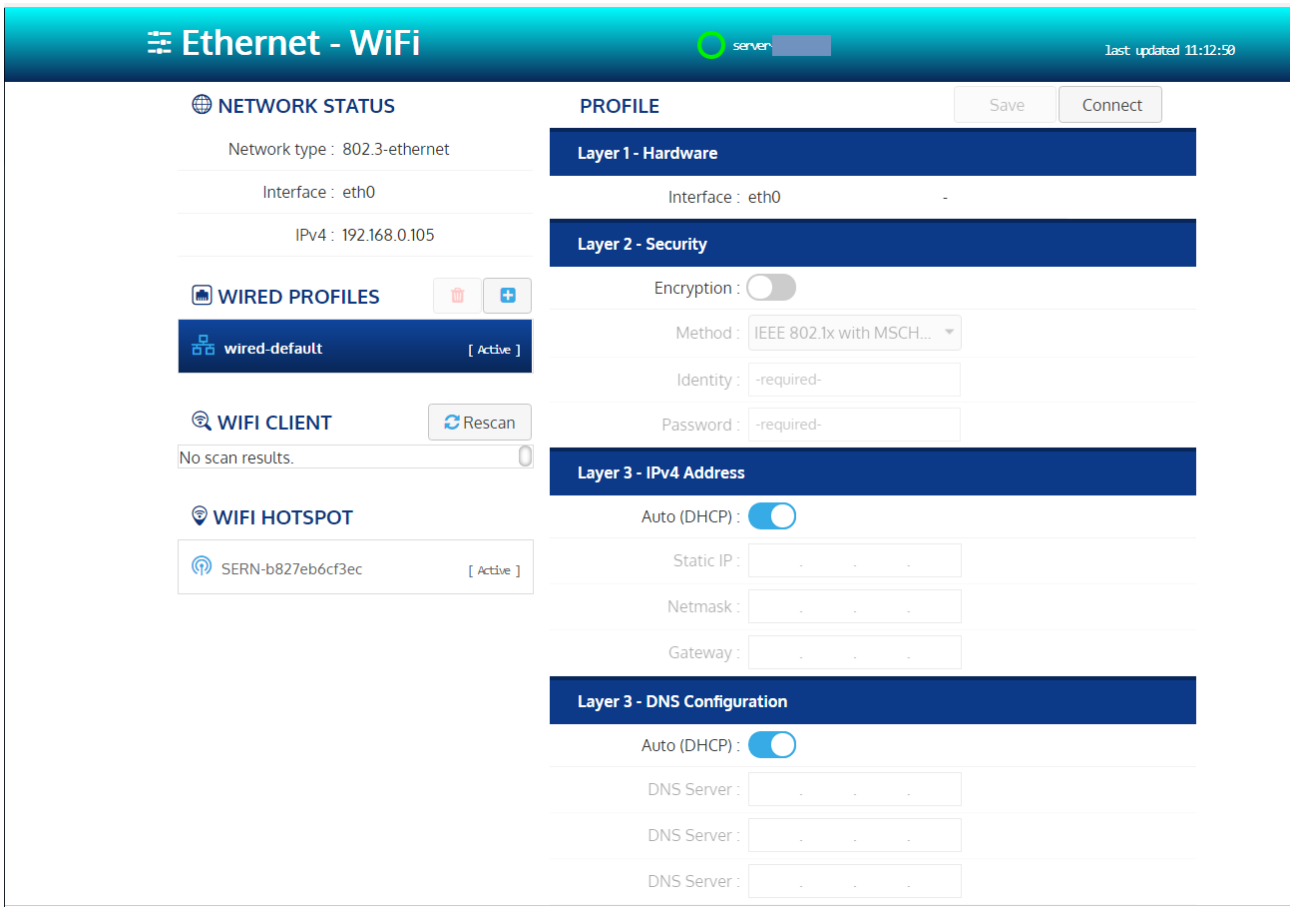
9.1. WIFI setup

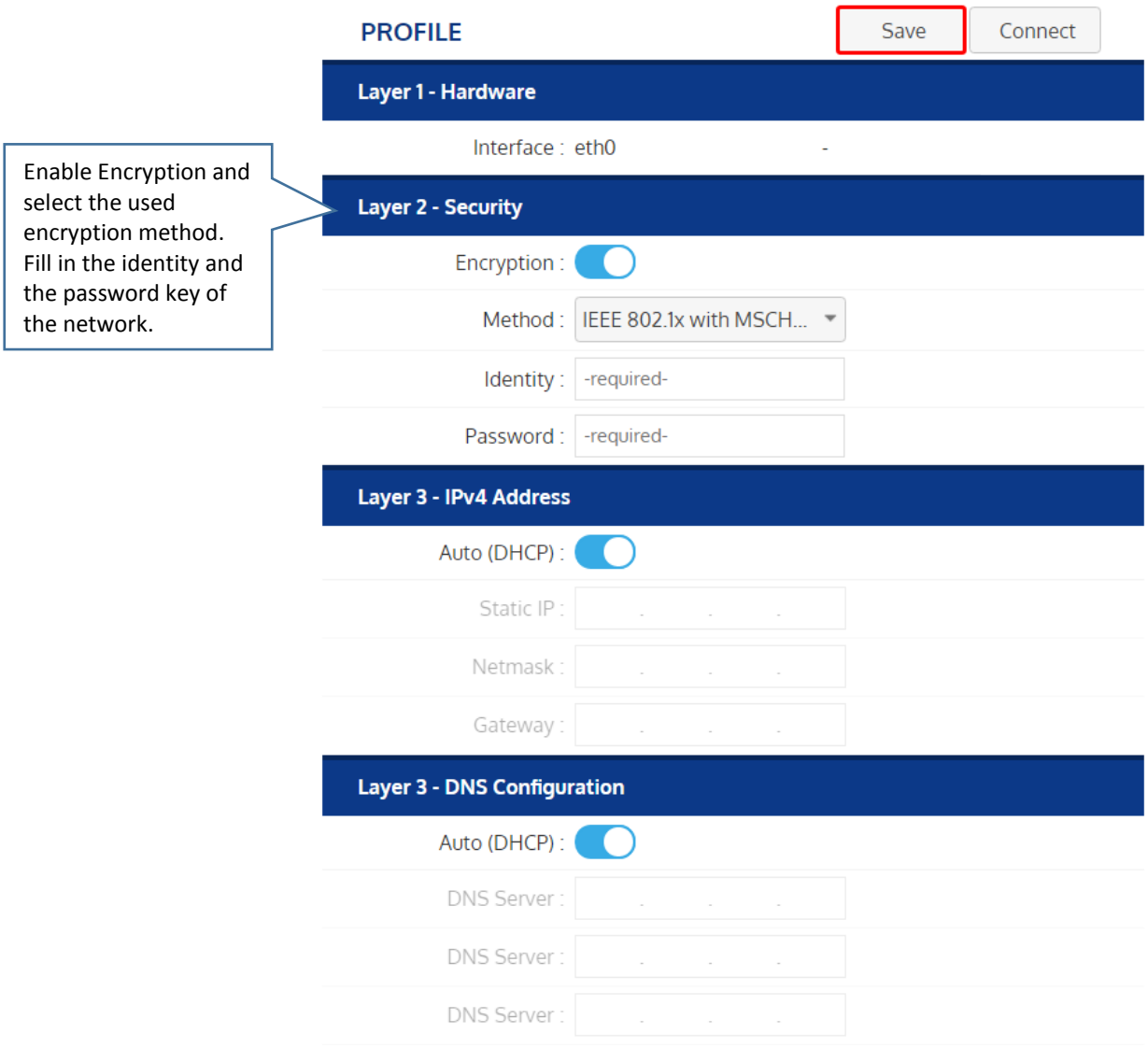
IMPORTANT: before changing the settings of the iQunet server to WiFi, a wired connection to the internet is needed, either via a network in the neighborhood, or via a wired mobile MiFi connection. Once the iQunet Sensor Dashboard is reached on the iQunet server, a WiFi connection can be established and the wired connection can be disconnected.

Clicking the 3 stripes under the iQunet logo will open a side pane.

Select "Ethernet – WiFi" to change the settings.



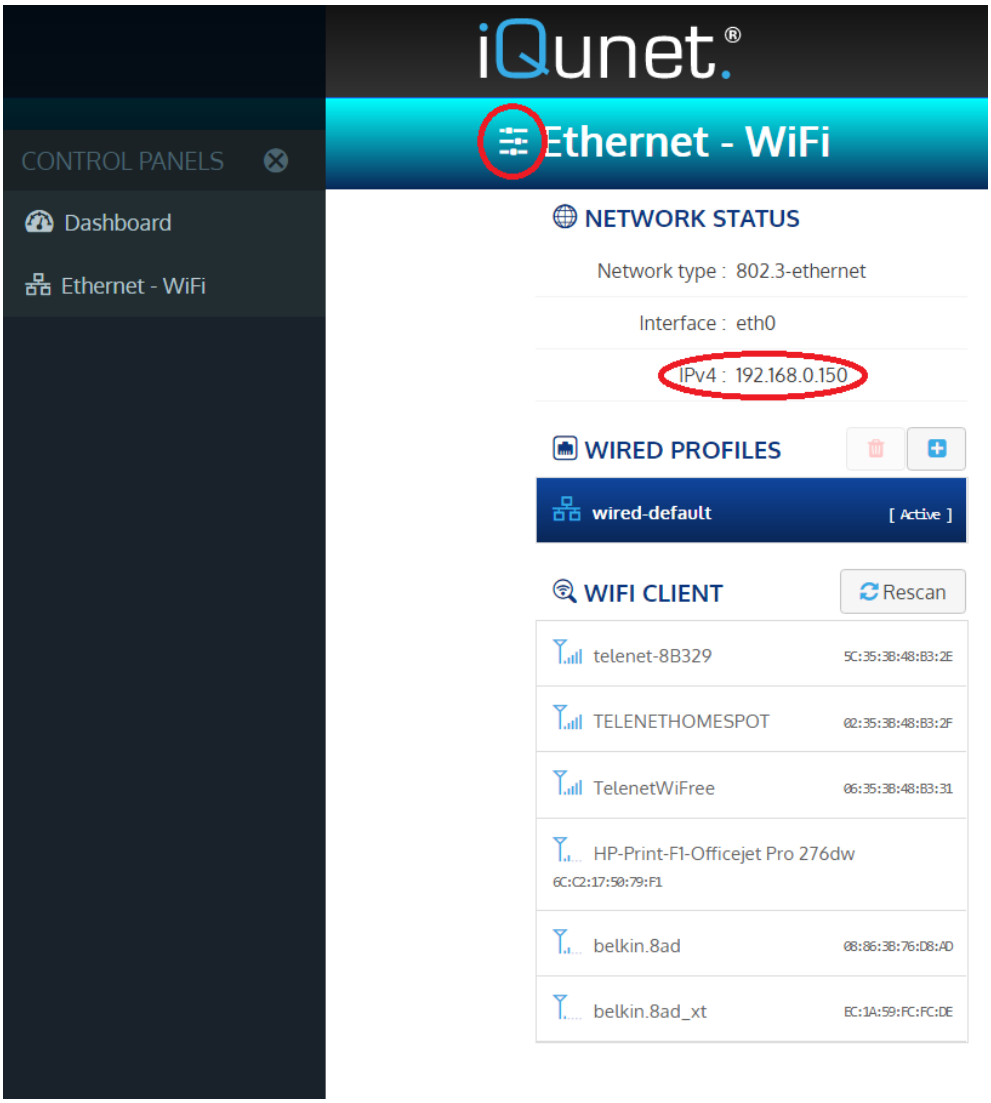




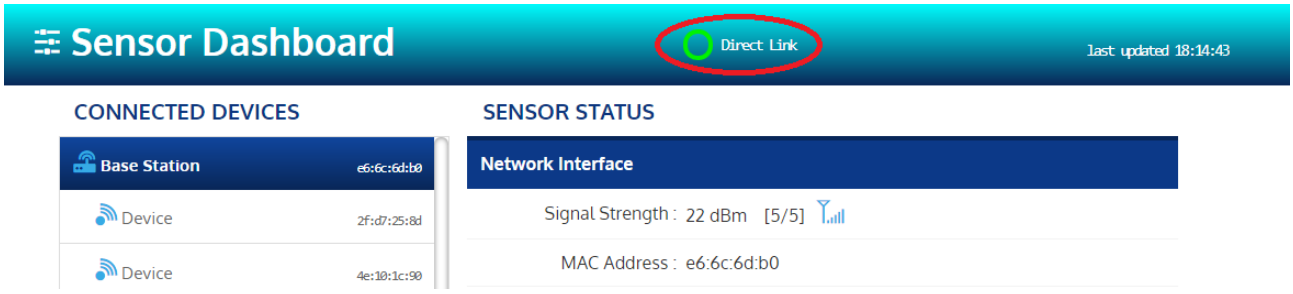
Now press the “Save” button on top of the pane.

Disconnect the Ethernet cable and put the iQunet server with the connected Base Station on the desired spot in reach of the selected WiFi network.

9.2. Direct Access setup (intranet)



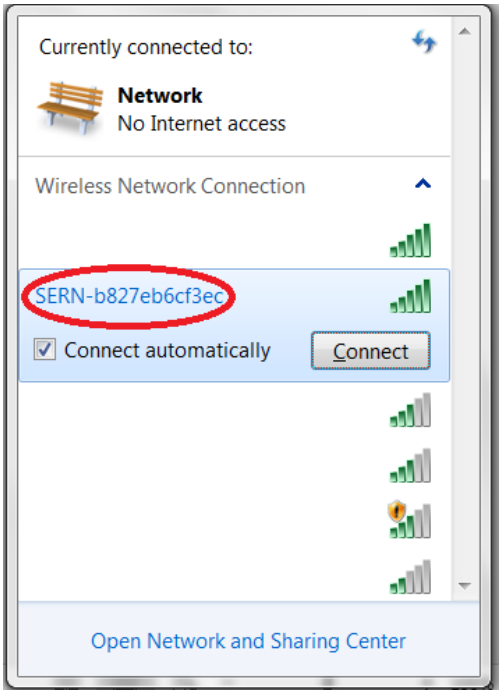
1. Click the 3 bars below the iQunet logo.
2. Copy the network IPv4 address of the running iQunet server.
3. Copy the address into http://xxx.xxx.xxx.xxx:8000/dashboard/app and open it in your Chrome browser.
4. From a computer in the SAME network and subnetwork you will now have direct access to the iQunet server.
5. If the connection is established, “Direct Link” will appear next to the green circle instead of the server name “server-xxxxxxxx”.



10. Hotspot

10.1. Connect to hotspot

A WiFi hotspot is automatically created once the iQunet server is connected to the 230V mains (even without connection to the network). To use the hotspot's WiFi network on your PC, select the hotspot in your network center (SERN-xxxxxxxxxxx) and click Connect. The hotspot's password is the Sensor Proxy ID (also used for the connection to WebRTC in section 4.1). This ID is written on your UNIX server (e.g. server-xxxxxxxx).



The IP address of the server is 192.168.42.1. Once connected to the hotspot network, you can use this IP address to make a direct access connection to the server by browsing to http://192.168.42.1:8000/dashboard/app (see section 9.2 for more information). You can also use the server's IP address to set up an OPC UA client or to access the GraphQL APIs (see sections 7.2 and 8.2).

When the iQunet server is connected to the network, you can also connect via WebRTC as explained in section 4.

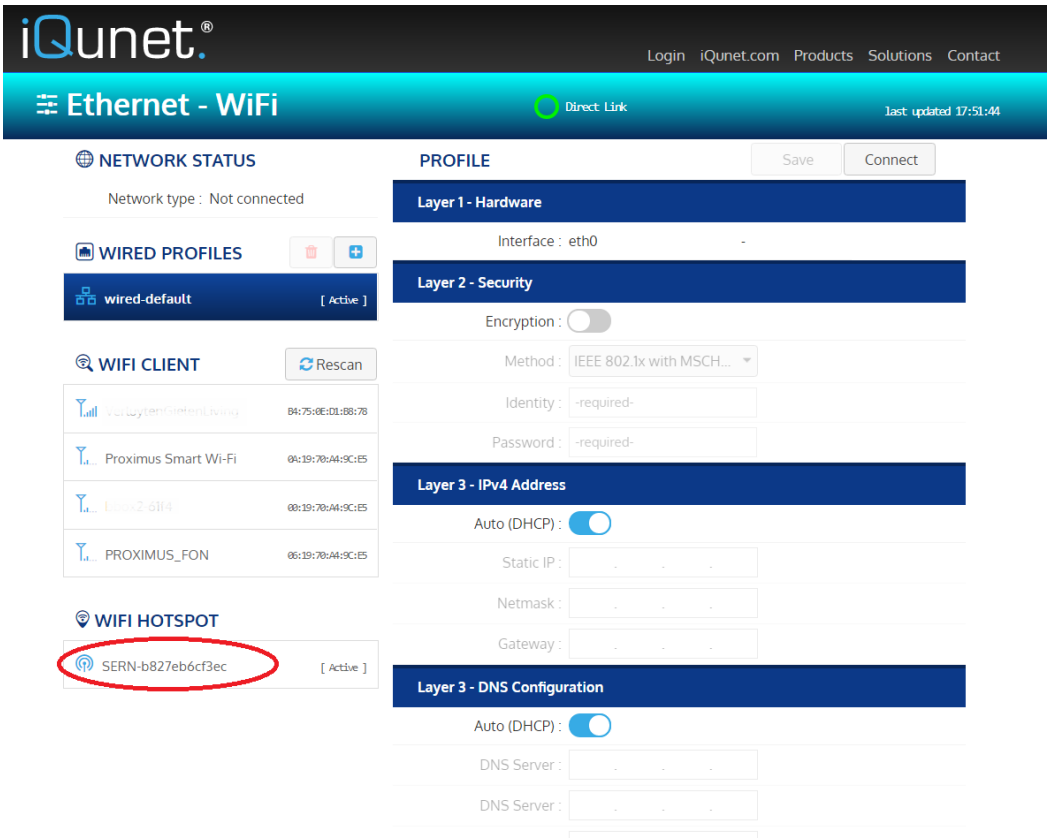
10.2. Turn off hotspot

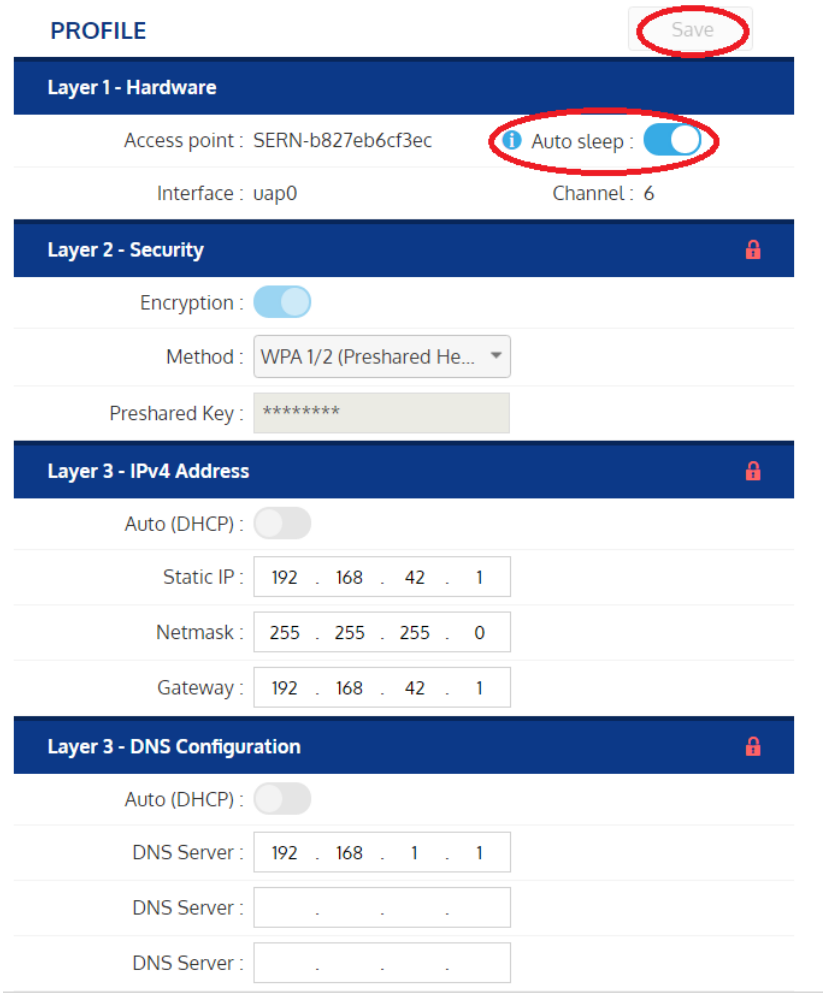
Connect to the iQunet sensor dashboard via WebRTC (see section 4). Click on the 3 bars below the iQunet logo and open the "Ethernet-WiFi" panel to see the hotspot settings. In the "WIFI HOTSPOT" section you can find the state of the hotspot (active/offline) and the hotspot's network name (for example SERN-b827eb6cf3ec). Click on the hotspot's name (SERN-xxxxxxxxxxx) to see more details on the hotspot network.

To turn off the hotspot, the user can activate the sleep mode of the hotspot by enabling "Auto sleep" in the hardware layer. Slide the slider to the right and click the Save button in the upper right corner. When enabled, the hotspot will automatically turn off after 10 minutes if another active network connection is available. If the other network connection drops down, the hotspot will become active again.

Important remark: the hotspot will not turn off when there is still someone connected to it.

The other network settings shown below are not user adaptable.


iQunet®
Login iQunet.com Products Solutions Contact
Ethernet - WiFi
Direct Link
last updated 17:51:44
NETWORK STATUS
Network type : Not connected
WIRED PROFILES
wired-default [Active]
WIFI CLIENT
Rescan
Proximus Smart Wi-Fi
PROXIMUS_FON
WIFI HOTSPOT
SERN-b827eb6cf3ec [Active]
PROFILE
Save
Connect
Layer 1 - Hardware
Interface : eth0
Layer 2 - Security
Encryption :
Method : IEEE 802.1x with MSCH...
Identity : -required-
Password : -required-
Layer 3 - IPv4 Address
Auto (DHCP) :
Static IP :
Netmask :
Gateway :
Layer 3 - DNS Configuration
Auto (DHCP) :
DNS Server :
DNS Server :


PROFILE
Save
Layer 1 - Hardware
Access point : SERN-b827eb6cf3ec
Auto sleep :
Interface : uap0
Channel : 6
Layer 2 - Security
Encryption :
Method : WPA 1/2 (Preshared He...
Preshared Key : ********
Layer 3 - IPv4 Address
Auto (DHCP) :
Static IP : 192 . 168 . 42 . 1
Netmask : 255 . 255 . 255 . 0
Gateway : 192 . 168 . 42 . 1
Layer 3 - DNS Configuration
Auto (DHCP) :
DNS Server : 192 . 168 . 1 . 1
DNS Server :
DNS Server :