egnite

Querx TH and Querx TH WLAN Review

How Hot and Humid is Our Server Room?

Server rooms – the modern IT altars – require a great deal of attention. Instead of altar boys, however, a host of sensors watch over the valuable tech. We kindly asked the Syseleven experts to review a pair of sensors that measure temperature and humidity.

By Mario Keller and Carl Stegmann, Golem.de/SysEleven.de
(https://www.golem.de/news/querx-th-wlan-im-test-wie-heiss-und-feucht-ist-unser-serverraum-1606-121047.html)
Translation by Lawrence Klein, egnite

Syseleven employees reviewed two network-compatible sensors that track temperature and humidity. (Image: Mario Keller/Syseleven)

Most of us know that the temperature of a computer center is highly important. Not too many, however, know about the vital role that the ambient humidity plays. If it is too high, water may condense on cold parts, causing damage. If it is too low, moving parts can be statically charged, which can also cause damage.

At least the servers themselves, but also various other devices in a computer center, feature internal temperature sensors. Usually they even incorporate separate sensors for the warm- and cold aisles. They do not, however, feature humidity sensors. So when the golem.de editors asked us if we might put these two sensors designed by egnite to a practical test, I did not even need to begin persuading our infrastructure folks.

Two network-compatible sensors that measure temperatures as well as humidity and are capable of transmitting the recorded values via Ethernet or WiFi were tested. Knowing these values is vital. The measurements do not, however, need to be all that precise; an accuracy of 1 °C (0.5 °F) will suffice for our needs. The devices' network capabilities, on the other hand, are important to us: Which protocols are supported, how can the devices be secured, which ports are open and which data is sent automatically and where is it sent?

First Contact

As soon as the packages containing the test devices had arrived, they were unboxed and examined by our admins' eager hands. Needless to say, we do not simply integrate unknown hardware into our networks, so the first tests were conducted in an isolated environment. You just never know whom Internet-of-Things devices want to communicate with in their default settings. We received two devices: The "small" Querx TH and the larger Querx TH WLAN. Both feature an Ethernet port, which is why we will leave the WiFi capabilities for later.

Our test setup is an autonomous switch to which we connected the sensor and a laptop. The laptop runs Wireshark, recording any data that is sent over the network. We additionally use nmap to track what services are listening in on which ports. Without any further configuration we were only able to trace DHCP requests in the network and the device never tried to phone home, even after receiving an IP-address. Both devices can only communicate via IPv4, IPv6 is not supported.

A positive note: The devices require a mere 5 V of power which can be supplied by a USB-cable with a micro-USB plug. Any device with a USB port can be used to power the sensor. PoE (Power over Ethernet) is not supported yet, but the manufacturer says they are planning to integrate this feature for the larger Querx TH WLAN instead of the WiFi-module.

We were able to test the firmware update feature on the Querx TH WLAN right out of the box. Since this device is the newer of the two, an updated firmware version was available for installation. In this regard the devices pleasantly surprised us, as they feature two firmware slots. This means that an update does not need to overwrite a working firmware version but can instead be loaded into the second slot before being activated. An easy rollback feature is available, should any problems occur during installation, or the firmware not keep what it had promised. Any recorded values will not be lost during an update, since they are saved separately.

An Old Friend

The platform on which both Querx variants are built is no stranger, as it is based on the open-source project Ethernut, which is also managed by egnite. Both devices run Nut/OS 5.

The reviewed devices measure both humidity and temperature with an Si7021-I2C sensor by Silicon Labs. The measurement range for the temperature is -40 to 85 °C (-40 to 185 °F) at 0.1 °C (0.05 °F) accuracy; concerning the relative humidity the range is 0 to 95 percent at an accuracy of 2 percent.

The sensor is connected to the device by a permanently installed cable that is approximately 30 cm long. This prevents measurements from being influenced by any heat produced by the processor, for instance and it also makes it possible to install the small sensor in an opening or a channel, while the device itself remains easily accessible outside. The cable does not influence the measurements, since the data is transmitted between sensor and device digitally (I2C / Link). Anyone who requires the highest levels of precision can additionally have their sensor calibrated.

The current dew point is calculated in addition to the measured values. Both devices are also available in a further variant which allows users to connect PT100/PT1000 sensors, enabling measurements of up to 750 °C (1382 °F).

Data Tomb and Chatterbox

Both devices can save the data of a relatively long time period locally, due to the internal flash-RAM: Depending on the rate at which data is saved this varies between two months and several years. The data can then be conveniently downloaded automatically from the web interface in the CSV, XML and JSON file formats. This lets the sensor work even without a constant network connection.

The rate at which measurements are made is set to one measurement per second, but the user can define the frequency at which the measurements are saved. A battery-backed real time clock ensures that the date is not reset to the first of January, 1970, even after a power shortage.

The user can choose between various protocols. SNMP-traps can be sent and data can be queried via SNMP, making it possible to integrate the device into any monitoring-systems. The appropriate MIB file can be downloaded from the device itself, which is highly practical if the monitoring system is a closed system. This suits our environment pretty well, so we quickly compiled some graphs for temperature and humidity, using MRTG.

Users who would rather save their data in the cloud are also supported by both devices. They can transmit their data to the IoT providers Thingspeak and Xively. These services offer various additional options for the evaluation and visualization of the measurements.

A further medium supported by both devices is email. Mails can be sent from two separate accounts (SMTP) to a number of email addresses, including optional authentication.

The current and recorded values can also be directly accessed via HTTP. The HTTP-interface lets the user set the file format (XML, JSON, CSV), starting- and endpoint, as well as the interval between values via URL-parameters.

Both devices also support the syslog- and modbus-(TCP)-protocols. As of writing, no values are transmitted via syslog, but after we made the developers aware of this fact, this will be changing in the next firmware-update. Modbus is particularly interesting for home automation and similar applications.

The options for the alerts are just as comprehensive as the communication capabilities. Alerts and all-clear signals for the transgression of threshold values are standard features for such devices. One can likewise expect a dead-band that only lets a second alert be triggered after the value has fallen below a certain level before reaching the limit again. This prevents continuous switching between alerts and all-clear signals, should the value float around the threshold value.

We were pleasantly surprised by the possibility of triggering an alert if a measurement changes by a certain margin within a specified timeframe, even if the threshold value has not yet been transgressed. This feature is available with various settings and for rising and falling values alike.

The web interface features an interactive graph on the homepage, which can visualize recorded data lucidly.

The graph can additionally be embedded directly into an external website using iframe - provided the browser can access the Querx sensor directly.

Querx TH (Querx Minor) and TH WLAN (Querx Major)

The beating heart of Querx is an ARM-Cortex-M3-processor with 512 KByte flash memory and 64 KByte RAM. An additional 4 MBytes of flash memory are integrated for the firmware buffer and sensor data. This lets the device save the measurements of anywhere between two months and several years, depending on the selected rate at which data is saved.

At a mere 56 x 40 mm, Querx is surprisingly small. The power consumption is also pleasantly low at a maximum of just 1 W. The power is supplied via a 5 V micro-USB cable either by a power adaptor or any USB port that can supply at least 200 mA.

Our first test was conducted in a laboratory setup consisting of a switch, the sensor and a computer which tracked any data that was sent across the network using

Wireshark. By default, Querx TH is configured for DHCP and accessible at a zeroconf-address. A web interface is provided for the configuration of all necessary settings.

The interface features user administration settings, making it possible to set up a number of users with differing access rights: users can be granted the rights to read data, read the configuration, change the configuration and to combinations of these options. Several users with different access rights can be created.

While the larger Querx TH WLAN supports SSL for the web interface, the smaller TH does not.

The configuration can be exported and reimported in a text file. The latter is especially helpful in automated environments which administrate more than one sensor. Querx TH is available from the manufacturer's shop for 166.60 €.

Querx TH WLAN (Querx Major)

Querx TH WLAN is not only physically larger than the TH model with its dimensions of 66 x 50 mm, but the processor is also slightly beefier. An ARM-Cortex M4 with 2 MByte of flash and 256 KByte of RAM plus an additional 8 MByte of external RAM and 125 MByte of external flash for the firmware buffer and sensor data are installed in this device.

This also increases the power consumption slightly, being amped up to 300mA and thus 1.5 W. The power is also delivered via USB.

The most obvious difference is, of course, the WiFi antenna. It is detachable, making it possible to replace the reflector antenna with a Yagi antenna, for instance. The fact that either the WiFi or the Ethernet module is active initially confused us. If a cable is connected to the network socket, the WiFi module is switched off.

Querx TH WLAN is denied access to 5 GHz networks, as the device currently only supports 2.4 GHz WiFi. With regards to security, Querx TH WLAN offers WEP, WPA and WPA2 with preshared keys. The WLAN variant features a larger internal memory, which lets it save decidedly more data - up to 7.5 years worth at a rate of one measurement per minute. The web interface, as well as the communication capabilities, are identical to the smaller variant's. In contrast to the smaller version, incoming HTTP connections can be encrypted by SSL. Querx TH WLAN is available from the egnite web store at a price of 279.65 €.

Conclusion

We ran both devices for several weeks and the conclusion was unanimously "workable". The simple setup and the wide range of features left a positive impression.

The LAN sensor was installed in our office's server room, where it measured the temperature and humidity directly on the rack.

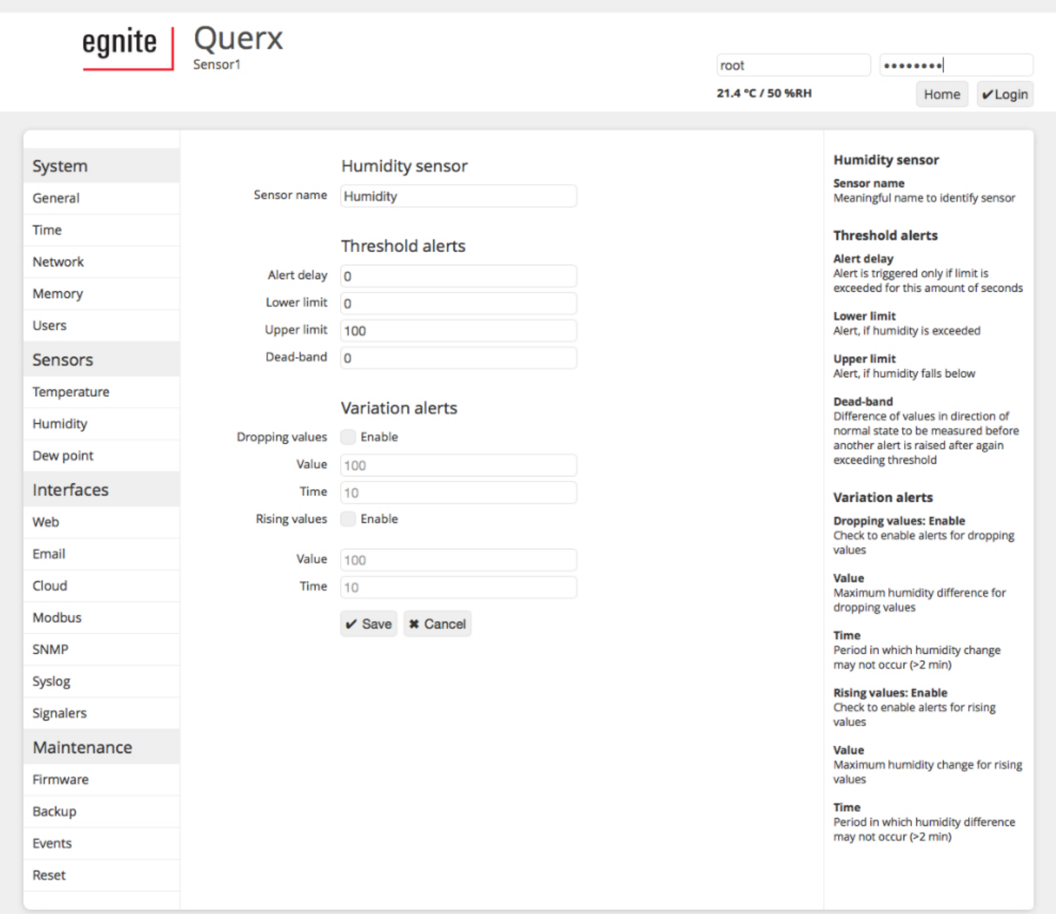
The data was queried via SNMP and visualized with MRTG. Alerts were simultaneously sent by email. This worked fine, at the latest when a playful admin had a finger in the proverbial pie.

The interactive graph on the website provided by the sensor itself proved very helpful, making it easy to gain a quick overview of the measurement history.

The WiFi capable device was connected up to one of our open WiFi nodes and set up to transmit its data to a Thingspeak account and thus into the cloud. This, too, worked reliably.

The Querx sensors may be polished products, but they are not static ones. The manufacturer is open to new ideas and suggestions and the firmware is continuously being developed. Our comments are already on the to-do list, too.

We were granted a peek at the future during our review, as we were able to test the beta version of the upcoming firmware version which will be officially released soon. A template system based on Jinja and Django, which is already being used internally, will make it possible to create customized HTTP-requests for external services. This will let the sensors be connected to virtually anything that features an HTTP-interface.

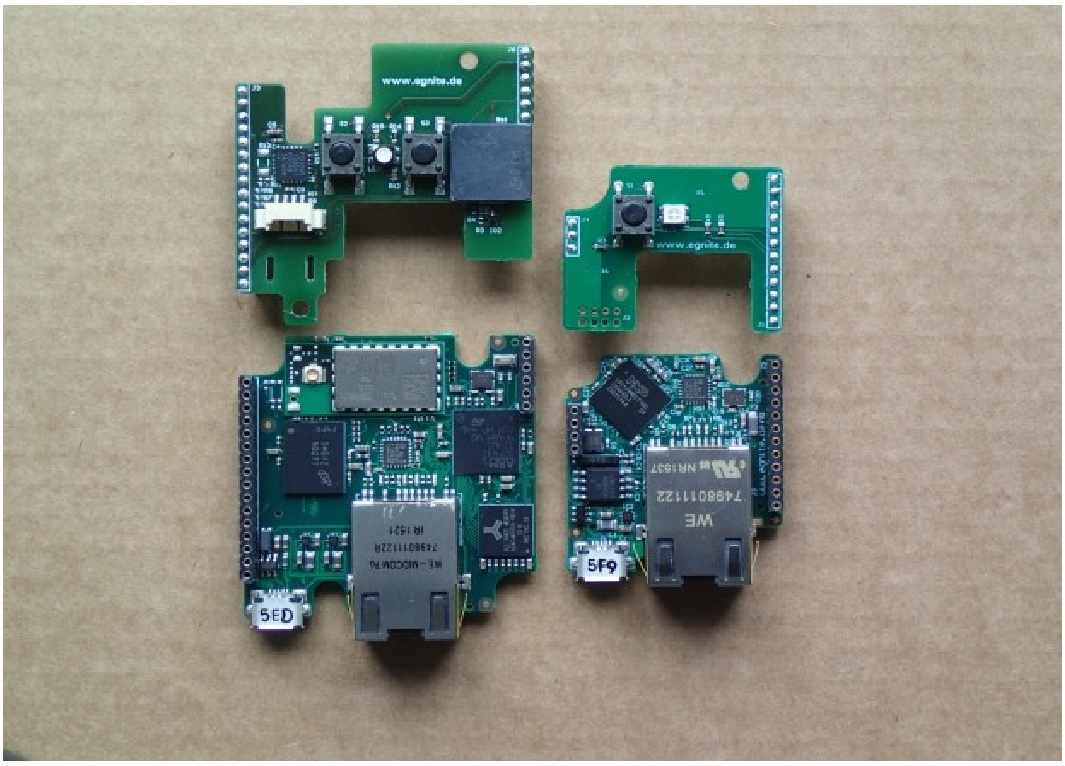


Overview of the alert settings (Image: Mario Keller/Syseleven)

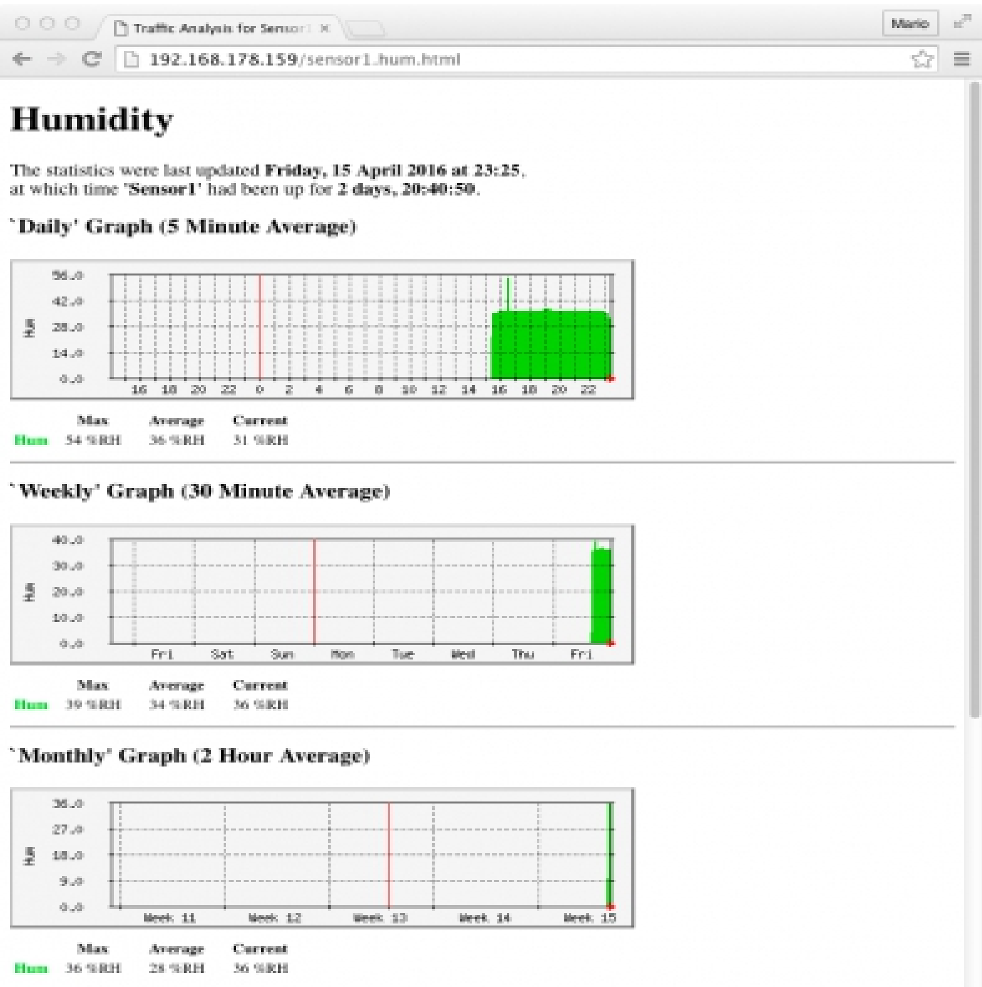
Graph displaying recorded temperature values (Image: Mario Keller/Syseleven)

Thermometer module (Image: Egnite)

WiFi-capable variant of the thermometer module (Image: Egnite)



Compact internals based on Ethernut (Image: Egnite)



Statistics displayed in a web interface (Image: Mario Keller/Syseleven)

(Image: Mario Keller/Syseleven)

Temporary installation in a server rack (Image: Mario Keller/Syseleven)

Temporary installation on a wall (Image: Mario Keller/Syseleven)