



# Quick Start Guide

**A.Login Procedure**

**B.Sensor Dashboard (software version 1.2.5)**

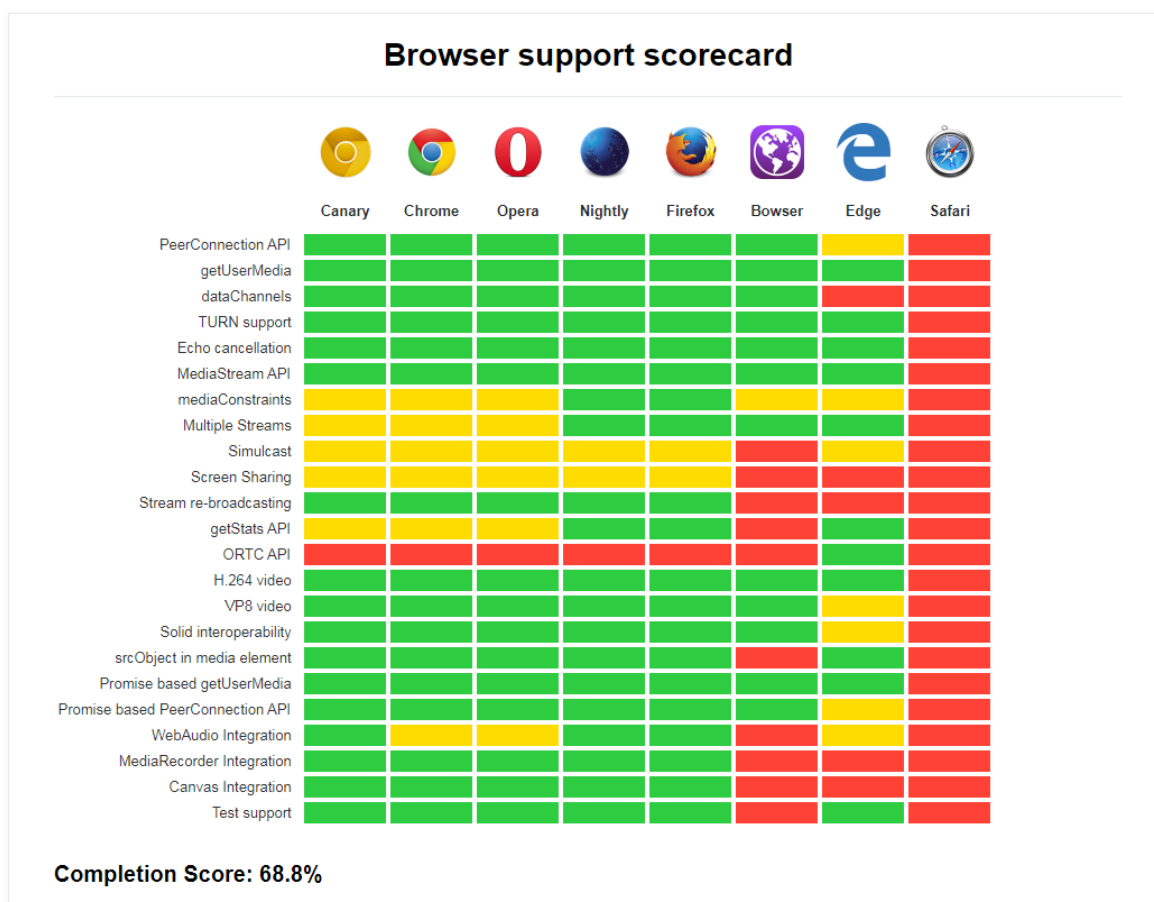
## A. Login procedure iQunet sensor network

### 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://iswebtrcreadyyet.com/> for the latest updates.

## Is WebRTC ready yet?



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](http://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.



Eén account. Al het beste van Google.

Log in met uw Google-account

[Inloggen met een ander account](#)

Eén Google-account voor alles van Google



#### 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-xxxxxxx)

## 5. You are connected to the iQunet Unix Server

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### Sensor Dashboard

Last updated 14:11:55

**CONNECTED DEVICES**

- Base Station
- VibrationMach1647a
- vent reed schoepen
- vent tril boven
- vent tril zij
- vent reed uitzwaai
- vent holt uitzwaai

**ACTIVE DEVICES**

**SCHEDULE**

- VibrationMach1642a
- Wiretension1 VIA RepMach456

**NETWORK ACTIVITY**

```
14:11:16.089 --> [1.0] Scheduled core status request.  
14:11:26.044 --> [1.145] Scheduled core status request.  
14:11:35.497 --> [1.0] ICMP echo request.  
14:11:35.554 --> [1.0] RSSI request.  
14:11:35.615 --> [1.0] Incoming RSSI: 214  
14:11:36.808 --> [1.0] ICMP echo request.  
14:11:36.832 --> [1.0] Core status request.  
14:11:37.599 --> [1.0] ICMP echo request.  
14:11:38.051 --> [1.0] Incoming core status: BATT=318 BOARD=31311 BEAT=220  
14:11:38.695 --> [1.0] ICMP echo request.  
14:11:38.753 --> [1.0] Incoming ICMP  
14:11:55.979 --> [1.145] Scheduled vibration request.
```

**SENSOR STATUS**

**Network Interface**

Signal Strength: -54 dBm

MAC Address: 32:70:26:5F

PAN Address: 1145

Wakeup Interval: 60 seconds

Last Seen: Thu Feb 23 2017 14:11:04 GMT+0100

**System Information**

Firmware: F4Z54F6

Hardware: SERN-322-9943

Temperature: 21.5 °C

Power: 2.97V [100%]

**MEMS Vibration Setup**

Rate: 100Hz Range: 16G

Samples: 32 Offset [g]: 0

Capture:  Axis: DATA20

**Vibration Download**

Address: 0 Samples: 32

Download:  Auto: ☒

Progress:  Analyse:

**Auto Measurements**

Queue Interval: 00:20 (h:mm) ☒

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# B.iQunet Web GUI: Quick Start Guide

## 1. General

**iQunet®** Login iQunet.com Products Solutions Contact

**Sensor Dashboard** Last updated 11:34:28

**CONNECTED DEVICES**

**Base Station** e6:6c:6d:b0

- Device 2f:d7:25:8d
- Device 4e:10:1c:90
- Device 72:f0:7d:90
- Device a0:84:5c:53

**ACTIVE DEVICES**

**SCHEDULE**

**SENSOR STATUS**

**Network Interface**

Signal Strength : 22 dBm [5/5]

MAC Address : e6:6c:6d:b0

PAN Address : 192.168.1.0

PAN Subnet : 192.168.0.0/24

Last Seen : Sat Jan 27 2018 18:25:01 GMT+0100

**System Information**

Firmware : B38E648F

Hardware : SERN-322-9953

Temperature : no sensor onboard

Power : 3.31V [100%]

**NETWORK ACTIVITY**

```

11:32:54.381 <-- [1.140] Incoming ICMP
11:33:03.683 <-- [1.142] Incoming ICMP
11:33:12.345 <-- [1.143] Incoming ICMP
11:33:56.489 <-- [1.140] Incoming ICMP
11:33:56.531 --s [1.143] Scheduled core status request.
11:34:07.244 <-- [1.142] Incoming ICMP
11:34:16.066 --> [1.143] Core status request.
11:34:16.201 <-- [1.143] Incoming core status: BATT=350 BOARD=26100 BEAT=60
11:34:17.308 <-- [1.143] Incoming ICMP
11:34:19.977 <-- [1.143] Incoming ICMP
11:34:24.499 <-- [1.143] Incoming ICMP
11:34:32.431 <-- [1.143] Incoming ICMP
    
```

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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

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**Sensor Dashboard** Last updated 11:34:28

server

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

The screenshot shows a web interface titled 'CONNECTED DEVICES'. It has a scrollable list of devices. The first device is 'Base Station' with MAC address 'e6:6c:6d:b0'. Below it is a 'Device' with MAC address '2f:d7:25:8d'. This is followed by three more 'Device' entries with MAC addresses '4e:10:1c:90', '72:f0:7d:90', and 'a0:8d:5c:53'. Below the list is a section titled 'ACTIVE DEVICES' and 'SCHEDULE' with one 'Device' entry and 'ETA 15:03:53'. To the right of this section is a toggle button labeled 'Active' with a power icon.

### 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)

The screenshot shows a web interface titled 'NETWORK ACTIVITY' with a scrolling log of network messages. The log contains the following entries:

```
15:00:51.554 <- - [1.143] Incoming ICMP
15:00:58.287 <- - [1.140] Incoming ICMP
15:01:11.241 <- - [1.142] Incoming ICMP
15:01:19.419 <- - [1.143] Incoming ICMP
15:02:00.357 <- - [1.140] Incoming ICMP
15:02:01.960 <- - [1.143] Incoming ICMP
15:02:14.889 <- - [1.142] Incoming ICMP
15:03:02.447 <- - [1.140] Incoming ICMP
15:03:05.532 <- - [1.143] Incoming ICMP
15:03:18.497 <- - [1.142] Incoming ICMP
15:03:49.741 - -s [1.140] Scheduled core status request.
15:03:53.536 - -s [1.140] Scheduled vibration request.
```

## 5. Sensor status

### 5.1. Network interface

**Network Interface pane is showing current interface settings from selected device.**

**Signal strength:** current wireless signal strength between device and base station.

**When connected, the device receives a unique PAN address. This address is used in the network activity log. Ping to check network activity.**

**Sensors last network contact**

**MAC address:** the device's unique number. This number is printed on the device itself.

**Device wakeup interval:** the device will be in iQunet sleep mode for the set time. It will become active at the end of the set time interval. Change interval by changing the number.

**SENSOR STATUS**

**Network Interface**

Signal Strength : -93 dBm [2/5]

MAC Address : 2f:d7:25:8d

PAN Address : 192.168.1.140

WakeUp Interval : 60 sec

Last Seen : Fri Feb 02 2018 18:42:37 GMT+0100

**System Information**

Firmware : 0407830E

Hardware : SERN-322-9943

Temperature : 5.7 °C

Power : 2.74V [83%]

Ping

Refresh

Reboot

View

View

### 5.2. System information

**System Information pane is showing the current connected device information.**

**Firmware:** current firmware version running on selected sensor device.

**Board Temperature of the sensor device (when available). Pressing "View" will generate a graph over time. Data points correspond to each System Information inquiry by clicking on the device in the device pane on the left.**

**Current hardware version of the selected sensor device. Pressing "reboot" resets the hardware. This is equivalent to removing and re-installing batteries.**

**Status of the batteries, with indication of remaining charge of the batteries. Pressing "View" will generate a graph over time. Data points correspond to each System Information inquiry by clicking on the device in the device pane on the left.**

**SENSOR STATUS**

**Network Interface**

Signal Strength : -93 dBm [2/5]

MAC Address : 2f:d7:25:8d

PAN Address : 192.168.1.140

WakeUp Interval : 60 sec

Last Seen : Fri Feb 02 2018 18:42:37 GMT+0100

**System Information**

Firmware : 0407830E

Hardware : SERN-322-9943

Temperature : 5.7 °C

Power : 2.74V [83%]

Refresh

Reboot

View

View

### 5.3. Sensor control

#### 5.3.1. Hall sensor control (proximity sensor)

Pane appears when selecting a sensor device with a hall 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.

**Hall Sensor Control**

Trigger Sensor :

Hall :

Field values are combined with the measuring voltage at that time (for calibration purposes). The burst of measurements can be viewed in a graph by pressing "View".

#### 5.3.2. Tilt sensor control (inclination sensor)

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

Maximum allowed roll before initiating an alarm. If the set value is surpassed, the connected actuator device will be triggered.

**Tilt Sensor Control**

Guard Roll :

Burst Samples :

Activity Level :

Position :

Trigger Sensor :

Select the number of samples in a measurement burst.

Required activity level to wake up the sensor.

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. The measurement will stop after the chosen number of burst samples.

When active, Roll and Pitch values are visualized. The recorded burst of measurements can be viewed in a graph by pressing "View".



### 5.3.3. Temperature logger

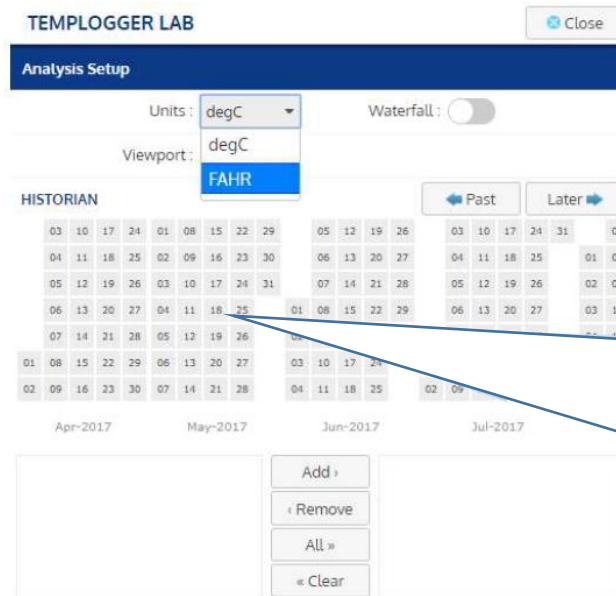
The temperature logger is a sensor that can operate away from the network. Once armed in the network, the sensor can be triggered by vibrations to start the measurement, even when there is no network connection. The measurements are logged on the sensor until the sensor comes back in the sensor network.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

The image displays three screenshots of the 'Temp-Logger Setup' and 'Temp-Logger Download' web interface, illustrating its configuration options and status.

**Top Screenshot:** Shows the initial setup. The 'Samples' dropdown is set to 32. The 'Status' is 0. The 'Capture' button shows a red dot and 'REC'. The 'WakeUp' dropdown is set to 'off'. Callouts explain: 'Number of samples during one record' (pointing to Samples), 'REC starts the logger.' (pointing to Capture), 'Once started, the status will show “armed”.' (pointing to Status), and 'The sensor is waking up by the set vibration threshold.' (pointing to WakeUp).

**Middle Screenshot:** Shows the 'Samples' dropdown menu open, listing options from 32 to 8192. A callout states: 'Select the desired number of samples. Sample rate is set standard to 1,8Hz.'

**Bottom Screenshot:** Shows the 'WakeUp' dropdown menu open, listing options: off, awake, 0.06G, 0.12G, 0.25G, 0.50G, 0.75G (highlighted), 1.00G, 1.50G, 2.00G, and off. A callout points to the '0.75G' option, stating: 'Vibration threshold setup'.

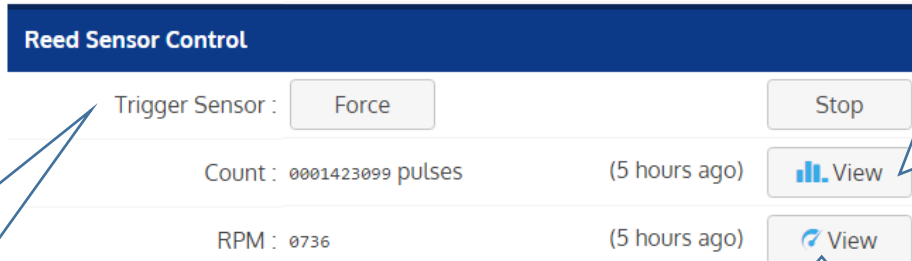


All measurements are stored in the OPC historian and can be viewed individually or compared to others in the waterfall graph. Graphs can be downloaded to Google Sheets and saved as Excel sheets for quick reference.

#### 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

Pane appears when selecting a sensor device with an acceleration sensor on board.

Select the sampling rate.

Select the number of samples.

By pressing "REC", the vibration measurement is triggered with the set parameters.

#### MEMS Vibration Setup

Rate : 3200Hz

Axis : Z

Samples : n = 1024

Limit : 16G

Capture :  REC

Level : 

Select 1, 2, or 3 measurement axes in the dropdown menu.

Select the desired dynamic range of the sensor in the dropdown menu.

Check if vibration level is high enough for download (see section 6.5).

Select a number of samples to make an antecedent RMS calculation for the vibration measurements. If the RMS value is below threshold, the full sensor download is aborted (see 6.5).

Progress of automatic download

#### Vibration Download

 Prefetch : n = 128

Highpass : 6Hz

Download : 

Threshold : none

Analyse :  vLAB

Trending :  Stats

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.

By pressing "vLAB", the "VIBRATION LAB" pane opens.

By pressing "Stats", the "STATISTICS LAB" pane opens.

A full measurement is downloaded when the RMS is above threshold. See section 6.5.

### 5.3.6. Vibration Lab (vLab)

Vibration Lab pane shows basic analysis of measured vibration signals.

#### VIBRATION LAB

Close

Close Vibration Lab pane.

Units

6Hz

3D

1X

Units : g

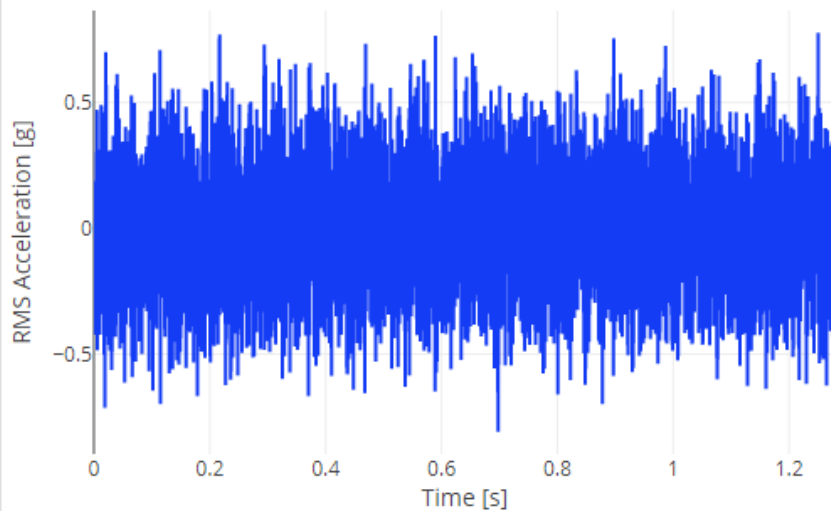
Viewport : 0.5 g

ACC/TIME

Sheets

Hide

Tue, Mar 20, 2018 9:22 AM | axis: Z | rate: 3200Hz | range:  $\pm 16G$



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

HISTORIAN

Past

Later

04	11	18	25	01	08	15	22	29		05	12	19	26		05	12	19	26		02	09	
05	12	19	26	02	09	16	23	30		06	13	20	27		06	13	20	27		03	10	
06	13	20	27	03	10	17	24	31		07	14	21	28		07	14	21	28		04	11	
07	14	21	28	04	11	18	25		01	08	15	22		01	08	15	22	29		05	12	
01	08	15	22	29	05	12	19	26		02	09	16	23		02	09	16	23	30		06	13
02	09	16	23	30	06	13	20	27		03	10	17	24		03	10	17	24	31		07	14
03	10	17	24	31	07	14	21	28		04	11	18	25		04	11	18	25		01	08	15
Dec-2017				Jan-2018				Feb-2018				Mar-2018				Apr						

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.

TIME SERIES

Tue Mar 20 2018 08:10:53 +0100  
 Tue Mar 20 2018 08:11:24 +0100  
 Tue Mar 20 2018 08:11:57 +0100  
 Tue Mar 20 2018 09:12:51 +0100  
 Tue Mar 20 2018 09:13:26 +0100  
 Tue Mar 20 2018 09:19:02 +0100  
 Tue Mar 20 2018 09:21:33 +0100

> Freq

< Time

>> Bulk

<< None

SPECTRUM

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

Units

6Hz

3D

1X

Select graph units: g or mm/s.

Units : g

Viewport : 0.5 g

Select predefined viewport settings to alter graph format.

## VIBRATION LAB

Close

"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.

Highpass : 6Hz

1/f detrend :

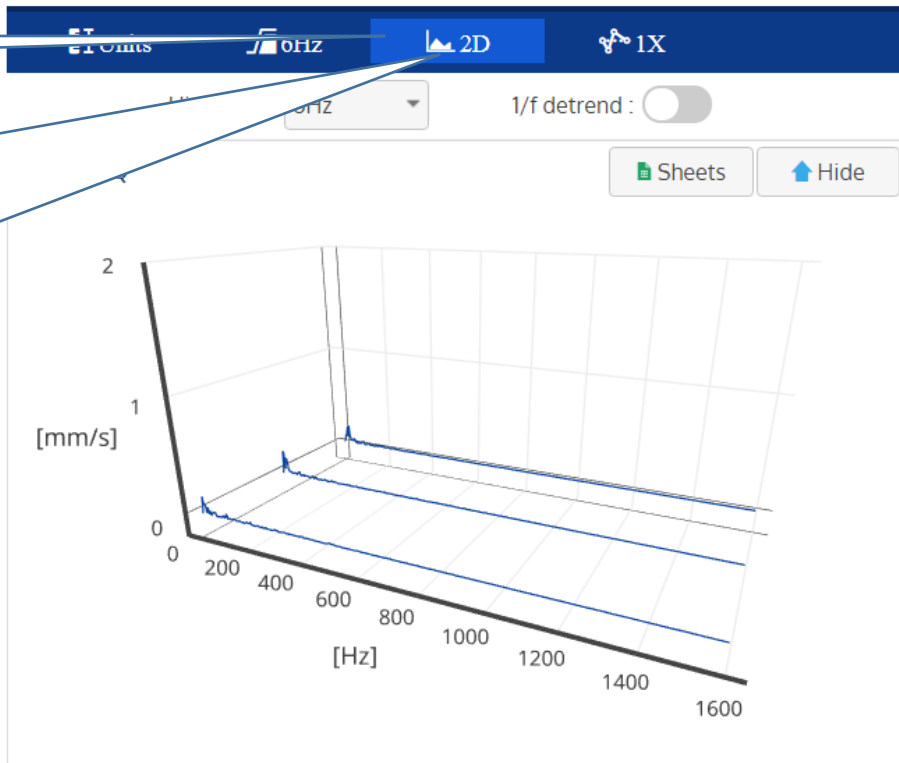
Enable/disable 1/f flicker noise detrending (only for velocity spectra).

## VIBRATION LAB

Close

"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.



## VIBRATION LAB

Close

"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.

DFT Averaging : off

### 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).

#### STATISTICS LAB

Units

6Hz

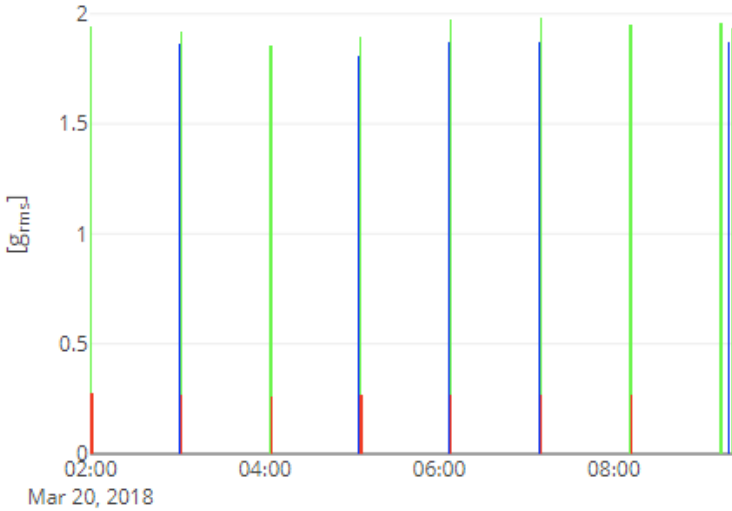
Units : g

Statistic : RMS

RMS: HANNING | ACC

Sheets

Hide



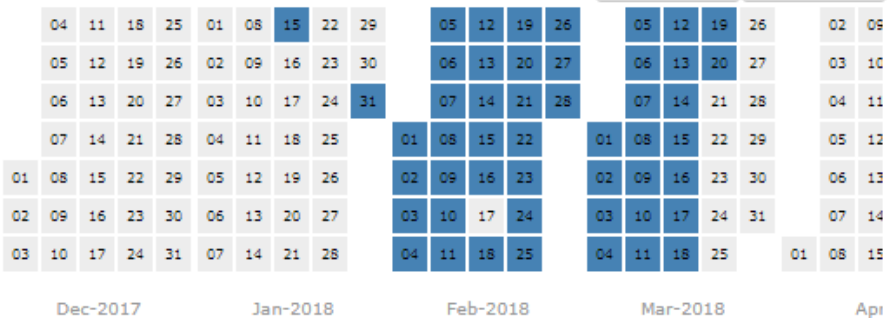
X [g]  
Y [g]  
Z [g]

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

#### HISTORIAN

Past

Later



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.

#### START DATE

Tue Mar 20 2018 01:59:57 +0100  
Tue Mar 20 2018 02:00:29 +0100  
Tue Mar 20 2018 02:01:00 +0100  
Tue Mar 20 2018 03:01:37 +0100  
Tue Mar 20 2018 03:02:11 +0100  
Tue Mar 20 2018 03:02:44 +0100  
Tue Mar 20 2018 04:03:19 +0100

Full

31 Month

7 Week

Clear

#### END DATE

Tue Mar 20 2018 08:10:53 +0100  
Tue Mar 20 2018 08:11:24 +0100  
Tue Mar 20 2018 08:11:57 +0100  
Tue Mar 20 2018 09:12:51 +0100  
Tue Mar 20 2018 09:13:26 +0100  
Tue Mar 20 2018 09:19:02 +0100  
Tue Mar 20 2018 09:21:33 +0100

"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.

#### STATISTICS LAB

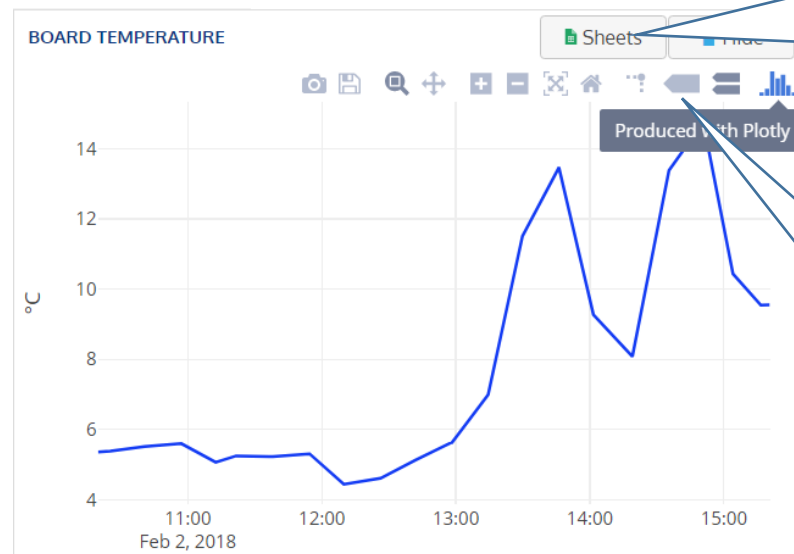
Units

6Hz

Highpass : 6Hz

Close

## 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.

 **Device** 2f:d7:25:8d


**Edit Device Tag**

Tag for [2f:d7:25:8d]

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".

 **Device** 2f:d7:25:8d

**Edit Device Tag**

Tag for [2f:d7:25:8d]

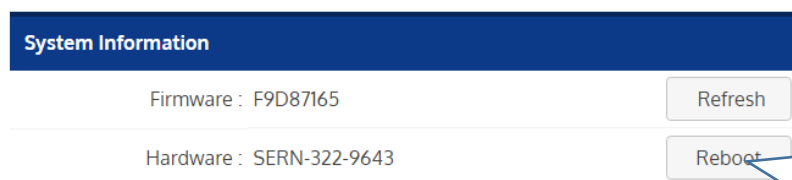
When deleted, the device will be removed from the sensor list. As soon as the battery is activated in the device, the device pops up again in the list and is automatically connected to the closest base station in the field when in reach.

### 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.

#### SENSOR STATUS



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.



MEMS Vibration Setup

Rate : 3200Hz

Axis : XYZ

Samples :

Capture :

Vibration Download

Prefetch :

Download :

Analyse :

Stats

Auto Measurements

Queue Interval :

00:05

[ hh : mm ]

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.

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

#### CONNECTED DEVICES

Base Station	e6:6c:6d:b0
Device	2f:d7:25:8d
Device	4e:10:1c:90
Device	72:f0:7d:90
Device	a0:8d:5c:53
ACTIVE DEVICES	
SCHEDULE	
Device	ETA 16:08:18

**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.

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.

### CONNECTED DEVICES

Base Station	e6:6c:6d:b0
Device	2f:d7:25:8d
<b>Device</b>	<b>4e:10:1c:90</b>
Device	72:f0:7d:90
Device	a0:8d:5c:53

### ACTIVE DEVICES

#### SCHEDULE

Paused

Device	ETA 16:08:18
--------	--------------

The queue process is paused. To reactivate the process, click the "Paused" button with the play icon.

### CONNECTED DEVICES

Base Station	e6:6c:6d:b0
Device	2f:d7:25:8d
<b>Device</b>	<b>4e:10:1c:90</b>
Device	72:f0:7d:90
Device	a0:8d:5c:53

### ACTIVE DEVICES

Device	15:51:50
--------	----------

#### SCHEDULE

Active

Within the set interval, the device will become active and appears under the active devices list.

## 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.*

The interface is divided into two main sections. The top section, titled 'Vibration Download', contains settings for data acquisition: 'Prefetch' is set to 'n = 128', 'Highpass' is set to '6Hz', 'Download' is an empty input field, and 'Threshold' is set to 'none'. Below these are buttons for 'Analyse' (with a gear icon and 'vLAB' text) and 'Trending' (with a line graph icon and 'Stats' text). The bottom section, titled 'Auto Measurements', shows a 'Queue Interval' of '00:20' in '[ hh : mm ]' format, followed by a toggle switch that is currently turned on.

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

The 'STATISTICS LAB' panel has a 'Close' button in the top right. Below the title bar, there are two tabs: 'Units' and '6Hz', with '6Hz' being the active tab. A 'Highpass' dropdown menu is set to '6Hz'.

Figure 2: prefetch settings in statistics lab pane

The 'VIBRATION LAB' panel also has a 'Close' button. It features four tabs: 'Units', '6Hz', '3D', and '1X', with '6Hz' being the active tab. Below the tabs, the 'Highpass' dropdown is set to '6Hz', and the '1/f detrend' toggle switch is turned off.

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.

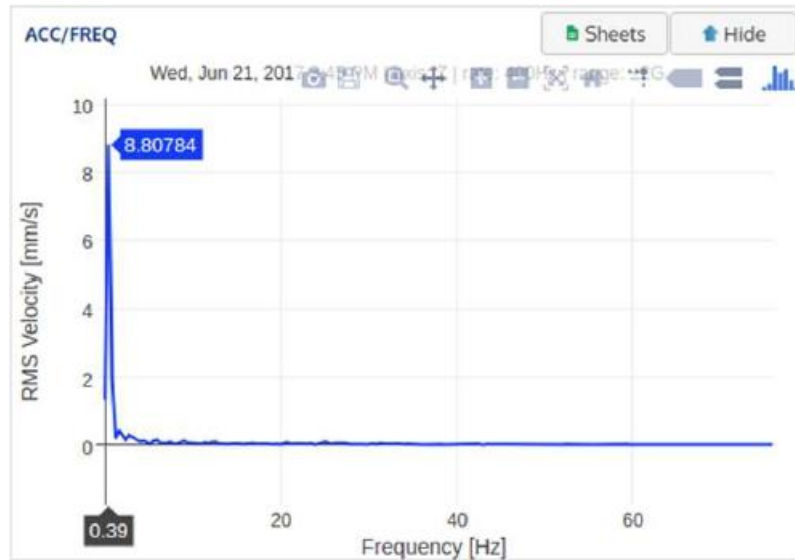


Figure 4: choosing the best setting for the high pass filter

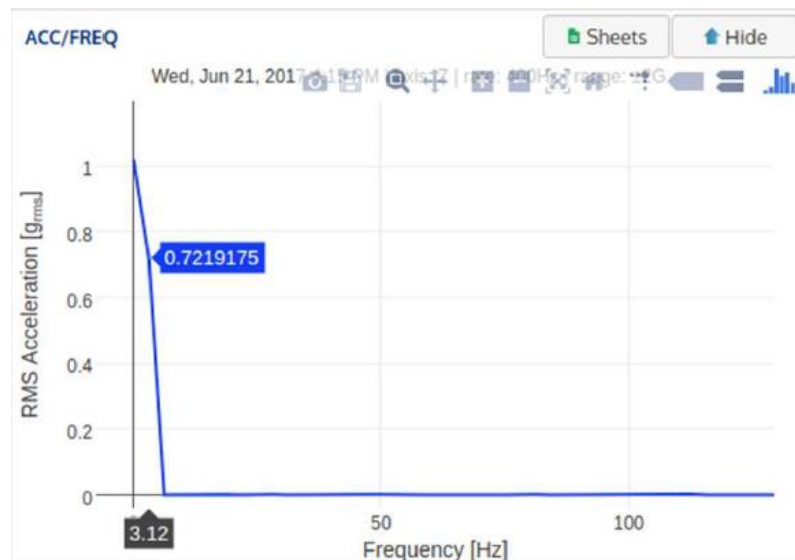


Figure 5: choosing the best setting for the high pass filter

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.

**Vibration Download**

Prefetch : n = 128 →

Download :  ←

Analyse : vLAB

Highpass : 6Hz

Threshold : none

Trending : Stats

Figure 6: vibration pane

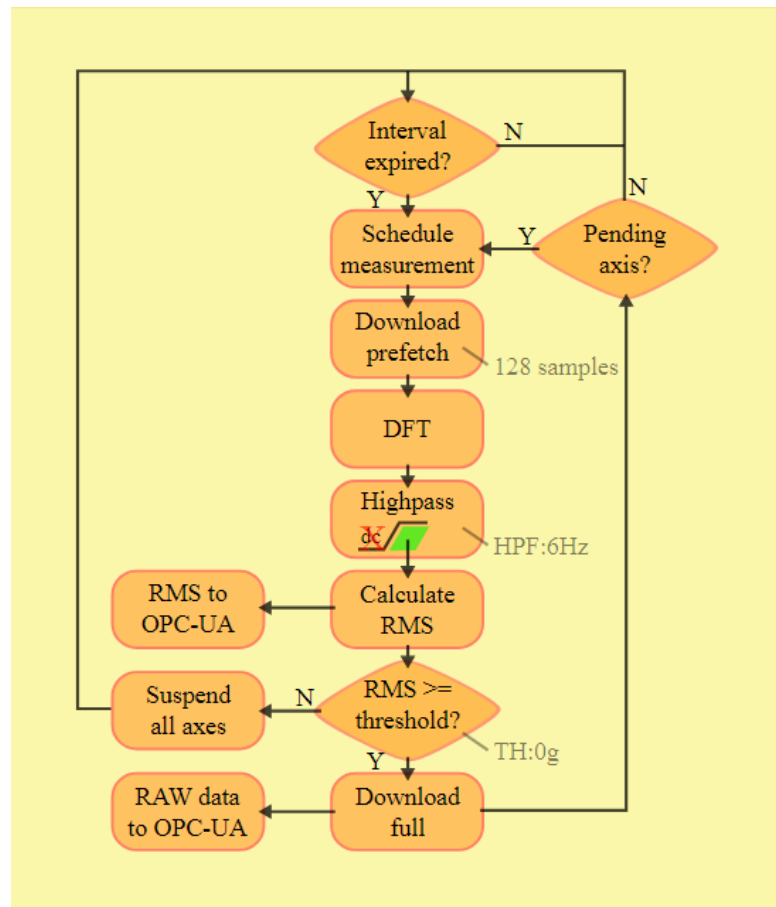


Figure 7: How data is send to OPC UA and unwanted measurements are suspended (e.g. if the DUT is inactive)

## 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

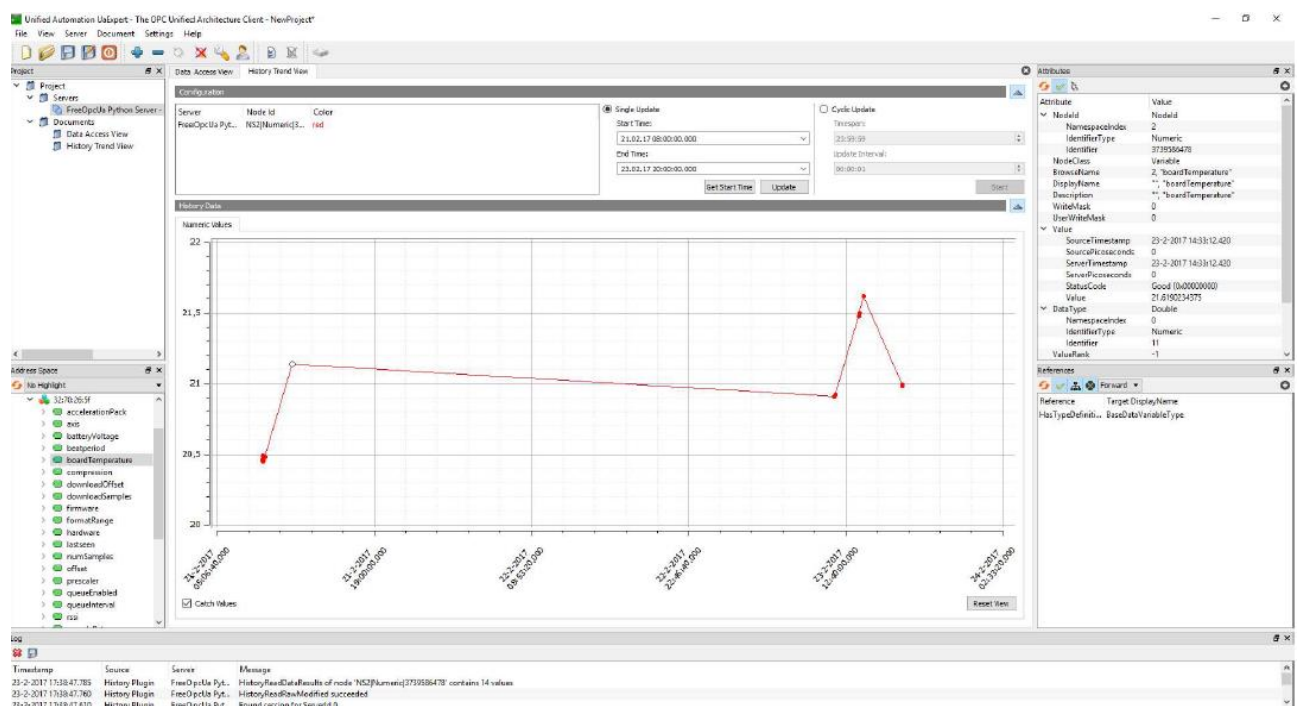
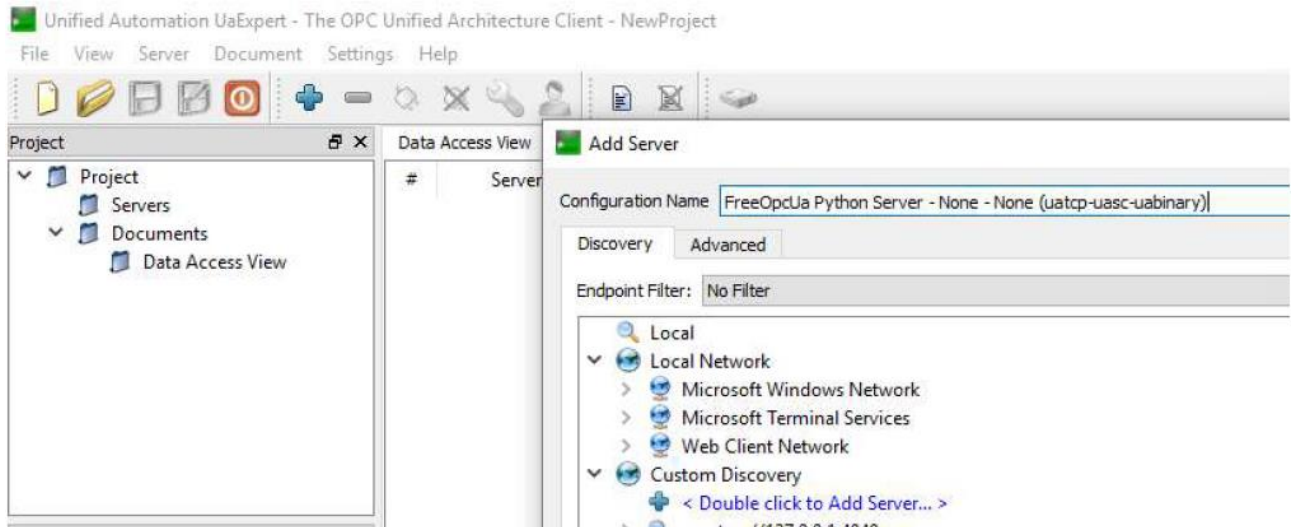


Figure 9: OPC UA data (board temperature of sensor 32:70:26:5f) viewed in an OPC UA client

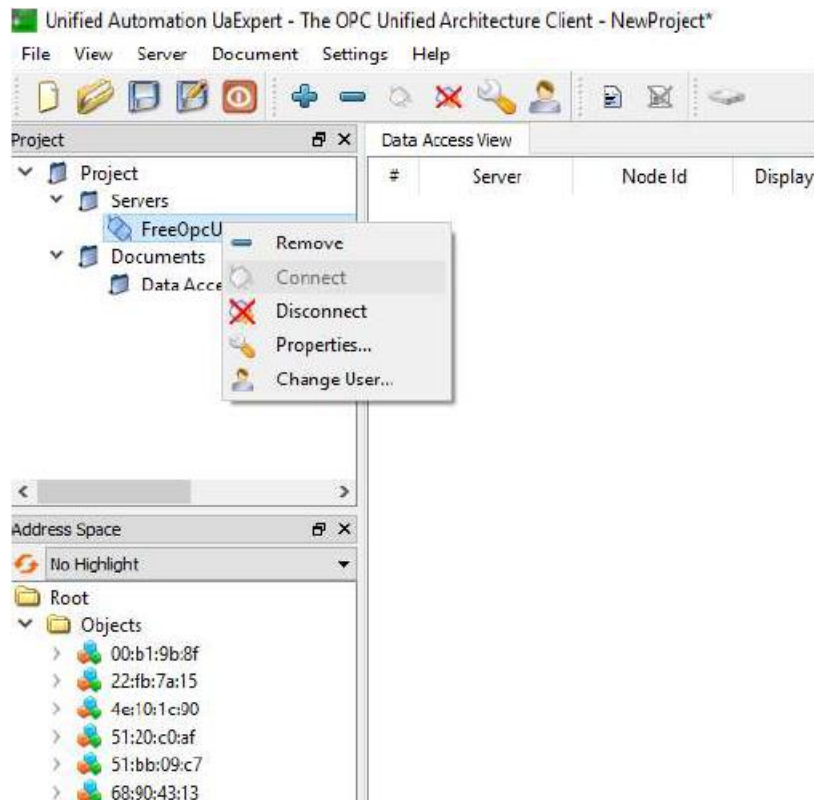
## 7.2. Setting up OPC UA client

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.

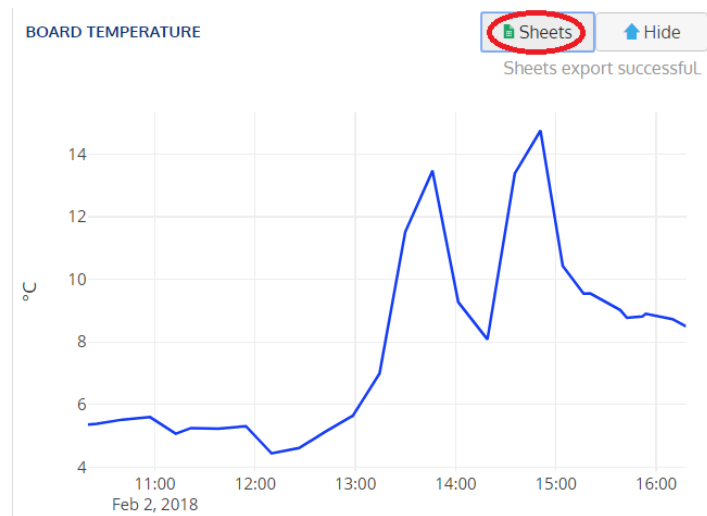


3. Edit the URL to e.g. `opc.tcp:// 192.168.8.102:4840` (see also section 9.2)
4. Connect to the server.

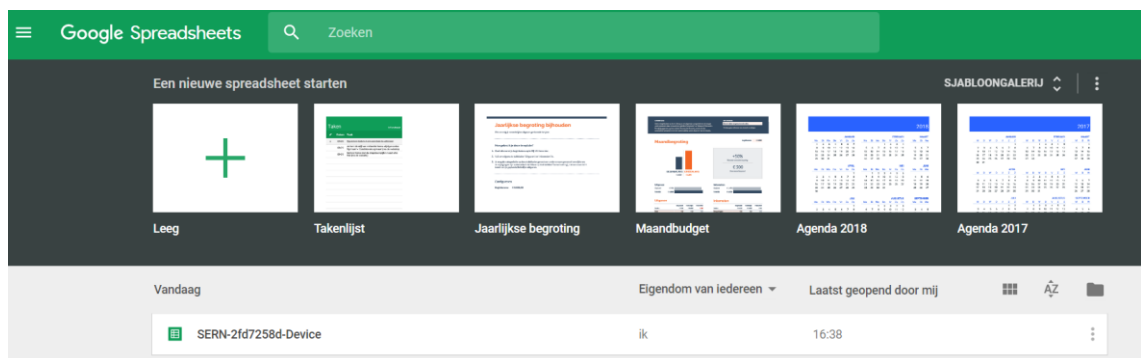


5. The iQunet sensors will appear in the object list.
6. Browse the attributes of the sensors by clicking on the tags.

### 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.

SERN-2fd7258d-Device

Bestand Bewerken Weergeven Invoegen Opmaak Gegevens Extra Add-ons Help Laatste bewerking was 8 minuten geleden

Opmerkingen Delen

	A	B
1	ISO 8601 Date	boardTemperatu
2		
3	2018-02-02 09:11	5,36
4	2018-02-02 09:21	5,36
5	2018-02-02 09:21	5,39
6	2018-02-02 09:41	5,52
7	2018-02-02 09:51	5,57
8	2018-02-02 09:51	5,6
9	2018-02-02 10:11	5,07
10	2018-02-02 10:21	5,25
11	2018-02-02 10:31	5,23
12	2018-02-02 10:31	5,23
13	2018-02-02 10:51	5,31
14	2018-02-02 11:01	4,44
15	2018-02-02 11:21	4,61
16	2018-02-02 11:21	4,61
17	2018-02-02 11:41	5,12

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.

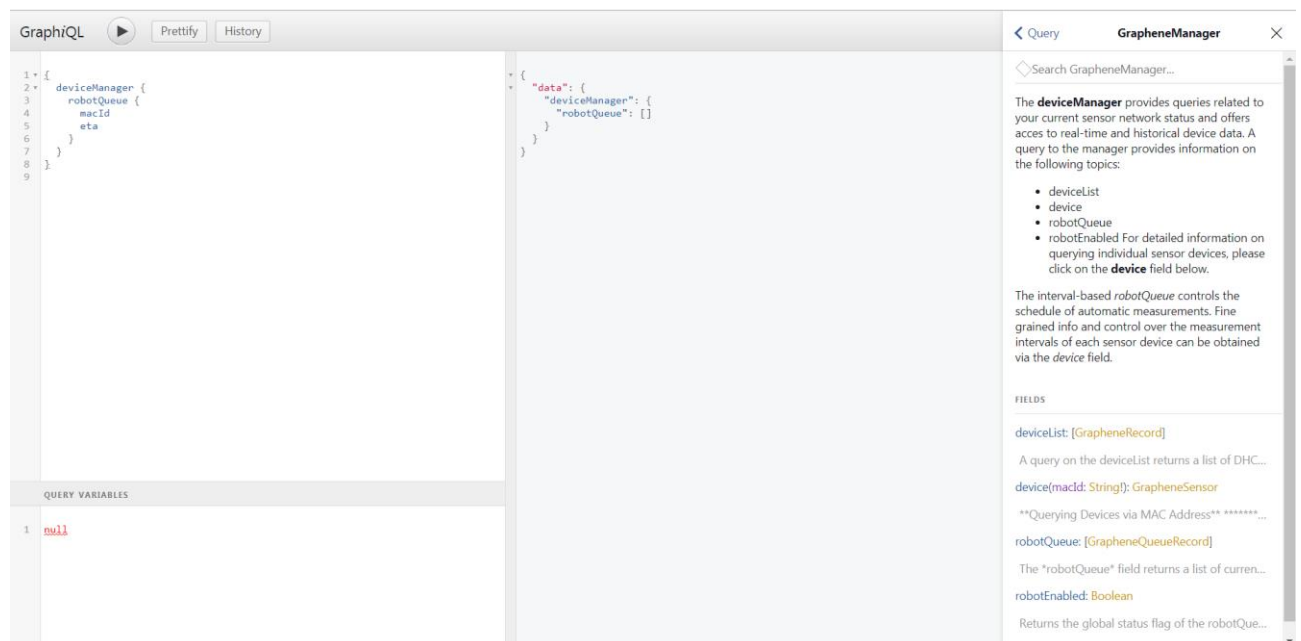


Figure 10: The iQunet graphical interactive in-browser GraphQL IDE (Integrated Development Environment)

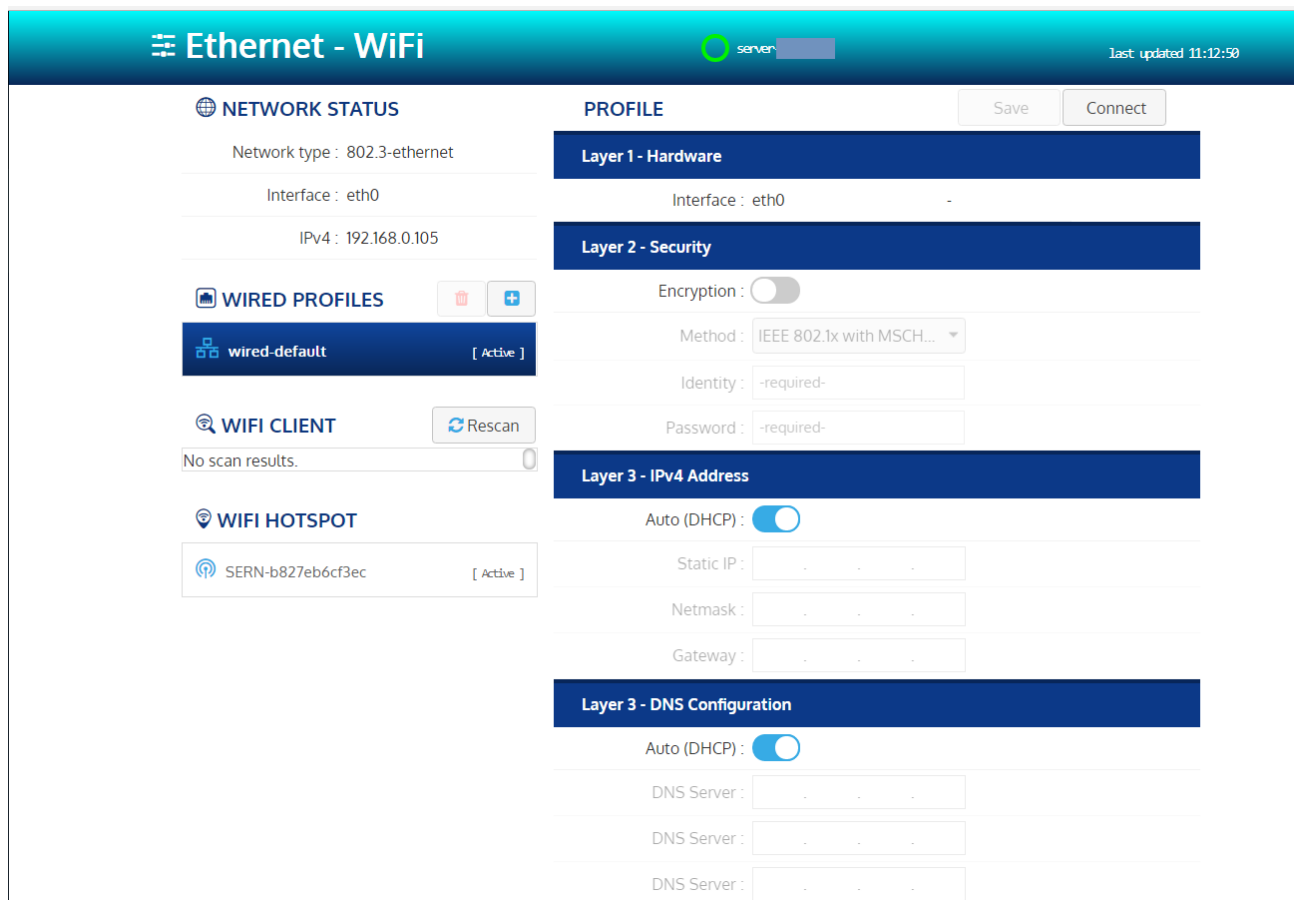
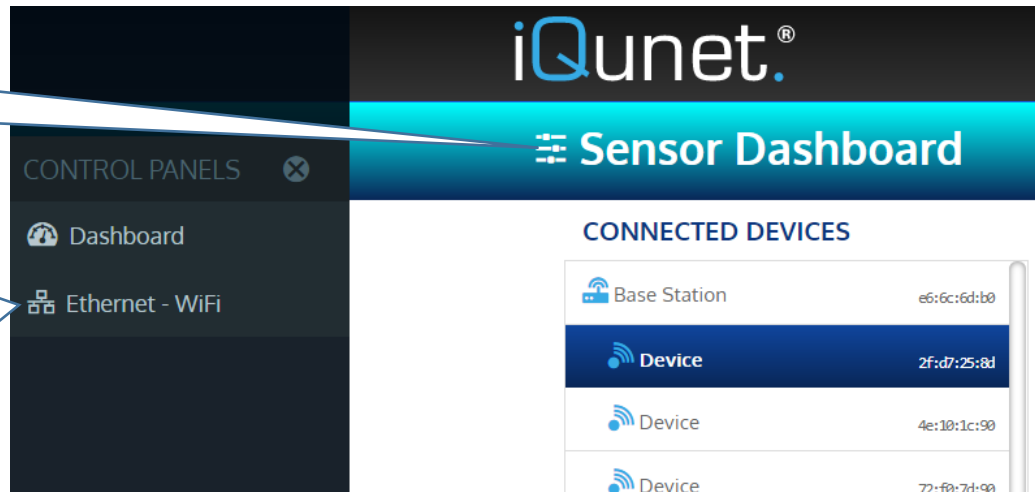
## 9. Wireless connection (as from version 1.1.16)

### 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.



## 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 : . . .

DNS Server : . . .

Enable Encryption and select the used encryption method. Fill in the identity and the password key of the network.

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)

**iQunet®**

**Ethernet - WiFi**

**CONTROL PANELS**

- Dashboard
- Ethernet - WiFi

**NETWORK STATUS**

Network type : 802.3-ethernet

Interface : eth0

IPv4 : 192.168.0.150

**WIRED PROFILES**

- wired-default [ Active ]

**WIFI CLIENT** [ Rescan ]

Device Name	MAC Address
telenet-8B329	5C:35:38:48:B3:2E
TELENETHOMESPOT	02:35:38:48:B3:2F
TelenetWiFree	06:35:38:48:B3:31
HP-Print-F1-Officejet Pro 276dw	6C:C2:17:50:79:F1
belkin.8ad	08:86:3B:76:D8:AD
belkin.8ad_xt	EC:1A:59:FC:FC:DE

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-xxxxxxx”.

**Sensor Dashboard** [ Direct Link ] Last updated 18:14:43

**CONNECTED DEVICES**

Device	MAC Address
Base Station	e6:6c:6d:b0
Device	2f:d7:25:8d
Device	4e:10:1c:90

**SENSOR STATUS**

**Network Interface**

Signal Strength : 22 dBm [5/5]

MAC Address : e6:6c:6d:b0

## 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-xxxxxxxxxx) 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-xxxxxxx).



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-xxxxxxxxxx) 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.

NETWORK STATUS

Network type : Not connected

WIRED PROFILES

wired-default [ Active ]

WIFI CLIENT

Rescan

Verlytem ContentLiving	84:75:0E:01:88:78
Proximus Smart Wi-Fi	04:19:70:44:9C:E5
Linux2-6114	00:19:70:44:9C:E5
PROXIMUS_FON	06:19:70:44:9C:E5

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 : . . .