QuarkLink Ignite
Getting Started Guide

Version V1.10

Table of Contents

1 Scope

Welcome to the ***Crypto Quantique (CQ) QuarkLink Ignite Quick Start Guide***. This user guide is designed to provide information to users who have signed up for an **Ignite** version of the QuarkLink security platform.

2 Reference Material

The following additional reference material is recommended for review prior to using the QuarkLink **Ignite** security platform:

- QuarkLink User Guide
- QuarkLink Demonstration Videos (https://www.youtube.com/@CryptoQuantique)
- Crypto Quantique GitHub (https://github.com/cryptoquantique)

3 QuarkLink Ignite Hardware

The QuarkLink **Ignite** includes support for the Espressif Systems ESP32 family of RISC-V Wireless modules. The user requires an ESP32-C3 compatible module that includes USB connectivity in order to create a connected IoT device using the QuarkLink. Examples of ESP32 modules are available from electronics distributors. Some examples are shown below:

- M5eduKit (M5Stack)

- ESP32-DevKitM-1

4 Getting Started

Once a user has signed up to the **Ignite** version of QuarkLink (see ***Signup*** section of ***QuarkLink User Guide***) they will be sent an activation email with instructions on how to log into their new QuarkLink instance. It is assumed that the reader has completed this task and has access to their QuarkLink **Ignite**.

Signup can be accessed via the QuarkLink signup website : https://signup.quarklink.io/.

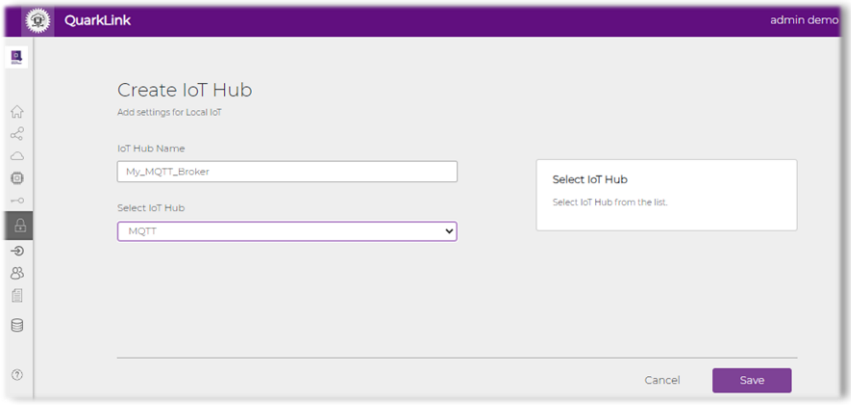
With access to a QuarkLink, a user can now build an IoT device (based on the ESP32) and connect it to either an IoT Hub (AWS or Azure), an MQTT broker or directly to a database (e.g.; Mongo Atlas).

This guide will take the user, step by step, through the process of provisioning an ESP32 such that it connects securely to the QuarkLinks local MQTT broker.

4.1 Creating an MQTT Broker

The QuarkLink needs to be configured to create and MQTT broker that will be used by the IoT device to receive and transmit messages (see ***QuarkLink User Guide*** section 12.4 for more information on MQTT broker support).

1. Log into the QuarkLink **Ignite** and click on the ***IoT Hubs*** menu option (left hand menu).
2. Click the ***Create IoT Hub*** button.



3. In the Create IoT Hub dialogue box enter the following information :

   IoT Hub Name : ***My_MQTT_Broker***
   Select IoT Hub : ***MQTT***

4. Click the ***Save*** button.

You have now created an MQTT broker instance for your QuarkLink. The MQTT broker URL and port is shown below :

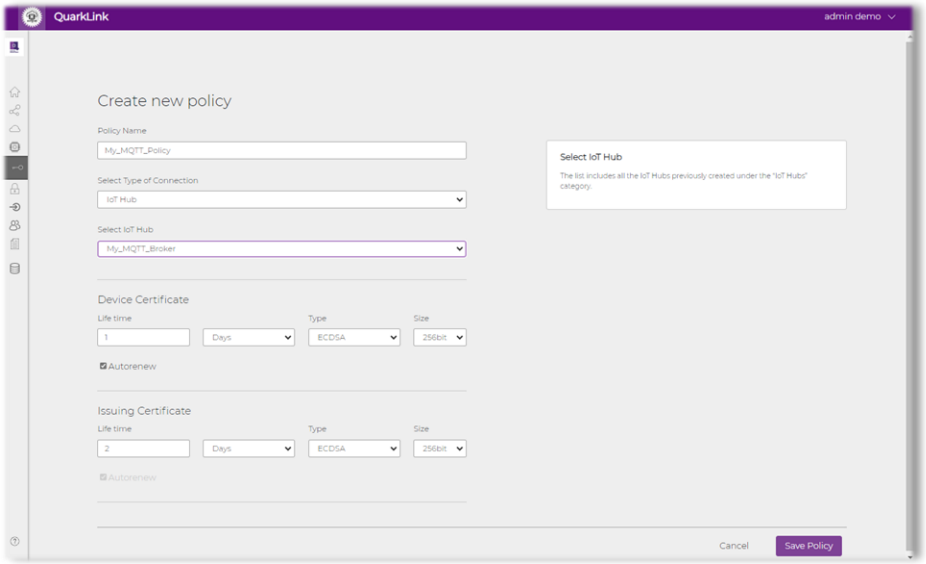
https://<quarklink_instance_name>.quarklink.io:8883

The IoT device that will be created can publish and subscribe to topics via this URL and port. Topics will be handled by the broker as appropriate supporting one to many and many to one capabilities.

4.2 Configuring the MQTT Policy

When an IoT device enrols onto the QuarkLink and has been securely authenticated, it will then be sent device credentials which include end point information and signed certificates dependant on what type of cloud service the device has been configured to connect to. The QuarkLink must be configured such that each enrolled device is sent the correct information based on a secure policy. The next step is to create a security policy for the MQTT broker created in section 4.1.

5. Click on the ***Policies*** menu option (left hand menu) of the Dashboard.
6. Click the ***Create new policy*** button.



7. In the Create new policy dialogue box enter the following information :

   Policy Name : ***My_MQTT_Policy***
   Select Type of Connection : ***IoT Hub***
   Select IoT Hub : ***My_MQTT_Broker*** (will be in dropdown menu).

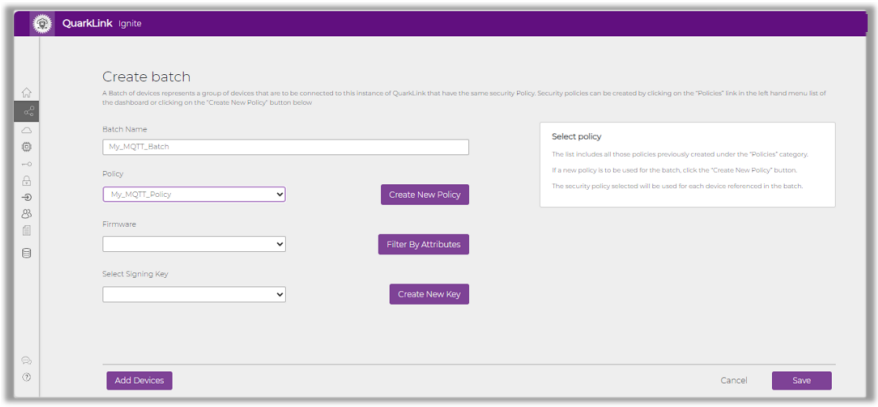
   All other inputs leave as default (see above).
8. Click the ***Save Policy*** button.

4.3 Creating a Batch

Prior to a device being recognised and authenticated by QuarkLink, the IoT devices identity must be configured into a ***Batch***. A ***Batch*** is a group of IoT devices that are associated with a security policy. The ***Batch*** links the IoT devices identity to a security policy. In this section we create a ***Batch*** that is associated with our security policy (see section 4.2). There a now IoT device identities that we can enter into the batch at this stage because we have not provisioned our IoT device. The provisioning step will program the IoT device and automatically load the IoT device identity into the ***Batch*** created in this section.

9. Click on the ***Devices*** menu option (left hand menu) of the Dashboard.
10. Click the ***Create Batch*** button.
11. In the Create Batch dialogue box enter the following information (see below) :

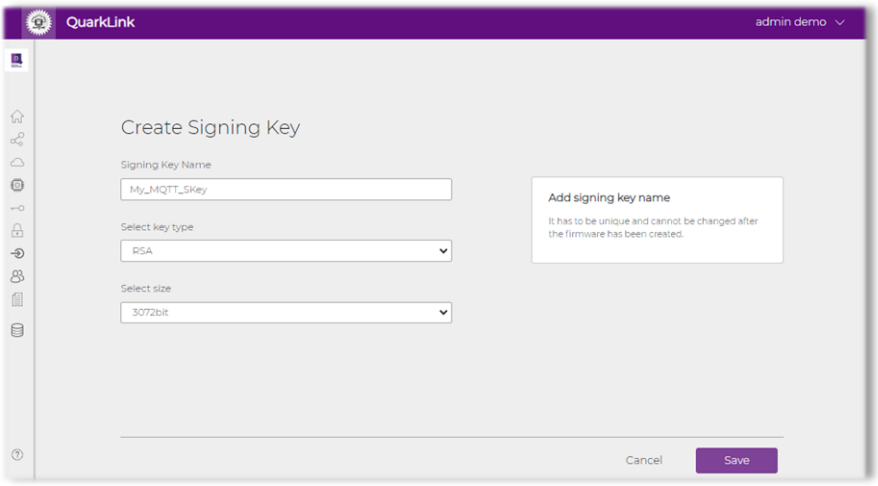
    Batch Name : ***My_MQTT_Batch***
    Policy : ***My_MQTT_Policy***
    Firmware : no entry



12. For the **Signing Key**, we need to generate a new key for the QuarkLink to use to sign any new software downloaded to the connected device. To do this, click on the ***Create New Key*** button.

13. In the **Create Signing Key** dialogue box enter the following information (see below):

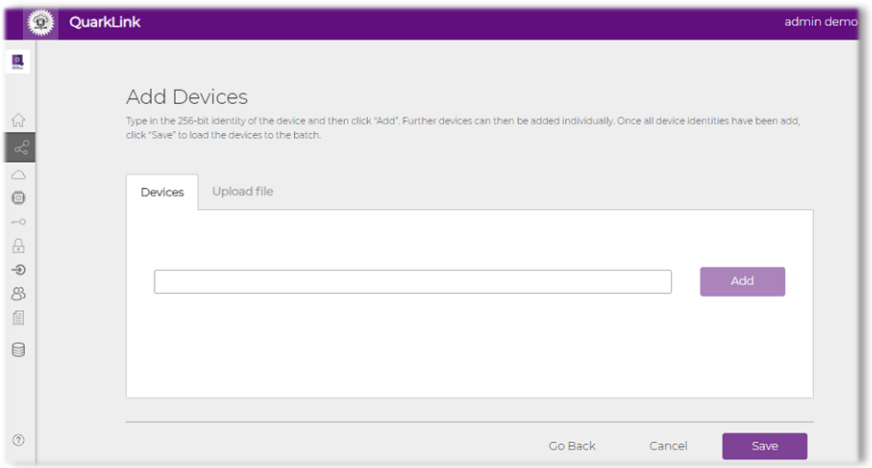
    Signing Key Name : ***My_MQTT_SKey***
    Select Key Type : ***RSA***
    Select Size : ***3072bit***



14. Click the ***Save*** button to generate the new key.

The display will revert back to the **Create Batch** dialogue box.

15. Click the ***Add Devices*** button.



The ***Devices*** will be automatically added during the provisioning step (see section 4.5). No information is required to be added in this dialogue box (see above).

16. Click the ***Save*** button.

4.4 Creating a Provisioning Task

At this stage of the procedure the QuarkLink has been prepared to enrol, create and deliver security credentials' to an IoT device once it has been authenticated. This next step is required to configure the QuarkLink provisioning tool which will carry out the following :

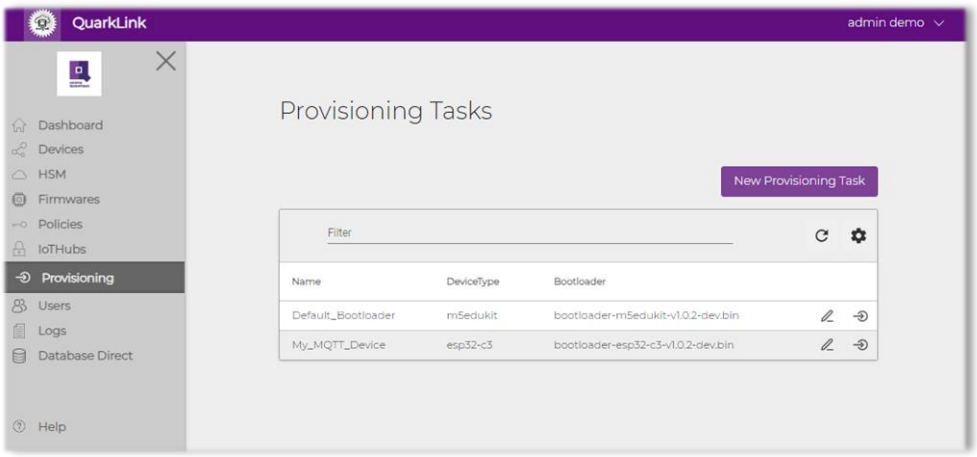
a. Program the IoT device with a secure bootloader
b. Program the IoT device with an Initial Enrolment Firmware
c. Extract the IoT device identity and add it to ***My_MQTT_Batch***.
d. Configure the IoT device with the local WiFi credentials to allow it to connect to the local WiFi network.

17. Click on the ***Provisioning*** menu option (left hand menu) of the Dashboard.
18. Click the ***New Provisioning Task*** button.
19. In the New Provisioning Task dialogue box enter the following information (see below) :

    Provisioning Task Name : ***My_MQTT_Device***
    Select Device Type : ***Esp32-c3***
    Select Bootloader : ***bootloader-esp32-c3-Vx.x.x-vefuse.bin***
    Select Initial Enrolment Firmware : ***Ief-esp32-c3-Vx.x.x-vefuse.bin***
    Select Batch : ***My_MQTT_Batch***

20. Click the ***Save Provisioning Task*** button.

The new provisioning task with be shown in the ***Provisioning Tasks*** table.



The QuarkLink is now ready to program an IoT device.

4.5 Provisioning an IoT device

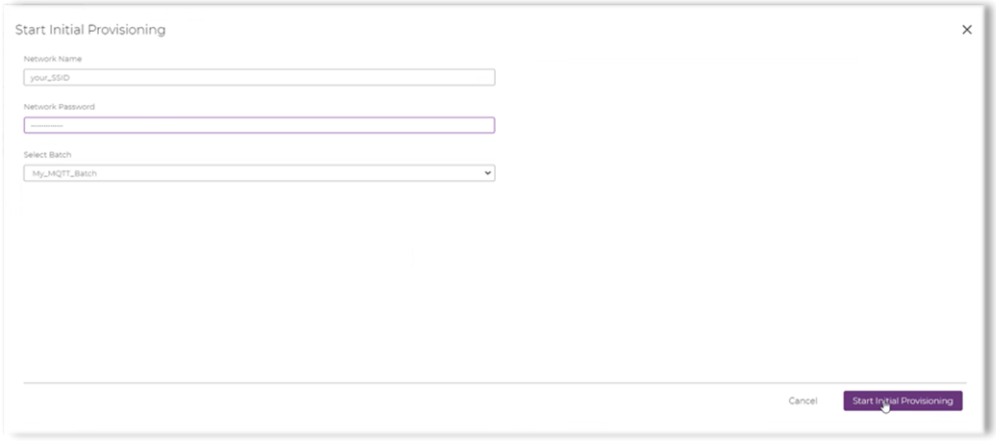
Now we will prepare an IoT device for connection (enrolment) onto a QuarkLink, capability to receive firmware updates and communication with an MQTT broker. Once provisioned, the provisioning tool will extract the IoT device identity and copy it to the selected ***Batch***.

21. Connect an Esp32-C3 IoT device (see section 3) to the PC/Laptop that is running the QuarkLink in a browser via a USB cable.

22. Click the  button.

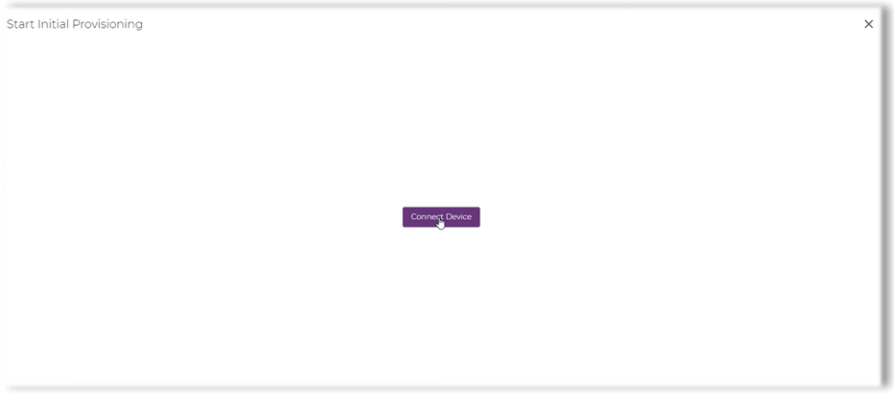
    In the dialogue box that opens, enter the following information (see below):

    Network Name : The SSID of your local WiFi network (no spaces)
    Network Password : WiFi network password
    Select Batch : ***My_MQTT_Batch***



23. Click the ***Start Initial Provisioning*** button.

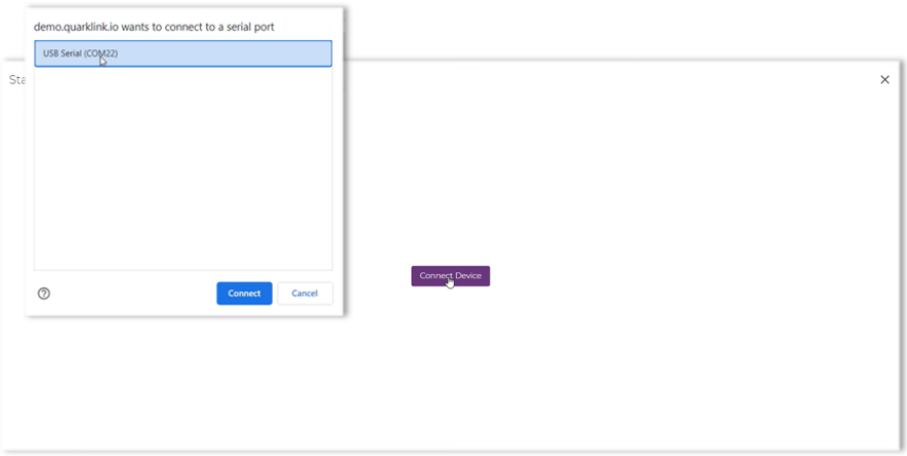
The dialogue box below will be shown.



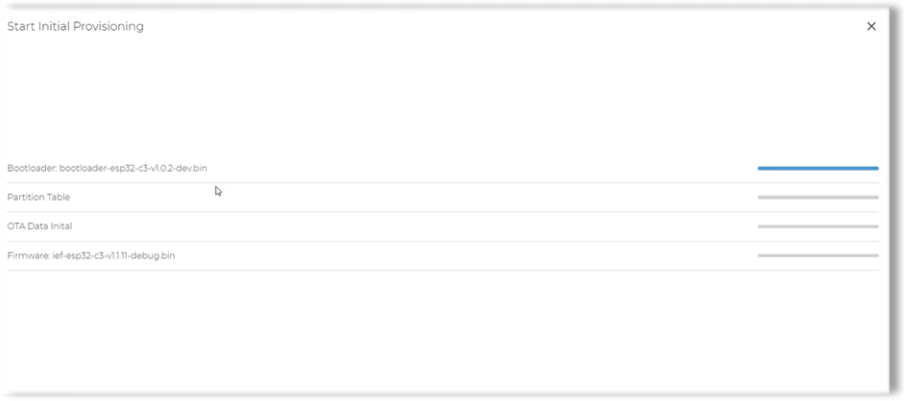
24. Click ***Connect Device***.

    The provisioning tool will now search the COM Ports of the PC/Laptop and display their descriptions.

25. Click on the correct IoT device description for your device and then click the ***Connect*** button (see below).

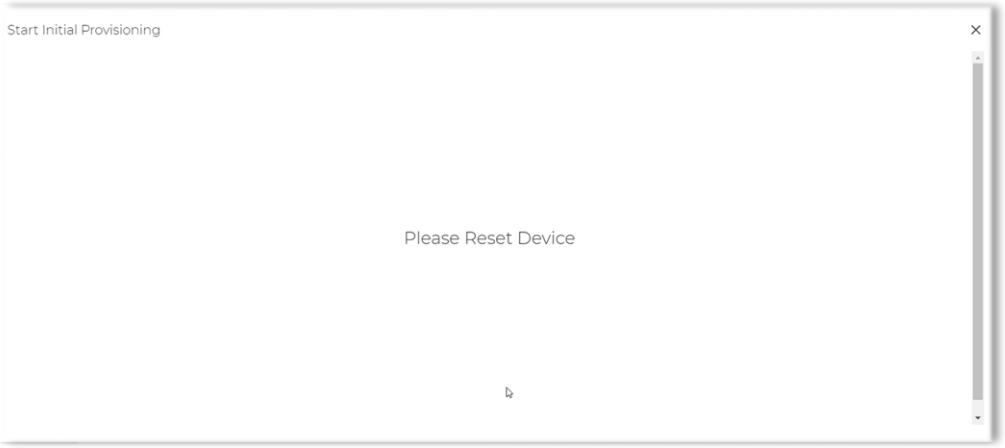


The provisioning tool will now provision the IoT device. The following screens will be displayed during the provisioning process.



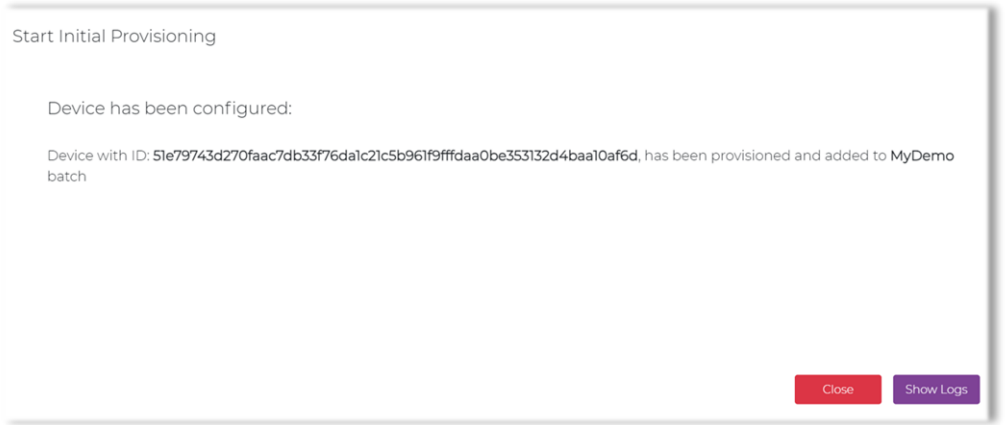
On completion of this screen the IoT device bootloader and IEF have been programmed.

On completion of this step, the WiFi credentials have been programmed into the device, the unique device identity has been extracted and sent to the Batch in the QuarkLink.



26. Press the reset switch/button on the Esp32-C3 IoT device.

    The IoT device will now reset and the provisioning tool will display the configuration settings of the IoT device that has just been provisioned. The dialogue box will also include a log of the entire provisioning process (see below).



Please note the ***DeviceID*** (recommend to copy and save to a file on the PC/Laptop).

27. Optionally, click the Show ***Logs*** button to display the log of the provisioning process (see below).

28. Close the ***Start Initial Provisioning*** dialogue box by clicking on the ***Close*** button.

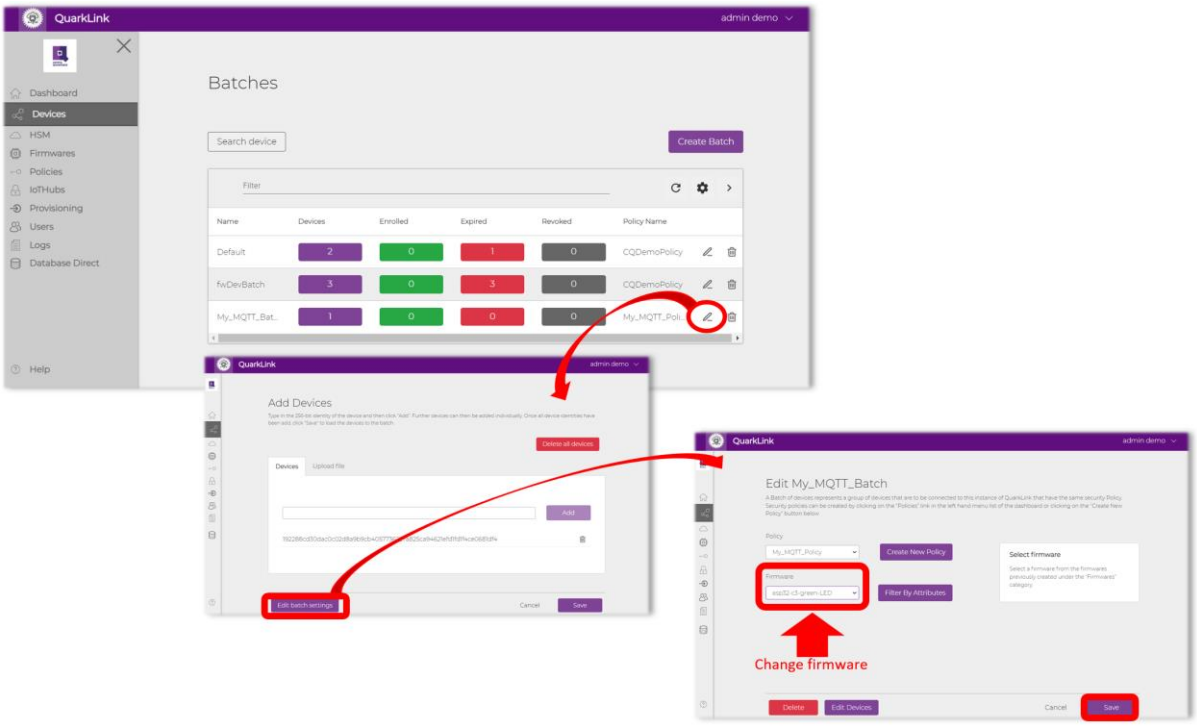
4.6 Firmware OTA Update

The Esp32-C3 IoT device has now been provisioned (programmed) with both a bootloader image and the IEF. Also, the Esp32-C3 IoT device has been configured with the local WiFi network to allow it to connect to the cloud based QuarkLink. The Esp32-C3 IoT device will now enrol onto the QuarkLink and check the status of the IoT system.

During the checking process, the Esp32-C3 IoT device will determine whether there is a firmware update available. The next steps will configure the firmware OTA function and trigger the process of re-programming the Esp32-C3 IoT device with new firmware.

To trigger a firmware OTA, follow the steps below:

29. There are two LEDs illuminated on the Esp32-C3 IoT device. There is a smaller RED led and a larger colour LED. Note the colour of the larger LED (either Blue or Green).
30. Click on the ***Devices*** menu of the left hand main menu in the QuarkLink ***Dashboard***.
31. Click on the ***Edit*** icon of the ***My_MQTT_Batch*** and the dialogue box shown below will be displayed:



32. Click on the ***Edit Batch Settings*** button and the Edit ***My_MQTT_Batch*** dialogue box will be displayed..
33. Click on the ***Firmware*** dropdown menu and select the firmware option that includes the colour GREEN in the filename. (Select Blue in the filename if the LED on the Esp32-C3 IoT device is currently illuminated green).

Note: The aim is to download a new firmware OTA that changes the colour of the LED on the Esp32-C3 IoT device.

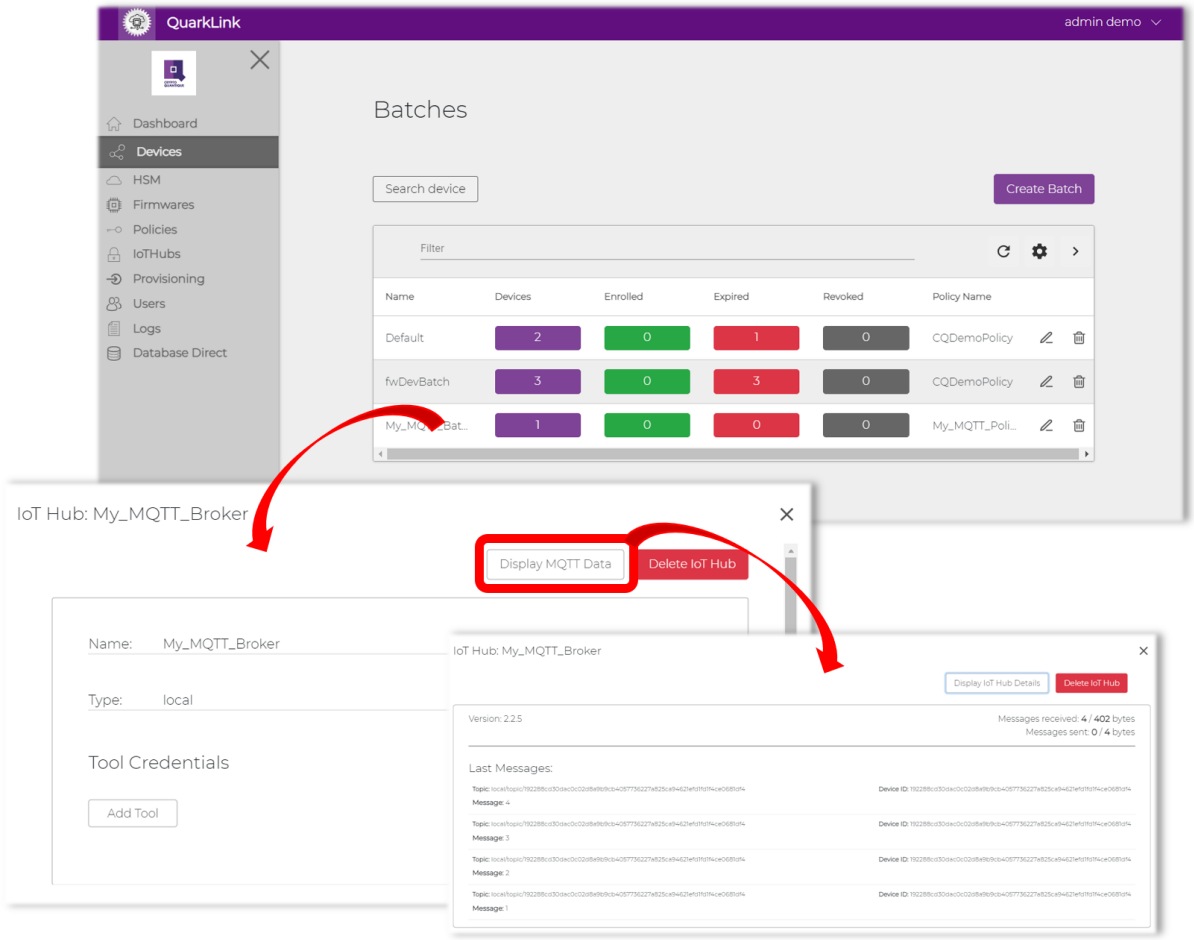
34. Click the ***Save*** button and wait for approximately 1 minute while the Esp32-C3 IoT device is being updated. The device will then reset and the LED colour will change. The Esp32-C3 IoT device has been successfully updated.

4.7 Monitoring MQTT Messages

Following on from section 4.6, the Esp32-C3 IoT device is running and transmitting message to the QuarkLink local MQTT broker over WiFi as defined in the ***My_MQTT_Policy*** (see section 4.2).

35. Click on the ***IoTHubs*** menu of the left hand main menu in the QuarkLink ***Dashboard***.

36. Click in the ***My_MQTT_Batch*** area and the IoT Hub: ***My_MQTT_Broker*** dialogue box shown below will be displayed:



37. Click on the ***Display MQTT Data*** button. The MQTT messages being transmitted from the Esp32-C3 IoT device will be displayed in the dialogue box (see above). The message will show an incrementing count value.

Congratulations!

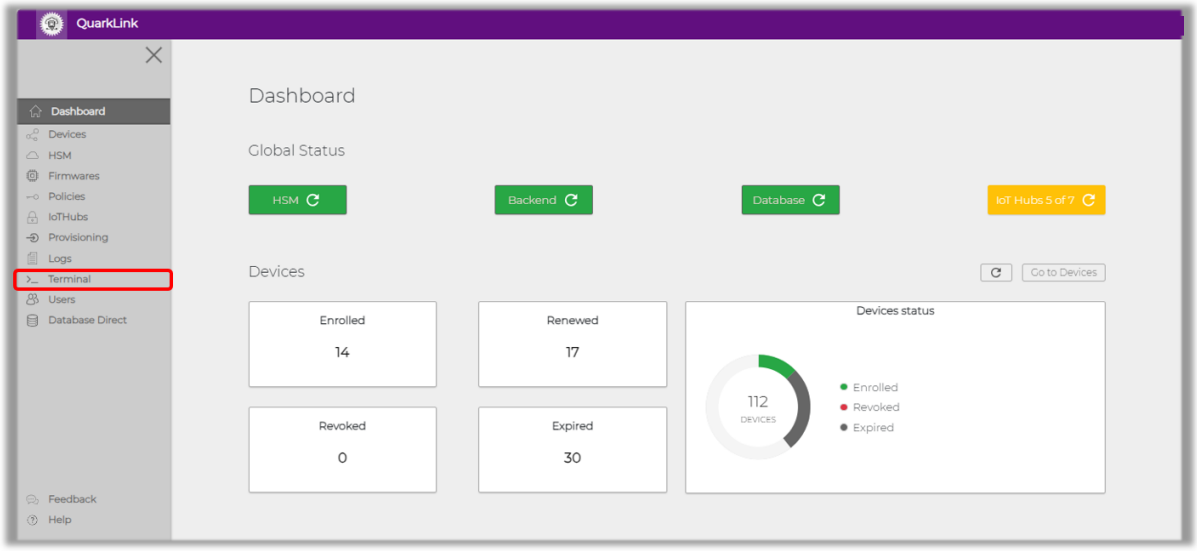
You have completed the Getting Started procedure for your QuarkLink **Ignite**!

5 Appendix I - Terminal Emulator Usage

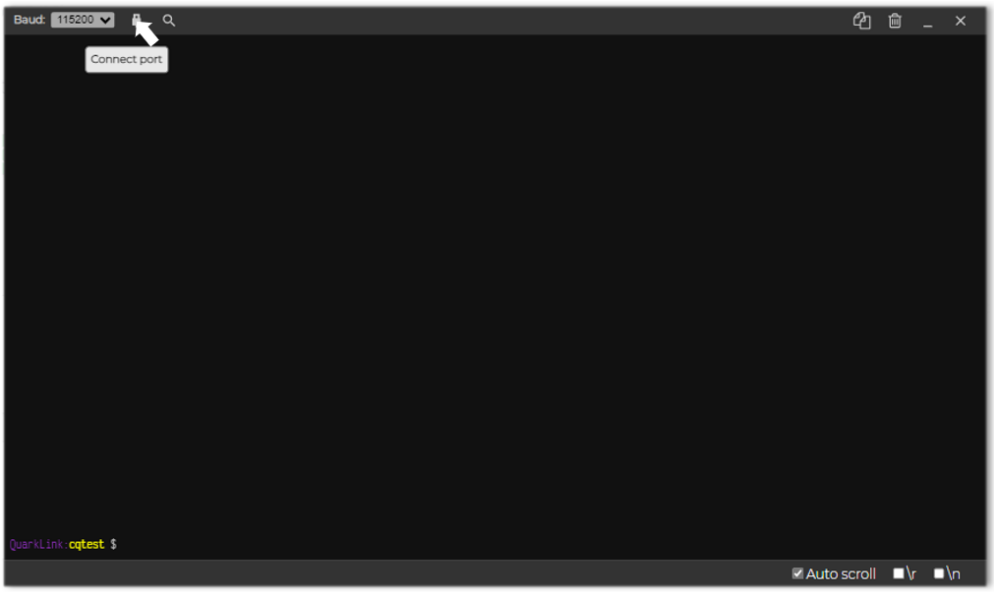
Once the Esp32-C3 IoT device has been provisioned via the QuarkLink Ignite (from section 4.6) it can continue to be connected to the Laptop/PC USB port to view the debug information transmitted by the IEF firmware. There are two terminal options available to the user to allow the display of debug information transmitted from the Espr32-C3 device. The options are detailed in the following sections.

5.1 Local Terminal Emulator

In line with Crypto Quantiques' mission to ensure ease of use of security tools, QuarkLink includes a terminal emulator application that can be used to receive UART information from any connected device. The **Terminal** application is accessed via the QuarkLink **Main Menu** on the left of the **Dashboard** display, see below:



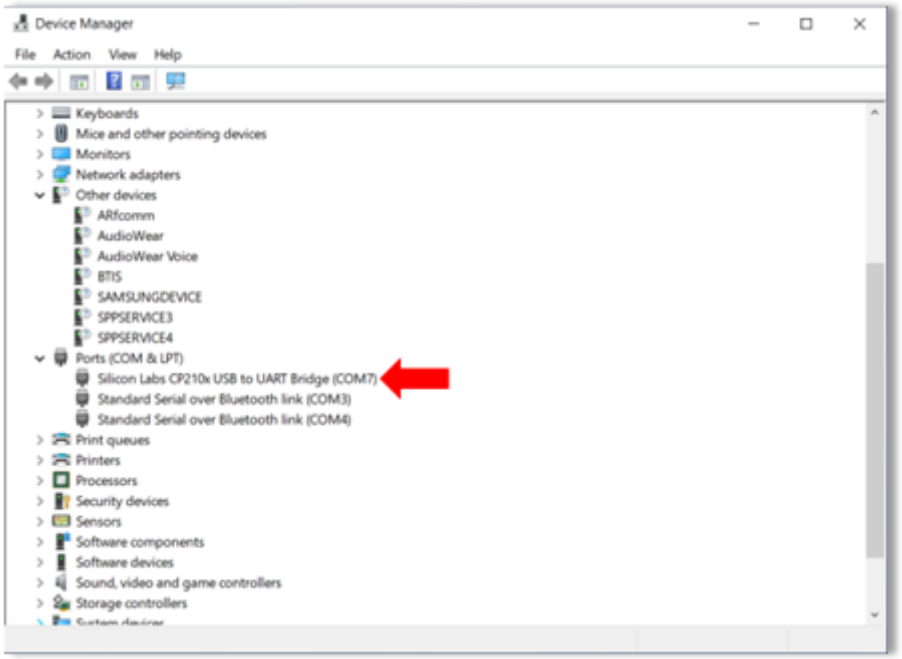
Click on the ***Terminal*** option to display the terminal window. Once the terminal is open click on the ***Connect*** button to connect to the device (see below).



5.2 Third Party Terminal Emulator

Several Terminal Emulator products are available. The following information may be helpful in setup of the terminal emulator.

The users PC/Laptop that will be utilized during the Getting Started process may not have the correct drivers installed to communicate with the Esp32-C3 IoT device. The Esp32-C3 IoT device uses a CP210x USB to UART Bridge device to allow connection to a PC. If there are no drivers installed on the PC (Windows) a USB device will appear under ***Other devices*** in the **Device Manager** utility. If drivers are installed, the USB device will appear under ***Ports*** (see below).



If the drivers for the device have not been installed, ensure you are an administrator for your machine, and download the drivers from here - https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads and install the relevant driver package for your machine.

With the drivers installed correctly, the Device Manager will indicate the correct ***COM port*** to use for the chosen Terminal Emulator program.

Useful Links :

Download https://putty.org/

Download http://www.teraterm.org/

Download https://freeware.the-meiers.org/

6 Revision History

QuarkLink Ignite Getting Started Guide

Rev.	Date	Owner	Description
1.00	12.7.2023	CDJ	Original document
1.10	20.9.2023	CDJ/KB	Updated batch settings screen, terminal and Application description

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