MQTT Broker Examples

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Introduction

The Stride MQTT Gateway can integrate your Modbus data into an IIoT system using any MQTT broker. It is compatible with popular public IIoT platforms such as Amazon AWS, IBM Watson IoT, ThingsBoard and others. You can also set up you own MQTT broker using Mosquitto or other MQTT software.

The steps to set up the Stride MQTT Gateway are essentially identical regardless of which MQTT Broker you plan to use, but a given broker may require specific settings for the MQTT connection, topic syntax or message structure. Please check the requirements of your chosen system prior to configuring the gateway.

To demonstrate the MQTT setup, including both the gateway and MQTT broker, we will present two examples; one using a public Mosquitto testing server, and one using ThingsBoard.io.

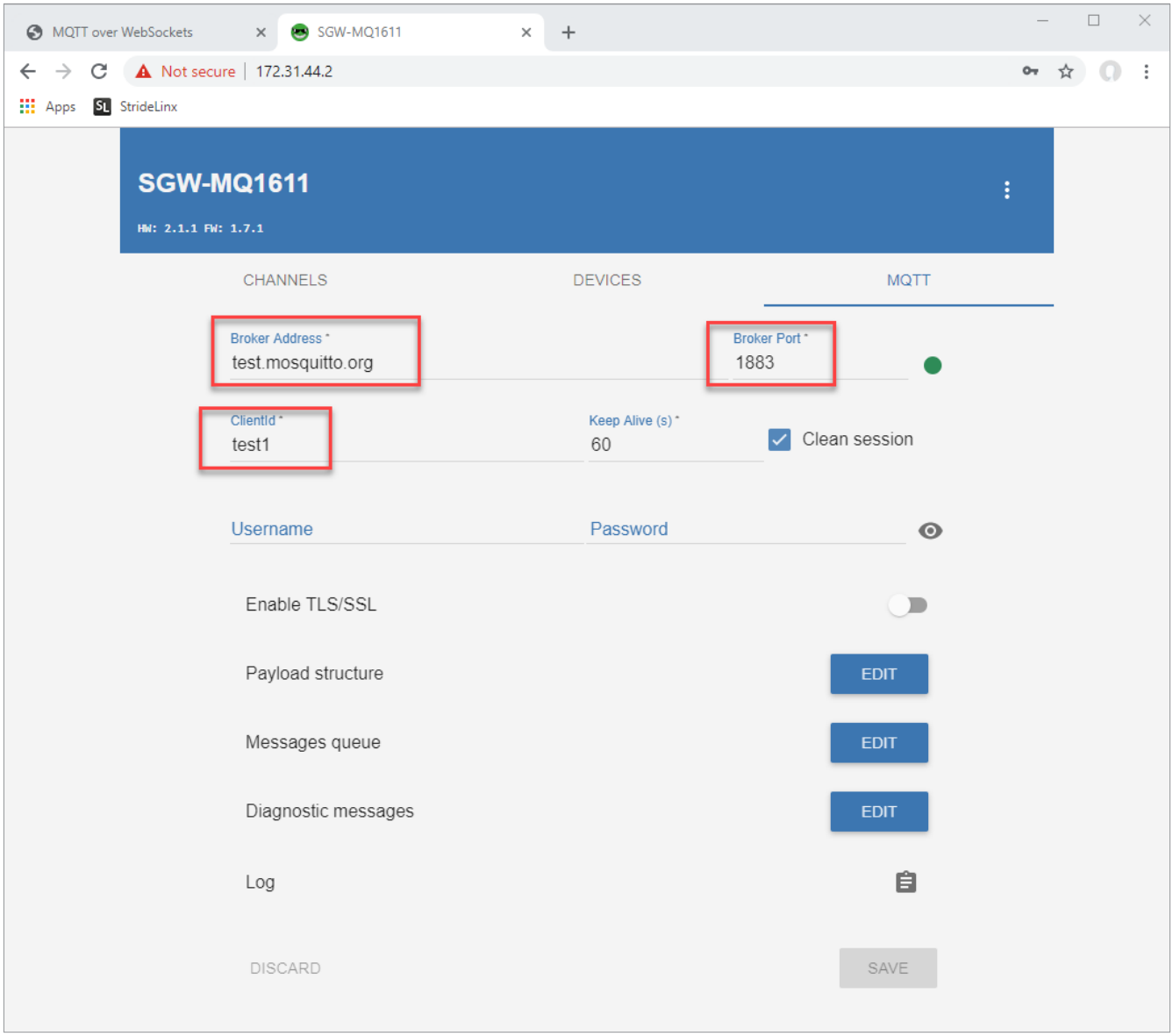
Example using Mosquitto

Mosquitto is primarily an MQTT broker software intended to be installed on your own server. A public test server is available, however, and can provide a quick verification that all parts of the IIoT system are functioning properly.

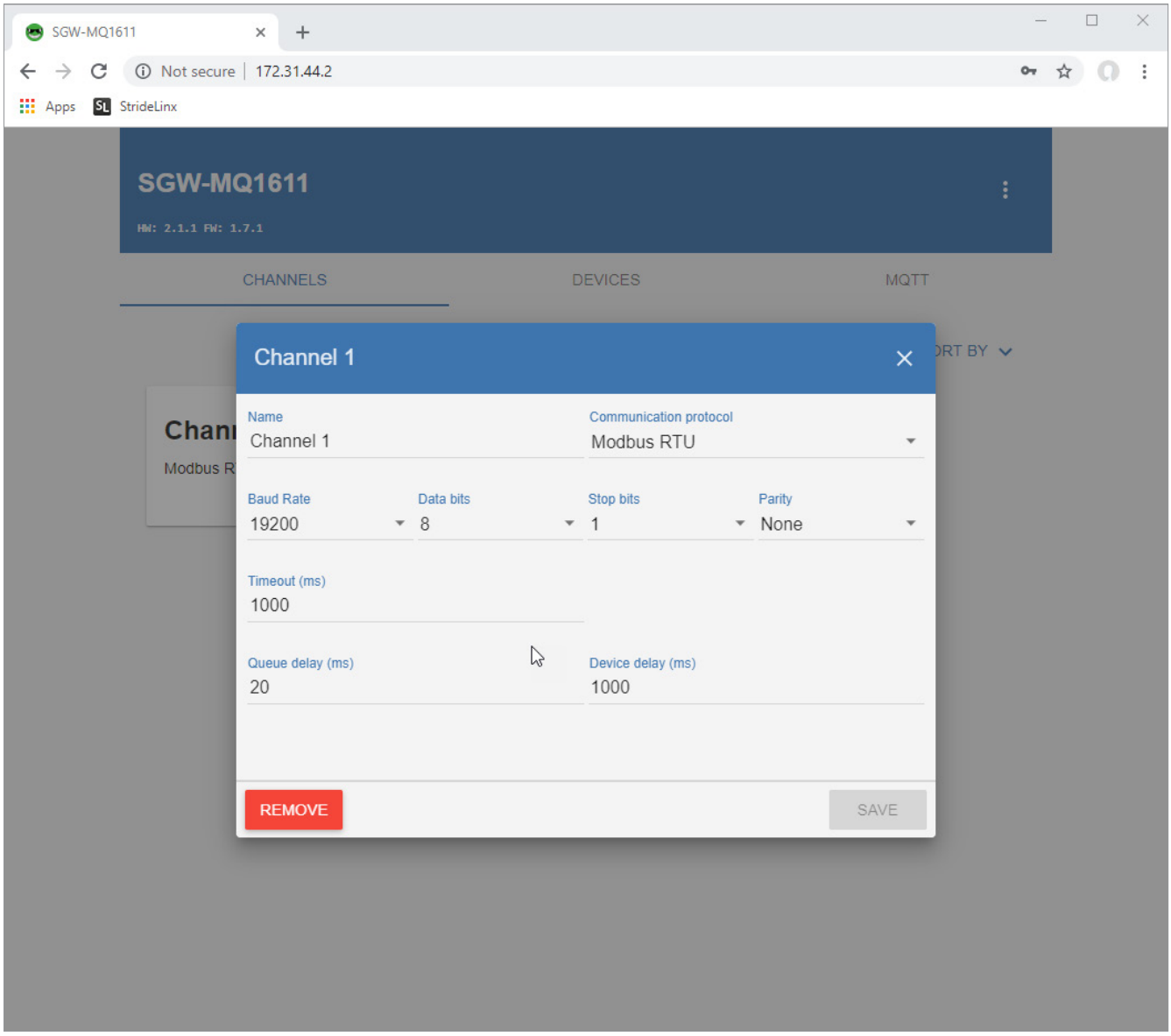
This example is designed to verify the MQTT functionality and the network path. Be sure that a valid Default Gateway is specified (LAN IP address of the router) and accessible DNS addresses are being used to be able to access the Broker Address URL. If in doubt on the DNS addresses, use Google's DNS addresses of 8.8.8.8 and 8.8.4.4.

To test the MQTT connection using "test.mosquitto.org", use the settings as shown below in the "MQTT" section of the setup.

There are a few different port options depending upon if encryption is being used or not, but for the sake of simplicity port 1883 (unencrypted) is being used in this example.

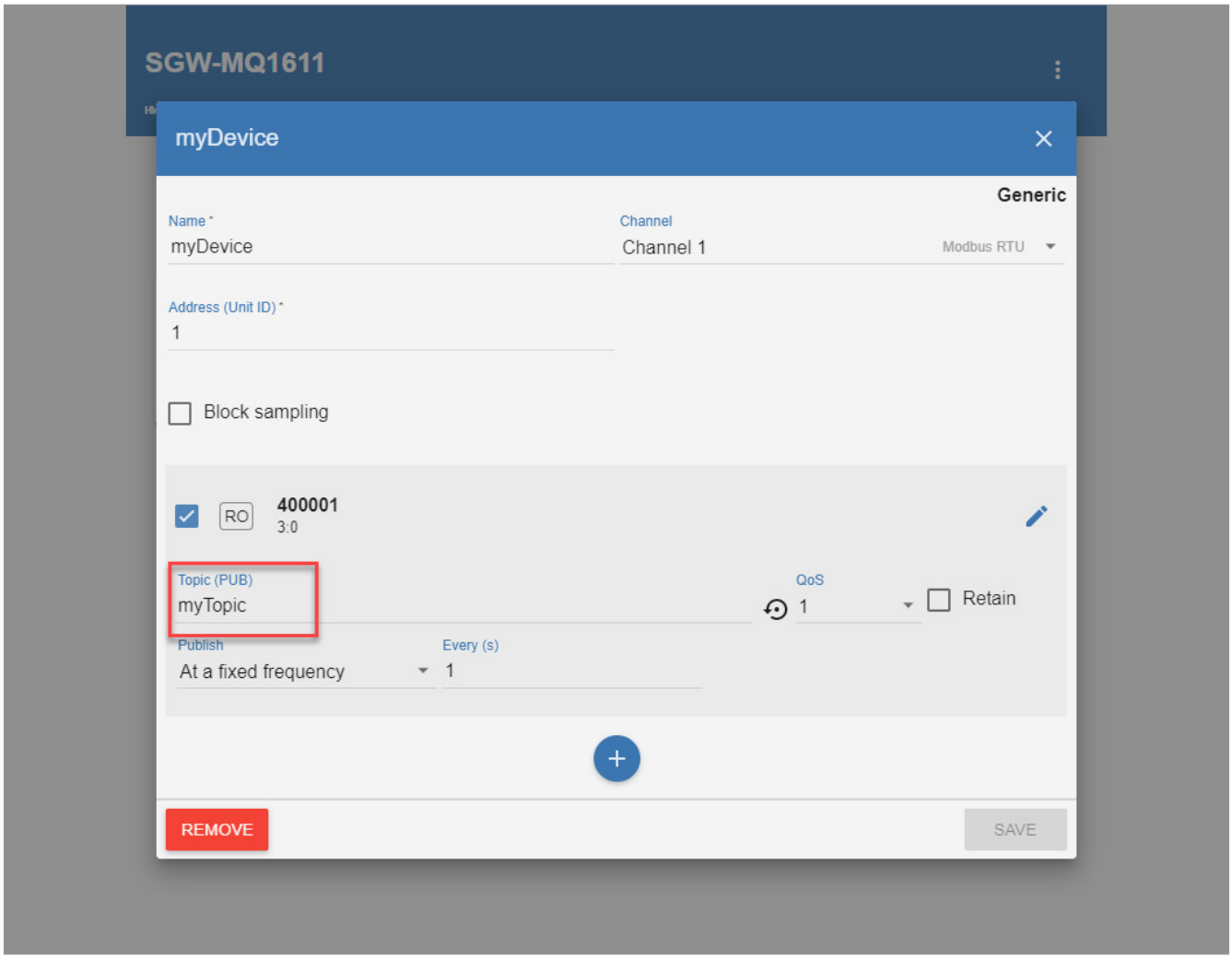


Setup a valid Channel under the “Channels” setup tab. In this case, Modbus RTU is being used back to a PC running Modbus Slave (available at https://www.modbustools.com) with the USB-485M converter.



Create a device in the “Devices” tab to specify a Modbus address and a MQTT topic.

In this example, we are targeting Modbus RTU device 1, requesting Modbus address 400001 (Function Code 3, offset 0) and Publishing that to the “myTopic” Topic at test.mosquitto.org on a 1 second interval.

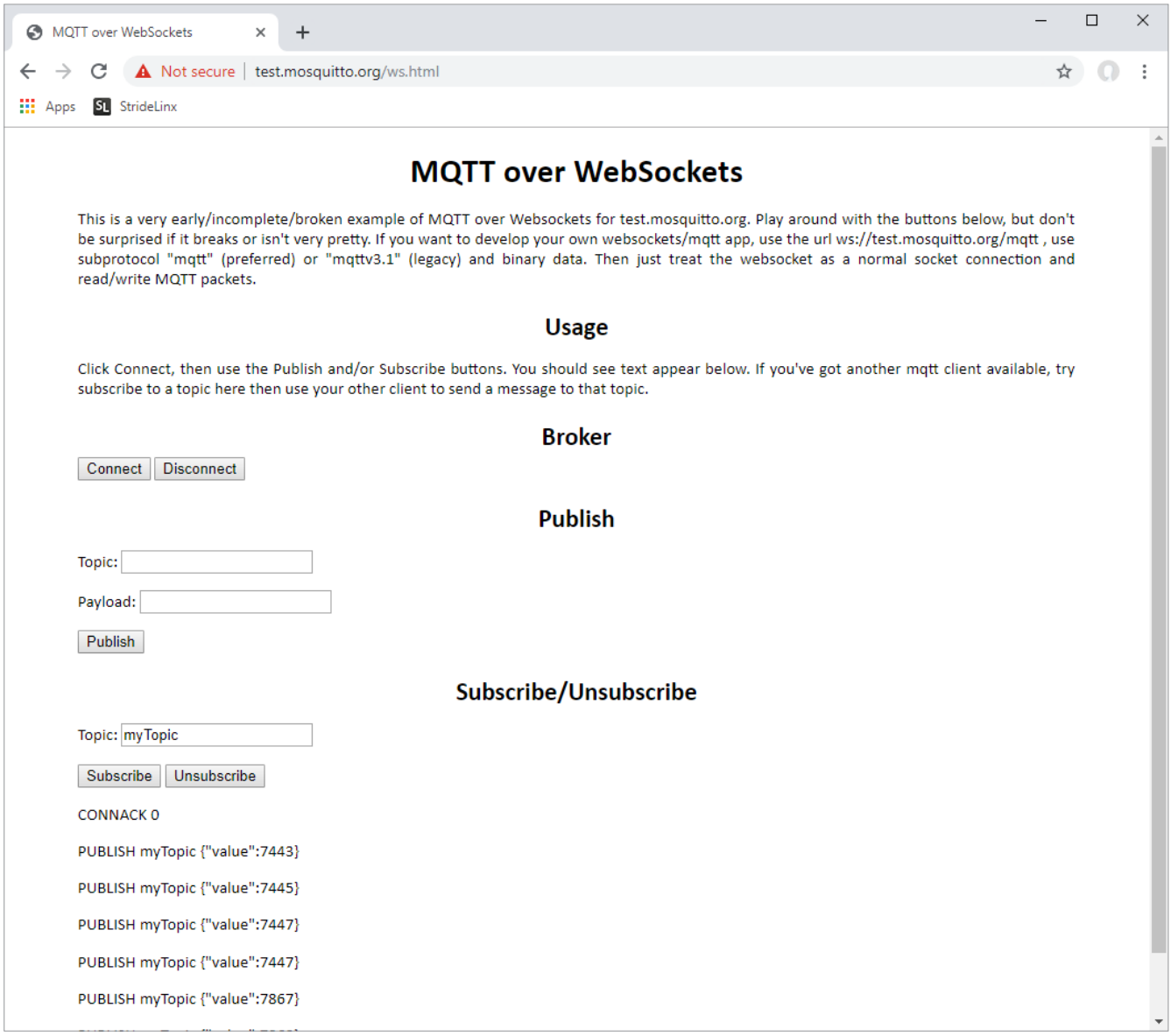


Once this setup has been saved to the gateway, we can go to the "test.mosquitto.org/ws.html" URL to check and see if our gateway is publishing data to the Broker.

At the test.mosquitto.org/ws.html website, click on the "Connect" button and you should see a "CONNACK 0" text at the bottom if the access was successful.

To see the values being published by the gateway, type in the "myTopic" Topic name in the "Subscribe/Unsubscribe" Topic field and click on the "Subscribe" button.

You should see the value in 400001 being published at a 1 second interval at the bottom of the screen.



If the PUBLISH messages are showing up on the screen, the MQTT functionality and network path are correctly configured.

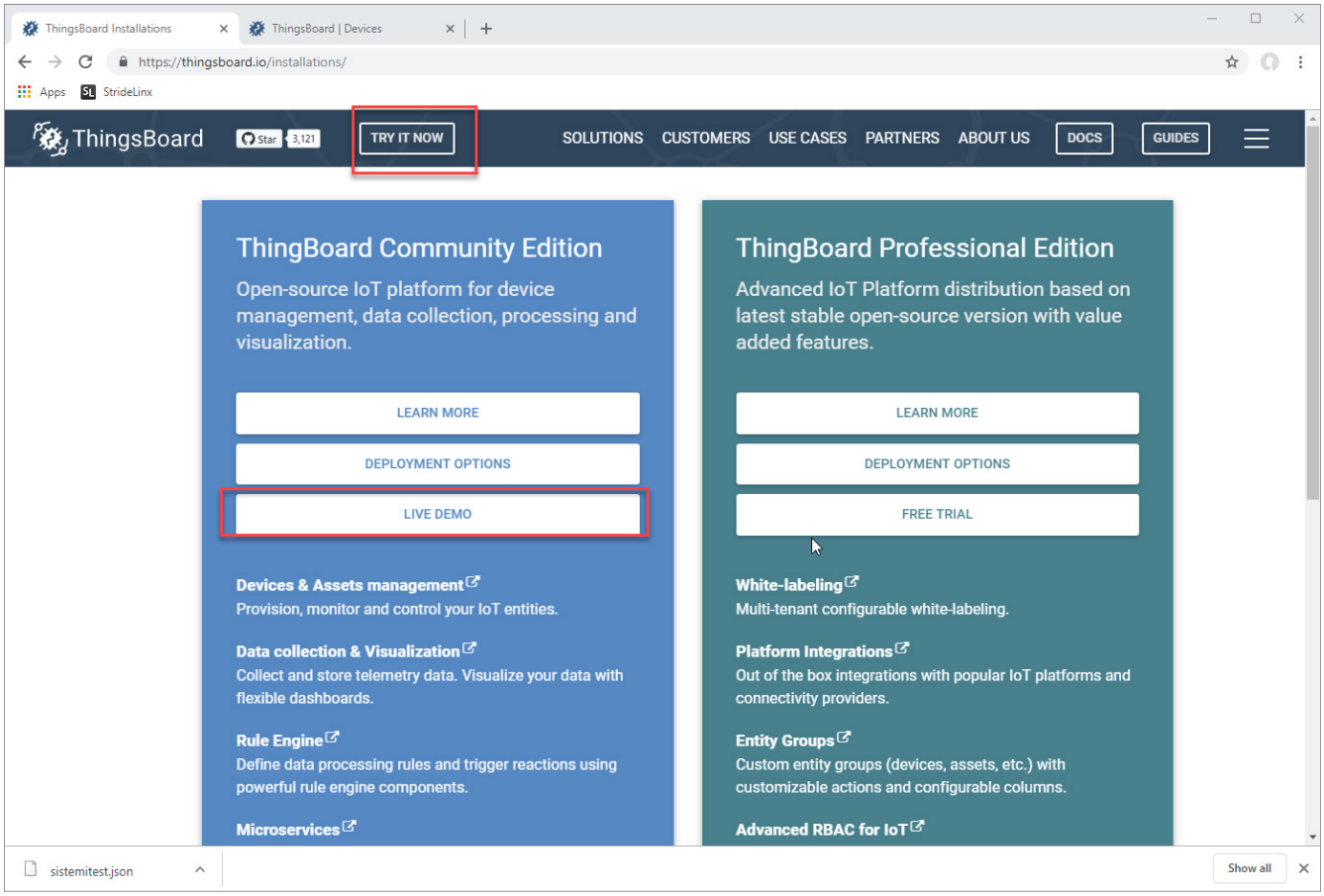
Note that the public test server at test.mosquitto.org may occasionally be down. The most obvious indication of this is the lack a "CONNACK 0" message when you click on the "Connect" button. If this occurs, please wait for the server to become available again later.

Example using ThingsBoard.io

ThingsBoard is an open-source IoT platform that provides device management, data collection, processing and visualization for your IoT solution. They offer multiple tiers of service. We'll use a demo of their Community Edition to demonstrate a full-fledged IoT solution including data visualization.

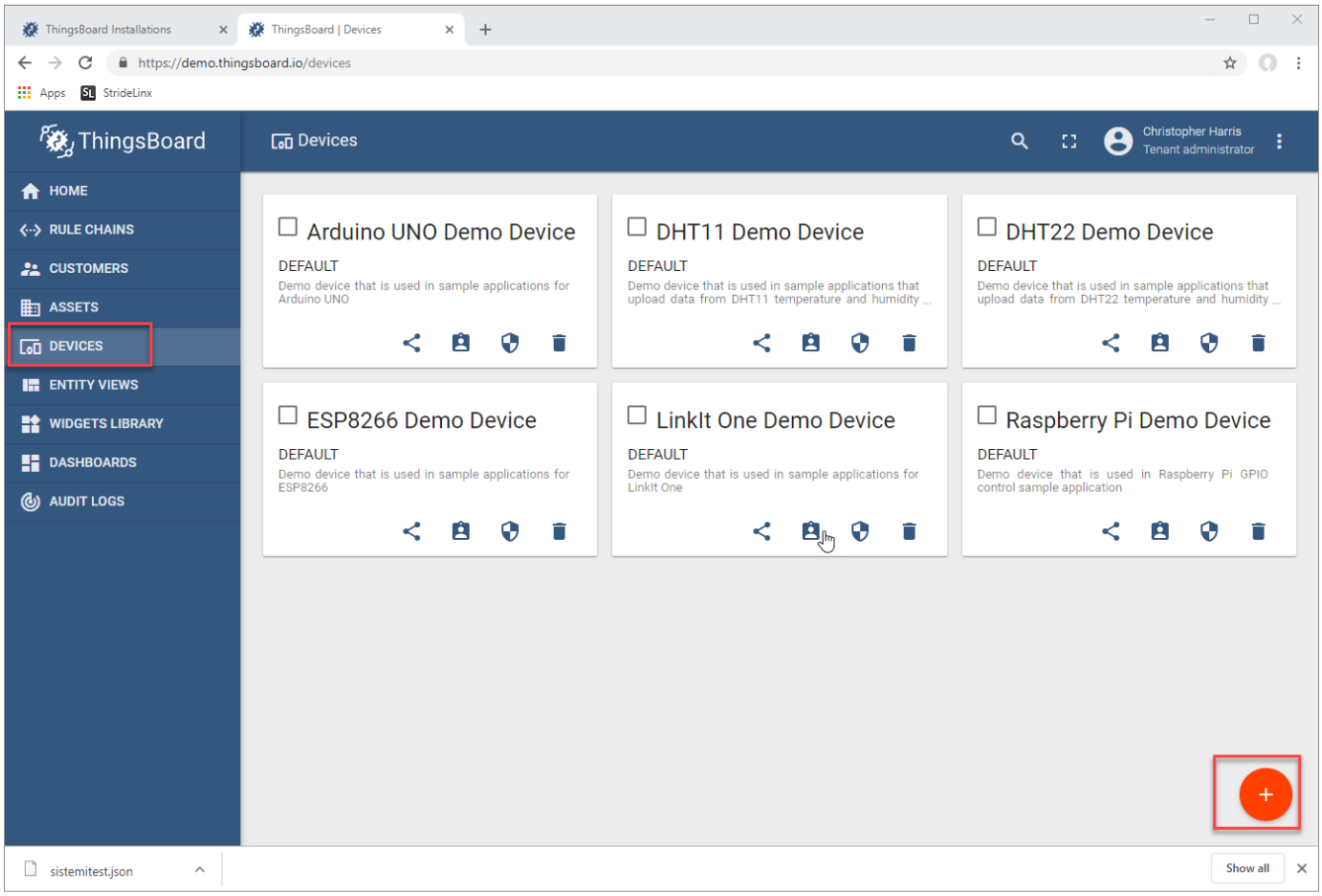
To begin, go to https://thingsboard.io and click on the "TRY IT NOW" button at the top. When presented with the screen shown below, choose the "LIVE DEMO" button.

Setup an account and activate it.

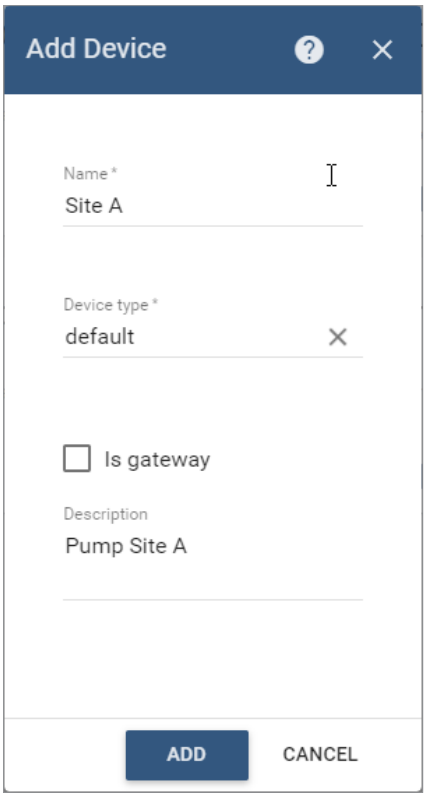


After the account has been created, go to https://demo.thingsboard.io.

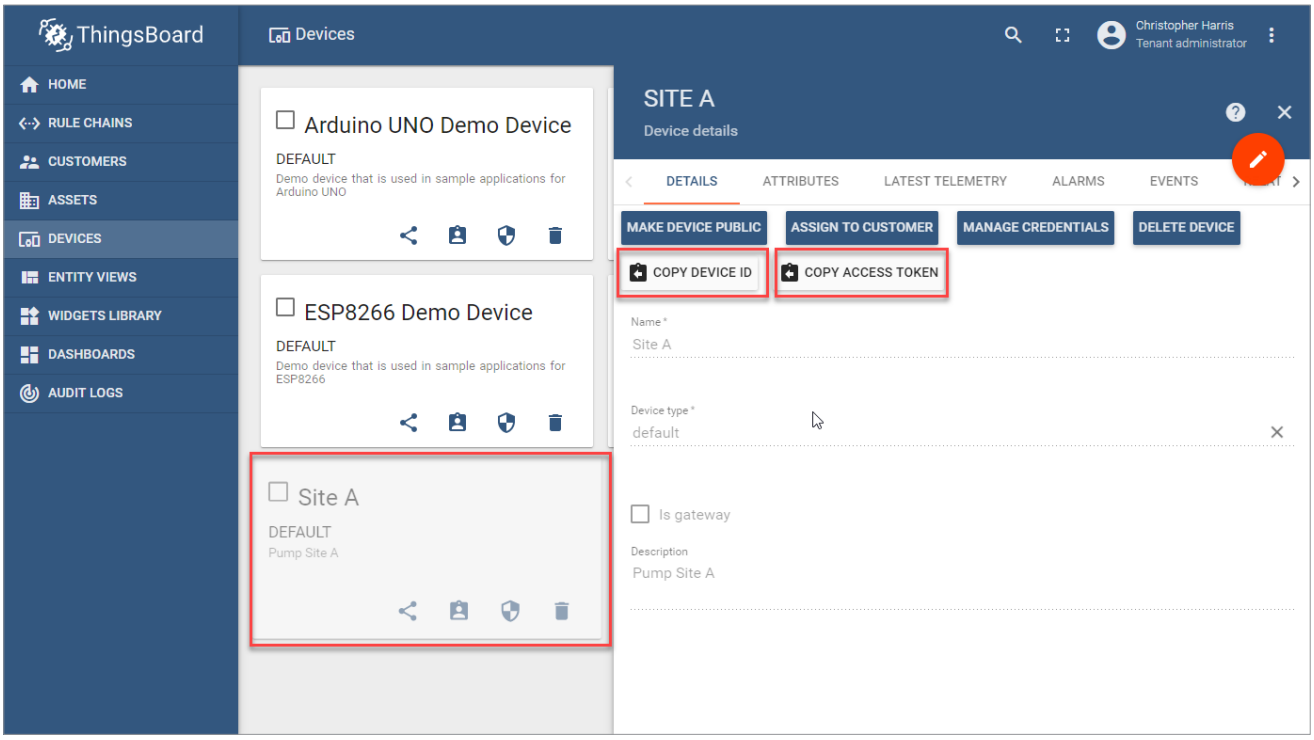
Sign in and go to the "DEVICES" tab on the left hand side. Click on the red + button on the bottom right hand side to create a new Device.



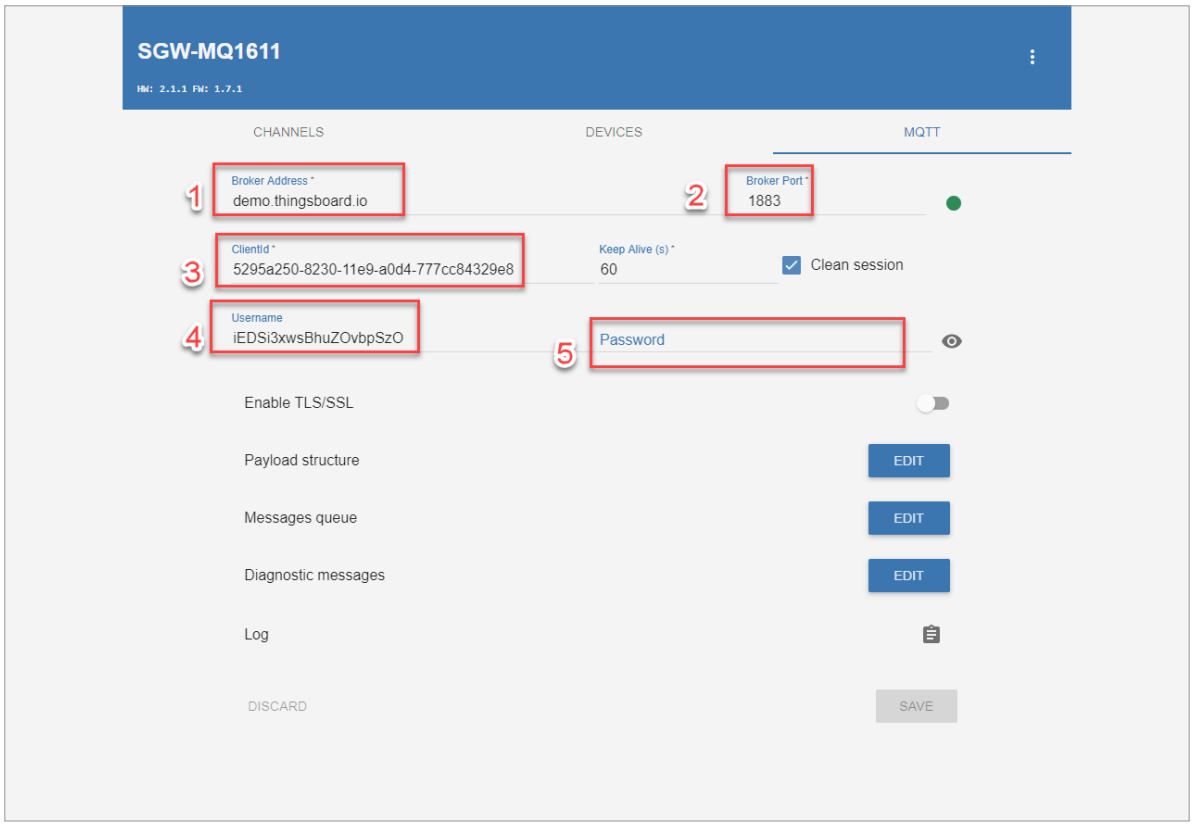
Enter in a unique name and choose the "default" Device type. The description is optional.



Click on the Device that was just created. There are 2 important buttons on this next screen: "COPY DEVICE ID" and "COPY ACCESS TOKEN". Click on the "COPY DEVICE ID" and then paste (CTRL-V) into the "ClientID" field of the MQTT setup tab in the MQTT gateway setup (field 3 in the screen capture below). Click on the "COPY ACCESS TOKEN" button and then paste this value into the "Username" field of the MQTT setup tab in the MQTT gateway setup (field 4 in the screen capture below).

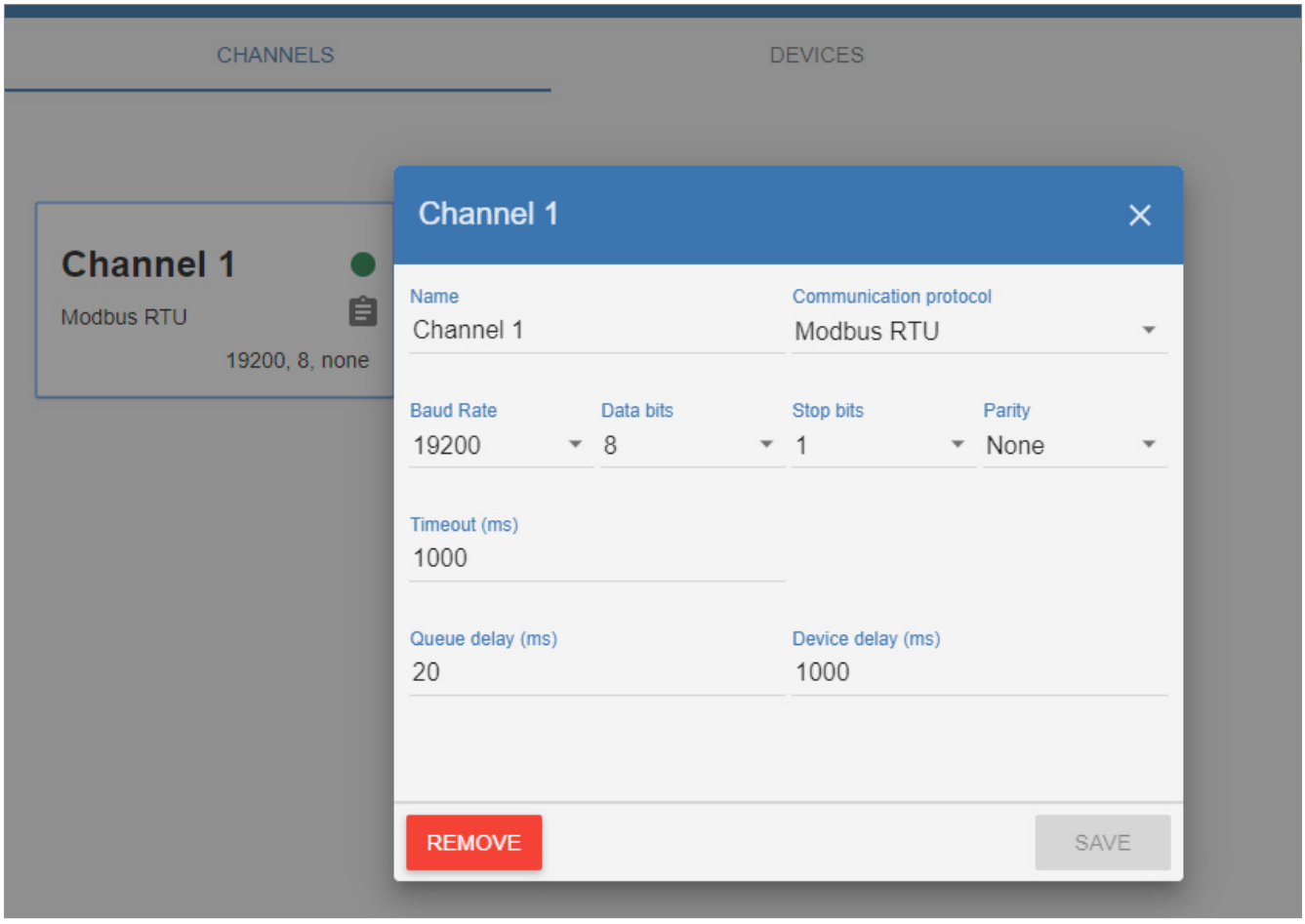


Switch to the setup of the MQTT gateway. The items are described below.

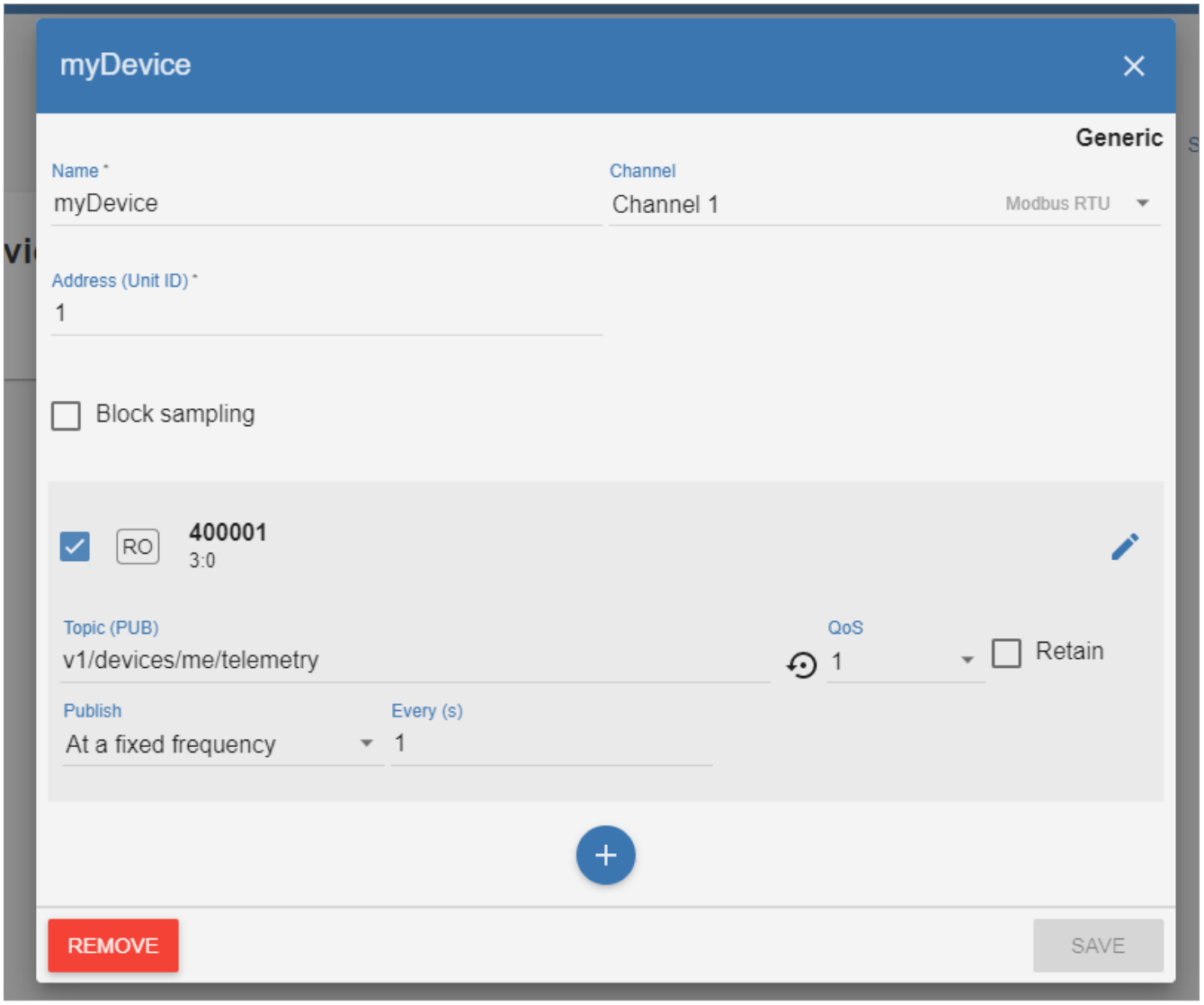


1. Broker Address should be: demo.thingsboard.io
2. Port number can be a few different options. For unencrypted connection, choose 1883.
3. This is the value that comes from the “COPY DEVICE ID” button of the thingsboard Device setup.
4. This is the value that comes from the “COPY ACCESS TOKEN” button of the thingsboard Device setup.
5. Leave this field blank for connectivity to thingsboard.

Go to the “Channels” tab of the MQTT Gateway setup and create a new Channel. In this example, we are performing Modbus RTU communications.

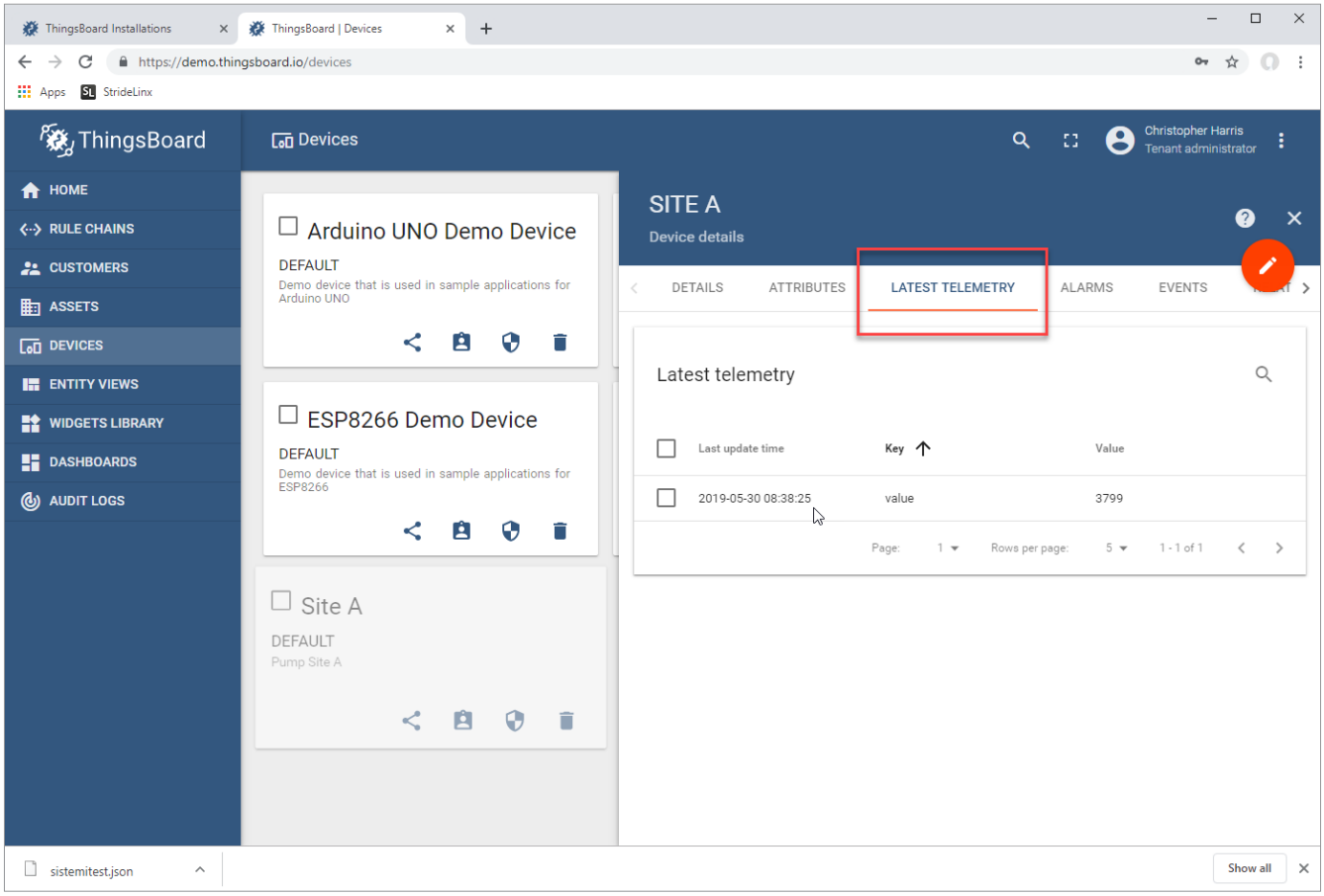


Go the “Devices” tab of the MQTT setup page. Create a new Device and choose the Channel just selected. Choose the Address of your Modbus RTU device. In this example, we are reading Modbus address 400001 (Function Code 3, Offset 0). This example is publishing at a fixed rate of 1 second. The topic MUST be exactly as shown in the screen capture below: v1/devices/me/telemetry

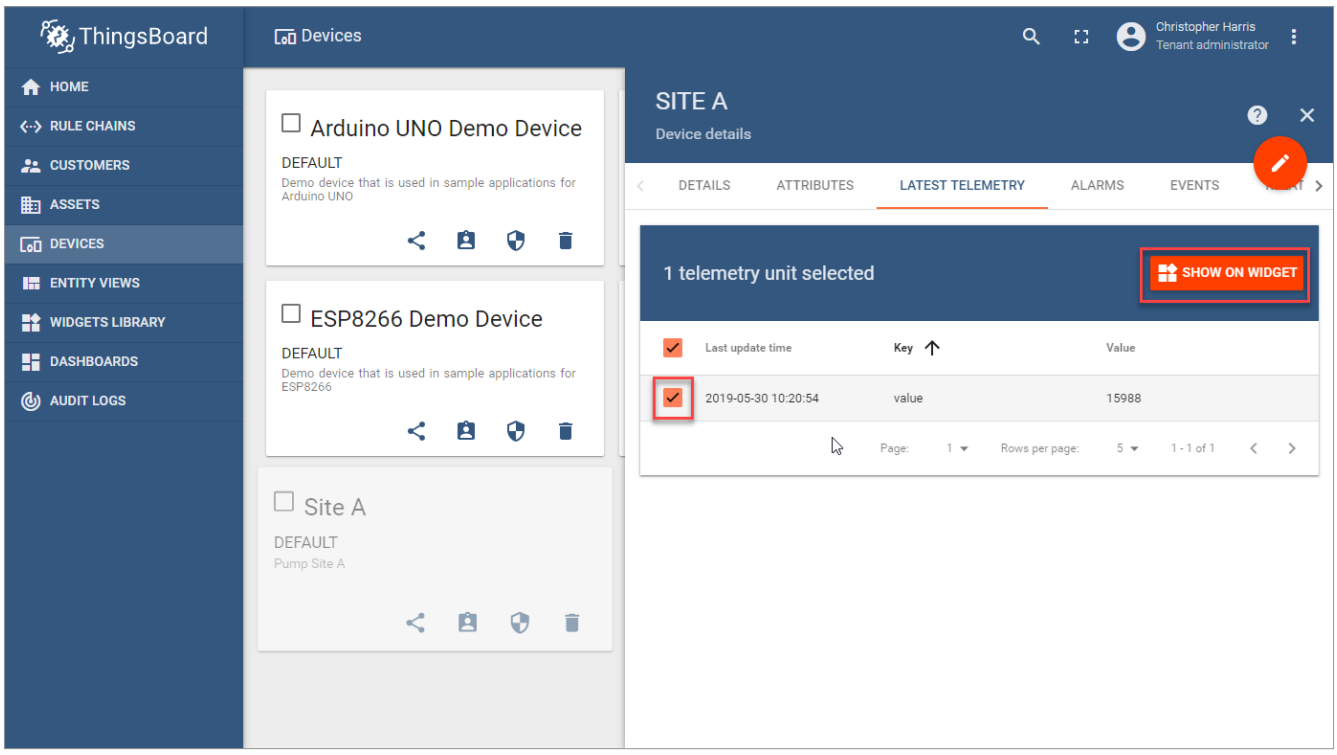


Save this configuration to the MQTT Gateway and switch back over to the thingsboard dashboard. In the Device setup, go to the "LATEST TELEMETRY" tab.

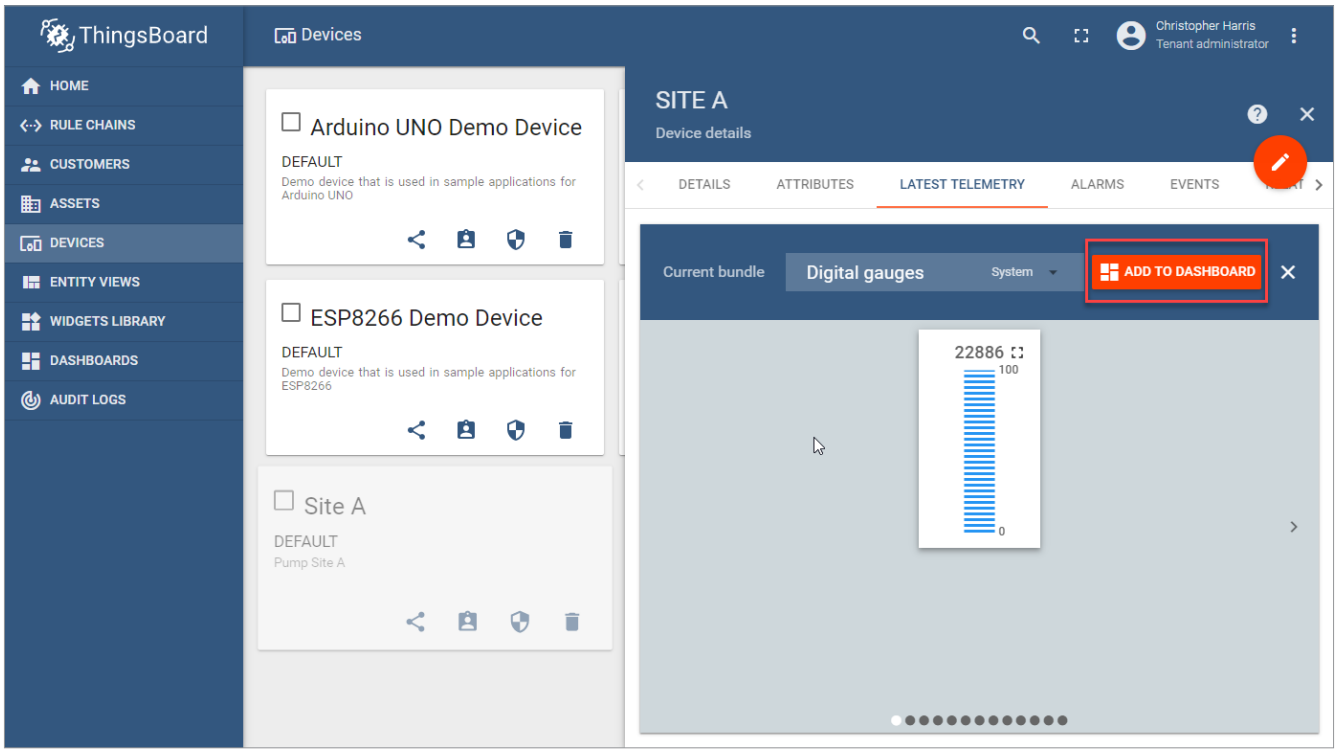
If the communications are setup correctly in the MQTT Gateway, there will be an updating value shown here.



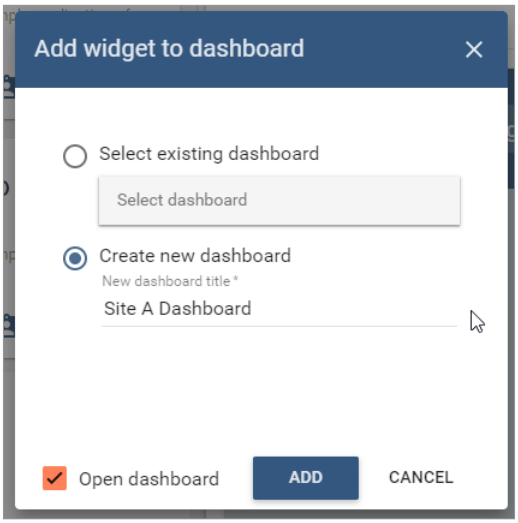
Click on the checkbox to the left of the item that is updating then click the "SHOW ON WIDGET" button.



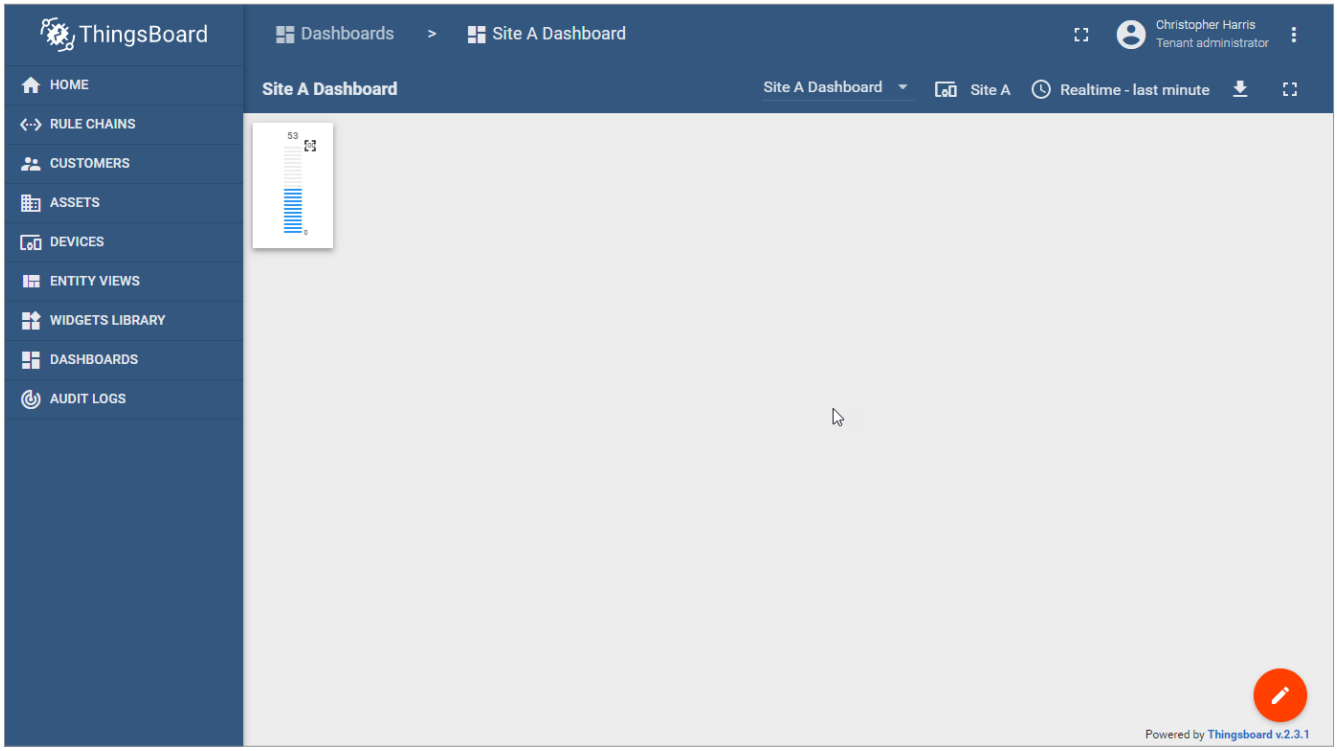
There is a list of widgets to choose from. For this example, we will choose a simple digital gauge as shown below. Click on the "ADD TO DASHBOARD" option after selecting a Widget.



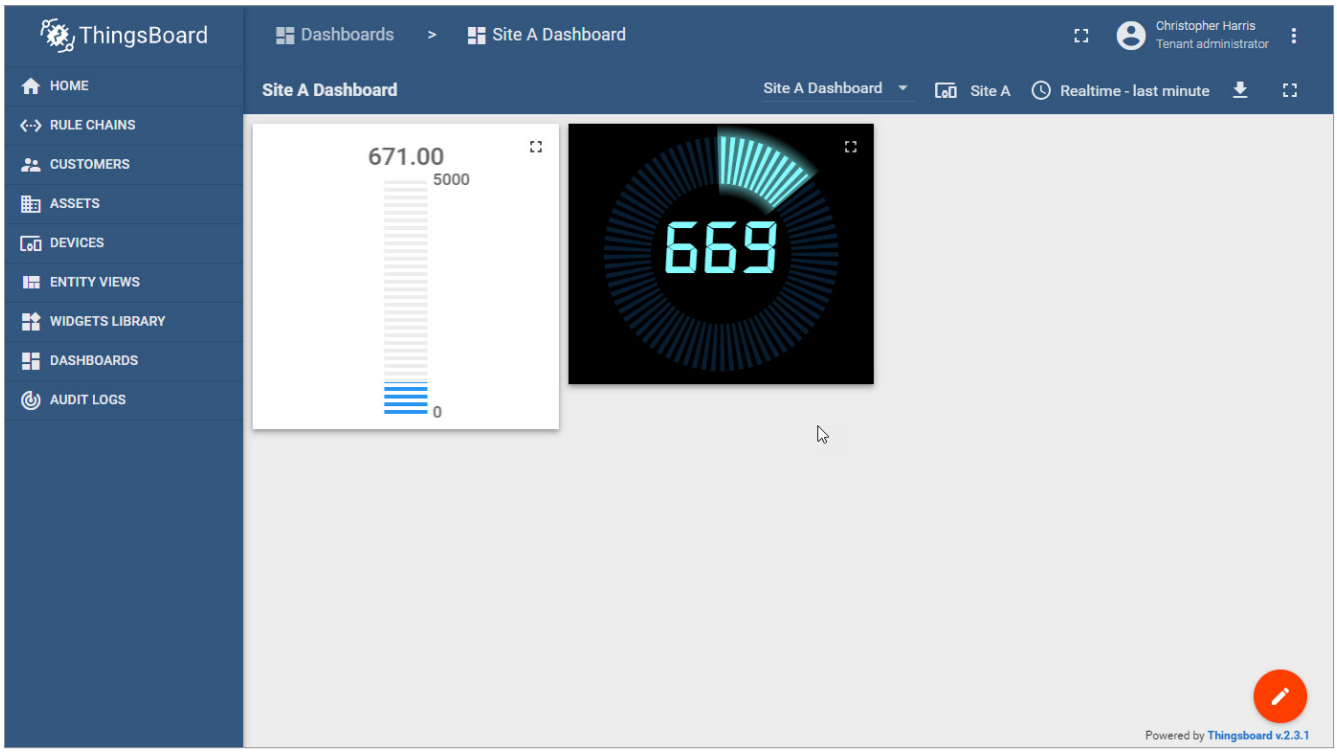
We will create a new Dashboard called "Site A" and choose the "Open dashboard" option.



The widget is now added to the Dashboard and is displaying the value in the Modbus RTU device at 40001. There are many other widgets and many display options available. To edit the dashboard and widgets, click on the pencil in the bottom right hand corner.



Dashboard after adjusting widget display options:



We hope that this brief example helps you see how you can use the platform to build a data dashboard for your intended use.