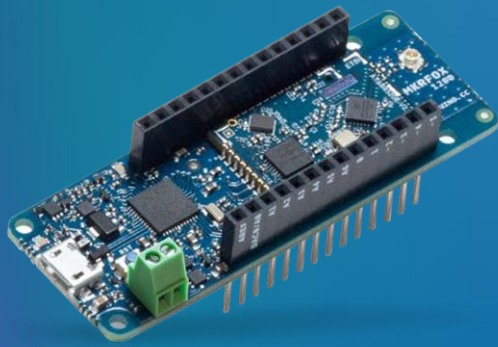


ARDUINO MKR NB 1500 & TELSTRA IOT PLATFORM INTEGRATION GUIDE



SO, YOU WANT TO CONNECT YOUR ARDUINO TO AN IOT PLATFORM?

We hope you've been enjoying your purchase of the Arduino MKR NB 1500. Our introductory offer is a great opportunity for you to get some hands-on IoT developer experience and get cracking on that project you've always had in mind! Let us know what you're working on by posting in our [project sharing community forum](#) or emailing us at telstradev@team.telstra.com

This guide will help you connect your device to the [Telstra IoT Platform - Cumulocity](#) (TIOTP). After following these steps, you will be able to send data from the Arduino board to the cloud and access the data on our online dashboard.

GET STARTED

CHAPTER 1	EXPLANATION	3
	Introduction	3
	Telstra IoT Platform - MQTT Device Integration	3
	Arduino Environment	3
CHAPTER 2	PROCEDURE	4
	Procedure	4
	Troubleshooting	8
	Future Steps	9
	Summary	9

Chapter 1

EXPLANATION

INTRODUCTION

This guide will show you how to:

- Register an Arduino MKR NB 1500 on the Telstra IoT Platform (TIOTP) over MQTT
- Send measurements from an Arduino MKR NB 1500 to the TIOTP over MQTT

Previously referred to as Cumulocity, Telstra IoT Platform gives you very fast visibility and control over your remote assets. You can either build applications for your needs or buy and download pre-built ones. For more info, start at our [Telstra IoT Platform introductory blog post](#), [check out our Enterprise website](#) or the [Cumulocity IoT introduction page](#).

If you are looking to use the Telstra IoT Platform's REST Interface over HTTP see [this example instead](#).

The following steps should still work even if you haven't purchased your board and SIM from Telstra. However, in that case you may have to make slight adjustments to work with your TIOTP tenancy.

TELSTRA IOT PLATFORM - MQTT DEVICE INTEGRATION

It is assumed you already have a TIOTP tenancy. This is what allows you to monitor the connectivity and operations of your IoT devices. If you need help signing up for a tenancy, start at our [Telstra IoT Platform introductory blog post](#), or request a call back with a Telstra Representative via our [IoT website](#).

TIOTP offers a wide range of functionality for interfacing IoT devices and other IoT-related data sources with the platform. [MQTT](#) is one of the languages used to 'talk' between the device and the platform. For an explanation on how devices integrate to the TIOTP using MQTT refer to the [Cumulocity documentation](#).

TIOTP assumes each device has a unique identifier. For this example we are using the [IMEI](#) number printed on the u-blox module of your Arduino. In the script below, we will verify that IMEI for you to copy and paste!

ARDUINO ENVIRONMENT

It is recommended that you have setup your Arduino MKR NB 1500 device and run through our general [Starter Guide](#) first. No third-party libraries are required, only the standard MKRNB and ArduinoMqttClient libraries from Arduino. Install these libraries in the Arduino IDE Library Manager found under Tools > Manage Libraries.

The example code for this guide used can be found on Telstra's [GitHub](#).

At a high-level, the example program does the following steps:

1. Fetches device-specific credentials for your TIOTP tenancy
2. Creates itself in the TIOTP's inventory using those credentials
3. Sends dummy measurements every minute

After verifying this all works, you should then customise the sample code to fit your use case.

Chapter 2

PROCEDURE

PROCEDURE

1. Get the Telstra IoT Platform Static User Credentials

When you have a Telstra IoT Platform tenancy, reach out to Telstra Enterprise IoT Solutions Centre to get your unique TIOTP Static User Credentials:

Support Number: 1800 325 220, Option 2, Option 4

Support Email: Enterprise.IOT.Support@team.telstra.com

2. Get the Example Code

Visit [Telstra's GitHub](#) and either clone or download the repository.

Open the .ino file from that repo in the Arduino IDE.

This sketch simulates a temperature sensor being attached to the Arduino. We hard code the sketch to send randomly generated dummy temperature measurements every minute. This dummy data is just to prove the connectivity and data flow from your Arduino device through the IoT network to the Telstra IoT Platform via MQTT. After completing the below instructions, you may attach your own live sensors and modify the code accordingly to take true measurements.

3. Update the Secrets file

Update the arduino_secrets.h file from the repo with your TIOTP domain and the static user credentials from the earlier step (different to your normal TIOTP user credentials).

The Tenant ID is the unique identifier for your tenancy. It can be found via logging into your account and clicking your user name. The Tenant ID will be at the bottom of the dropdown menu.

```
#define SECRET_BROKER "tenantname.iot.telstra.com/mqtt"  
#define SECRET_USER "tenant id/username"  
#define SECRET_PASSWORD "password"
```

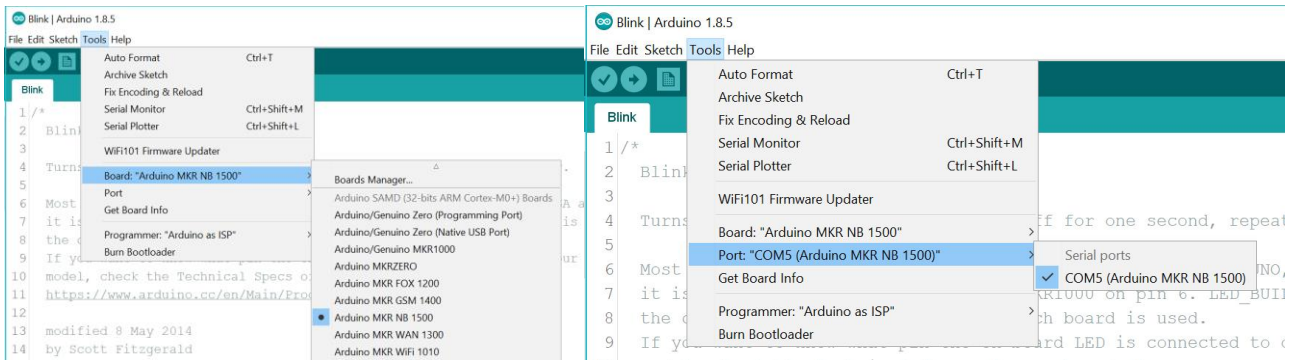
4. Connect your board to your computer

Connect your Arduino board to your computer running Arduino IDE via micro-USB cable. See the micro-USB on the side of the board in the image below.



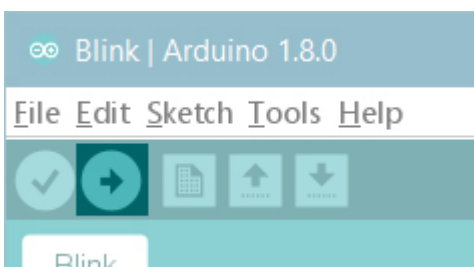
5. Select the correct board and serial port

You need to select the correct board from *Tools > Board > Arduino MKR NB 1500* and the correct serial port which is occupied by the board.



6. Upload the Sketch

Upload the sketch by clicking the arrow button, the second round icon from left on the top bar of the Arduino Software (IDE) or press *Ctrl+U* or else select the menu *Sketch* and then *Upload*.



The sketch will be compiled and then uploaded. After a few seconds the bottom bar should show *Done Uploading*.

7. View the Serial Monitor

Open the Serial Monitor under the 'tools' menu bar, or by hitting *Ctrl+Shift+M*.

You should see an output like the below. Copy your device's IMEI as you will need it for the next step. The "Publishing register device message" will keep repeating until we complete the next step.

Further troubleshooting for this step can be found in the [Troubleshooting](#) section

```
Modem's IMEI: <IMEI>

Connecting to LTE Network
Connected to LTE Network

Registering device
Attempting to connect to MQTT broker: <tenant>.iot.telstra.com

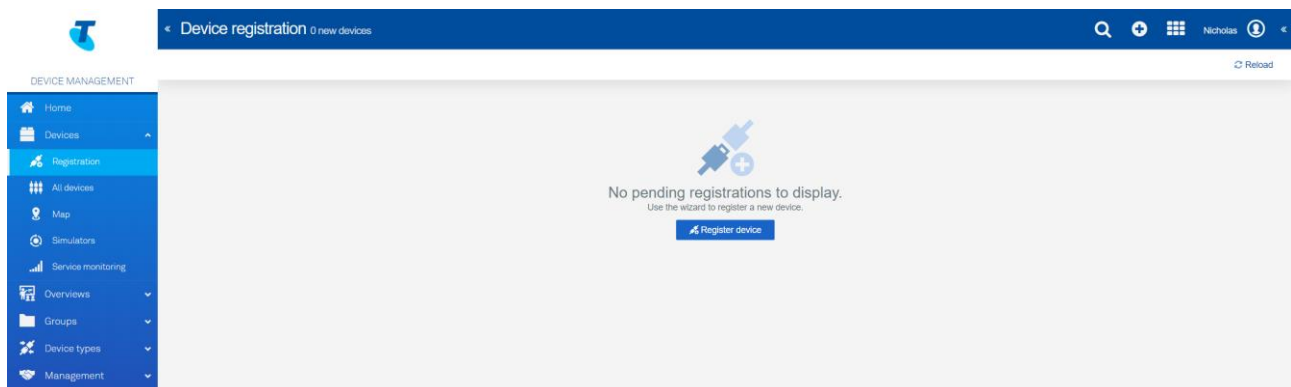
You're connected to the MQTT broker

Publishing register device message
Publishing register device message
Publishing register device message
```

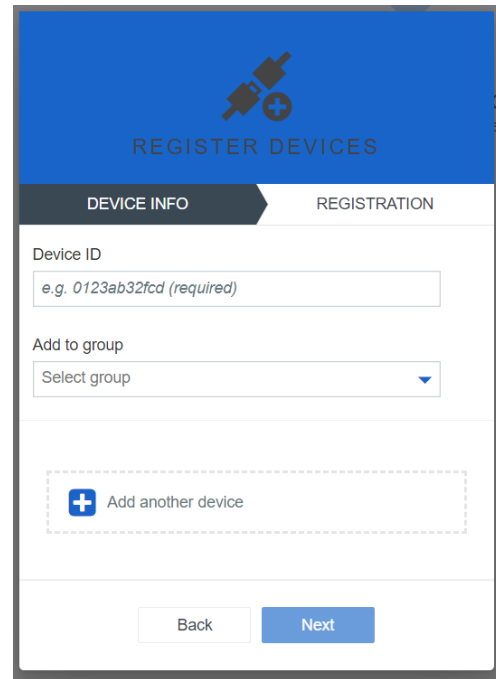
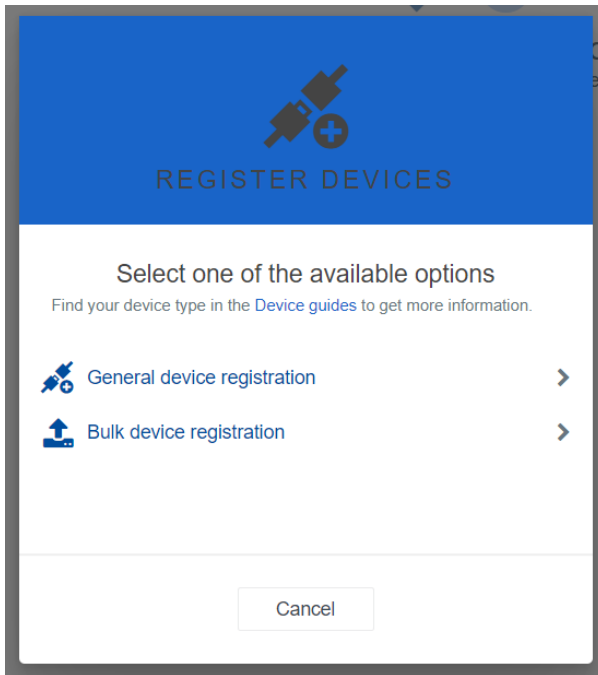
8. Register the device in Telstra IoT Platform

Log in to TIOTP and switch to the Device Management application.

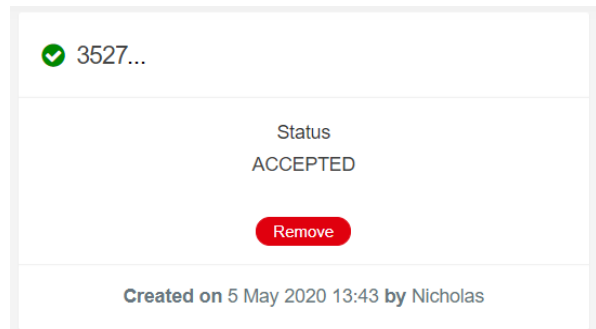
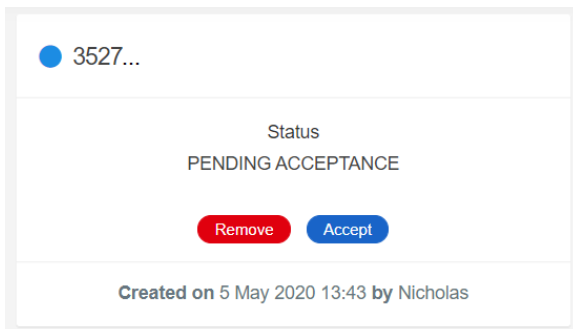
Navigate to Devices > Registration. You won't have any devices pending yet.



Click Register device > General device registration. Enter the IMEI printed to the Serial Monitor in the Device ID field and click Next.



Click Accept on the newly created device registration. If the Accept button has not appeared yet, you may need to use the Reload button in the top-right corner. Check the Arduino Serial Monitor to make sure it has not timed out.



9. Device Created in Telstra IoT Platform

Once accepted, TIOTP will send the device credentials to the Arduino and the Arduino will now use those credentials to create a device in TIOTP's inventory.

The Serial Monitor should now output like below.

```

Received a message on topic: s/dcr
70,<tenant_id>,<username>,<password>
Received device creds
Device registered

Creating device
Using username: <tenant_id>/<username>
and password: <password>
Attempting to connect to MQTT broker: <tenant>.iot.telstra.com

```

You're connected to the MQTT broker

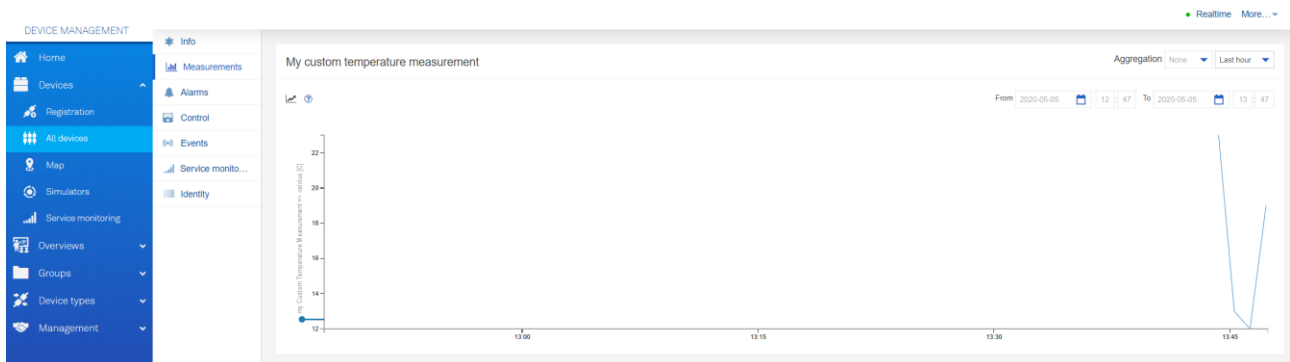
Publishing create device message

Device created

10. Measurements in Telstra IoT Platform

Navigate to Devices > All devices. Your device should have appeared.

If you switch to the Measurements tab, you will see the Arduino send a measurement every minute. In the sample code, the temperature is a random number. This is where you would customise for your use case, using real data input from your sensors.



Every time a measurement is published, the following will be printed to the Serial Monitor.

Publishing measurement message

```
200,myCustomTemperatureMeasurement,celcius,23,C
```

TROUBLESHOOTING

If your sketch is not printing to the serial monitor as planned, take note of the Error codes. Refer to the list of error codes in this file: [Arduino MQTT Client Error Codes](#). A summary of these codes is as follows:

Error Code	Error Definition	Troubleshooting
-2	MQTT Connection Refused	Make sure that the socket address (combination of IP and port number) for your TIOTP account is correct. Port number is set to 1883.
-1	MQTT Connection Timeout	Recompile and upload program. Increase value of <i>timeOutMillis</i> in program file.
0	MQTT Success	-

1	MQTT Unacceptable Protocol Version	Protocol level is not supported by the server. If this occurs, ensure you are using MQTT protocol. Redownload all provided programs.
2	MQTT Identifier Rejected	Sketch uses IMEI as Identifier. Change this line: mqttClient.setId(imei); To : mqttClient.setId("<write_IMEI_here>");
3	MQTT Server Unavailable	Take note on if the failure to reconnect is constant, or only happens sometimes. Contact your Telstra representative.
4	MQTT Bad Username or Password	Verify username and password in Secrets file. Check you have read and write privileges in that account.
5	MQTT Not Authorized	Verify username and password in Secrets file. Check you have read and write privileges in that account.

If you receive the error: "Can't find IMEI" try an alternative power source, check the [Arduino Troubleshooting Guide](#) and check the [Arduino forums](#) for further troubleshooting steps.

At any stage in your development, if you get stuck or come across some errors, check out our online resources:

- Review the [Frequently Asked Questions](#)
- Read the posts on our [TelstraDev forum](#) and the [TelstraDev blog](#)
- Check your error codes [on GitHub](#)
- [Join the community](#) with our good friends at Arduino

If you're REALLY stuck, post your problem on our [TelstraDev forum](#) and one of our team or a fellow dev will help.

For platform questions with the Telstra IoT Platform, reach out to Telstra Enterprise IoT Solutions Centre:

Support Number: 1800 325 220, Option 2, Option 4

Support Email: Enterprise.IOT.Support@team.telstra.com

FUTURE STEPS

Your device is now connected and sending test measurements to your TIOTP tenant. From here, you may wish to try connecting a sensor to your Arduino in order to take real time messages. This will include editing the `Arduino_mqtt_nb_1500_cumulocity-mqtt` file so that the device will publish a sensor reading every second. More information on TIOTP's sensor library can be found [here](#). There are many possible IoT sensors for you to try, let us know your favourite, and remember to share your projects on our [community forum](#)!

SUMMARY

We saw in this guide how to add your device to the Telstra IoT Platform and send/receive some dummy measurements. Now it is your turn to explore ideas and create something using this great technology combo at your disposal.

We want to share your projects, no matter how big or small, to continue inspiring developers in the IoT community. You could sit alongside our case studies, how to's, guides and project ideas, on the [TelstraDev Developer Portal](#). Let us know what you're working on by posting on our [community forum](#).